UNIVERSAL CYCLOPÆDIA AND ATLAS

VOLUME II

UNIVERSAL CYCLOPÆDIA AND ATLAS

A NEW EDITION UNDER DIRECTION OF

CHARLES KENDALL ADAMS, LL.D.
PRESIDENT OF THE UNIVERSITY OF WISCONSIN
EDITOR-IN-CHIEF

ASSISTED BY A CORPS OF ASSOCIATE EDITORS
COMPOSED OF THE ABLEST AND MOST DISTINGUISHED SCHOLARS
IN THE UNITED STATES AND CANADA, AND OF EMINENT
SPECIALISTS IN BOTH EUROPE AND AMERICA

A NEWLY REVISED AND ENLARGED EDITION

ROSSITER JOHNSON, PH.D., LL.D.
EDITOR OF REVISION

ILLUSTRATED WITH COLORED PLANS, PLATES, AND ENGRAVINGS

COMPLETE IN TWELVE ROYAL OCTAVO VOLUMES

VOLUME II

NEW YORK
D. APPLETON AND COMPANY
PUBLISHERS
1901

MAPS IN VOL. II.

POLITICAL.

CITIES.

PLATES AND FULL-PAGE ILLUSTRATIONS.

PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

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

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

å: labialized guttural *a* in Swedish.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ṇ: in Sanskrit the cerebral nasal.

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

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

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

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

ǫ: short open *o* in Scandinavian.

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

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

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

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

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

ṣ: voiceless cerebral spirant; used in transliterating Sanskrit.

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

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

ṭ: in Sanskrit a voiceless cerebral explosive.

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

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

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

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

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

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

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

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

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

KEY TO THE PRONUNCIATION.

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

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

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

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

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

aў or *ā*.. same, but less prolonged.

ã..... as *a* in *welfare*.

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

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

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

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

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

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

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

ī..... as in *fire*, *swine*.

ī..... same, but less prolonged.

ō..... as in *mole*, *sober*.

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

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

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

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

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

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

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

ŭ..... as in *but*, *hub*.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

*z*h..... as *s* in pleasure, and *j* in French *jour*.

All other letters are used with their ordinary English values.

NOTE.

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

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

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

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

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

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

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

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

THE
UNIVERSAL CYCLOPÆDIA.

Bhagavad-Gītā, bha'ga-vad-gĕĕ-taa' (song of the Exalted One, i. e. of Krishna or Vishnu): a Sanskrit theosophic poem, very celebrated in India, which is loosely interpolated into the MAHA-BHARATA (*q. v.*). Its authorship is unknown; its date is perhaps not very far either way from the time of Christ. It teaches the unity of the Supreme Spirit, and inculcates devotion thereto by renunciation of all worldly attachments and aversions. It has much that is lofty and spiritual, but is in nowise a coherent system. Its correspondences with the New Testament are indeed striking, but of no necessary significance. Edited by Schlegel and Lassen (1846). English translations by Davies (Trübner's Oriental Series) and by Edwin Arnold (metrical, Boston, 1885). See SANKHYA KARIKA. C. R. LANMAN.

Bhamo, or **Bhanmo**: See the Appendix.

Bhandara, bŭn-dăă-raa': a district and town of Nagpur, Central Provinces, British India; about midway across the peninsula, between parallels 20° and 22° N., and meridians 79° and 81° E. It abounds in small lakes and tanks, and hence is called the lake region of Nagpur. It is not well watered otherwise, but these afford means of irrigation. Area, 3,922 sq. miles, one-third of which is under jungle and uncultivated. The agricultural products are rice, wheat, pulses, pease, sugar-cane, oil-seeds, and cotton. Native cloth, baskets, and brass-ware are the chief manufactures. The climate is unhealthy; fever, smallpox, and cholera are common. Pop. about 700,000, of whom 84 per cent. are Hindus. The inhabitants are rude, unpolished, and unthrifty. The aboriginal Gonds are common. The chief town is Bhandara, 38 miles E. of Nagpur city; pop. 12,000. M. W. H.

Bhartpur, bŭrt-poor', or **Bhurtpore**: a "protected" state of British India; between 26° 30′ and 27° 50′ N. lat., and between 77° and 78° E. lon. Area, 1,974 sq. miles. Good crops of cotton, sugar, and grain are produced. The heat in summer is extreme. Pop. about 800,000.

Bhartpur, or **Bhurtpore**: a large town of India; capital of state of same name; in a plain 33 miles W. of Agra; lat. 27° 12′ N., lon. 77° 33′ E. (see map of N. India, ref. 6–D). Pop. (1891) 67,560. It was formerly fortified by a mud wall, and a ditch which could be filled with water from a lake.

Bhar'tri-ha'ri: Hindu poet, referred doubtfully to the first century A. D.; reputed author of the *Three Centuries* or *Hundreds* of Sanskrit apothegms on love, wise conduct of life, and renunciation of the world, the concern respectively of youth, manhood, and old age. Best edition by K. T. Telang, in the Bombay Sanskrit Series (see BÜHLER). Translations by C. H. Tawney, metrical (Calcutta, 1877), and B. H. Wortham (London, 1886).

Bhaunagar': feudatory state and city of Kathiawar, Bombay, British India. The state lies just W. of the Gulf of Cambay (see map of S. India, ref. 2–B). Area, 2,860 sq. miles. Pop. 400,000. The city of Bhaunagar lies on the west shore of the gulf. Pop. (1891) 55,640.

Bhawalpur, baw-ăăl-poor': a feudatory state of the Western Plains district, Punjaub, British India; S. of the Indus and Sutlej rivers; from 69° 30′ to 73° 58′ E. lon., and from 27° 41′ to 30° 25′ N. lat. It is remarkably level, except for numerous sandhills 50 or 60 feet high. The cultivable part is confined to a strip along the above-named rivers, about 10 miles wide. Beyond this is a desert of loose, moving sands, almost devoid of vegetation, though the empty beds of great rivers can still be traced. Total area, 17,285 sq. miles; only one-sixth part cultivable. The principal products are woolen, cotton, and silk cloths, indigo, cereals, alum, and saltpeter. The rains are very scanty and the wells deep. The state has prospered greatly under British management. Pop. (1881) 573,494; (1891) 648,900, mostly Mohammedans, consisting of Jats of Hindu descent, Baluchis, and Afghans. The city of Bhawalpur, the capital, is situated on a branch of, and not far from, the river Sutlej (see map of N. India, ref. 5–B); pop. 14,000. Other principal towns are Ahmadpur, Uch, and Khanpur. M. W. H.

Bhilsa: same as BILSA.

Bhooj: same as BHUJ.

Bhopal: A British political agency, native state, and city of Central India. The agency comprises 31 native administrations, with a total population of 1,900,000. The state is one of the dependencies under this agency, in lat. 22° 32′ N. to lat. 23° 46′ N., and between lons. 76° 25′ and 78° 50′ E., N. of the Nerbudda river. Area, 6,764 sq. miles. The surface is mountainous, being traversed by the Vindhya range, and inclines to the N. The population is about 700,000, including many of an aboriginal tribe called the Gonds. The principal crops are wheat, maize, oil-seeds, pulses, and opium. Bhopal was founded in 1723 by Dost Mohammed Khan, an Afghan invader. Since 1818 it has been steadily loyal to the British. The city of Bhopal, capital of the state, in lat. 23° 20′ N., lon. 77° 20′ E., is inclosed by a dilapidated stone wall, outside of which are some large pools and a fort. Pop. (1891) 70,630. M. W. H.

Bhuj, booj: a fortified town of Hindustan; capital of Cutch; 170 miles S. E. of Haidarabad (see map of N. India, ref. 7–A). It contains a beautiful mausoleum of Rao Lakka, a former ruler of Cutch. Its manufactures of gold and silver are widely celebrated. Pop. 25,000.

Bhurtpore: See BHARTPUR.

Bhutan, boo-taan', or **Bhotan** (also *Bootan*): a state in the Eastern Himalayas, India; bounded N. by the Himalaya Mountains, which separate it from Tibet, E. by Tibet, and S. and W. by Bengal. Area about 16,800 sq. miles. The Peak of Shumalari on the north border rises about 27,000 feet above the sea. Wheat, barley, rice, and maize are cultivated here. The religion of Bhutan is Buddhism. The people practice polyandry and polygamy. Pop. about 200,000.

Biaf'ra, Bight of: a bay of the Atlantic Ocean; on the west coast of Africa; is the eastern portion of the Gulf of Guinea, and lies between Cape Formosa and Cape Lopez.

Bialystok: same as BIELOSTOK (*q. v.*).

Bianchini, bĕĕ-ăăn-kee'nee, FRANCESCO: Italian astronomer and antiquary; b. at Verona, Dec. 13, 1662. He spent several years in an effort to draw a meridian line from the Adriatic to the Mediterranean, but failed to complete it. He succeeded in drawing a meridian line through the Church of Santa Maria degli Angeli. D. in Rome, Mar. 2, 1729.

Biarritz, bĕĕ'ăăr'rĕĕts': a village and fashionable watering-place of France; on the Bay of Biscay; department of

Basses-Pyrénées; 5 miles S. W. of Bayonne (see map of France, ref. 9–C). Here are several curious grottoes and mineral springs. The situation is pleasant and healthful. This was once the summer residence of Napoleon III. Pop. (1896) 11,869.

Bi'as: one of the Seven Sages of Greece; a native of Priene, and a contemporary of Crœsus, King of Lydia. He lived about 570–550 B. C. He was distinguished for eloquence as well as wisdom, and was employed as a legal and political adviser or advocate. Besides other pithy sayings is ascribed to him this: "I carry all my goods (or riches) with me."

Bib, called also **Pout** or **Whiting Pout** (*Gadus luscus*): a fish allied to the cod and haddock; is found on many parts of the British coasts and farther N. It is seldom more

The bib.

than a foot long, and is remarkable for the depth of its body, which equals one-fourth of its length. It is esteemed for food.

Biband, bē̆'bō', François Marie Uncas Maximilien: Canadian author; b. in Montreal in Nov., 1824; son of Michel Biband, the historian. He has been for many years Professor of Law in the Jesuit College of Montreal. Among his works are *Discours historique sur les races sauvages de l'Amérique* (Montreal, 1846); *Dictionnaire historique des hommes illustres du Canada et de l'Amérique* (1857); *Tableau historique des progrès matériels et intellectuels du Canada* (1858); and *Panthéon Canadien* (1858).

Neil Macdonald.

Biband, Michel: b. at Côté des Neiges, near Montreal, Canada, Jan. 20, 1782; was educated at College of St. Raphael, and wrote much in defense of the nationality of Canada and for the conservation of the French language. He wrote the first French history of Canada since its British conquest. D. in Montreal, Aug. 3, 1857.

Bibb, George M.: b. in Virginia in 1772; graduated at Princeton in 1792; became a prominent lawyer of Kentucky: was several times chosen chief justice of that State, and once chancellor; was U. S. Senator (1811–14 and 1829–35); Secretary of the Treasury under Tyler. He published four volumes of Kentucky *Law Reports* (1815–17). D. in Georgetown, D. C., Apr. 14, 1859.

Bibb, William Wyatt, M. D.: b. in Virginia, Oct. 1, 1780; member of Congress from Georgia (1806–13); U. S. Senator (1813–14); Governor of Alabama Territory (1817–19); and first Governor of the State of Alabama (1819–20). D. near Fort Jackson, Ala., July 9, 1820.

Biber, bee'ber, George Edward, LL. D.: a clergyman of the Church of England; b. at Ludwigsburg, Würtemberg, Sept. 4, 1801, and educated at the University of Tübingen; formerly associated with Pestalozzi in educational enterprises; was author of several pedagogic works. He took an active part in Church controversies, publishing a number of volumes, the most important of which were *The Standard of Catholicity* (1840); *English Church on the Continent* (1846); *Sermons, Occasional and for Saints' Days* (1846); *The Seven Voices of the Spirit* (1857); *The Communion of the Faith Essential to the Celebration of the Holy Eucharist* (1863); *The Veracity and Divine Authority of the Pentateuch Vindicated* (1863); *The Supremacy Question* (1865); *On the Unity of the Church* (1871). This last work was an English version of a Latin correspondence with Dr. Michaelis, one of the leaders of the Old Catholic movement, previously published in the original. D. at his rectory of West Allington, near Grantham, Jan. 19, 1874. W. S. Perry.

Biberach, bee'ber-ăăk'h: a town of Würtemberg; in a charming valley, and on the river Riss; 23 miles by rail S. S. W. of Ulm (see map of German Empire, ref. 8–E). It has a Realschule, a beautiful church, built in 1110, manufactures of paper, linen goods, leather, etc. Pop. 8,263. The French general Moreau here defeated the Austrians under Latour in Oct., 1796, and the Austrian general Kray in 1800. In 1803 it was deprived of its imperial freedom, and it was transferred to Würtemberg in 1806. The poet Wieland was born near Biberach.

Biberich, bee'ber-ich, or **Biebrich**, bee'brich: a village of Prussia; province of Hesse-Nassau; on the right bank of the Rhine; 3 miles S. of Wiesbaden (see map of German Empire, ref. 6–D). It has a ducal residence which is said to be the finest palace on the Rhine. The river-scenery here visible is almost unrivaled. Pop., including Mosbach (1890), 11,023.

Bibiru: See Bebeeru.

Bible [from Fr. *bible* < Late Lat. *biblia*, fem. sing. < Class. Lat. *biblia*, neut. pl. = Gr. *τὰ βιβλία*, the books], popularly known also as the **Holy Bible** and **Holy Scriptures** in (Gr. *ἡ γραφή, αἱ γραφαί*; Lat. *Scriptura sacra*): a collection of ancient writings, from the age of Moses down to the death of the apostle John at the close of the first century, thus embracing fourteen centuries. It is divided into two parts, the Old and New Testaments; the first is regarded by the Jewish Church, and both are regarded by the Christian Church, as the inspired record of divine revelation. With respect to the more precise definition and character of the Bible, the views are diverse in the different Churches. The Greek and Roman Catholic Churches put ecclesiastical tradition, as determined by general councils and creeds, on a par with the Bible as a rule of faith and conduct, and claim the sole right of authoritative explanation. The Protestant Churches make the Bible the only and sufficient rule of faith, and give to tradition a subordinate place. They are generally agreed in regarding the Scriptures—1, as of divine authority; 2, as containing all knowledge necessary to salvation; 3, as the appropriate form of a divine revelation (as opposed to tradition or the inner light); 4, as the heritage of all Christians—i. e. it is the right and duty of all to read and become acquainted with the teachings of the Bible. As regards inspiration, opinions are divided between the theories of verbal or literal, plenary, and dynamic inspiration. The creeds and confessions of faith teach or imply the *fact* of inspiration, but do not define the *mode* and the *degrees*. The first theory was prevalent in the seventeenth century, but is now abandoned by the great majority of Protestant divines; the last is advocated by most German divines.

Old Testament.

The Old Testament was originally written in Hebrew (some portions in Aramaic), but of course the Hebrew manuscripts which we possess are separated by a long interval and many vicissitudes from the original handiwork of the authors. The oldest complete codex dates from the year 1009.

The History of the Hebrew text is briefly as follows: I. *First Period* (536–180 B. C.)—The Babylonian captivity (from 586, the chief deportation, to 536, the first return) forms an epoch in the history of the Jews. It is a gulf dividing the independent from the subject position of the nation. It was under the former that they had original and productive power and a living revelation. After the captivity, when the Jewish nation had been purified by adversity, they turned back to them with new interest. They were able to see that Isaiah and Jeremiah had been the only men of their times who had truly had "the mind of the Spirit." They desired to restore the ancient law, worship, and traditions. To this end the collection and preservation of the ancient writings, which served as the authority for, or bore witness to, the former observances, became an object of great interest and importance. With this movement, however, the nation entered on a new stage. Its work was not original and creative, but preservative and reconstructive.

In the work which now began Ezra had a prominent part. He is called a second Moses and the restorer of the law. He was the first "scribe," and raised the scribe above the priest. He collected and arranged the ancient writings, and so laid the foundation of the canon (see below, section on the *Canon*); and from this point the history of the written codex begins. The books were at this time written in the ancient Phœnician characters which appear on some ancient Phœnician inscriptions, on the Moabite Stone, on some coins of the Asmoneans, and in the Samaritan Pentateuch. The letters

had no variation of form or shape for capitals and small letters, and neither words, verses, nor chapters were marked off in any way. Some of the books which now appear separately were then united, and a few which are now found in the canon had not yet been written. The work, however, which was now to be done extended beyond the collection, arrangement, and preservation of the ancient Scriptures. The Hebrew language was already a dead language. The popular dialect was the Aramaic, and the Hebrew of Moses, David, and the prophets had become a sort of classical and sacred language, known only to the oldest and to the learned. It was an object of academical acquisition. It was therefore necessary to explain and translate or expound the writings. This task naturally devolved upon such as possessed the requisite knowledge, and they constituted an informal body for this purpose. So much is no doubt true, and it forms the historical basis of the rabbinical tradition about the "Great Synagogue" which was said to have done this work.

When this much is said of the commencement of this period, we have in fact told nearly all which is known about it. We can only infer, from what we know of its beginning and what we find at its close, that the following movements were in progress: 1. The college of interpreters, though not a formally or legally constituted body, and though their business was primarily literary or academical, were gaining in authority and dignity, and acquiring a certain official character from general consent. The "elders" came to have civil and judicial authority from the lack of others to fill these functions. Possibly the Sanhedrin was an outgrowth of this body. 2. The canon (see below) was being formed; the idea of *Holy* Scripture was being elaborated and formulated; the respect for the traditional writings, and the disposition to set them by themselves, were gaining ground; the doctrine of inspiration took its rise. At the close of this period the canon is formed and these doctrines are established dogmas. 3. The form of the letters was undergoing a change. At the period referred to, the square letters which are represented in our printed texts had become established in use.

II. *Second Period* (180 B. C. to 500 A. D.).—The "schools" begin with Simon the Just, in 180 B. C. These schools produced the Talmud (i. e. body of doctrine, from *lamad*, to teach), an immense work in a dozen folio volumes, containing a commentary on the Mishna, which is itself a "repetition" of the "Law." It was completed in the fifth century. The Talmudic scholars developed intense zeal for the text of the Scriptures—a zeal which, though frivolous and fanatical in many of its manifestations, has been of immense value to biblical scholarship. They spent unwearying labor in the establishment of the consonant text; they separated the words by spaces (but characteristically ordained just how great the space should be). They probably also introduced the verse-mark (:), and therefore the division into verses. The preservation of the text from corruption in copying was secured by counting the letters or by other devices, and by crabbed, rigid, and minute rules. This work exercised its legitimate influence on the characters of those who did it; it made them punctilious about trifles and negligent of "the weightier matters"; but it preserved the Old Testament text from corruption, and handed it down to us in a comparatively pure and trustworthy form. In their exegesis the Talmudists were generally guided by arbitrary rules, by dogmatic prepossessions, by a view of the Bible which made it a storehouse of occult wisdom, only to be unlocked by cabalistic and allegorical treatment. It is asserted by some who are well acquainted with the Talmud that it contains valuable geographical, ethnological, historical, and exegetical information for the elucidation of the Bible, but the commentaries of Jews and Christians alike fail to bear witness to the truth of the assertion.

The Targums.—One result of the zeal of the Jews for the original Hebrew was the publication of paraphrases in the Aramaic or popular dialect, which were called *Targumim* (from a root signifying to "interpret). They present the rabbinical and traditional interpretation of the Scriptures. Their origin is very obscure. See TARGUM.

III. *Third Period* (500–1488 A. D.).—The Talmud, having grown by the work of successive generations for three or four centuries, closed about the year 500—i. e. the last of the commentators whose sayings are included in it lived at that time. Then a new work began. The Jewish nation had long been broken up and dispersed. Christianity had grown into a powerful opponent. The latter fact had led the Jews to abandon the Septuagint Greek version of the Old Testament (see below, on the *Versions of the Old Testament*), and the former fact made it necessary to provide still further for the preservation of the Hebrew text. The pronunciation of a language written only with consonants must, of course, be very uncertain; that of the Hebrew had been preserved in the rabbinical schools by tradition. There seemed to be danger that it would now be lost if no means of recording it were devised. The Syriac language had shortly before been provided with points to designate the vowel sounds, and to make the written language a complete representation of the spoken. The chief seats of rabbinical learning at this period were Tiberias, in Galilee, and Sora, in the Euphrates valley, and the scholars are known as the Massoretes. The Massorah was a mass of notes, comments, emendations, and corrections of various kinds, which the Talmudists had adopted, committed to memory, and handed down by tradition, but which they had not ventured to mark in any way upon the pages of the sacred text. The Massoretes now undertook to do this. They marked in the text—1, the vowels, the shades of pronunciation of the consonants, and the diacritical points which distinguish two sounds expressed by one character; 2, the accents, which are partly marks of pronunciation, and partly serve the purpose of musical notes, marking the intonations of the chant; 3, the emendations and corrections which the Talmudists had adopted. These they mark on the margin by a peculiar device, which leaves the consonants as they were, but suggests those which should be read. Here, again, the superstitious reverence of the rabbis for the text served the purpose of a true biblical science, since their proposed amendments are still open to criticism and review. It is difficult to pass a summary judgment on their emendations, but perhaps in a majority of cases modern scholars retain the original reading and reject the Massorah.

The work of the Massoretes did not begin before the sixth century, and it was finished before 1109, the date of the oldest manuscript now known to exist. This manuscript presents the Massoretic text. The work certainly covered a long period, and was done by many different hands. It was not possible, even with the minute and stringent rules which were adopted, to prevent errors in copying, and our manuscripts, all of which belong to the period between 1106 and 1488, offer many variants. The Jews continued to use in the synagogues copies of the Scriptures containing only the consonant text.

IV. *After the art of printing* was invented some books of the Old Testament were printed separately. In 1488 the first edition of the whole Hebrew Bible was printed at Soncino. The second, based on the first, was published at Brescia in 1494. This was the one used by Luther. An independent text appeared in the Complutensian Polyglot, 1520. A collection of variants was made from 615 manuscripts by Kennicott, Oxford, 1780, and a better one by De Rossi, 1788. The Hebrew Bibles in use are scarcely more than reproductions of the two first printed editions. They possess some critical advantages, but generally the excellence of a subsequent edition over the former consists in typographical accuracy and neatness. A satisfactory critical edition, with a full account taken of the variants, is yet to be prepared. The best editions are those of Hahn, Theile, and especially Baer (with preface by Delitzsch, Leipzig, 1869, *sqq.*). The most complete collection of Massoretic material is by Ginsburg, *The Massorah, Compiled from MSS., Alphabetically and Lexically Arranged* (London, 1880–86, 4 vols.).

V. *The Old Testament in the Christian Church.*—The Church of the first and second centuries based the authority and truth of its doctrines on the Old Testament, just as it is used in the New Testament. The Church of the third and fourth centuries wavered between acquiescence in the authority ascribed to the Old Testament by our Lord and his apostles, and hatred and suspicion of all things Jewish. No Christians save converted Jews knew Hebrew, and of these very few were of the class who "knew the Law." The Septuagint Greek version (see below) was the form in which the Christians became acquainted with the Old Testament. The first Christian scholar who undertook to learn Hebrew was Origen (d. 254 A. D.). He prepared a *Hexapla*, containing the Hebrew and five versions, which unfortunately is lost, except some fragments. We possess, however, his commentaries, which show that he had borrowed from the rabbis, but especially from Philo of Alexandria, the allegorical and mystical methods of interpretation. He is counted

among the Fathers of the Eastern Church, and is the first biblical scholar of whom that Church can boast.

Jerome (d. 419 A. D.) endeavored to learn Hebrew of a Jew, and did learn as much as his teacher could or would teach him. His method of treating the Old Testament shows the influence of his teacher. Through him the rabbinical ideas of inspiration, etc., found their way into the Western Church. His translation of the Scriptures (see *Vulgate*, in the section below on the *Versions*) was regarded as a finality, and all interest in the original text died out. In 1311 Clement V. ordered that Hebrew should be studied at the universities, but no results followed. Nicholas de Lyra (1340) was, perhaps, a converted Jew. At all events, he knew Hebrew and used the Jewish commentators. His commentaries carried great authority among Christians, and influenced Luther so much that a popular saying arose: "If Lyra had not played the lyre, Luther would not have danced." (*Si Lyra non lyrasset, Lutherus non saltasset.*) But the father of Hebrew learning among Christians is Reuchlin (d. 1522), who wrote the first Hebrew grammar and dictionary, 1506 (on the basis of Kimchi). The Reformers returned with zeal to the study of the Hebrew. That pursuit participated in the general revival of learning, and in the most recent times it has been wonderfully advanced by the development of philological and historical science. It is probably not too much to say that the Hebrew language is more at the command of this generation than of any other since the Babylonian captivity.

It follows from the above—1. That the only text we can hope to establish on manuscript authority is that of the Massoretes, but it can be greatly improved from the Septuagint. 2. We have no manuscript, even of this text, older than 1009. We shall see below, under *Versions*, what means we have of learning what the text was at an earlier date. 3. The vowel-points, accents, word, verse, and chapter divisions are all many centuries more recent than the original writings. Even the consonant text has been transliterated. The chapter divisions were made in the thirteenth century, and applied to the Vulgate. In the sixteenth century it was asserted that the vowels, etc., were of later origin than the text. This assertion was considered heterodox, as it was inconsistent with the prevailing theory of inspiration. It is only in the most recent times that this fact has been admitted, and it is now undisputed. 4. The crude and superstitious theories of inspiration which have prevailed to some extent in the Christian Church are of rabbinical manufacture. They were introduced into the Christian Church first as attaching to the Old Testament, and then extended over both in their purest and most original form. See W. Robertson Smith, *The Old Testament in the Jewish Church* (London and New York, 1881; 2d ed. 1892), and especially Ludwig Diestel, *Geschichte des Alten Testaments in der Christlichen Kirche* (Jena, 1869).

VI. *The Canon and the Apocryphal Books.*—As we said above (A, I.), when the period of creation and production was ended, and the period of conservation and reflection and application began, one of the first ideas which was elaborated from the crude into the dogmatic form was that of the Scriptures in their sacred character and divine authority. Hence the terms Holy Scripture, Word of God, etc. When this doctrine was established, the necessity of defining and limiting its application at once made itself felt. What books come under this designation? What is the standard by which they must be tested in order to answer this question? It is certain that these questions never received any authoritative answer. Ezra made a collection of books, but he did not include those books which were not yet written. The Hebrew Bible as we now possess it is divided into three parts: 1, the Torah (i. e. Law—Pentateuch); 2, the Nebiim (Prophets, including Joshua, Judges, First and Second Samuel, and First and Second Kings); 3, the Chetubim ("Writings," "Hagiographa," including the poetical and all the other books in the English Version of the Old Testament). The addition of the third part can not be historically accounted for. The form of the collection, as a whole, bears witness to successive collections and successive gradations of authority. This gradation may be traced still further. Besides and beyond the Chetubim were a number of books which were on the line, not accepted and not definitely rejected. Still again, beyond these were others which were positively set aside. The translators of the Septuagint included in their collection a number which do not appear in the Hebrew collection (they form the Apocrypha of the English Bible). The Ethiopic version contains others which belong even to the class of the totally rejected. Thus one who knew only the Septuagint version would find the book of Exodus and the book of Tobit side by side, presented to him as of equal authority. Ethiopian Christianity would give the same authority to the book of Adam as to the book of Genesis. Thus it is certain that, when these versions were made, the strict definition of the books to which standard authority belonged was not yet established. Fürst has even shown from the Talmud (*Kanon des Alten Testament*, p. 25) that this idea of the canon was not so definitely established at the time of our Lord but that the rabbis ventured to propose to exclude the book of Ezekiel from the canon, on account of its contradiction to the Pentateuch. Here, then, we have the idea of the canon. It is the limited collection to which, and to which only, authority as the inspired word of God appertains. The works which were in circulation, and to which this authority was denied, were called *apocryphal*, from a Greek word meaning "to withdraw," because they were withdrawn from use for public instruction. The third class, the *pseudepigraphs*, were so called because many of them bore names which were forged. In 2 Maccabees ii. 13 we read: "The same things are narrated in the writings and memoirs of Nehemiah, and how he collected the books about the kings and prophets, and those of David, and the letters of the kings in regard to offerings." The Pentateuch had been restored to authority and use by Ezra in 444 B. C. (Nehemiah viii). Nehemiah added the "Nebiim," which are distinctly described in this passage ("kings and prophets"), and the Psalms, which are the nucleus of the Chetubim. The "letters" are those of the Persian kings, such as we find in the books of Ezra and Daniel. The subsequent omission of these letters from the canon bears witness to the soundness of the standard by which its formation was governed. The Massoretes were finally called upon to decide what books they would recognize as canonical, but in this, as in other things, they no doubt confined themselves to the establishment of the tradition which they had received. In the Christian Church the influence of the Septuagint secured the introduction of the Apocrypha with full canonical authority. Jerome translated all into the Latin Vulgate. They thus remain in authority in the Greek and Roman Churches. Luther adopted the Hebrew canon, but translated the apocryphal books, setting them by themselves, and giving them a heading which recommended them for edification, though not for dogmatic definition. The English translators followed the same policy. Of late, however, the Apocrypha have been omitted from the popular editions of the English Bible, because the presence in the volume of works which formed a grade between it and ordinary works seemed to detract from the supreme and isolated position of Holy Scripture.

The Apocrypha and Pseudepigrapha are both quoted in the New Testament. See Jude 9 (Translation of Moses); Jude 14 (Book of Enoch); 1 Corinthians ii. 9 (said by Origen to be from a lost apocryphal writing under the name of Elijah). Compare also James iv. 5, John vii. 38, and Luke xi. 40—citations which we can not identify with passages in any known book.

It appears from the above—1, That the canon was fixed only after long experience, and by the general consent of successive generations, who bore testimony, by their esteem and veneration for particular books, to their intrinsic authority and profitableness. 2, There is no broad and distinct line of demarkation between the canon and the Apocrypha. If we allow ourselves to form estimates of the comparative value of various books we shall find that the first book of Maccabees compares very favorably, as an edifying religious history, with the book of Esther, and that the book of Jesus the son of Sirach compares favorably with Ecclesiastes as a book of religious instruction. On the Jewish canon see the works of Fürst (1867); Samuel Davidson (1877); Wildeboer (1889); Buhl (1891); and H. E. Ryle (*The Canon of the Old Testament*, London, 1892).

VII. *The Order of the Books of the Old Testament.*—In the arrangement which has been adopted there appears to have been an effort to conform as far as possible to chronology, not only in regard to the historical, but also the legal and prophetic portions. The following are the principal divisions:

1. Law (in Hebrew, תורה, *Torah*; Gr. *νόμος*) or Pentateuch (Gr. *πεντάτευχος*), because it consisted of five parts.

2. Prophets (Heb. נביאים; Gr. *Προφῆται*).

3. Holy Writings or Hagiographa (Gr. *ἁγιόγραφα*), called in Heb. כתובים, *Chetubim*—i. e. the "writings," *par excellence*.

The Law included—1, Genesis or "origin"; 2, Exodus, or the "going out"; 3, Leviticus, or the book relating to the Levites; 4, Numbers, so called because Moses was commanded to "take the sum of all the congregation of the children of Israel" (Numbers i. 2); 5, Deuteronomy (from the Gr. δεύτερος, "second," and νόμος, "law"), because it was the second laying down (or the repetition) of the Law.

The Prophets were divided into the Former or Earlier (*Priores*), including Joshua, Judges, First and Second Samuel, First and Second Kings; and Later (*Posteriores*), comprising the greater prophets (except Daniel), viz., Isaiah, Jeremiah, and Ezekiel, and the twelve minor prophets, Hosea, Joel, Amos, etc.

The Holy Writings, or Hagiographa, included the Psalms, Proverbs, Job, The Song of Songs, Ruth, Lamentations, Ecclesiastes, Esther, Daniel, Ezra, Nehemiah, First and Second Chronicles. For a more particular notice of the different books the reader is referred to their respective heads.

VIII. *Versions of the Old Testament.*—As we saw above, the oldest manuscript of the Hebrew Scriptures which we possess dates from 1009 A. D., and presents the Massoretic text. If we wish to go back of this to reach something nearer to the original work of the authors, and to eliminate errors which may have crept in, we have one means of doing so—viz., the ancient translations which were made from the text at a remote date.

1. The first and most important of these is the Greek version, called the *Septuagint* (LXX.).—Passing over the fables of the Jews and early Christians in regard to this version (such as that it was made on a set occasion by seventy-two men, six from a tribe, chosen by the high priest, and sent to Egypt for the purpose—that they each separately translated the whole, but that, by virtue of divine inspiration, the seventy-two translations were identical), we state only the best-assured facts in regard to it. The Pentateuch was translated by Alexandrian (not Palestinian) Jews, but by how many is unknown. It was a result of the enlightened interest of the Ptolemies (Lagus and Philadelphus) in all literary and scientific progress. It was made about 285 B. C. The work thus begun was carried on by various persons at various times until all the canonical and apocryphal books were translated. Some originally written in Greek were added. The parts vary in fidelity to the original and in literary excellence. Job and Isaiah are so poorly translated that one must know Hebrew to see the sense of the Greek; Ecclesiastes is faithfully and correctly rendered. At this time Greek was the language of popular intercourse. The Jews of the time of Christ neglected the Hebrew, and generally relied on the Septuagint version. It is the form in which the Old Testament is quoted by Mark, Luke, Peter, and, for the most part, by Paul. Matthew, John, and Paul show acquaintance with the Hebrew, but they also use the Septuagint. Its influence was at this time paramount. It passed into the Christian Church as the authoritative form of the Old Testament. It soon began to be asserted, however, by the Jews, when the Septuagint was quoted in controversy by the Christians, that it was not a faithful rendering of the original. Hence the Jews abandoned it and returned to the Hebrew, and the most scholarly of the Christians attempted to acquire that language. Nevertheless, the Septuagint remains the authority of the Greek Church to this day. Other Greek versions which need only be mentioned are those of Aquila, Theodotion, and Symmachus. The best editions of the Septuagint are by Tischendorf, Lagarde, and Swete; but a thoroughly critical edition with textual apparatus is still a desideratum.

2. *The Peshito* is a Syriac version, whose name signifies "simple" or "faithful," because it is a literal translation, not a paraphrase. It includes the New Testament. Its origin is obscure. It was in use in the time of Ephraim Syrus (378 A. D.).

3. *The Vulgate.*—Augustine says (*De Doctr. Chris.*, ii. 11), in regard to the early Latin versions, that "in the first days of the faith, if any one obtained a copy of the Greek Scriptures, and gave himself credit for any knowledge of the two languages, he ventured to translate." He recommends only one of the versions existing at the time—viz., the Itala. This is now lost, except in fragments as quoted by the earlier Latin fathers, but seems to have been made from the Septuagint. Jerome (d. 419) undertook to learn Hebrew, in order to make a new translation from the original. History repeats itself with regard to all new translations of the Bible. This one was made avowedly in order to meet the wants of the common people, and it was called the "Vulgate" because written in the popular Latin. It was met by the most violent opposition, by all the arguments of tradition and prescription, and by all the considerations of policy and expediency, which suggest themselves in such a case. It was finally adopted, and now it has itself become sacred in the Latin Church. The Council of Trent (1546) put it on a par with the original. The text of the Vulgate became so corrupt by repeated copyings that, on the invention of printing, the true text seemed lost in a chaos of variants. An attempt to revise it resulted in an arbitrary decree of Sixtus V. (1598) deciding what it should be, and this text is now the "received text" in the Roman Church. A text having critical and scientific authority is still a desideratum.

New Testament.

With the advent of our Lord the fountain of divine revelation once more began to flow. Mankind once more received an original and creative revelation, not whimsical traditions or weary reflections on the record of past thought and life. The Greek language, which, as we saw above, was at this time the medium of popular and literary intercourse, became the vehicle of the new revelation. The Gospel of Matthew was probably originally written in Aramaic, but the remainder of the New Testament was certainly Greek from the very hands of the authors.

I. *History of the Greek Text.*—The original handiwork of the writers soon perished. We have no record or tradition of the original manuscripts, and no tradition to bear witness to any care for them. Copies were made from them, and by the middle of the second century the interest in them had become so great as to lead to extensive multiplication of copies. The oldest manuscripts which we possess date from the fourth century. (See articles Codex Bezæ, Codex Sinaiticus, etc.) From that time on the number of manuscripts which we possess increases as we come down, but as the copies increase in number so also do the variants. When printing was invented one of the first uses to which it was put was the printing of the Greek Testament. This art gave ground to hope that the text-copies might be multiplied for the future without the errors inseparable from manual copying. The first printed text was contained in the Complutensian Polyglot, prepared under the patronage of Cardinal Ximenes, at Alcalá (the ancient Complutum), in Spain, in 1514, but not published till 1520. It is not known what manuscript served as copy for this edition. Erasmus prepared a very faulty text, published at Basel in 1516. These two editions from late manuscripts taken at hazard served as the basis of succeeding ones (Stephanus, 1546; Beza, 1565; Elzevir, 1624, 1633). The last of these (chiefly on account of its convenience of form and typographical beauty) became the "received text." The doubt between various authorities was settled in this case, as in so many others, not by thoroughly investigating the matter, but by giving arbitrary sanction to one. The Elzevir remained supreme until the time of Griesbach (1812). Here again we come to a department in which the credit for what has been done belongs chiefly to German scholars. Griesbach, and after him Lachmann (1854), and Tischendorf have prosecuted the tedious labor of comparing the variants and weighing the authorities. They were followed in England by Tregelles, Scrivener, Westcott and Hort. The effort can not be defined as one to re-establish the text of the apostles, for that may be pronounced hopeless, but to recover the text to which the oldest and best manuscripts bear witness. The scholars mentioned form a succession in which this aim has been prosecuted with intelligence, zeal, and consistency. The best attainable text is presented by Tischendorf's eighth critical edition (with apparatus and the *Prolegomena* of Gregory), and by Westcott and Hort (the Harper ed., with introduction by Schaff, 1881; third revision 1892).

The dialect of Greek in which the New Testament is written is what is called the Hellenistic. It was based upon the Attic dialect, and was spoken by the Jews with a strong infusion of a Hebrew spirit and Hebrew modes of speech. Hence the Hebraistic character of the Septuagint and the Greek Testament. Though differing from classical Greek in grammatical purity and accuracy, this dialect was best adapted to express the ideas of the Christian revelation to the primitive Christians, and has an undying beauty and force of its own.

The order of the books in the Greek differs from that in the English version, in that the catholic Epistles follow the Acts.

II. *Respecting the Separate Books of the New Testament.*—The following account includes such facts as can be relied on, omitting questions involved in controversy.

The Gospels.—We possess a fourfold record of the life and teachings of our Lord. It strikes the attention of the reader at once that the first three contain many passages which are almost identical. On the other hand, each differs from each in a manner equally remarkable. From the earliest times efforts have been made, without much success, to harmonize them into one consistent narrative. Within a century these phenomena have again been examined with great zeal. The question is raised: Do not these resemblances point to an interdependence between the synoptical Gospels? If so, which is the original? If one served as the original, how is it that the authors of the others, in using it, failed to transfer passages of high interest? In fact, the phenomena of identity and difference are so perplexing that these questions seem unsolvable. The prevailing opinion of scholars at the present time appears to be that the Gospel of Mark presents the nearest approach to the original of the synoptical Gospels; that Matthew was originally written in Aramaic. That Luke is a subsequent compilation of the gospel-material is certain. It was written before the year 70 or 80. Before the historic interest in the Gospels arose, and before the movement toward a New Testament canon began, the Gospels no doubt exerted great influence on each other.

The Gospel of John is clearly independent of the others in its material, scope, and purpose. It takes up the life of our Lord not so much pragmatically as philosophically and mystically—in its religious rather than its historical aspect. It has been vigorously attacked by the negative and rationalistic school of critics (especially by Baur and his followers), and is held by them to be the product of an anonymous Christian Plato after the middle of the second century. These opinions, however, rest chiefly on philosophical and historical dogmas which are set up as postulates; and one who refuses to admit the necessary *a priori* truth of these postulates finds that the true critical grounds on which this opinion rests are meager and insufficient. The recent discoveries of Tatian's *Diatessaron* (1888) and of a fragment of the Gnostic Gospel of Peter (1892) prove the existence and use of John's Gospel before the middle of the second century. Conservative scholars of every grade (Meyer, Lange, Weiss, Beyschlag, Godet, Lightfoot, Westcott, Salmon, Sanday, Gloag, and many others) admit the authenticity of the book. One of the ablest defenses is Ezra Abbot's *Authorship of the Fourth Gospel* (1880, republished in his *Critical Essays*, Boston, 1888).

III. *The Canon.*—The first century of the Christian era produced a large number of literary works beyond those contained in the New Testament. The idea of the canon therefore came to be applied here once more (see above, *Canon of the Old Testament*). Such of these works as were of genuine apostolic origin, or were faithful representatives of Christian truth, must be separated and recognized apart from all others. Here once more the same phenomenon appeared as in the Old Testament. There was no distinct dividing line to be drawn. The division did not make or suggest itself. The whole body of works might be graded from the Gospel of Matthew down to the most gross and contemptible product of superstition, but the stages were gradual all the way. Different persons differed in their comparative estimate of a few (e. g. the Epistle of Barnabas and the Epistle of Jude, the Shephard of Hermas and the Epistle to the Hebrews), though they agreed in the general range of estimate. Down to the middle of the second century the Christians used the Old Testament for their apologetics and their polemics. Moreover, the tradition was still so fresh that literary authority was not needed. We do not find in any writers earlier than Irenæus (d. 202) references to the New Testament writings as authoritative, or as inspired in any such sense as the Old Testament was believed to be inspired. From this time on the chief interest of the Christian Church is rapidly transferred to the New Testament. The books are collected and studied and compared. Their respective authority is determined. The informal verdict of the Church accepted certain books and rejected others, but there were a number which were on the line or in doubt. These were the Epistle of Jude, the Second of Peter, Second and Third of John, the Epistle to the Hebrews, the Shepherd of Hermas, and the Epistle of Barnabas. In the third century considerable disfavor to the book of Revelation was manifested in the Western Church, though earlier it had been very popular. To go into details of various authorities would lead us too far. Eusebius (d. 340 A. D.) bears witness that the matter stood, in his time, in just about the position above described. Not only the above-mentioned doubtful books, but others also which had become familiar and gained a footing in popular affection, were retained, as the Apocrypha is still sometimes retained in our Bibles. The Synod of Laodicea (360) made the first official list (omitting the Apocalypse), and forbade the public reading of uncanonical books. The Councils of Hippo (393) and Carthage (397) under the influence of St. Augustine fixed the canon as it now stands and is accepted by all the Churches. On the canon of the New Testament, see the works of Reuss, Westcott (6th ed. 1889), and Zahn (1890).

Literature.—The literature on the Bible is immense. On the general questions discussed in this article, see the historico-critical introductions to the *Old Testament* by De Wette (8th ed. by Schrader, 1869); Bleek (revised by Wellhausen, 5th ed. 1885); Reuss (2d ed. 1890); Keil (3d ed. 1873); Riehm (1869); Reusch (1875); Kuenen (Dutch, 1885); Cornill (2d ed. 1892); Wright (2d ed. 1892); and Driver (3d ed. 1892). On the *New Testament*, Hug (Rom. Cath., 1820); De Wette (8th ed. by Schrader, 1869); Bleek (4th ed. by Mangold, 1860); Reuss (6th ed. 1887; Eng. trans. 1884); and Salmon (7th ed. 1894); and especially Weiss (2d ed. 1889; Eng. trans. 1888) and Holtzmann (3d ed. 1892). The last two represent the latest state of New Testament criticism—Weiss on the conservative, Holtzmann on the other side. Prof. F. Godet, of Neuchâtel, issued in French an *Introduction to the New Testament* (1893, *seq.*, 3 vols.; Eng. trans. 1894, *seq.*). See also Schaff, *Companion to the Greek Testament and the English Version and Revision* (New York, 4th rev. ed. 1892), and the articles Hexateuch and Higher Criticism.

Revised by Philip Schaff.

Modern Versions of the Bible.

English.—The earliest known version in a Teutonic language is the Mœso-Gothic of Ulphilas, made from the Greek in the fourth century; extant portions are the Gospels and various fragments. The English have a better right than the Germans, the Dutch a better right than either, to claim this as the first version in their language. The early English or Anglo-Saxon versions are from the Vulgate, the earliest extant being the paraphrase of Cædmon. The earliest recorded translators are Aldhelm and Guthlac, each of whom made a version of the Psalms, probably now lost; Bede, who translated the Gospel of John, and King Alfred, who prefixed to his laws an abridged translation of the Ten Commandments, and is said to have been engaged on the Psalter at the time of his death. In the tenth century or a little later a large number of books were translated, the Gospels apparently in three distinct versions. In the ages following the Norman Conquest considerable portions were translated into Norman French. The most memorable and conspicuous is the version completed by John de Wycliffe in 1382, with the subsequent aid and revision of several others. Many manuscripts remain exhibiting great variations. It was not printed till 1850, when an edition was published at Oxford presenting two texts in parallel columns with variants from some sixty manuscripts. The first English translation from the Greek and the basis of all subsequent ones was the New Testament of William Tyndale (martyred in 1536). This was printed in 1526 at Cologne. The books were burned at Oxford and London, and six editions were dispersed before 1530. In 1535 the first complete English Bible, by Miles Coverdale, was printed, probably at Antwerp. Next followed *Matthew's Bible* (Thomas Matthew a pseudonym for John Rogers); then in 1539 Richard Taverner's *The Great Bible*, so called from its size, was revised mainly by Coverdale from preceding versions, sometimes called *Cranmer's Bible*, and sometimes *The Chained Bible*, because chained in churches for public reading. The *Genevan Bible*, the sweetest of all English versions, was produced at Geneva by the exiles sent over by "Bloody Mary" in 1557. Its expense was defrayed by John Bodley, father of the founder of the Bodleian Library. It was the most popular Bible till superseded by the authorized version, and was that brought to America by the Pilgrim Fathers; sometimes called the *Breeches Bible* because of the rendering of Genesis iii. 7, which says that Adam and Eve "sewed figge-tree leaves together, and made themselves breeches." This rendering, however, occurs in several earlier versions. The *Bishops' Bible*, under Queen Elizabeth's license, was printed in 1568, favored and in part made by the bishops. Some editions of it are called the *Treacle Bible*, reading "treacle" for "balm" in

Jeremiah viii. 22. Another name, *The Bug Bible*, from Psalm xci. 5, belongs to several versions. The *Douay Bible* (1609) was translated by the Roman Catholics from the Vulgate, and owes much to Tyndale and other versions, often called the *Rosin Bible*, from Jeremiah viii. 22. In 1611 the *Authorized Version*, or King James's, appeared, prepared by various companies under the king's instructions, in two editions, better known as the "He" and "She" Bibles from the different renderings in Ruth iii. 15. Various editions have been termed *The Vinegar Bible* from the misprint vinegar for vineyard in the page-heading at Luke xx.; the *Wicked Bible*, which omitted the *not* in the Seventh Commandment. Since the issue of the authorized version a large number of versions have been printed, among which the most notable are *The Revised Version of the New Testament*, published in 1881, the whole Bible in 1885 (see BIBLE REVISION below), and the Baptists' versions, using the word *immersed* instead of *baptized*. Among other versions used in Great Britain may be mentioned the Welsh, dating back to 1527, the standard version being completed in 1604. It was the demand for this Bible that occasioned the institution of the British and Foreign Bible Society in 1804. The Gaelic version for the Highlanders of Scotland dates back to 1767; a Roman Catholic translation in 1796. The first New Testament in Erse was early in the fourteenth century; a number of later versions have been published. A Manx version was published in the latter part of the eighteenth century.

French.—There have been a great number of French versions, all (Protestant as well as Roman Catholic) based on one made from the Vulgate by Jacob Faber Stapulensis, at Antwerp, 1512–30. The most important versions are Olivetan's, of which the most prominent edition was called the *Geneva Bible*; Martin's version and Osterwald's revision. Of Roman Catholic versions the most important are De Sacy's, Orsini's, and Lassere's. The last, published in 1887, under the authority of the Archbishop of Paris, has reached more than twenty editions. These are all in the standard French; other versions are in the Vaudois, Provençal, and Mauritius dialects. Akin also to the French are the Breton and Basque versions, the last in three forms—French, Spanish, and Guipúzcoan. The Flemish version used in Belgium dates back to the year 1477. Later revisions and editions have been published at Louvain, Cologne, and The Hague.

Dutch.—The first complete edition of the Scriptures in Dutch was published in 1526. Lutherans of Holland still use a translation according to Luther's version, published in 1648. Others have followed, including a revised edition circulated at the present time.

German.—In Germany, after the version of Ulphilas, there were a large number of glosses and translations of single books. The earliest translation of the whole Bible was probably about the beginning of the fifteenth century, and early in the sixteenth century fourteen different editions had been published. These were all replaced by Luther's version, 1522–32, which has remained the standard until the present day, a revision of it having been completed in 1892.

Other European Versions.—Akin to the German also are Danish, Icelandic, and Swedish versions. There is also a Gospel of Matthew in Finnish. The Wends have the Scriptures in the Upper, Lower, and Hungarian dialects, and in Eastern Switzerland there are three versions of the Romansch Scriptures, the Upper and Lower Engadine and the Oberland. In Eastern Europe there are numerous Slav versions based entirely upon the Slavonic version of Cyril's translation, the most ancient manuscript of which is the Ostromirov's Gospel, written in 1053 for a Russian prince. The various dialects in which these have been supplied are the Czech or Bohemian, dating to the latter part of the fifteenth century; the Slovak, Servian, Croat, Slovenian, Ruthenian, Russian, and Bulgarian. The present Russian versions are one completed early in the present century under the auspices of the Holy Synod, and one prepared by the British and Foreign Bible Society, completed in 1876. The best of Slavonic versions is the Bulgarian, prepared by Dr. E. Riggs, missionary of the American Board in Constantinople, Turkey. The Magyars, or Hungarians, and the Roumanians each have versions in their own language, as have also the Lithuanians, Letts, and other members of the Finnish race, one of the most prominent being the Esthonian, recently prepared by the American Bible Society. There are also versions in Albanian. Versions of the Bible in the modern Greek or Romaic date back to 1638. Several revisions have followed, the latest having been completed early in the nineteenth century.

In Southern and Southwestern Europe there are versions in Italian, Spanish, Portuguese, and Gitano. That in Italian dates from 1471. The most important translation was that of Diodati, published at Geneva in 1607, and which has been the basis of all subsequent revisions. The Spanish versions also date from the middle of the fifteenth century, in the Castilian and Lemosinian dialects; the most important versions are those of De Reyna, Valera, and Scio. There have been revisions, especially with reference to use in Spanish America, and one is now (1893) being completed under the auspices of the American Bible Society.

Asia.—In Western Asia the three most important versions for Moslems are the Arabic, Persian, and Turkish. The earliest Arabic version was made by John, Bishop of Seville, in 750; then followed that of Rabbi Saadia and others. The most important was that begun in Beyrout by Dr. Eli Smith, of the American Board, in 1837, and completed by Dr. C. V. A. Van Dyck in 1864; published by the American Bible Society, and circulated wherever the Arabic language is known in Asia or Africa. There is another version prepared by the French Roman Catholic priests, published in Beyrout, and said to be excellent. The earliest Persian version known was published in Constantinople for Persian Jews, early in the sixteenth century. Different translations have been made, one of the New Testament by Henry Martyn, and of the Old Testament by Archdeacon Robinson and the Rev. W. Glen. A revision of Henry Martyn's version, under the auspices of the Church Missionary Society and the American Presbyterian Board, has been made. There are a large number of Turkish versions in dialects used in Russia, Siberia, and Central and Western Asia. In Osmanli Turkish, spoken by the Turks of the Ottoman empire, there were two translations about the middle of the seventeenth century, by Seaman and Ali Bey respectively. The latter was revised early in the present century by Mr. Redhouse, the Turkish scholar and lexicographer. A practically new translation has been prepared by the missionaries under the auspices of the British and American Bible Societies. The work was begun by the Rev. Dr. W. G. Schauffler, and completed by a committee. There are also editions in the Armenian character, called Armeno-Turkish, and in the Greek character called Græco-Turkish or Caramanlija, from the province of Asiatic Turkey where it is chiefly used. A complete translation into Azerbaijan-Turkish, the dialect used in the Caucasus and Northern Persia, has also been prepared. The Armenians use an ancient version prepared by Mesrop in the fifth century. Various editions of this have been issued, and a revision is now (1893) in preparation under the auspices of the American Bible Society. The first edition in the modern language was published in Paris in 1825; another edition by Dr. E. Riggs, at Constantinople in 1845, subsequently revised by him. Portions have been translated into the Kurdish, used by the mountaineers between Turkey and Persia. A Georgian version dates from the eighth century. It was revised in the eighteenth century, and is now printed in the common character by the Moscow and the British Bible Societies. The Nestorians and Syrians of Mesopotamia still use the ancient Peshito in their churches. A modern Syriac version was prepared by Dr. Justin Perkins, revised later by the Rev. Dr. Benjamin Labaree.

In British India the Bible has been translated in whole or in part into almost all the languages and dialects of the empire, the impulse toward translation being chiefly given by the labors of Carey at the beginning of the nineteenth century at the Danish settlement of Serampore. His early editions have been largely set aside by subsequent revision and translation. Only a few of the more important can be noticed. A Sanskrit version was published at Serampore in 1818, an improved translation in 1873. It is in three forms—Bengali, Devanagari, and Uriya. There are versions in Punjabi, or Sikh, and some of the associated dialects. The Hindi Scriptures include the Standard—those in the Hindi language—prepared originally by Carey and subsequently revised in 1883 by a large committee. Allied to this are the versions in the Hindustani or Urdu, originally by Schultze. There are also several other dialects allied to the Hindi-Bengali. A version in the Standard was prepared by Dr. Carey, subsequently revised, and now (1893) in the hands of a revision committee. The Mussulman-Bengali version was begun in 1855, but not completed for several years. There are important versions also in Marathi, Gujarathi, Sindhi, Telugu, Tamil, Santal, and a large number of other dialects. For the Burmans there are versions in the Burman and Karen languages, prepared by the Baptist missionaries. The

Karen versions are in four forms—Bghai, Sgau, Pwo, and Paku. There are also versions in Siamese, Lao, Shan, and Annamese, all prepared by the missionaries. In Ceylon there are the Sinhalese and Pali versions. In the Indian Archipelago there are versions in the various Malayan dialects—the standard and low Malay, the Batta, Java, Sunda, and other dialects. There are also two versions for the Dyaks.

No translations of the Scriptures have required more scholarship or been a more eloquent tribute to the work of missions than those for the Chinese. While portions seem to have been translated by the earlier Roman Catholic missionaries, all of those now existing belong to the nineteenth century. The classical versions are Dr. Marshman's, 1806–22, published at Serampore; Morrison's and Milne's, 1807–23, published at Malacca; the Delegates' version, by a committee of delegates from the several missions in China, and published at Shanghai in 1852. Unfortunately unanimity in regard to the terms for *God* and *Spirit* could not be secured; soon after the completion of the Delegates' version, what is known as the Bridgman-Culbertson version was begun by the Rev. E. C. Bridgman and M. S. Culbertson and others, and completed in 1863. These different versions are in what is called Wên-li, or the "book-style," and can be understood only by persons of fair education. A version of the New Testament in "Easy Wên-li" has been prepared for the National Bible Society of Scotland by Dr. Griffith John, of Hankow, and now committees have been appointed to select three corps of revisers to make a standard version for China (1) in the Wên-li or ordinary book-style, (2) in Easy Wên-li, a simplified book-style, and (3) in the Mandarin colloquial, the every-day speech of three-fourths of the people of China proper. These versions are to take the place of all existing versions that are not mere dialectal versions, of which there are many both in the Chinese characters and in Roman letters. There are also two Mandarin versions of the New Testament, one by Dr. Medhurst, called the Nanking or Southern Mandarin, and another by the late Bishop Schereschewsky, called the Pekingese or Northern version. There is also a Manchu version, and in Central Asia there are several Mongol versions—the Literary, prepared by the missionaries of the London Missionary Society; the Northern or Buriat; the Southern or Kalkhas; and the Western or Kalmuk. The only complete and usable Japanese version is that prepared by a committee of missionaries, chiefly from the U. S., completed in 1888, the expense being shared by the American Bible Society, the British and Foreign Bible Society, and the National Bible Society of Scotland. Dr. Bettelheim, a missionary who had settled in the Loo Choo islands, had previously prepared a Japanese version of the Gospels and Acts of the Apostles, which was printed at Vienna, but it proved to be of little value.

In the Pacific, translations of the Scriptures have been made for most of the islands—Polynesia, Melanesia, and Micronesia—by the missionaries of Great Britain and the U. S. Among the most prominent are the Hawaiian, Samoan, Tahiti, Tonga, Maori, Aneityum, Tanna, Eromanga, the Gilbert islands, the Ruk, and many others.

Africa.—In Africa the Arabic versions of the Scriptures are very largely used. The Copts of Egypt have their ancient version used in their churches, made probably in the second or third century. The Abyssinians use the Amharic. A "Jesuit" version is spoken of in the seventeenth century, but the one in use now was published early in the present century by the British and Foreign Bible Society, revised by Dr. Krapf. There are also versions in Tigre, Bogos, and Falasha-Kara, and the Galla. The latter is in three forms. Portions have also been prepared in a number of Central African dialects. In the South there are the Zulu, Kaffir, Tonga, Hottentot, and other dialects, all prepared by missionaries, many of them requiring the reduction of the language to written characters. The same is true of the dialects of Western Africa. Among the more important are the Congo, Yoruba, and Benga. While there is no completely accurate list, there are certainly sixty versions in these African dialects, and the number is being increased every year.

America.—On this continent the work of translating the Scriptures and of providing the Bible for the Indian tribes began with the labors of Eliot, "the Apostle to the Indians," and has been carried on by various missionaries engaged in the work. Twenty-six different versions are in use in the U. S. and Canada, and eleven in South America, all produced by the missionaries, and published by the Bible societies of Great Britain and the U. S. There are also three versions for the Esquimaux of Greenland, Labrador, and Hudson's Bay, the first having been prepared originally by Hans Egede at the beginning of the eighteenth century, since revised and published by both the Danish and the British Bible Societies. E. M. Bliss.

Bible Christians, or **Bryanites**: a Christian sect, followers of William O'Bryan, of Cornwall, England, a Wesleyan local preacher, who on account of his being a married man could not be received as an itinerant minister among them, and seceded about 1815. The first society formed was in a farm-house in Shebbear, Devon, when twenty-two gave in their names; these all had hitherto been constant attendants at the parish church. The first conference was held at Baddash, Launceston, Cornwall, Aug. 17–26, 1819, and was attended by twelve preachers. Their doctrines are identical with those of the Wesleyan body; their government and methods are similar to those of the Primitive Methodists, and, like them, they license women to preach. They had in Great Britain in 1891, 180 ministers, 1,463 lay preachers, 584 chapels, and 27,121 communicants; besides scores of churches and thousands of members in Australia, Canada, Prince Edward Island, and in Ohio and Wisconsin.

Bible Communists, or **Perfectionists**: See Oneida Community.

Bible Revision: such changes in any version of the Bible as may be called for by changes in the language of the version itself, or by the advance of scholarship. The greatest modern revision of the English Bible was inaugurated on May 6, 1870, when the Convocation of Canterbury appointed a committee of eminent biblical scholars and dignitaries of the Church of England to revise the Authorized English Version of 1611, and to associate with them representative biblical scholars of other Christian denominations using that version. This committee was divided into two companies—one for the Old Testament and one for the New—which held regular meetings in the Jerusalem Chamber in the deanery of Westminster, London. On the invitation of the British committee, a committee of U. S. scholars and divines was organized in 1871, and began active work in Oct., 1872. This was likewise selected from different denominations, and divided into two companies, which met once a month for several days in their own rooms in the Bible House at New York. Virtually, these two committees formed one organization, with the same principles and objects, and were in constant correspondence with each other. The intention was not to furnish a new version, but simply to adapt King James's version to the present state of the English language, without changing the idiom and vocabulary, and to the present standard of biblical scholarship, which, since 1611, has made very great advances in textual criticism, in Greek and Hebrew philology, in biblical geography, and in archæology. The two committees consisted of 79 members—52 in Great Britain, and 27 in the U. S. The first result of their labor, the revised New Testament, was published in 1881. The revised Old Testament was published in 1885. See Bible and Revised Version.

Revised by R. Lilley.

Bible Societies: societies for the dissemination of the Holy Scriptures. While the sixteenth century is distinguished for the labor spent upon numerous translations of the Holy Scriptures into the languages of Christian nations, the nineteenth is no less memorable for the multiplication of Bible societies as a means of securing the widest diffusion of the Bible, not only in civilized lands and among Christian communities, but throughout the world. Priority of date belongs to the Canstein Bible Institute in the Orphans' Home in Halle, which was founded in 1710 by Karl Hildebrand, Marquis of Canstein, for the purpose of putting the Word of God into the hands of the poor at a low price. Before the death in 1719 of the founder, 40,000 Bibles and 100,000 Testaments had been printed. During the first century of its existence more than 3,000,000 copies of the Scriptures, in different languages, had been distributed, and its total circulation up to the year 1879 was reported to be 6,100,000. The British and Foreign Bible Society was established in London, Mar. 7, 1804. Previous to that time eight societies in Great Britain had been engaged in publishing or distributing Bibles, though only three, the Naval and Military Bible Society (1780), the Dublin Association (1792), and the French Bible Society (1792), had made this their principal work, and these, it is believed, did not long survive. The great destitution which was found to prevail in the princi-

pality of Wales in 1802, and the utter inability of existing societies to supply the demand for Bibles, led to the organization of the British and Foreign Bible Society, with the sole object of encouraging a wider dispersion of the Scriptures, first in the British dominions, and then, according to its ability, in other countries, Christian, Mohammedan, and pagan. Three hundred persons of different religious denominations united in organizing it, and £700 were at once subscribed. Its entire receipts the first year fell a little short of £5,600.

The American Bible Society was founded in the city of New York, May 11, 1816, with the sole object, as announced in its constitution, of encouraging "a wider circulation of the Holy Scriptures without note or comment." This society had, however, been preceded by fifty or sixty others, which had come into being at one point and another in the U. S. after the organization of the British and Foreign Bible Society. The first of these was founded at Philadelphia in 1808; the second at Hartford, Conn., in 1809. Next came the Massachusetts Bible Society, at Boston, the New York Bible Society, and the New Jersey Bible Society, at Princeton. Such local societies accomplished much good within their own bounds; but, having no bond of union, their operations lacked efficiency and economy, and it soon became apparent that a combination of effort was essential for thorough work. Thirty-five local organizations sent delegates to the convention which founded the American Bible Society, and eighty-four became auxiliary to it during the first year of its existence. Among the delegates were representative men of the leading denominations—Baptist, Congregational, Reformed Dutch, Methodist Episcopal, Protestant Episcopal, Presbyterian, and the Society of Friends; but, every sectarian jealousy and party prejudice being laid aside, all united with perfect harmony and cordiality in the single object of "disseminating the Scriptures in the received versions where they exist, and in the most faithful where they may be required." The announcement of this organization brought from the British and Foreign Bible Society the expression of their warmest congratulations, and the offer of a gift of £500. At an early date Bible societies were formed on the Continent of Europe, as at Basel (1804) and Berlin and Ratisbon (1805), and nearly fifty others, chiefly in the north of Europe, before 1816. At that time, also, two had been established in Africa, five in Asia, and others in Nova Scotia, Canada, and the West Indies. About seventy principal societies may be named as having been actually engaged in the manufacture and publication of Bibles. Auxiliary and branch Bible societies and associations have been very extensively formed, with a view of enlisting local sympathies, collecting funds from churches and individuals, maintaining depositories, and looking after the circulation of the Scriptures among the needy. The American Bible Society has more than 2,000 auxiliary societies, and with them are connected nearly 5,000 branches. Such societies are expected to supply the wants of their field from their own resources, if possible, though receiving aid from the national society when necessary, and paying over their surplus funds annually into its treasury. The British and Foreign Bible Society has also not far from 1,200 auxiliaries and branches, as well as 3,134 Bible associations, in the management of which women have a principal part. Besides these home institutions it has many colonial auxiliaries, and also foreign agencies superintending its depositories of Bibles in the chief cities of Europe. Not far from 16,000 smaller organizations are thus connected with the two principal Bible societies of the world; and when it is remembered that many of the continental societies also have adopted the auxiliary system, it is very clear that this multiplication of associations for the distribution of the Scriptures is one of the phenomena of the age.

The National Bible Society of Scotland, the third in importance, was formed in 1861 by the union of Edinburgh Bible Society with the leading Scottish societies of the time. It has issued nearly ten million copies or portions of the Bible.

The American and Foreign Bible Society was founded in New York in 1836 by representatives of the Baptist denomination, owing to the refusal of the American Bible Society to apply its funds to print and circulate versions of the New Testament made by American Baptist missionaries, in which *βαπτίζειν* and its cognate terms were literally translated, not transferred. The American and Foreign Bible Society, thus inaugurated, instructed its translators "to endeavor to ascertain the exact meaning of the original text, to express that meaning as literally as the nature of the languages into which they should translate the Bible would permit, and to transfer no words which were capable of being literally translated." Some of the members of this society were earnest advocates of the publication of a new version of the English Scriptures on the same principle as that which governed its translations into foreign tongues; and on its refusal to authorize such a revision the American Bible Union was formed (1850)—a society which has published a revised version of the New Testament, Psalms, Job, Genesis, and other portions of the Old Testament in conformity with the principle indicated—translating *βαπτίζειν* by "to immerse," etc. Although some of the most eminent scholars among the Baptists have been employed on the versions of this society, it has never received the support of the great body of American Baptists.

In general, several characteristics of Bible societies are to be noted. They are voluntary associations, being neither close corporations nor under ecclesiastical direction, and the privileges of membership are secured by the payment of money. They are unsectarian, inviting all men to common efforts on the simple basis of the Scriptures of the Old and New Testament without note or comment. They are Protestant organizations, however, because the rules of the Roman Catholic Church are opposed to the free circulation of the Scriptures without admixture of comment. They are strictly benevolent societies, publishing not for profit, but at prices as low as possible, and making large grants, as their receipts may allow, for the supply of the destitute. Their work is exceedingly helpful to Sunday-schools and to various forms of missionary effort at home and abroad; and their influence has been most happy in promoting Christian union, and presenting a form of religious activity in which all denominations might participate without the sacrifice of principle.

The work of Bible societies has constantly encountered difficulties of one sort and another. The circulation of the Bible in all lands creates a demand for new versions, the preparation of which involves many nice points, while the revision of existing versions can hardly fail to occasion complaint. Even the determination of the canon of the Scripture is not universally agreed on. The most violent controversy in the British and Foreign Bible Society turned upon the question whether the Apocrypha should be published and circulated. The controversy continued for years; and when in 1826 it was finally decided to withhold all aid from associations circulating the uncanonical books, fifty auxiliaries on the Continent withdrew from the parent society. The Edinburgh society, which had earnestly opposed the circulation of the Apocrypha, also withdrew and stood aloof. The proposal to combine men of different persuasions in Bible effort, and to circulate the Bible without the Book of Common Prayer, encountered some opposition in England at an early date, which after a few years died away. The Russian Bible Society at St. Petersburg (founded 1813) flourished until 1826, when its operations were summarily suspended by the Emperor Nicholas, on the ground that it belonged to the Church, rather than to a secular society, to furnish the people with the Word of God.

In the American Bible Society differences of opinion concerning the principles which should govern translations into foreign tongues led to the formation of the American and Foreign Bible Society in 1836; and at a later period (1858) its harmony was again imperiled for a time in consequence of dissatisfaction at some attempted modifications (numerous though generally slight) in the English editions of the society—a dissatisfaction which was allayed by abandoning the proposed changes.

The work accomplished by Bible societies in the nineteenth century is vast in extent and of unspeakable usefulness. In 1892 the receipts of the American Bible Society for the year ending Mar. 31, applicable to its general purposes, were $556,527.29. The same year it had issued 1,298,196 volumes, including Bibles, Testaments, and integral portions of Scripture. The British and Foreign Bible Society reported its issues for 1892 as 3,989,215 volumes, of which 823,313 were Bibles. Its total issues from 1804 to 1892 are 131,844,796 volumes, and the total issues of the American Bible Society from 1816 to 1892 are 55,531,908. It is a low estimate that 235,000,000 volumes of the Bible or separate books of the Bible have been issued by Bible societies since the tears of a little girl in Wales in 1802 led Thomas Charles to ask what could be done to secure Welsh Bibles for his congregation. The aggregate number of volumes issued by no

means measures the results of Bible society work. From motives of benevolence the prices of Bibles have been determined by the cost of materials and of manufacture, without regard to profit. The British and Foreign Bible Society has its work done by contract; the American Bible Society manufactures its publications on its own premises, and in so doing gives constant employment to about 250 persons. Besides the books which are sold at unremunerative prices a large part of the publications each year are given away to destitute families and individuals, to charitable institutions, Sunday-schools, missionary societies, soldiers, seamen, immigrants, travelers, prisoners, and other classes of persons. Four times in seventy-six years the American Bible Society and its auxiliaries have made an extensive canvass of all parts of the U. S., in the effort to reach every destitute family in the land with the offer of a Bible, and they are now engaged in a similar effort to supply every Sunday-school scholar with a Bible. It also has twelve agents in foreign lands, under whose direction 323 persons were employed in 1891 to distribute the Scriptures. It has distributed the Scriptures in about eighty different languages and dialects, and in many new versions which have been made in the present century. The circulation of the Scriptures has been promoted by the British and Foreign Bible Society in about 300 languages and dialects.

For further information respecting Bible societies reference may be had to the following works: Owen's *History of the British and Foreign Bible Society* (1817); Browne's *History* of same (1859); Dudley's *Analysis of the System of Bible Societies* (1821); *Jubilee Memorial of British and Foreign Bible Society* (1854); *Jubilee Commemoration at Bombay* (1854); Strickland's *History of American Bible Society* (1856); *Jubilee Memorial* (1866); *Manual of American Bible Society* (1887); Memoirs of S. H. Turner, Gardiner Spring, and John C. Brigham; numerous controversial pamphlets; *Bible Society Record*, and *Annual Reports* of each Bible society. E. W. Gilman.

Bib'lia Pau'perum [a Latin term signifying "the Bible of the poor"]: the work known to bibliographers under this name is one of the earliest "block books" printed before the use of movable type, probably about 1420. The work consists of a series of thirty-four to fifty cuts illustrating the history of our Lord, each with representations of those Old Testament events which were considered to have been their types. The descriptive text is in abbreviated Latin. It has different titles, but Heineken gave it the name which he found attached to a copy which he described. It would seem ill adapted to the wants of the ignorant laity of that time, when few among them were equal to the task of deciphering the letterpress, and without this the engravings would have been meaningless. There seems good reason for the opinion of Jackson and Chatto (*History of Wood-engraving*) that the work was prepared to aid the mendicant friars in their preaching—the text forming the topic for their sermons, and the pictures an excitement for their imaginations. Facsimile reprints have appeared, London, 1859, 1877, 1884; and from a German original, Vienna, 1890.

Revised by S. M. Jackson.

Biblical Archæology: See Archæology, Biblical.

Bibliog'raphy [from Gr. *βιβλιογραφία*; *βιβλίον*, book + *γράφειν*, write]: the science which treats of books in all their aspects; therefore peculiarly the science of booksellers and librarians. Pure bibliography concerns itself with the external features of books; applied bibliography takes cognizance of their contents. A bibliography is also a classified list of the works in some particular department of knowledge, as a bibliography of political economy. The first book published on this subject was the *Bibliotheca bibliothecarum*, by the Jesuit P. Labbé (Paris, 1664). Conrad von Gesner compiled the *Bibliotheca Universalis* (4 vols., Zurich, 1545–55); to-day, so far from any one attempting a "universal" bibliography, it is sometimes the work of a lifetime to trace the history of a single book or series of books. Of general bibliographies, some of the most important are Brunet's *Manuel* (9 vols., incl. supplement, Paris, 1860–80); Graesse, *Trésor* (7 vols., Dresden, 1859–69); Ebert, *Allgemeines bibliographisches Lexikon* (2 vols., Leipzig, 1821–30; Eng. translation by A. Brown, 4 vols., Oxford, 1837); Watt, *Bibliotheca Britannica* (4 vols., Edinburgh, 1824). The *American Catalogue* (3 vols., N. Y., 1890–91) gives under an author and a title index the titles of all books published in the U. S. on sale in 1876, and which appeared up to June 30, 1890, and is supplemented by an annual volume. The new books are noted as they come out in the *Publishers' Weekly* (N. Y.), from which the *Catalogue* is made up. Works published in Great Britain are found in the *English Catalogue* (1835–89), with annual supplements, and in the weekly *Publishers' Circular*; for French literature the *Catalogue de la libraire française*, by Lorenz, is the standard. It extends from 1840 to the present time, and the periodical *Bibliographie de la France* has been published since 1811. German authorities are Hinrichs, *Verzeichniss*; Heinsius, *Bücherlexikon* (1700–89); Kayser, *Vollständiges Bücherlexikon* (1750–1890); and the *Gesammt Verlags Katalog des deutschen Buchhandeles*. Dutch literature has been catalogued in the periodical *Nederlandische Bibliographie* since 1854, the best catalogues being those by Brinkmann; Belgium has had the periodical *Bibliographie de Belgique* since 1875; the *Bibliographie Nationale* covers the ground since 1830. There are also special catalogues in all the other leading modern tongues. English periodical literature is catalogued in the great *Index* of W. F. Poole (first published in 1853; new ed. Boston, 1882; supplements published every five years, first in 1888). This is supplemented by the *Co-operative Index to Periodicals*, edited by W. I. Fletcher, published quarterly in New York since 1885. Every department of learning, as well as every nation, has its special bibliography. In this cyclopædia a brief bibliography is appended to all the leading articles. Pure bibliography is closely related to library management. (See Library.) An index society was founded in London in Dec., 1877, for the purpose of forming indexes to rare and important books, and a bibliographical society in 1892. Petzholdt's *Bibliotheca Bibliographica* (1864); Vallée's *Bibliographie des Bibliographies* (1883), with supplement (1887); British Museum *Hand-list of Bibliographies* (1881); Wheatley's *How to Form a Library* (1886).

C. H. Thurber.

Bibliomancy [from Gr. *βιβλίον*, book + *μαντεία*, divination]: a mode of divination used in both ancient and modern times by opening the Bible and observing the first passage which occurred, or by entering a church and taking note of the first words of the Bible heard after entering. It seems to have originated with the pagans, who employed Homer or Vergil in like manner, and to have been adopted from them by the Eastern Christians. The application either depended upon the sound of the words or upon the signification of the passage. Prayer and fasting were used as a preparation for consulting the divine oracles. Bibliomancy was prohibited, under pain of excommunication, by the Council of Vannes, 465 A. D., and by succeeding councils. It continued, however, to prevail for many centuries thereafter. It came into use in the Gallican and Greek Churches in the choice of bishops, and prevailed in some places for centuries. Many eminent Protestant Christians have made use of this practice in times of perplexity, for instance John Bunyan and John Wesley.

Bibliomania [from Gr. *βιβλίον*, book + *μανία*, madness]: the passion for acquiring and possessing books. Bibliomaniacs are governed in their selection by all sorts of curious fancies, for books of a certain binder, of a certain press, early and rare editions, *éditions de luxe*, uncut copies, illustrated copies, etc. Extraordinary prices are often paid: Bernard Quaritch paid what is said to be the largest sum recorded for a single volume, £4,950 for the *Psalmorum Codex*. Over $10,000 was paid for a copy of the first dated *Decameron*. In 1884 a Mazarin Bible (one of the twenty-five copies of the first printed Bible, date 1450, known to have belonged to Cardinal Mazarin) brought £3,900. High prices are often paid for books containing certain faults or misprints. The bibliomaniac is governed in his choice mainly by incidental and often trifling considerations; whereas the bibliophile, or book-lover, collects books with some specific literary or scientific purpose, seeking to bring together everything pertaining to a given author or subject. Dibdin, *Bibliomania* (1811); Andrew Lang's *Books and Bookmen* (1887). C. H. Thurber.

Bibliothe'ca [Lat. from Gr. *βιβλιοθήκη*: *βιβλίον*, book + *θήκη*, chest, repository]: the Latin word signifying library, a collection of books; often used, like our word "library," as a name for publications of various kinds, as *Bibliotheca Hispana*, *Bibliotheca Sacra*, etc.

Bice [from Fr. *bis*, dark-colored, brown; Ital. *bigio* < a deriv. of Lat. *bombyx* = Gr. *βόμβυξ*, silkworm]: the name of two blue and green pigments; native carbonates of copper, used by painters from very early times. The blue bice is sometimes called mountain-blue and ongaro. The syno-

nyms of green bice are Hungarian green, verdetto, malachite green, mountain green, etc.

Bi'ceps [Lat., double-headed; *bi-*, twice + *caput*, head]: the large round muscle lying upon the front of the arm. Above, it consists of two portions or heads—whence its name—one being attached to the coracoid process of the scapula, the other to the margin of the shallow socket for the head of the humerus. The former is the short, the latter the long, head of the biceps. They unite to form a fleshy belly, which terminates in a rounded tendon inserted into the tubercle of the radius. The action of the biceps is to bend the forearm. Another biceps is found on the outer and posterior aspect of the thigh. Its long head arises from the tuberosity of the ischium; its short head, from the *linea aspera* of the thigh-bone. Its tendon is the outer hamstring.

Bicêtre: the name of an old castle, a hospital, and a fort in the department of Seine, in the southern environs of Paris. The castle, which is very large, has been converted into a hospital for old men and for lunatics. Here the prisoners sentenced to death or to the galleys were formerly kept until the sentence was executed. But in 1837 this prison was transferred to La Roquette. Situated on an eminence, it commands a fine view of Paris and the Seine. Here are accommodations for about 900 male lunatics, who receive gentle treatment. The name is said to be a corruption of *Winchester*. Its castle was founded in 1290 by John, Bishop of Winchester.

Bichat, Marie François Xavier: French anatomist and physiologist; b. at Thoirette, in Jura, Nov. 11, 1771. In 1797 he began to lecture on anatomy, surgery, etc., in Paris. He published *Researches on Life and Death* (1800), and an excellent and profound work entitled *General Anatomy Applied to Physiology and Medicine* (4 vols., 1801). He simplified anatomy and physiology by reducing the complex structures of the organs to the simple or elementary tissues, and he was the first to recognize the importance of the distinction between the organic functions and the animal or vital functions. Having impaired his health by close application, he died before the age of thirty-one, July 22, 1802.

Bickaneer: same as Bikanir.

Bick'erstaff, Isaac: Irish dramatist; b. in Ireland about 1735; was in his early life an officer of marines. He produced several popular comedies and comic operas, among which are *The Maid of the Mill*; *The Padlock*; *Love in a Village* (1763); and *The Captive*. D. after 1787. Steele's *Tatler* was published under the assumed name of Isaac Bickerstaff, which often occurs in the papers of that work.

Bick'ersteth, Edward: an English theologian; b. in Kirkby Lonsdale, Westmoreland, Mar. 19, 1786. He took orders in the Anglican Church (1815), and was sent by the Church Missionary Society to Africa in 1816 to reorganize their mission stations. On his return the same year he was chosen secretary to that society, and ably served it until 1830, when he became rector of Watton, in Hertfordshire. He was one of the leaders of the Evangelical party in the Church of England, and one of the founders of the Evangelical Alliance in 1845. Among his works, which are highly esteemed, are a *Help to the Study of the Scriptures* (1814); *The Christian Student*; *A Treatise on Baptism*; and *The Promised Glory of the Church of Christ*. D. at Watton, Feb. 28, 1850. His collected works were published in 16 vols., 1853. See T. R. Birks, *Memoir of the Rev. E. Bickersteth* (2 vols., 1851).

Bickersteth, Edward Henry, D. D.: a poet and bishop of the Church of England; b. at Islington, Jan. 25, 1825, and was educated at Trinity College, Cambridge. Ordained deacon in 1848, and priest the following year. He was consecrated Lord Bishop of Exeter, Apr. 25, 1885, in St. Paul's Cathedral, London. He has published, besides numerous other works, *Poems* (1849); *The Rock of Ages* (1859); *Yesterday, To-day, and For Ever* (1866; 18th ed. 1886), which has had a great success; *The Two Brothers, and Other Poems*; and *The Hymnal Companion to the Book of Common Prayer*, of which numerous editions have appeared.

Bick'more, Albert Smith, Ph. D.: naturalist; b. in St. George's, Me., Mar. 1, 1839, and graduated at Dartmouth in 1860. He studied under Agassiz at Cambridge, and in 1865 sailed for the Dutch East Indies for the purpose of collecting shells. He also traveled in China, Japan, Manchuria, Siberia, and Russia. He became in 1870 Professor of Natural History in Madison (now Colgate) University, and has devoted much time to the Museum of Natural History founded by him at the Central Park, New York, and of which he is superintendent. He has published *Travels in the East Indian Archipelago* (1869).

Bick'nell, George Augustus: jurist; b. in Philadelphia, Pa., Feb. 6, 1815; graduated at the University of Pennsylvania, and from the Yale Law School. In 1876 and 1878 he was elected a member of Congress from Indiana. In 1881 he was appointed commissioner of appeals in the Supreme Court of Indiana. From 1861 to 1870 he was Professor of Law in the Indiana State University. D. in New Albany, Ind., Apr. 11, 1891. Henry Wade Rogers.

Bicycle [from Lat. prefix *bi-*, having two + Gr. κύκλος, wheel]: a form of velocipede which began to appear in England in 1867 with two wheels arranged one in front of the other, and which is kept upright by its own motion. The wheels differ in diameter, from the earlier forms, when the trailing-wheel had less than a third of the diameter of the driving-wheel, to the safety with both wheels of like dimension. They are propelled by pedals moved by the feet, and acting sometimes directly upon a crank, and again by gearing. They have rubber tires of varied character, and are very light, strong, and swift. See Cycling and Velocipede.

Bidar, bee'dar: a fortified city of Hindustan; capital of a native state of the same name; near the Manjira river and in the Nizam's Dominions; about 75 miles N. W. of Haiderabad (see map of S. India, ref. 3–D). It was formerly an important place, but is now chiefly remarkable for the manufacture of tutenag wares of an alloy of tin and copper.

Bidassoa, bĕe-daăs-sō'ăă: a small river forming part of the boundary between France and Spain. It rises in Spain, and enters the Bay of Biscay at Fuentarabia. On the Isle of Pheasants, in this river, the treaty of the Pyrenees was concluded in 1659. In Aug., 1813, Wellington defeated the French marshal Soult at San Marcial on the Bidassoa.

Bid'deford: a city and railroad center, York co., Me. (for location of county, see map of Maine, ref. 11–B); on Saco river, 9 miles from its mouth. It was named from the city of Bideford, England. The first settlement was made at the "Pool" (at the mouth of the river) by Richard Vines in 1616–17. It was settled by a patent to John Oldham and Vines in 1630. York County originally embraced all of the province of Maine, and while settlements were made at a very early date along the seacoast (none earlier than this) to the Piscataqua river, Bideford or Biddeford for a long series of years was the chief settlement and center. Here are inexhaustible ledges of granite, which ranks among the best in the world, and is largely exported. The business of the place is principally the manufacturing of cotton cloth. A large amount of lumber is also manufactured. Pop. (1880) 12,651; (1890) 14,443; (1900) 16,145. Editor of "Journal."

Bidding-prayer [the original meaning of *bidding* was "praying"; cf. *beads—bidding*; cf. O. Eng. *biddan*, beg; Germ. *Bitten*; Goth. *bidjan*, now confused with descendants of O. Eng. *bēodan*; Germ. *Bieten*; Goth. *biudan*, offer, proclaim, command]: a formula of public prayer found in the ancient Greek liturgies, in the Gallican liturgy, and in the English service-books, in which the priest recites in detail what the people are to pray for, and closes with the Lord's Prayer, in which all the previous petitions are considered to be summed up. Canon 55 of 1603 (the Church of England) directs that before all sermons, lectures, and homilies, not delivered in the course of divine service, the preacher shall move the people to devotion by the use of the bidding-prayer, a form of which is given. In Dr. Henderson's *Manuale et Processionale ad Usum Insignis Ecclesiæ Eboracensis*, App. x. (Surtees Soc., 1874–75), are forms of bidding-prayers from the eleventh to the fifteenth centuries, and a sixteenth-century form is given among the *Preces in Dominicis dicendæ* (*Manuale*, etc., p. 123). Notes and illustrations of the York bidding-prayers are found in Canon Simmons's *Lay Folks' Mass-book* (Early Eng. Text Soc., 1879). See Rock, *Church of our Fathers*, ii. 352–378; Maskel's *Mon. Ritualia*, iii.; and Wheatley on *Bidding of Prayers before Sermons . . . an Hist. Vind. of the 55th Canon* (new ed. 1845). William Stevens Perry.

Bid'dle, Clement: a soldier; b. in Philadelphia, May 10, 1740. He was appointed deputy quartermaster-general of the militia of Pennsylvania and New Jersey; fought with the rank of colonel at the battles of Trenton, Princeton, Brandywine, and Monmouth; quitted the army in 1780; became quartermaster-general of the State Sept. 11, 1781.

He was a friend and correspondent of Gen. Washington, who appointed him marshal of Pennsylvania. D. in Philadelphia, July 14, 1814.

Biddle, Edward: brother of Nicholas Biddle: b. in 1739; was an officer in the French war (1756–63), and became a noted lawyer of Reading, Pa.; was member and speaker of the Assembly, and was a delegate from Pennsylvania to the Continental Congress 1774–76 and 1778–79. He was a leading advocate of independence. D. Sept. 5, 1779.

Biddle, George W.: See the Appendix.

Biddle, James: a naval officer; b. in Philadelphia, Feb. 28, 1783; educated at the University of Pennsylvania, and entered the navy in 1800. He served against Tripoli, where he was a prisoner nineteen months. In the war of 1812 he served with distinction in several engagements, and while commanding the Hornet captured the brig Penguin, receiving a wound in the action Mar. 23, 1815. For his services he received a gold medal from Congress, besides other honors. He became a captain in 1815. He was afterward commissioner to Turkey, China, etc., and held other important positions. D. in Philadelphia, Oct. 1, 1848.

Biddle, John: an early English Unitarian: b. at Wotton-under-Edge, in Gloucestershire, in 1615 (baptized Jan. 14); graduated at Oxford, and became an eminent tutor there; then in 1641 a schoolmaster in Gloucester. He was prosecuted about 1645 for the expression of heterodox opinions respecting the personality of the Holy Spirit, and after a formal trial by Parliament was condemned to imprisonment for five years. While in prison he published in 1648 a *Confession of Faith Concerning the Holy Trinity*. He was liberated about 1652, and gathered a congregation of his fellow-believers. He was subsequently persecuted and imprisoned twice during the Commonwealth. He was protected by the friendliness of Cromwell, whose toleration was equal to the widest differences of belief. At the Restoration his persecution was renewed, and he died in prison in London, Sept. 22, 1662. See his *Life* by Joshua Toulmin, London, 1789.

Biddle, Nicholas: a naval officer; b. in Philadelphia, Sept. 10, 1750. He entered the royal navy in 1770, and once served in a ship of which the famous Nelson was mate. He obtained the rank of captain in the U. S. navy in 1776, and took several prizes from the British. Early in 1777 he took command of the Randolph, a frigate, which encountered the Yarmouth, a 64-gun ship, Mar. 7, 1778, near Charleston, S. C. During the action that ensued the magazine of the Randolph exploded, and killed Capt. Biddle, with nearly all his crew.

Biddle, Nicholas, LL. D.: financier; a nephew of Nicholas Biddle; b. in Philadelphia, Jan. 8, 1786. He was a son of Charles Biddle, who was vice-president of Pennsylvania in 1786–87; graduated at Princeton in 1801; was elected to the Legislature of Pennsylvania in 1810; appointed a director of the U. S. Bank by President Monroe in 1819. In 1823 he became president of that bank, the affairs of which he managed with great ability and success for many years, so that it supplied the country with a sound and uniform currency. The bill to recharter the bank having been vetoed by President Jackson in 1832, the bank was closed in 1836 by the limitation of its charter. He was soon elected president of a new State bank, called "The United States Bank," which was chartered by the Legislature of Pennsylvania. This bank became insolvent in the financial crisis of 1841. He was president of the trustees of the fund ($2,000,000) which Stephen Girard left to found a college for orphans. "To his exertions alone," says Judge R. T. Conrad, "the country owes one of the most beautiful structures of modern times, the Girard College. He proposed the present plan, and in the midst of wild political excitement and opposition persisted firmly, and secured a building which every citizen now not only approves, but applauds." D. in Philadelphia, Feb. 27, 1844. See a *Memoir of N. Biddle*, by R. T. Conrad, in the *National Portrait Gallery*, vol. iv., 1839.

Biddle, Richard: lawyer and writer; a brother of the preceding; b. in Philadelphia, Mar. 25, 1796; practiced law at Pittsburg; a member of Congress (1837–41), and wrote a *Memoir of Sebastian Cabot, with a Review of the History of Maritime Discovery* (1831). D. in Pittsburg, July 7, 1847.

Bid'eford: a seaport-town of Devonshire, England; on the river Torridge; 1½ miles from its entrance into the estuary of the Taw; 30 miles N. W. of Exeter (see map of England, ref. 13–D). It has a stone bridge of twenty-four arches, about 680 feet long, a town-hall, a hospital, and manufactures of ropes, sails, earthenware, and leather. Among the articles of export are linen and woolen goods, iron, sails, and naval stores. Vessels of 500 tons can go up to the center of the town. It had a great trade in the sixteenth and seventeenth centuries. Pop. (1891) 7,918.

Bidpai, bid'pī: See Panchatantra.

Bidwell, Daniel D.: general of volunteers; b. at Black Rock, now part of Buffalo, N. Y., Aug. 12, 1816; held important local offices; identified with the militia organizations of the city for many years. On the outbreak of the civil war he enlisted as a private soldier; promoted to be captain in the Sixty-fifth, and subsequently colonel of the Forty-ninth New York volunteers. He was engaged in the various actions of the Peninsula campaign, in the battles of South Mountain and Antietam, Fredericksburg, and Chancellorsville, and before Richmond and Petersburg, being most of the time in command of a brigade. In July, 1864, he was commissioned a brigadier-general of volunteers, and assigned to a command under Gen. Sheridan in the Shenandoah Valley, participating in the battle of Cedar Creek, Oct. 19, 1864, where he was mortally wounded while leading his brigade.

Biebrich: See Biberich.

Bie'dermann, Aloys Emanuel: a German rationalistic theologian; b. at Oberrieden, Mar. 2, 1819. He studied at Basel and Berlin: became professor extraordinary of Theology at Zurich 1850; ordinary 1864. D. at Zurich, Jan. 25, 1885. He wrote *Die freie Theologie* (Tübingen, 1844); founded the *Kirche der Gegenwart* (1845; 2d ed. Berlin, 1884–85, 2 vols.); published in 1869 at Zurich his *Christliche Dogmatik* (2d ed. 2 vols. Berlin, 1884–85), one of the most important emanations of recent rationalistic theology.

Biedermann, Friedrich Karl: German journalist and author; b. at Leipzig, Sept. 25, 1812; became Professor of Philosophy there in 1838, but was dismissed in 1845 on account of his advanced political opinions; played a conspicuous *rôle* in the Parliament at Frankfort 1849; was reinstated as professor, but was again dismissed in 1853 for political reasons. From 1863–66 he edited the *Deutsche Allgemeine Zeitung*; also founded and edited several other liberal papers. Among his works are *Wissenschaft und Universität* (Leipzig, 1838); *Die deutsche Philosophie von Kant bis auf unsere Tage* (1842–43, 2. vols.); *Vorlesungen über Socialismus und sociale Fragen* (Leipzig, 1847); *Erinnerungen aus der Paul's Kirche* (Leipzig, 1849).

Biel, Gabriel: erroneously called "the last of the Schoolmen"; b. at Spire, in Germany, after 1442; studied at Heidelberg and Erfurt; became cathedral preacher in Mainz; provost of Urach 1477; was adviser in the establishment of the University of Tübingen which occurred about this time; became Professor of Theology there 1484. D. in Tübingen, 1495. Although a devout and earnest Catholic, he sided with the Council of Basel against the pope, and deplored the corruptions and abuses of his time. He is worthy of note as having rejected the doctrine of sensible and intelligible species so widely prevalent among the Schoolmen.

Revised by W. T. Harris.

Biel: See Bienne.

Bie'la, Wilhelm, Baron von: German astronomer; b. at Roslau, Prussia, Mar. 19, 1782; discovered in Josephstadt, in Bohemia, in 1826, the comet known by his name. D. in Venice, Feb. 18, 1856.

Biela's Comet: a comet of short period (6¾ years); discovered by Baron von Biela in 1826. It was observed apparently unchanged at various returns, but at its return in 1845–46 it was found to have separated into two parts, both of which were observed in 1852. It was due in 1865, and again in 1872, but no trace of it could be found; in November of the latter year the earth crossed its path, and a shower of meteors was observed, which is now supposed to have been due to fragments of the lost comet.

Bielau: See Langenbielau.

Bielaya, bĕĕ-ăy-lī'a, or **Bielaia**: a river of Russia; rises in the Ural Mountains; flows through Orenburg, and, after a very tortuous course of about 650 miles, enters the river Kama.

Bielaya Tserkov: a village of Russia; one of the principal commercial centers of the government of Kiev; 44 miles S. S. W. of the city of Kiev. It has eleven annual fairs, three of which last for ten days. Great quantities of

grain and cattle are disposed of by these fairs. Pop. about 12,000.

Bie'lefeld: a town of Prussia; in Westphalia; finely situated on the Minden and Cologne Railway; 20 miles S. W. of Minden (see map of German Empire, ref. 4–D). It has manufactures of woolen stuffs, leather, soap, and meerschaum pipes. Its principal industry, however, is linen-weaving. It is, indeed, the center of the whole Westphalian linen-trade. The origin of this industry dates back to the thirteenth century, but it was greatly extended during the sixteenth and seventeenth centuries by refugees from Holland. Here is the old castle of Sparrenberg, now used as a prison. Pop. (1880) 30,679; (1890) 39,942.

Bielgorod, bĕĕ-el'gō-rod (i. e. White Town): a Russian town; in the government of Kursk; on the Donetz; 80 miles S. of Kursk (see map of Russia, ref. 9–D). There are three annual fairs here. Pop. 22,000.

Bie'litz: a town of Austrian Silesia; on the river Biala, and opposite the Galician town Biala; 48 miles S. W. of Cracow, with which it is connected by rail (see map of Austria-Hungary, ref. 3–H). It has an active trade in woolen cloths and cassimeres. Here is a castle of Prince Sulkowsky. A bridge across the river connects Bielitz with Bialia, in Galicia. Pop. (1880) 13,060; (1890) 14,499.

Biella, bĕĕ-el'la: a town of Italy; in the province of Novara; on the Cervo: 38 miles by rail N. E. of Turin (see map of Italy, ref. 3–B). It has manufactures of paper, hats, and woolen goods. Pop. 15,000.

Bielopoli, bĕĕ-ăy-lō'pō-lĕĕ: a town of Russia; government of Kharkof; on the Vira; 118 miles N. W. of Kharkof (see map of Russia, ref. 9–D). It is on the railway from Orel to Kiev. It has a considerable trade and several distilleries. Pop. 12,256.

Bielostok, bĕĕ-ay'-lō-stok (in Pol. *Bialystok*): a fortified town of Russia; government of Grodno; on the river Bialy; 52 miles by rail S. W. of Grodno (see map of Russia, ref. 7–B). It is well built and handsome, has several churches, and a palace with a park, which have been called the "Versailles of Poland." Here are a gymnasium and manufactures of woolen goods, hats, leather, and soap. It is on a railway from Warsaw to Grodno. Pop. (1897) 63,927, a large proportion being Jews.

Bielozero, bĕĕ-ayl'ō-zay'rō (the White Lake): a lake about 25 miles long and 20 miles broad in the government of Novgorod, Russia; lat. 60° 10′ N., lon. 37° 30′ E. Its bottom of white clay gives to the water during stormy weather a milky appearance which was doubtless the cause of its name, White Lake. It receives many small streams; is of considerable depth; abounds with fish. It is connected by the Sheksna river with the Volga and united by canals with the Onega, Sukona, and Dwina. The old town of Bielozersk, situated on the south shore of the lake, was formerly the capital of an ancient principality bearing the same name, and has considerable trade in cattle, corn, and pitch, also manufactures of candles. Pop. (1882) 5,982.

Bienne, bee'ne (Germ. *Biel*): a town of Switzerland; in the canton of Berne; at the northeast extremity of the Lake of Bienne; 13 miles W. S. W. of Soleure (see map of Switzerland, ref. 4–D). It is beautifully situated at the foot of the Jura; is inclosed by old walls, and is connected by railways with Berne and Lausanne. Here are manufactures of watches, cotton goods, etc. Many Roman coins have been found at Bienne, which is a place of great antiquity. Pop. (1897) 19,237, communal.

Bienne, Lake of: in the Swiss canton of Berne. It is 10 miles long, 3 miles wide, and 250 feet deep; is near the base of the Jura Mountains, and has an elevation of 1,419 feet above the sea. The Thiele passes through it before joining the Aar. It incloses the island of St. Pierre, which was the residence of J. J. Rousseau in 1765. In digging peat, which is extensively procured from its marshy border, the remains of a prehistoric village of lake-dwellings have been found on the southeast side of the lake.

Biennial Plants: all plants which live longer than annuals, and not so long as perennials. They grow the first season without flowering, and produce flowers in the second season, at the end of which they die. Such are the turnip, parsnip, beet, and many other plants which are cultivated. Many biennials, if sown early in the spring, will flower in the summer or autumn of that year, and become annuals.

Bienville, bi-ăn'veel', Jean Baptiste Lemoine, de: a French officer and pioneer; b. in Montreal, Feb. 23, 1680; was a brother of Lemoine d'Iberville. He accompanied the latter in an expedition to the mouth of the Mississippi in 1699, and was three times appointed colonial governor of Louisiana. He founded New Orleans in 1718. D. in France in 1768.

Bierstadt, beer'staăt, Albert: landscape-painter; b. in Düsseldorf, Germany, Jan. 7, 1830. He was brought by his parents when he was only a year old to New Bedford, Mass., where he lived until he went to Düsseldorf in 1853, to continue the study of painting, which he had taken up by himself at home. He visited Rome also, and returned to the U. S. in 1857. He then began to paint pictures of Rocky Mountain scenery, making frequent visits to the West, and has returned to Europe for short visits a number of times. His name is widely known, and his pictures have been exhibited in all the important cities of the U. S. His *Discovery of the Hudson River* is in the Capitol at Washington. Most of his works are of large size and are often panoramic in style. He has received various medals at exhibitions in Austria, Germany, and Belgium, and the Legion of Honor at the time of the Paris Exposition in 1867. He was elected a National Academician in 1860. Studio in New York.

William A. Coffin.

Bies-Bosch: a marshy lake of the Netherlands; between the provinces of North Brabant and South Holland, and formed in 1421 by an inundation which destroyed 72 villages and 100,000 people. It forms the part of the estuary of the Maas which is called Holland's Dip, and contains a number of islands.

Bi'frost: in Scandinavian mythology, the trembling way; the beautiful many-colored bridge which the asas built between heaven and earth. It is the rainbow. The red in it, says the Younger Edda, is fire, which keeps the frost-giants away from it. In Ragnarok it breaks.

Bi'ga (or **Bigæ**, a plural form with the same signification): a term applied by the ancient Romans to a vehicle drawn by two horses abreast; a two-horse chariot used in processions and games. Like the Greek war-chariot, it had two wheels, was low and open behind, and higher and closed in front. Figures of the bigæ are often found upon ancient coins.

Bigamy [Fr. *bigamie*, deriv. of *bigame*, from Lat. *bi'gamus*; *bi-*, twice + Gr. *-γαμος*, wedded]: the offense of contracting a marriage while a former marriage is still subsisting. The more proper term for this offense is "polygamy." It is governed by statute. It is usual to provide that if a husband or wife shall remain absent for a specified number of years (generally seven) without being heard from or being known to be living, and the other party shall marry again, no crime will be committed, though the absent party be alive. A party who has obtained a divorce from the bonds of matrimony is free to marry again as if no previous marriage had existed; the conditions upon which the divorcee may remarry vary in different States. Bigamy, it is generally held, consists in the act of marrying; so that if the parties marry in one State and cohabit in another, the crime is committed solely in the place of the marriage, and can only be prosecuted there; but the State laws differ on this point. In a prosecution for bigamy, an *actual* marriage must be established. Evidence of reputation, or even of cohabitation, will not suffice. It does not follow that proof of a ceremonial marriage is necessary. The laws of the States differ upon that point, some holding that a case may be established by proof of consent before witnesses, without any ceremony. Such is the law in New York.

George Chase.

Big Bethel: the name given to the action of June 10, 1861. Gen. Butler, who had taken possession of and fortified Newport News a few days previously, found the Confederates under Gen. Magruder in possession of all the commanding points in his front; he accordingly directed a reconnoissance in force to be made, with the object of surprising and capturing the position called Little Bethel; and to make the expedition more certain of success two regiments, Duryea's Zouaves and the Third New York under Col. Townsend, were to start about midnight of the 9th, and gain the rear of the position to prevent retreat, while a battalion of Vermont troops, Col. Phelps, and a New York regiment, Col. Bendix, were to be ready to attack in front by daybreak of the 10th. Though various precautions had

been taken against mistake, the commands of Cols. Bendix and Townsend approaching each other near daybreak, Col. Bendix's command opened fire on the Third New York, killing two men and wounding a considerable number, and throwing the whole command into confusion before the mistake was discovered. The Confederates, being thus notified, retreated to Big Bethel, where they hastily threw up breastworks behind a deep creek. Gen. Pierce, who was in command of the Federal expedition, after being re-enforced, and finding Little Bethel deserted, advanced toward Big Bethel, a few miles to the N., where he found a Confederate force, estimated at 1,800, under the command of Col. J. B. Magruder, a graduate of West Point, protected by the hastily constructed earthworks. Gen. Pierce ordered an attack, which was continued nearly four hours, during which time the Federal troops were exposed to a deadly fire, while the Confederates were almost entirely protected. Later in the day a more general assault was made, led by Maj. Theodore Winthrop, in which he was instantly killed while encouraging his men to the assault. Gen. Pierce finally ordered a retreat, which was effected in good order, the Confederates following at some distance with cavalry. Lieut. John T. Greble, of the Second U. S. Artillery, was killed while covering the defeated troops. The Confederates, fearing re-enforcements of the Federals from Fortress Monroe, fell back that night to Yorktown. The Federal loss in killed and wounded was about 100 men; the Confederate loss was said to be only 1 killed and 7 wounded.

Big Black: a river of Mississippi; rises in Choctaw co., flows southwestward, and enters the Mississippi at Grand Gulf. Length about 200 miles. It is navigable for steamboats for 50 miles. Gen. Grant's army, moving to the siege of Vicksburg, defeated the Confederates on the Big Black, nearly 15 miles E. of that town, May 17, 1863. The morning after the battle of Champion Hills, May 16, 1863, found the Confederate forces under Pemberton strongly posted on both banks of the Big Black river. The works were successfully assaulted, and all the troops on the east bank, with seventeen pieces of artillery, captured, the remainder of Pemberton's army retreating to the fortifications of Vicksburg.

Big Black River: See BLACK RIVER.

Big Bone Lick: a salt "lick" or spring in Boone co., Ky., which takes its name from the fossil bones of the mastodon and other animals which are thought to have resorted to this place to "lick" the salt earth, and to have perished in the marshy soil, where their bones are now found.

Big'elow, ERASTUS BRIGHAM, LL. D.: inventor; b. in West Boylston, Mass., Apr. 2, 1814. While a mere boy, he invented a loom for suspender-weaving and other machines, and wrote a book on shorthand writing. He subsequently invented looms for counterpanes (1838–40), another for coach-lace, and in 1839 brought out his well-known carpet-loom. He was one of the principal manufacturers in Clinton, Mass. He published *The Tariff Question* (1862) and other works. D. in Boston, Dec. 6, 1879. Memorial sketch by R. C. Winthrop in 1886.

Bigelow, FRANK HAGAR, A. M., B. D.: student of terrestrial magnetism and allied subjects; b. at Concord, Mass., Aug. 28, 1851; educated at the Boston Latin School, Harvard College, and Episcopal Theological School at Cambridge, Mass., and has taken orders as a clergyman. He was for some years assistant astronomer at the Argentine National Observatory at Cordoba, then Professor of Mathematics at Racine College, Wisconsin, then assistant in the *Nautical Almanac* office in Washington, and finally (1891) Professor of Meteorology in the U. S. Weather Bureau, which position he now (1893) holds. His name is especially associated with an instrument for the photographic record of the transit of stars and with some novel studies by which the solar corona, the aurora, and terrestrial magnetism are shown to be associated. The theory involved, though still (1893) new, has met with a favorable reception in scientific circles. He has published many articles on the solar corona, terrestrial magnetism, the aurora, and astronomical instruments and photography. The most important is a monograph on the solar corona, published by the Smithsonian Institution in 1889. M. W. HARRINGTON.

Bigelow, JACOB, M. D., LL. D.: physician and botanist; b. in Sudbury, Mass., Feb. 27, 1787; graduated at Harvard in 1806. He became Professor of Materia Medica and Clinic Medicine at Harvard, and president of the Massachusetts Medical Society. He practiced medicine in Boston many years, founded the Mt. Auburn Cemetery, and laid out the grounds with much taste. Among his works are *American Medical Botany* (3 vols. 8vo, 1817–21); an able *Discourse on Self-limited Diseases* (1835); *Nature in Disease* (1854); and *History of Mt. Auburn* (1860). D. in Boston, Jan. 10, 1879.

Bigelow, JOHN, LL. D.: an author and diplomatist; b. in Malden, N. Y., Nov. 25, 1817; graduated at Union College in 1835. He contributed many articles to the *Democratic Review*, and in 1850 became managing editor of William C. Bryant's journal, the *New York Evening Post*. Having visited Jamaica in that year, he published *Jamaica in 1850, or the Effects of Sixteen Years of Freedom on a Slave Colony*. He was appointed U. S. consul at Paris in 1861, and minister plenipotentiary at that court in Apr., 1865. He resigned his position in 1866, and was Secretary of State for New York 1867–68. He published in Paris *Les États-Unis d'Amérique en 1863*. He has also edited the *Autobiography of Franklin* (1868), from the original manuscript which he found in France. Among his other works are *Some Recollections of Antoine Pierre Berryer* (1869); *France and Hereditary Monarchy* (1871); *The Wit and Wisdom of the Haytians* (1877); *Molinos the Quietist* (1882); and a *Life of William Cullen Bryant* (1890). In 1885 he published *The Writings and Speeches of Samuel J. Tilden*; and in 1888 *The Complete Works of Benjamin Franklin*.

Bigelow, MELVILLE M., Ph. D.: legal author and teacher; b. in Eaton Rapids, Mich., Aug. 2, 1846. He received his education at the University of Michigan and at Harvard. For a number of years he has been a lecturer on law in the Boston, Northwestern, and Michigan University law schools. He has written a number of legal treatises, the more important of which are those on estoppel, fraud, and torts. He is the American editor of *Jarman on Wills*.

Bigelow, TIMOTHY: b. in Worcester, Mass., Aug. 12, 1739; a blacksmith who became a member of the Provincial Congress of 1774–75; entered the Revolutionary army as captain of minute-men in 1775; was captured at Quebec, became a colonel of Massachusetts troops, serving at Stillwater, Valley Forge, etc. D. in Worcester, Mar. 31, 1790.

Big'ger, SAMUEL: b. in Warren co., O., about 1800; educated at Athens University; studied law at Lebanon, and commenced practice in Indiana; was member of Congress 1834–35; and subsequently judge of the circuit court; elected Governor of Indiana for 1840–43 by the Whigs. D. at Fort Wayne, Ind., 1845.

Big-horn, or **Rocky Mountain Sheep** (*Ovis montana*): a large sheep native in the Rocky Mountains. It has enormous horns about 4 feet long and from 18 to 20 inches in circumference. It is about 4 feet high, has coarse hair, and moves with great agility.

Big Horn: a river of the U. S.; the largest affluent of the Yellowstone. It rises in the State of Wyoming, among the Wind River Mountains; flows in a generally northward direction; crosses the southern boundary of Montana; enters the Yellowstone at Big Horn City, in Montana. Entire length, estimated at 450 or 500 miles. The upper part or head stream of it is called Wind river.

Biggs, ASA: b. at Williamston, Martin co., N. C., Feb. 4, 1811; educated at an academy; studied law; was admitted to the bar in 1831; was elected member of the constitutional convention of North Carolina in 1835, and of the State Legislature in 1840, 1842, and 1844. He was a member of the Twenty-ninth Congress, and in 1850 was one of the commissioners appointed to revise the statutes of the State. In 1854 he again became a member of the State Senate; elected a Senator in Congress in 1854 for six years; resigned in May, 1858, and was appointed judge of the U. S. district court of North Carolina. D. in Norfolk, Va., March 6, 1878.

Big'ler, JOHN: b. in Cumberland co., Pa., Jan. 8, 1804; a brother of Gov. William Bigler of Pennsylvania; became a printer, a journalist, and subsequently a lawyer. He removed to Illinois in 1846, and to California in 1849, where he was a prominent Democratic politician, and was known as "Honest John Bigler." He was Governor of California (1852–56). D. Nov. 13, 1871.

Bignon, bĕĕn'yōṅ', LOUIS PIERRE ÉDOUARD: a French statesman and historian; b. at La Meilleraye, Jan. 3, 1771. He was elected to the Chamber of Deputies in 1817, and be-

came a peer of France in 1837. He wrote a *History of France from the 18th Brumaire to the Peace of Tilsit* (7 vols., 1827–38), and other works. Napoleon I. bequeathed him 100,000 francs. D. in Paris, Jan. 5, 1841.

Bigno'nia [named by Tournefort in honor of the Abbé Bignon, the librarian of Louis XIV.]: a genus of plants, the type of the family *Bignoniaceæ*, natives of the tropical and sub-tropical parts of America. Many of them are climbing plants, with compound leaves terminating in a tendril, and handsome trumpet-shaped or bell-shaped flowers, which are five-lobed, or rather two-lipped. The *Bignonias* are probably the handsomest twining plants known. The trumpet-creeper or trumpet-flower of the U. S. is the *Bignonia radicans* (or *Tecoma radicans*). It has a large and showy orange and scarlet corolla, funnel-shaped and five-lobed, with four stamens.

Bignonia Family (*Bignoniaceæ*): mostly trees and shrubs (often climbing), dicotyledonous, gamopetalous, with superior ovaries. They are related to the *Acanthus* family, the figworts, bladderworts, etc. There are about 460 species known, natives, mostly, of warm climates. *Bignonia*, *Tecoma*, and *Catalpa* are representative genera. CHARLES E. BESSEY.

Big Rapids: city and railroad center: capital of Mecosta co., Mich. (for location of county, see map of Michigan, ref. 6–I); on the Muskegon river, 56 miles N. of Grand Rapids and 55 miles N. of Muskegon. It has Holly waterworks, extensive water-power (the river being dammed in two places), a heavy lumber trade, and manufactories of furniture, coiled elm hoops, and sash, doors and blinds. Pop. (1880) 3,552; (1890) 5,303; (1900) 4,686.

EDITOR OF "PIONEER."

Big Sandy River: an affluent of the Ohio; the boundary between West Virginia and Kentucky. It is navigable for more than 100 miles for steamboats. Its main stream, or Tug Fork, rises in the S. of West Virginia. Its West Fork flows through Eastern Kentucky. Its valley abounds in coal, timber, and mineral wealth.

Big Spring: town (founded in 1882); capital of Howard co., Tex. (for location of county, see map of Texas, ref. 3–E); on Texas and Pacific R. R., 270 miles W. of Fort Worth; has churches of five denominations, graded public school, private school, and shops of Tex. and Pac. R. R. The industries of the town are principally farming, sheep-raising, and cattle-raising. Pop. (1890) 1,158; not returned separately in 1900. EDITOR OF "PANTAGRAPH."

Big Trees of California: See SEQUOIA.

Big Vermilion River: See VERMILION RIVER.

Big Wood (Boisé or Boisée) River: of Idaho; rises in or near the Salmon Mountains; flows westward, and enters the Lewis or Snake river on the line between Idaho and Oregon. Gold is found near this river.

Bihar, bĕĕ-haar': a county of Hungary; bounded N. by the counties of Hajduken, Szabolcs, and Szatmar, E. by Szilagy and Klausenburg, S. by Arad, and W. by Bekes. Area, 4,279 sq. miles. The eastern part is mountainous, while the western is a plain, consisting alternately of swamps, sandy plains, and fertile ground, traversed by numerous small rivers. All kinds of grain abound, especially wheat of an excellent quality. Wine and tobacco are also raised in great quantities. Pop. (1890) 516,853. Chief town, Grosswardein.

Biisk, beesk: a fortified town of Siberia, in the government of Tomsk; 300 miles S. of Tomsk (see map of Asia, ref. 3–F). Pop. 17,560.

Bijapur, bĕĕ-ja-poor', or **Bejapoor** (i. e. the victorious or unconquerable city): a city of India; in the presidency of Bombay; 245 miles S. E. of Bombay (see map of S. India, 4–D). It was formerly the populous capital of the powerful Hindu kingdom of the same name, which was founded by Tusnef (d. 1510); conquered by Aurungzebe in 1686; and afterward a part of the empire of the Grand Mogul. According to tradition, it contained 100,000 houses, but is at present in ruins. It presents a magnificent external show of domes and minarets, temples and mausoleums, some of which display exquisite workmanship; and lofty walls of hewn stone inclose this scene of splendid desolation. Among the ruins, which are of great extent, is a mausoleum of Mahmud Shah, the dome of which is visible at a distance of 14 miles. Here are several brass cannon of enormous size.

Bikanir, bik-a-neer', or **Biekaneer**: a native state of Rajputana, British India; situated between lat. 27° 30′ and 29° 55′ N., and between lon. 72° 30′ and 75° 40′ E. Area, 23,340 sq. miles. The soil is poor, consisting almost entirely of deserts. The inhabitants are mostly Rajputs. Pop. 510,000.

Bikanir, or **Bickaneer**: a fortified town; capital of state of same name; in an arid and desolate tract 240 miles W. S. W. of Delhi; lat. 28° N., lon. 73° 22′ E. (see map of N. India, ref. 5–C). It is surrounded by a battlemented wall 3½ miles in circuit, and has a citadel, several temples, and lofty buildings, but the streets are dirty and most of the houses mean. Pop. (1891) 55,640.

Bikelas, DEMETRIOS: modern Greek poet and translator; b. in 1835; has translated into modern Greek Shakspeare's *Romeo and Juliet*, *Hamlet*, *Macbeth*, *Othello*, *Merchant of Venice*, and *Lear*. He has published a romance, *Loukis Laras*, 1879, and has written much upon mediæval Greek history and literature. His best-known historical work is *Les Grecs au Moyen Âge* (French translation, 1878). A collection of his poems appeared in 1862; another in 1885.

A. R. MARSH.

Bilaspur, bĕĕ-las-poor': a district of Chhatisgarh division, Central Provinces, British India; between parallels 21° 45′ and 23° 16′ N., and meridians 81° 30′ and 83° 15′ E., forming the upper half of the basin of the Mahanadi river. Area, 7,798 sq. miles. It is inclosed by ranges of hills, except on the south, where it is open and easily accessible. It has abundant natural waters, and also abounds in tanks. Rice, wheat, oil-seeds, and cotton are the chief agricultural staples, and it is so productive that it is popularly called the "land of plenty." Cotton and silk cloths are manufactured in considerable quantities. The climate is relaxing, but not oppressive. Cholera, fever, and smallpox prevail. Pop. 1,000,000, of whom 61 per cent. are Hindus, and 38 are members of aboriginal tribes. Among the Hindus the Chamars, or shoemaking caste, here form a separate religious body. A similar religious body is that of the Pankas, or weaver caste. Both have customs which now distinguish them from the Hindus. Bilaspur is also the name of a native hill state in the Punjaub. Area, 448 sq. miles. Pop. 90,000. MARK W. HARRINGTON.

Bilbao, bĕĕl-baa'ō (often written in English **Bilbo'a**): a seaport-town of Spain; capital of the province of Biscay; on the river Nervion, near the Bay of Biscay, and 28 miles N. W. of Vitoria; lat. 43° 15′ N., lon. 2° 54′ W. (see map of Spain, ref. 13–G). It is partly inclosed by high mountains, and is well built. Small vessels can ascend the river to this point, which is here crossed by several bridges. Bilbao has a cathedral and a number of convents; also manufactures of hardware, hats, leather, paper, and earthenware. The chief articles of export are grain and flour, iron, oil, and fruits. This town was founded in 1300, and was first called *Belvao*, and about 1500 was the seat of a famous commercial tribunal. It has steam communication with London and Liverpool. Was besieged by the Carlists in 1835 and 1874. Pop. (1887) 50,772.

Bilberry, or **Whortleberry**: the fruit of various small shrubs of the genera *Vaccinium* and *Gaylussacia*, and of the natural order *Ericaceæ*, natives of North America and Northern Europe. These fruits, under the name of huckleberries and blueberries, are extensively used in the Northern U. S. and Canada.

Bilderdijk, bil'dĕr-dīk, WILLEM: Dutch poet and philologist; b. in Amsterdam, Sept. 7, 1756; a man of great erudition and versed in many languages and sciences. He studied law and practiced as an advocate at The Hague. About 1805 Louis Bonaparte appointed him secretary of the Institute of Holland. He was the author of many poems, tragedies, and prose works, which had a high reputation and display a remarkable mastery of form. Among his poetical works are *Het Buitenleven* (1803); *Holland's verlossing* (1813); *Vaderlandsche uitboezemingen* (1815); and the fragment of an epic entitled *De ondergang der eerste wareld*. Among his philological works, his *Taal- en dichtkundige verscheidenheden* (4 vols., 1820–23) and *Nieuwe taal- en dichtk. verscheidenheden* (4 vols., 1824–25) are of value. His *Geschiedenis des vaderlands* (13 vols., 1832–53) has considerable importance, though written from the absolutist point of view. Bilderdijk's works appeared in Haarlem, 15 vols., 1856–59. See Isaac da Costa, *De mensch en de dichter Bilderdijk*, 1859. D. in Haarlem, Dec. 18, 1831.—W. Bilderdijk's wife, KATHARINA WILHELMINA BILDERDIJK, b. in The Hague, July 3, 1777, d. in Haarlem, Apr. 16, 1830, was also a well-known poet. See her *Dichtwerken* (3 vols., 1858–60). For further details, see Gorter, *Bilderdijk* (Amsterdam, 1871). Revised by A. R. MARSH.

Bile (Lat. *bilis*): the secretion of the liver in animals. In all vertebrates it is formed chiefly from the blood of the portal vein, which is mingled, however, to some extent with that of the hepatic artery. It is secreted slowly during the intervals of digestion, attaining its maximum (according to Dalton) about an hour after eating. It is in man a golden-red, viscid fluid, with a bitter taste and a peculiar smell. In carnivorous animals it is brownish yellow; in herbivorous, greenish. From 20 to 50 ounces of it are secreted daily in a man. A portion of bile is commonly detained in the gall-bladder, where it becomes more dense by the loss of water and the addition of mucus.

Bile contains certain coloring and saline and other constituents. The "bile salts" consist of cholic (glycocholic) and taurocholic acids, combined in man with soda. These acids are formed in the liver, not being present in the blood, unless from absorption after their elaboration in the liver. Cholesterin, the only alcohol existing free in the body, is present in notable quantity. It is found in the blood in small quantity. Of the bile pigments, *bilirubin* and *biliverdin* are the principal, and are derived from the coloring-matter of the blood.

Entering by the common biliary duct into the duodenum, the bile aids in the digestion of food, especially of fat, and the greater part of it is then reabsorbed from the small intestine. A portion, however, is excreted with the fæcal discharge. Bile stimulates the peristaltic muscular action of the bowels, being the natural laxative. It acts also as an antiseptic to the almost putrescent contents of the large intestine. Solidification of the components of the bile (especially of cholesterin) causes gall-stones, the passage of which through the duct often produces extreme pain.

The bile of salt-water fishes contains potash in place of soda, although from their being surrounded by much common salt (chloride of sodium) in the sea-water, we should naturally expect to find soda in abundance; and the bile of land and fresh-water animals contains soda, while, considering diet and habitat, potash might more naturally be looked for.

Revised by WILLIAM PEPPER.

Bilin, bĕĕ-leen′ (in Lat. *Belina*): a town of Bohemia; beautifully situated in the valley of the Biela; 17 miles W. of Leitmeritz (see map of Austria-Hungary, ref. 2–D). Near it are the celebrated mineral springs which are much frequented, and from which about 2,000,000 bottles of the well-known Sauerbrunnen water are annually exported. The well-known polishing-powder of Bilin is *Bergmehl*. Pop. (1890) 6,493.

Bilious Colic: See LIVER, DISEASES OF.

Bilious Fever: See FEVER.

Bill, or **Beak** (in Lat. *ros′trum*; Fr. *bec*): the hard, horny mouth of birds, consisting of two parts called the upper and lower mandibles, which may be regarded as mere extensions of the upper and lower jaws. Among existing birds the bill is never furnished with teeth, but in a number of fossil forms teeth are present. The bill is the principal weapon of offense and defense of many birds, and is an important character in the classification of the group. The forms of bills are especially adapted to the nature of the food on which the bird subsists, and to the operations by which that food must be procured. In birds of prey (*Raptores*) the upper mandible is hooked and sharp, and the whole bill is adapted for seizing animals and tearing their flesh; birds that feed on seeds have short, strong, and conical bills; while humming-birds have long, straight, and slender bills, fitted to insert into long, tubular corollas. Many aquatic birds, as ducks and geese, have broad, obtuse, and comparatively soft and sensitive bills, with laminæ on the inner margin in order to strain the mud in which they find their food.

Bill: in law, a formal statement or declaration in writing. It is commonly used in connection with some descriptive word, as in the phrases bill in equity, bill of credit, bill of exchange, bill of rights, bill of sale, etc. (*q. v.*). The principal uses of the word without other words of description are as applied to (*a*) a draft of a proposed law pending before a legislature, as "bills for raising revenue." After such a bill becomes a law, it is usually termed an "act" or "statute." (*b*) One of the forms of pleadings by which a common-law action was anciently commenced, answering to the modern declaration or complaint. Also the statement of facts and prayer for relief of the complainant in a suit in equity, usually called a bill in equity (*q. v.*). (*c*) An itemized statement of the claims of a creditor.

Revised by F. STURGES ALLEN.

Bil′lerica: town (founded about 1650); Middlesex co., Mass. (for location, see map of Massachusetts, ref. 2–H); beautifully situated 20 miles from Boston; on B. and M. R. R. Pop. of township (1880) 2,000; (1890) 2,380; (1900) 2,775.

Billet, bĕĕ′*la*′, PIERRE: contemporary French painter of landscape and figures, and of the life of fisher-folk, whose work is marked by simplicity of drawing, good color quality, and virile technique; b. at Cantin, Nord; pupil of Jules Breton; second-class medal, Paris Salon, 1874; second-class medal, Paris Exposition, 1889. Studio at Cantin.

W. A. C.

Billfish: any one of several fishes with jaws elongated into a bill or beak. Among these are species of the genus *Tylosurus*, known also as "garfish" and "needlefish," very common along the Atlantic coast of America; also the fresh-water garfishes of the genus *Lepidosteus*, common in the larger streams of North America, and the spearfish, *Tetrapturus albidus*, allied to the common swordfish.

Bil′liards [Fr. *billard*; Norman French, *billiart*: the stick or staff with which the ball is struck, from Fr. *bille*, a block of wood, hence *billet*]: an indoor game played by driving balls, usually of solid ivory, according to certain rules over the surface of a specially adapted table, called a billiard-table.

Origin and Early Development.—This game, which is now practiced by the people of all civilized countries, was developed out of an outdoor game played upon the grass or ground with two round stones; later with balls of lignum vitæ or other hard, heavy substance. A cone and port were also used, and afterward a cone and an iron or ivory loop, arch, or port, the balls being driven with a mace through the loop, arch, or port, and around the cone and port, in a way similar to the game of croquet. Afterward the game was played indoors in a similar form upon a table. The outdoor game was probably a modification of the ancient game of "bowls," which was played upon the ground with round stones thrown from the hand.

Billiards was known in England in the Middle Ages, having been introduced by the Knights Templars on their return from the second crusade, and the game was common in the monasteries of Europe. It was introduced into France during the reign of Louis XI. (1461), and into America by the Spaniards who settled in St. Augustine, Fla., in 1565.

The earliest authentic mention of the game appears in Reilly's English translation of the Abbé McGeoghegan's *History of Ireland*, in which is given the substance of the will of Cathire More, a sub-king of Ireland, who ruled the district of Leinster in the early part of the second century A. D. The following is a quotation from his will: "To Drimoth I bequeath fifty billiard-balls of brass, with the pools and cues of the same material."

In Great Britain there were added to the loop, arch, or port, and the post and king, three pockets of netting, all on one side of the table, two at the corners and one midway. Then to the square table was added a fourth pocket, and the pockets were placed one in each corner. Later the table was made oblong, and an additional pocket (or sometimes more than one) was placed midway of each long or side cushion-rail, making six pockets, as in the pool-tables of the present day. During the eighteenth century the loop, arch, or port, and the post and king were discarded, and the game was played wholly by pocketing the object-ball, each player playing in turn and taking but one stroke. The practice of each playing until he fails to score is an innovation of more modern times.

In France a hole was cut through the center of the bed of the table and the object-ball was driven into it by causing the ball to rebound from a cushion or by "banking" the cue-ball to a cushion, so that on the rebound it would strike the object-ball and drive it into the hole, from which a groove conducted the ball under the table to an opening at the side. Later no hole was cut in the center of the bed of the table, but six holes were cut in the bed, one at each corner and one midway of each of the long or side cushions. These holes were cut immediately in front of the cushions, but did not extend through the cushions, as do the pockets in the present style of pool-table. The game as played upon these tables was called "doublet," and long continued to be its most popular form in France.

Two white balls were generally used in all countries, the object in playing being to pocket or "kill" the ball of the opposing player. Each player had three "lives," and to the player who remained in the game the longest was awarded

the victory. In the U. S. this game was known in later times as "two-ball pool."

A further improvement in the game was made by the French shortly after the middle of the eighteenth century by the introduction of a third or red ball called the carambolet, thus inventing the carom game. In France with the introduction of the third ball the play was called a *carambole* or *carombolage*; in Great Britain *cannon*, and in the U. S. *carom*. Upon the introduction of the third ball, the game consisted of "both hazards" (i. e. pocketing the balls and making caroms on both object-balls), and was at that period the popular game in France. Soon afterward it became the game of winning and losing hazards and caroms in Great Britain, and this game now (1893) remains the standard there.

Cues and Cue-playing.—In the early part of the eighteenth century cue-playing was first introduced into France and England, the ball being struck with the flat end of the cue. With the flat-pointed cues, however, the cue-ball had to be struck exactly in the center, or a "miscue" would result. The first departure from the flat-pointed cues was the use of cues having a beveled end for striking the cue-ball below the center. Soon, however (about 1790), the end of the cue was rounded off, as it was found that so there was less chance for a miscue, and that certain extraordinary effects could be produced by striking the ball with a rounded cue-point.

From thus rounding the cue-point the side-stroke, twist, or "English" was developed, and soon chalk was applied to the rounded wooden ends of the cues, thus lessening the chance of the cue-point slipping, and the players were able to accomplish better and more remarkable effects.

About 1807 cue-tips were invented by a Capt. Mingaud, a Frenchman who had been imprisoned on account of some political offense. During Mingaud's imprisonment he was allowed the use of a billiard-table, and he experimented for the purpose of devising a covering, or tip, for the end of his cue to obviate the frequent disappointment caused by the wooden point of the old-fashioned cue slipping from the ball, and he soon invented a cue-tip with which he could twist and "draw" the cue-ball in an astonishing manner, so that it seemed to defy all laws of motion. When liberated from prison, Mingaud visited the cafés of Paris and astonished the frequenters of those places with his marvelous execution. Thus was the game of billiards revolutionized, and Capt. Mingaud's cue-tips soon superseded the old-fashioned implements previously used, and rapid improvement in the game soon followed. These cue-tips were introduced into the U. S. about 1823, but as their fame had long preceded them, some of domestic make were already in use.

Soon after the introduction of cue-tips in France the carom-game became popular, and the scoring of hazards or pockets was gradually abolished, and carom-tables were there introduced. These have the carom-rail continuous on the sides and ends, and are without pockets.

The game of billiards is played in the U. S. almost exclusively upon the carom-table, while tables with six pockets, one at each corner and one at the center of each side, and those with four pockets, one at each corner, are used for fifteen-ball pool.

Billiard-tables.—The present shape and construction of billiard-tables are the result of much experiment and observation. They have been made square, round, oval, octagonal, and last and best in the shape of an oblong rectangle. The frames are made of hard wood, as rosewood, walnut, maple, oak, etc.

The beds were at first made of wood, soft pine being used, then oak and other hard woods, the beds being made in small panels to prevent warping. When they became indented after considerable use the cloths were taken off and the beds planed down. About 1827 marble beds were introduced, but marble was soon superseded by slate, which, not being porous, does not gather moisture and rot the cloth, and is also not so brittle as marble, and therefore not as liable to be broken.

Generally three or four slabs, an inch in thickness, are used, and over this bed is stretched fine, green Simonis broadcloth. The table being made perfectly level, this gives a smooth, even surface for the balls to roll upon. Around this bed, and rising about 2 inches above it, are rails bearing the cushions, the top surface of which is 34 inches above the floor. The edge of the cushion where the ball comes in contact with it is $1\frac{7}{16}$ inches above the slate, and is, or should be, slightly pitched to prevent the ball from jumping and to permit the cue to strike the ball at the proper point. This height is adapted to the billiard-ball of regulation size. For balls of a different size the elevation of the cushions should be changed so that they come about a quarter of an inch above the center of the ball.

Upon the cushion much of the success of the stroke depends, and to insure the best results it should be made as nearly perfect as possible, combining qualities that will assure durability and accuracy; it should possess that nice degree of elasticity, the exactness of which requires long experience to learn, that will insure a proper angle when the ball rebounds; it must be unaffected either by damp or dry weather or by changes of temperature.

In 1835 cushions of india-rubber were introduced into both Great Britain and the U. S., which, on account of their elasticity, created great enthusiasm.

No other notable improvements were made until about thirty years later, when a vulcanized cushion (which was a combination of pure elastic and hard rubber) was introduced, the hard rubber being set on the front of the cushion to stiffen its face against the impingement of the balls. These cushions, on account of the correctness of the angles at which the balls rebounded and their elastic and wearing qualities, became a complete success, and are now in general use.

Since 1855 numerous improvements have been made in the construction of billiard-tables; and the skill of the manufacturers of the U. S. now leaves little further to be desired.

For a 5 by 10 table the cross-arms of the gas-pendant should measure from light to light 28 inches, and the long arms 56 inches. The standard size of the billiard-table used by the experts of the U. S. for all match games is 5 feet wide by 10 feet long, but for private houses and public billiard-rooms the smaller table, $4\frac{1}{2}$ by 9 feet, has become more popular and the 4 by 8 feet table is frequently used. In Great Britain the standard size of table is 6 by 12 feet, the balls used on them are $2\frac{1}{16}$ inches in diameter, and the pockets are $3\frac{5}{8}$ inches wide where the slate is cut away.

Billiard-rooms.—An apartment to accommodate a billiard-table should be of sufficient size to afford space for the free exercise of the cue. For tables 5 feet by 10 feet the room should be at least 15 feet by 20 feet. Architects in their plans for modern mansions now make suitable provision for this amusement. The light, if possible, should come from above, so as to prevent any shadow being thrown from the balls or cushions. The gaslight should be raised about 3 ft. 2 in. from the bed of the table and supplied with horizontal burners, as by such an arrangement no shadow is thrown from the pipe.

Modern Billiards.—As a game for both sexes billiards, as now played, is one of the best of all indoor pastimes. Its attractions are enhanced by the fact that it may be played by more than two persons, for billiard-games are varied, and several have been invented to accommodate party-playing. The use of the cue brings into gentle action all the muscles of the body, and it is said that an active player will walk a mile or two during the playing of a single game.

Proficiency in playing billiards calls for a quick eye, a steady hand, an exact measurement of distance and angles upon the table; it requires a deft and delicate touch in order to manipulate the cue and the cue-ball; great judgment is required in properly estimating the strength of stroke to be delivered to accomplish the different shots which present themselves, and correct judgment in this respect is as important as is correctness in the aim. The necessary force of stroke also depends upon the humidity of the atmosphere, as in damp days the cloth absorbs moisture and offers greater resistance to the ball. Scholars may in playing the game find mathematical, geometrical, and algebraic problems constantly arising before them for their solution.

The original American game was known as the American four-ball game of caroms and hazards, and was played on a 6 by 12 six-pocket table. This game was played in France before it was known in the U. S., and was called "The game of the Revolution." Variety was probably the aim of those who devised the game and it was a combination of the French game and the Russian game of "Carline." The former was composed of caroms and hazards and was played with three balls, while the Russian game was composed of hazards and caroms and was played with five balls: a clear white ball, a spotted white, a yellow or black ball, which was called the "Carline" and which was spotted in the center of the table; a red ball, which was spotted at the foot of the table, as in the American and French games, and a blue ball which was spotted at the head of the table.

The American four-ball game of caroms and hazards is played with two white balls (one of which has a small black spot to distinguish it from the other white ball), a light-red and a dark-red ball. The light-red is "spotted" at the head of the table and the dark-red ball at the foot of the table. The game is opened by "stringing" for the lead and choice of cue-balls. The player who strikes his ball from within the string-line, i. e. all that part of the table behind the spot at the head of the table, causes it to hit the cushion at the foot of the table, and lands it nearest the cushion at the head of the table, wins the lead and the choice of balls, and can choose the first shot or compel his opponent to play first. The white ball of the non-striker can be rolled down the table, through a stroke with the cue, past the dark-red ball at the foot of the table, and must come to a rest below that ball, or the non-striker may place his ball upon the white-ball spot at the foot of the table, 5 inches from the foot cushion and directly on a line with the other spots. In opening the game the player must strike his opponent's white ball before striking any other ball with his own. In the early American game a carom from white to red or from red to white counted two; from red to red three; from white to red, then to the other red, five, or *vice versa*; pocketing the opponent's white two; pocketing the red three; pocketing both reds six; pocketing the white and both reds eight; pocketing the three object-balls, after making a carom on all three, scored thirteen for the striker. Should the white cue-ball go to pocket from the white object-ball, or either before or after striking a red ball, the striker forfeited two; should the white cue-ball go to pocket off a red ball, the striker forfeited three. The game consists of 100 points. Playing the "spot-ball," i. e. scoring a succession of pockets without a miss, or without resorting to a carom, had been so perfected by the experts of the time (previous to 1854) that runs in the hundreds were common, and Lynn Higham, of Albany, N. Y., professionally known as the "Albany Pony," was credited with a run of 2,400 points off the spot-ball, scored without resorting to a carom and counting three for each pocket. In the fifties it became popular to make it conditional in regard to pocketing the red ball off the spot, and the play was limited to three strokes off the spot; then a carom was required. Later once off the "spot" became a common requirement among the better class of players. About this time the expert amateur and professional players abolished the pocketing of balls from the American four-ball game and resorted to caroms altogether, and in 1861 6 by 12 foot four-pocket tables were introduced, and the American four-ball carom game continued to be the common game of billiards in the U. S. until 1876. In April of that year the final public championship contest was played at that particular game.

As an offset to spot-ball play, the nursing of balls became so perfected by the great experts of the sixties and the early seventies, and such extraordinary runs were scored, that a game of 1,500 points was never held safe by a player who might, perhaps, be in the lead by several hundred points. In April, 1869, the American four-ball, bar-push game was inaugurated through a tournament which was held in Irving Hall, New York. Four changes were made in the rules in this tournament: The "push" shot was officially excluded; the table was reduced in size from 6 by 12 to 5½ by 11. The table was, as before, a four-pocket, but the size of the jaws of the pockets was made to measure 4 inches, and not more than three successive caroms could be made with the balls in the jaw. The system of counting and scoring the game was so changed that each single carom counted three and each double carom six, where formerly from white to red had counted two and from red to red three, and what was known as the "Diamond Cue Championship" was established through this tournament.

Further changes in the playing of the game occurred in 1873. The expert amateur and professional players had been favoring and gradually in their practice-playing drifting toward the three-ball carom game, and match contests at three-ball carom billiards, played on 5 by 10 tables, had become matters of record. In June, 1873, the first tournament for the championship at regular three-ball billiards on 5 by 10 table was inaugurated in Irving Hall, New York, and what became the "Challenge Cup Championship of the World" was inaugurated. A new set of rules to govern three-ball billiards was approved of by practical critics and experts, which, upon being submitted to a congress of experts and the players who were to participate in the tournament, were adopted as the standard rules to govern contests for the cup trophy which was to become emblematic of the championship of the world at regular three-ball billiards. All games were to be played on a 5 by 10 table. Each carom was made to count one; the crotching of balls was barred, and object-balls whose centers were both within a square of 4½ inches at either corner of the table were considered to be within the line. When the object-balls were so within a square three counts only would be allowed, unless at least one of the object-balls was forced out of it. In case of failure by a player to dislodge an object-ball from the square, his hand was out and the next player played with the balls as he found them.

Regular three-ball billiards was so mastered by the great experts that in 1880 a record at run-getting was established by Vignaux, in a match contest in Paris, of 1,531. In 1879 restrictions were placed upon the rail-nursing of balls, through the introduction of triangular spaces in each corner of the table, through a line drawn upon the surface of the cloth from a point on the face of the end cushions measuring 14 inches out from the corner of the cushions to a point on the face of the side cushion measuring 28 inches out from the corners. But three strokes were permitted with both object-balls within any of these triangular spaces without driving at least one ball out. These spaces were first used, but in a diminutive form, in the Vignaux (New York) tournament of 1874, they measuring in that tournament 5½ inches out on each cushion rail from the corners of the cushions. The games in the tournament with the larger triangular spaces (14 by 28) established a championship at "The Champions' Game," as it was called, but the game was short-lived, and there were but four public contests for the trophy emblematic of the championship of that game.

Meantime the amateurs of the world continued to practice the regular game of three-ball billiards, and mostly upon 4½ by 9 tables, and amateurs left to the professional experts the restricted games of billiards where lines and spaces were marked out on the cloth.

In 1883 the balk-line game came to the front through a professional tournament in Chicago. The lines in this tournament were made 8 inches from the cushions, and were drawn lengthwise of the table and across the table at the ends. Eight restricted spaces were thus formed, four being in the corners of the table and four along the side and end cushions. But two counting-strokes were allowed with both object-balls within any of these restricted spaces. The 8-inch balk-line game was, however, soon mastered by the great experts of the day, and in order to bring the non-nursing experts, who were known as "cushion-carom" players, and the nursing experts of the time together on equitable terms it was thought advisable to inaugurate a tournament at 14-inch balk-line billiards, and in Apr., 1885, the 14-inch balk-line game was formally introduced to the public. It was not until Dec., 1890, that a championship was established at 14-inch balk-line billiards, and this special restricted game of billiards remains the standard game for the expert "professional" players. Amateurs practice the regular three-ball carom game throughout the U. S. and Canada, France, and some other countries, and without regard to the restricted balk-lines.

For the rules of billiards and pool in all games, and for instructions how to play the games, see *Modern Billiards*, published by the Brunswick-Balke-Collender Company, New York.

MORTIMER T. HUMPHREY.

Bill in Equity: a statement of the plaintiff's case in a suit in court of equity, corresponding to the "declaration" or "complaint" in the common law. The defendant's reply is called the "answer." It is not necessary to adhere to a prescribed form in drawing up a bill in equity, as it is in the case of a common-law complaint; and the essence of a bill in equity is the statement of the facts and the prayer for relief or otherwise. (See PLEADING.) A bill is either original or not original. An original bill initiates the suit; a bill not original, as a cross-bill, a supplementary bill, etc., is used to controvert or suspend or revise a proceeding in the cause, as a decree or order, or for cross-litigation. In particular suits the bill receives special names, such as "bill of peace," "bill of interpleader," "bill of discovery," "cross-bill."

Revised by F. STURGES ALLEN.

Billings: city; capital of Yellowstone co., Mon. (for location of county, see map of Montana, ref. 6–H); on Northern Pacific R. R., and Yellowstone river, which furnishes water-power; chief distributing and shipping point for the great stock-ranges of Eastern Montana and Northern

Wyoming, and the wool-market of Montana. It is the terminus of a railroad to the largest and best coal-field in Montana, and has fine stone-quarries. Pop. (1890) 836; (1900) 3,221.

Billings, John Shaw, M. D., LL. D., D. C. L.: surgeon; b. in Switzerland co., Ind., Apr. 12, 1838; graduated at Miami University 1857; at the Ohio Medical College 1860; appointed acting assistant surgeon in the U. S. army 1861; served through the war, being with the Fifth Corps at the battles of Chancellorsville and Gettysburg; from Dec., 1864, connected with the surgeon-general's office in Washington; appointed surgeon, with the rank of major, in the regular army Dec., 1876; retired in 1895; in the same year became Pepper Professor of Hygiene in the University of Pennsylvania, and in 1896 was appointed director of the New York Public Library (Astor, Lenox, and Tilden foundation). He is the author of *Report on Hygiene of the United States Army* (1875); *Principles of Ventilation and Heating* (1884); *Mortality and Vital Statistics of the United States* (2 vols., 1885); *Index Catalogue of the Library of the Surgeon-General's Office* (12 vols. royal 8vo, 1880–92); *The National Medical Dictionary* (2 vols., 1889); *Description of Johns Hopkins Hospital* (1890); and of numerous papers in scientific and medical periodicals.

Billings, Josh: See Shaw, Henry Wheeler.

Bil'lingsgate: a wharf and fish-market of London; below London bridge; was made a "free and open market for all sorts of fish" in 1699. It is the only wholesale fish-market in London, and all fish, fresh or cured, if imported in British vessels, are admitted free of duty. All fish are sold here by tale, except salmon and eels, which are sold by weight; oysters are sold by measure. No fish are sold on Sunday, except mackerel. The women who vended fish here were formerly notorious for ribaldry and vituperative personalities, so that "Billingsgate" became a synonym of vulgar and foul expressions.

Billion: in the French system of enumeration, in use in the U. S., a thousand millions. In Great Britain a billion is a million millions—1,000,000,000,000.

Billiton, bi-lē̆e-ton', or **Billeton**: a Dutch island in the East Indies; situated between Borneo and the southeast end of Sumatra, and separated from Banca by Clement's (or Gaspar) Strait. It is about 3° S. lat., and 108° E. lon. (see map of East Indies, ref. 7–D). Area, estimated at 1,860 sq. miles. Iron ore and good timber abound here. Trepang, tin, birds' nests, and tortoise-shells are exported from it. Pop. (1890) 37,803, of which about 10,000 are Chinese and 100 Europeans.

Bill of Attainder: a legislative enactment declaring the attainder of one or more persons. (See Attainder.) Formerly persons were often attainted of high treason in England by act of Parliament, and during the war of the Revolution bills of attainder were frequently passed in this country. The Constitution of the U. S. provides that neither a State nor Congress shall pass bills of attainder. Such a bill is usually opposed to sound legislation in four principal respects: It is adopted by the legislature, instead of being a sentence by the judiciary; it departs from judicial rules in establishing the commission of the alleged criminal act, having no regular methods of trial or rules of evidence; it may declare an act to be a crime which was not so when committed; and it admits of the infliction of cruel and unusual punishments. Thomas Wentworth, Earl of Strafford, was attainted in 1641, but the matter ceased to be important in Great Britain by Acts of Parliament, 1870.

Bill of Credit: in law. (1) In mercantile law, a letter written by one person to another authorizing or requesting him to give credit to a third or his order, or to bearer. Such a letter is general when addressed to any one who may see fit to give the proposed credit, and who on giving credit may have recourse to the writer of the letter. On such a letter several persons may successively give credit. The letter is special when addressed to specified persons, so that they alone can give the credit. (2) The U. S. Constitution provides that no State shall "emit bills of credit." This expression is construed by the courts to mean instruments issued for the payment of money—issued on the credit of the States as such, payable at a future day, and intended to circulate as money. The clause does not prevent a State from issuing bonds for the payment of its indebtedness, payable at a future day; nor does it prohibit the creation of banks which issue currency. The provision aims at the use of the credit of the States in their corporate character, and was made in pursuance of the general policy which took from them the power to coin money, and restricted their power over the legal tender.

Revised by F. Sturges Allen.

Bill of Exceptions: a formal statement in writing of exceptions taken to the judge's opinion, decision, or direction upon matters of law during a trial. It sets forth the proceedings at such trial, the decision or ruling made, and the exception thereto, signed and sealed by the judge in testimony of its correctness. The object of a bill of exceptions is to bring the alleged error of the judge before the proper court for review, and it usually contains only such portion of the proceedings and evidence taken at the trial as is necessary for that purpose. Formerly the right to a bill of exceptions did not exist in cases of treason or felony, but now the defendant has this right in most of the United States.

Revised by F. Sturges Allen.

Bill of Exchange: an open letter of request, whereby one person requests another to pay a third or his order, or to bearer, a sum of money, absolutely and at all events. The person who writes the letter is called the *drawer*; the one to whom it is addressed is termed the *drawee*; and the person who is to receive the money is the *payee*. A bill of exchange is either inland or foreign. Where the parties are in the same State, it is inland; where the drawee resides in a State or country different from that of the drawer, or in any case where the bill is drawn in one State upon a person in another, it is foreign. A bill may be considered under the following heads: 1, its nature; 2, indorsement; 3, acceptance; 4, presentment for payment, and steps to be taken to charge drawer and indorsers.

1. A bill of exchange having all the requisites referred to in the definition as above given is *negotiable*, unless some other requisite is prescribed by statute, as is sometimes the case. Thus in some of the U. S. the receipt of a valuable consideration must be expressed. By this word is meant that a transfer of it in good faith before maturity will give the purchaser a right of action in his own name in a court of law, as distinguished from a court of equity; and he accordingly takes a title free from defenses that may have existed between the original parties. But if any of the qualities referred to in the definition are wanting, *negotiability* does not exist. The paper becomes assignable, and the defenses between the original parties are let in. Negotiability, however, assumes that the instrument has a legal existence as to its outward form, and is accordingly executed by a person competent to contract. A bill of exchange drawn by or upon a married woman or an infant would not create a valid obligation even as to a purchaser in good faith; nor if the instrument were declared void by statute, as is sometimes the case when infected with usury or given for a gaming consideration. Under these rules, if an instrument otherwise in the form of a bill of exchange were payable in something other than money, or upon a contingency, or from a special fund, or to a particular person, without the addition of the words "order" or "bearer," it would not be negotiable. The law presumes that a bill is given for a valuable consideration. Evidence may be offered as between the original parties, and as to all who can not insist upon the protection of negotiability, that there is no consideration. An important distinction thus arises between what may be called business paper and accommodation paper. The former is given for a valuable consideration as between the original parties, such as for money lent or goods sold. In accommodation paper there is no such consideration, but the person who makes it intends to lend his credit to some person. Every party to a bill may hold this relation to it. Thus there may be an accommodation acceptor, drawer, or indorser. This kind of paper must be distinguished from that which is simply without consideration, in which there is no *intent* to have the credit of the party who makes it used. A single illustration will show the distinction. If a person should draw a bill in favor of his friend on account of his affection, it would be simply without consideration; if under the same circumstances it was drawn with intent to have it discounted by a bank, it would be "accommodation paper." In the one case, if a purchaser should acquire it with knowledge of all the circumstances, he could not enforce it, while in the other case he could, by reason of the intent. When accommodation paper has been acquired for value, it is substantially equivalent, as far as the holder is concerned, to business paper. Between the original parties it would have no validity, and could

not supply the basis of an action. On the contrary, if an accommodation party to the bill is obliged to pay, he has his remedy against the party in whose favor he acted, either on the bill or on an implied contract, as the case may be. Thus an accommodation acceptor could not bring an action *upon the bill* against the drawer whom he had accommodated, but would be driven to an action on an implied contract on the part of the drawer to repay money which had been paid for the drawer's use and benefit. When one party gives his acceptance to another in return for the other's acceptance, it is not a true case of an accommodation acceptance, though sometimes so called. These "cross" acceptances are based upon a consideration, the one promise being a consideration for the other. They are certainly dangerous contracts, as either party may be called on to pay to a holder not only his own acceptance, but that of the other party. Without further pursuing this distinction, attention should be called to a peculiarity in this branch of the law which shows its close connection with the subject of currency. It is a well-settled general rule of the common law that a person having no title to goods can transfer none, even to a purchaser in good faith. A thief or a finder, for example, can create no better title than he possesses. There is a marked exception to this rule in the case of money. One who has stolen money may give a perfect title to one who takes it in good faith and for value. This exception is demanded by the necessities of commerce. The rule is extended to negotiable paper, payable to bearer, or even to order, when so indorsed as to pass from hand to hand without further indorsement.

It is plain that a bill when drawn imposes no obligation upon the drawee. It is necessary that he should assent to it in some legal form before he becomes liable. This act is termed "acceptance." Before acceptance the only person liable to the payee is the drawer. His liability is a contingent one, and implied by law. There is thus a marked distinction between the liability of a drawer and acceptor—one is implied, and the other is express and created by contract. The implied obligation of the drawer is created by the custom of merchants, and is conditional. It requires certain acts to be performed as a condition precedent to recovery of the amount of the bill, such as presentment either for acceptance or payment, and due notice to be given of a failure to accept or pay, as the case may be. This distinction between the *implied* liability of the drawer and the *express* contract of an acceptor is of great consequence, and must be carefully attended to. The same remark may be made as to the liability of an indorser. This is also implied and conditional. The nature of a check upon a bank should be referred to. It resembles a bill of exchange, though it is not precisely equivalent to it. The check, according to the better opinion, creates no obligation against the bank in favor of the holder without acceptance. In mercantile phrase, a check when accepted by the act of an officer, such as a teller, is said to be "certified." The bank after such an act is liable to the holder. The drawer of a check having funds on deposit has an action against the bank for damages for a refusal to honor his check, on the ground of an implied obligation to pay checks according to the usual course of business. While checks are usually drawn payable immediately, they may be made payable at a future day (being then called "post-dated checks"), when their resemblance to a bill of exchange is still more close.

2. *Indorsement.*—The payee of a bill may transfer it by writing his name upon the back of it. He is then termed an indorser. When the name is simply written the indorsement is said to be "in blank"; when some person is pointed out to whom payment is to be made, it is said to be "in full." When a bill is indorsed in blank, it will pass from hand to hand, as though payable to bearer; when indorsed in full, an indorsement by the person to whom it is tranferred will be necessary to its further transfer. There may be a series of indorsers, called first, second, third, etc., indorsers. Under these rules no holder can claim a title to a bill payable to order except through an indorsement made by the very person to whom it is payable, or some one holding under him, such as his executor, administrator, or assignee in bankruptcy. Accordingly, if it should come into the possession of another person of the same name as the owner, but acting without authority, he could give no title to one acting in good faith. When an owner of a bill indorses it for value, he can impose upon the purchaser no valid restriction preventing its further transfer. The right of sale is an inseparable incident to ownership. On the other hand, if a person indorse a bill to an agent, he may place valid restrictions upon the agent's authority to sell. These, if incorporated in the indorsement, will bind all purchasers. Where a bill is payable to several persons, all must, in general, unite in an indorsement. The regular effect of an indorsement is twofold; one consequence is to transfer the indorser's interest, and the other is to create an implied obligation on his part to pay the bill in case that the drawee does not accept or pay at maturity, and proper steps are taken to charge him. In an accommodation indorsement, as there would be no ownership, the sole effect would be to create an obligation to pay. This obligation closely resembles that of suretyship. Thus when a bill is accepted the acceptor is primarily liable, and the indorser is, as it were, a surety. The rules governing suretyship may in the main be invoked in his favor. An indorser may avoid this liability by making use of suitable words in his indorsement, such as "without recourse." The indorsement would then simply operate as a transfer of such interest as he might have. Indorsers are commonly liable in the order of time of their indorsements. Thus if there were three indorsers, if the third (or last) was compelled to pay, he would be entitled to sue the second or first, and recover in full. A holder need not pursue any prescribed order as between the indorsers. He may select any one, who, if he pays, will be entitled to proceed in the same way as to any one preceding him. If, however, the bill is made payable to several payees, who indorse, they are liable jointly and not successively, and each, as between themselves, would be liable only for their respective shares. Every indorsement is a new contract. One of the consequences of this rule is, that though the original bill may be void, the indorser will still be liable, as if the bill be void for usury or be made by a married woman. Another consequence is that the rules of private international law may cause a different effect to be given to the respective indorsements. Thus if A should indorse in one State or country, and B should indorse the same bill in another, each indorsement would be governed as to its effect by the law of the State or country where it was made. The mere act of writing one's name is not an indorsement; there must also be a delivery. Accordingly, if one should write his name and die before delivery, an executor could not deliver the bill so as to make a valid "indorsement." The proper course would be for the executor to indorse it in his representative character.

3. *Acceptance.*—The object of acceptance is to show the assent of the drawee of the bill to pay it according to its terms. Without such assent he would not be liable. He is allowed a reasonable time after the presentment of a bill within which to decide whether to accept it or not, which time has been held to be twenty-four hours. The regular and formal method of acceptance is to write the name of the drawee upon the front of the bill. But no particular mode of acceptance is necessary. It may be made by a writing separate from the bill or orally. It may sometimes be implied, as, for example, by a detention on the part of the drawee beyond a reasonable time. It may be either absolute or conditional. A conditional acceptance may be illustrated by one purporting to be made "on the consignment of goods to the drawee." A holder could not collect in such a case if there was no such consignment. An acceptance should not differ from the terms of the bill. A holder may decline to take such an acceptance, and treat the case as though there was no acceptance. Should he assent to it, he would thereby discharge the drawer and existing indorsers. It is not always necessary that there should be presentment for acceptance as distinct from one for payment, though in some cases it is requisite. Where a bill is payable a fixed number of days "after sight," the word "sight" means acceptance, and it would be necessary to present it once for acceptance, and, if that act took place, again for payment. If, on the other hand, the bill were payable a certain number of days "after date," it would only be necessary to present it once for all for payment, though it would usually be an act of prudence to present it for acceptance, as the holder would, in case of acceptance, have an additional person to whom he could have recourse, and in case of non-acceptance he could take immediate steps to charge the other parties to the bill. There has been great controversy on the question whether bills payable "at sight" must be presented for acceptance as well as payment. In some of the States the doubt is settled by legislation. The effect of acceptance is to make the drawee the

principal debtor. The other parties stand in relation of sureties, and if they are compelled to pay, they have their remedy over against the acceptors. This is clearly the case in business paper; in the case of an accommodation bill the position of the parties is of course reversed, so that the acceptor, as already explained, has his remedy on an implied contract against the person to whom he lent his credit, though as to the holder of the bill he holds the place of a principal debtor. Under these rules an acceptor is bound to know the handwriting of the drawer, and if that be forged he is still liable to the original holder. If acceptance is refused, the proper course, in the case of foreign bills, is to have a protest made, and prompt notice sent to the drawer and indorsers. In case of inland bills, protest is not essential, though presentment and notice are. Statutes usually allow protest in case of inland bills as a convenient medium of proof that the necessary steps have been taken to charge the parties to the bill. The term "protest" is applied to an official act by an authorized person (notary public), whereby he affirms in a formal or prescribed manner, in writing, that the bill has been regularly presented for acceptance or payment, as the case may be, and that it has been refused. It is used as presumptive evidence at a trial to establish the facts in question. The office of a "notice" is to give immediate information to the drawer or indorsers of failure of acceptance, so that they may take such steps as they deem necessary for their protection. The protest and notice are thus entirely distinct acts for different purposes, and must not be confounded. Assuming that acceptance has been refused and due protest made, mercantile law allows any person to intervene and accept a bill "for the honor" of a drawer or indorser. A holder is not bound to take such an acceptance, though it is valid if assented to. It takes place before a notary public, and is termed an acceptance "*supra protest*." The person thus intervening states for whose honor he accepts. In case he pays, he becomes the creditor of that party, and may also have recourse to all who precede him on the bill, in opposition to the general rule of law that one can not become the creditor of another without his consent. When the bill matures it is again presented to the original drawee for payment, who may in the meantime have been placed in funds, and may now be willing to take up the bill. Should he again refuse, it is protested and presented to the acceptor *supra protest* for payment, and if he then refuses to make payment, another and final protest will be necessary to charge drawer or indorsers.

4. *Presentment for Payment.*—It is a general rule that as between debtor and creditor no presentment for payment is necessary. It is the duty of the debtor to seek the creditor, and if the day for payment elapses without it there is an immediate remedy by action. The better opinion in the U. S. is that this rule applies to an acceptor of a bill of exchange, even where it is payable at a particular place, such as a specified bank. On this view it would not be necessary for the holder to prove a presentment, but the acceptor might show in his defense any facts that would relieve him or diminish liability, such as that he had left funds with the bank, which had failed. But to charge drawer and indorsers the case is entirely different. These enter into no absolute engagement, but only into an obligation implied by law. It is a part of the implied contract that presentment for payment shall be made, and protest, where that is necessary, and notice given. These acts must be alleged in the pleadings, and proved at the trial as conditions precedent to a right of recovery. The modes of performing these various acts branch out into much detail, and only the leading ones can be brought within the compass of this article. The general rule is that the bill, when payable without designation of place, must be presented, when it matures, to the acceptor, either at his residence or place of business, and, if at the place of business, within business hours. If a particular place, as a bank, is designated, presentment must be made there within the usual hours devoted to banking business. This duty continues, though the place of business be closed or the acceptor be notoriously insolvent. In the case of an accommodation acceptance no presentment is necessary in behalf of the person to whom the accommodation is given, since he could have no action against such an acceptor. The duty of presentment, as well as of the performance of the succeeding acts, may be waived by a party to the bill by appropriate acts. This waiver may take place either before or after maturity of the bill. An instance would be a writing on the bill, "I hereby waive demand of the within bill," or "I hereby waive notice of demand." The latter expression would be imperfect, since a waiver of notice does not dispense with the necessity of presentment, while a waiver of demand is, from the nature of the case, a waiver of notice.

A bill does not ordinarily actually mature on the day on which it apparently falls due. Three days are allowed, termed "days of grace." These have become so fully a part of the contract that the presentment before the last day of grace is nugatory. Should the last day fall on Sunday or a public holiday, the bill matures on the preceding day, except in New Jersey, where it falls due the day after. This matter is sometimes regulated by statute. If presentment is made and refused, protest should take place in the case of foreign bills, as already explained in reference to non-acceptance, and notice given to the parties to be charged. The subject of notice requires a fuller explanation than what has been given in connection with non-acceptance. The object of notice is to give information to the respective parties, to the end that they may protect themselves from loss. The test of its sufficiency is whether it gives the requisite information. No particular form is necessary. It may be either oral or written. It is a common practice to reduce it to writing, and either to give it to a party personally, or to send it to him by mail. By the general rule of law the mail can only be used for the purpose of transmission, and, accordingly, can not be resorted to where the holder and the person to be notified obtain their letters from the same post-office, though it is in some instances otherwise by statute. The law requires extreme diligence in dispatching the notice. It should be sent as early as the next day, and some authorities require by the first convenient mail on the next day. If the notice is properly sent by the mail, it will suffice, though never received. Any indorser receiving notice has a day to send it to one preceding him. After notice the rights of the holder are fixed, and it is not necessary for him to bring his action any earlier than he would be required to do by the statute of limitations. Delay to collect the bill from the acceptor does not of itself discharge the drawer and indorsers. If, however, a bargain (based upon a consideration) is made between the holder and acceptor, whereby the time of payment is extended, the drawer and indorsers are discharged, unless their consent is obtained. The drawer is not only liable for the face of the bill, but for damages incidental to non-payment. These damages are in some cases fixed by statute. It is sometimes necessary to take into account the difference in exchange between two countries; as, if a bill drawn in New York were payable in London, exchange being in its favor, and the action on the bill were brought in New York, and it cost a certain per cent. to place the funds in London, that amount should be included in the recovery. See PROMISSORY NOTE and EXCHANGE.

T. W. DWIGHT.

Bill of Lading: the written evidence of a contract for the carriage of goods by water. It is usually signed by the master of the vessel, either in duplicate or triplicate, acknowledges the receipt of the goods from a person (called the consignor), and undertakes to deliver them to a designated person (the consignee) or his assigns at a specified place, for the compensation and on the conditions therein specified. An indorsement of the bill of lading transfers the title to the goods, and, if made in good faith and for a valuable consideration, cuts off the right of stoppage *in transitu*. For most purposes, a bill of lading is assignable, and an assignee takes it subject to any defense existing between the original parties. For the single purpose of shutting out the right of stoppage *in transitu* it is negotiable. (See STOPPAGE IN TRANSITU.) This instrument consists of two parts—a receipt and a contract. That portion of it which is a receipt can be contradicted, as between the original parties, by parol evidence. For example, if it were stated that the goods were in good order, evidence may be adduced to show the contrary. This proposition would not extend to a person who had made advances on the faith of the statement, as he could invoke the doctrine of estoppel. (See ESTOPPEL.) The part of the bill which is a contract can not be contradicted by parol evidence, even as between the original parties. Although the term was originally applied only to a memorandum of a contract for transportation by water, it is now frequently used to denote the memorandum given by *any* carrier of the terms on which he agrees to carry the goods received.

T. W. DWIGHT.

Bill of Pains and Penalties: a special act of the legislature declaring a person guilty of some offense, without

any conviction in the regular course of judicial proceedings, and inflicting upon him some punishment less than death. It differs from a strict bill of attainder in that the punishment inflicted by the latter is death. Bills of pains and penalties are within the provision of the U. S. Constitution that neither Congress nor a State shall pass a bill of attainder or an *ex post facto* law. Thus a law of Congress disqualifying all attorneys of the Supreme Court who refused to take an oath that they had not been engaged in rebellion was accordingly held to be void. *Ex parte Garland*, 4 Wallace, R., 333. Revised by F. STURGES ALLEN.

Bill of Particulars: a written statement of the particulars of the demand for which an action at law is brought, or of a defendant's set-off against such a demand.

Bill of Peace: a bill in equity by which a person seeks to prevent a multiplicity of suits involving the same point, brought by a numerous class insisting upon the same right or by an individual attempting to establish an unsuccessful claim. An injunction is granted on the principle that equity will grant relief to prevent useless or oppressive litigation or irreparable mischief. A bill of peace is analogous to a bill *quia timet*, but is generally distinguished from it by the fact that it is brought only after the commencement of adverse proceedings. F. STURGES ALLEN.

Bill of Rights: an English statute enacted at the time of the accession of William and Mary to the throne. It declared, among other things, the right of the subject to petition the king, freedom in the election of members of Parliament, and freedom of speech in Parliament. It affirmed that standing armies without the consent of Parliament are illegal, that the king had no power of suspending or dispensing with laws, nor of levying taxes without the consent of Parliament. It provided that excessive bail should not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted, and for the right of Protestant subjects to bear arms for their defense. The provisions of this act have had great influence in the U. S., and are deemed of high consequence, as securing liberty to the individual. A number of them are literally inserted among the amendments to the U. S. Constitution, and are also found in State constitutions. Bills of rights were favorite enactments of the conventions in France following the revolution of 1789. The phrase "bill of rights" is frequently employed in the U. S. to designate all those portions of a constitution, State or national, designed to secure liberty to the individual.

Bill of Sale: a writing under seal conveying the title to goods and chattels. The seal by the common law is conclusive evidence of consideration. Accordingly, a bill of sale formally executed passes the title without any consideration or delivery of the property. Where there is no seal, there must be a consideration or delivery. A delivery without consideration would amount to a gift. A bill of sale may pass a title which would be valid as between the parties, and yet not of force as to creditors or purchasers, as if one who was indebted should make a bill of sale without actual consideration, or should sell, even with consideration, and still retain possession of the goods. The transaction might be regarded as infected with fraud, even though there were no fraudulent intent actually embodied in it. (See FRAUD.) English cases speak of the transfer of the ownership of a ship at sea by the assignment of the "grand bill of sale," but no distinction is made in the U. S. As to the general law concerning sales of chattels and the requisites to their validity, see SALE. In a more popular sense, a bill of sale is any written instrument, though not under seal, executed as evidence of a sale.

Revised by F. STURGES ALLEN.

Billroth, bil'rōt, CHRISTIAN ALBERT THEODOR: German surgeon; b. in Rügen, Apr. 26, 1829; studied at the universities of Greifswald, Göttingen, and Berlin, taking the degree of M. D. at the latter in 1852; professor and director of the surgical clinic, University of Zurich, 1860–67; after 1867 he held the corresponding chair in the University of Vienna. His contributions to professional literature are very numerous and important, and have been translated into all the leading modern languages. D. Feb. 6, 1894.

Bil'ney, THOMAS: English martyr; b. about 1495; ordained 1519. He was a fellow of Trinity Hall, Cambridge, and preached there and in London and many other places. He opposed the Schoolmen's formal "good works" and the worship of saints and relics, and he converted Hugh Latimer and others to these views. Arraigned in 1527, he recanted and escaped with a year's imprisonment in the Tower; but having begun to preach again in the fields of Norfolk, he was condemned and burned at Norwich, Aug. 19, 1531.

Biloxi: city; on railroad; Harrison co., Miss. (for location of county, see map of Mississippi, ref. 9–H); 79 miles E. N. E. of New Orleans, and on Biloxi Bay; lat. 30° 23·8′ N., lon. 88° 53·1′ W.; is a place of summer and winter resort. It has an iron lighthouse, with a fixed white light 62 feet above the level of the sea. Biloxi is a manufacturing and shipping point, and, besides fruit and vegetable canning industries, has an oyster-packing business second in extent only to that of Baltimore. Fine schools, numerous churches, electric lights, artesian water-works, and over 25 miles of shell-roads are among the advantages of the city. The first settlement made upon the Mississippi by white men was made here in 1699 by Pierre Lemoyne d'Iberville. Pop. (1880) 1,540; (1890) 3,234; (1900) 5,467.

EDITOR OF "HERALD."

Biloxi Indians: See SIOUAN INDIANS.

Bilqula Indians: See SALISHAN INDIANS.

Bil'son, THOMAS: English prelate; b. in Winchester in 1546–47; studied at Oxford; became a prebendary of Winchester 1576; Bishop of Worcester 1596; translated to Winchester the year following. Bilson was a man of great learning, and a zealous defender of the Church of England against the Puritans. He was, along with Miles Smith, the final reviser of the Authorized Version of the Bible, and prepared the chapter headings. He wrote, among other works, *The True Difference between Christian Subjection and Unchristian Rebellion* (Oxford, 1585), prepared at Elizabeth's command in answer to W. Allen's *Defense of English Catholics*, and *The Perpetual Government of Christ's Church* (London, 1593; n. e. Oxford, 1842), which is considered an able defense of the doctrine of apostolic succession; but his *magnum opus* was *The Survey of Christ's sufferings for Man's redemption and of his descent to Hades or Hell for our deliverance* (1604). D. in London, June 18, 1616.

Bils'ton: a market-town of Staffordshire, England; 2 miles by rail S. E. of Wolverhampton (see map of England, ref. 9–G). It forms part of the parliamentary borough of Wolverhampton, and is an important center of the hardware trade. It is situated between numerous iron and coal mines, and has large manufactures of japanned ware. Pop. (1891) 23,453.

Biluchistan: See BALUCHISTAN.

Bi'mana [quasi-Lat., from Lat. *bi-*, double + *manus*, hand]: an order of mammals proposed for the reception of man (see HOMINIDÆ) as distinguished from the apes and lemurs (*Quadrumana*). See QUADRUMANA and MAN.

Bimetallism: See MONETARY STANDARDS.

Bin, băn, JEAN BAPTISTE PHILIPPE ÉMILE: historical and decorative painter; b. in Paris, Feb. 10, 1825; pupil of Gosse and of Léon Cogniet; Legion of Honor 1878. His *Prometheus Chained* (1867) is in the museum at Marseilles. Decorated the Polytechnicon in Zurich (1865–70). Style academic and formal. Bin has taken an active part in Paris politics, and has been mayor of the Eighteenth (Montmartre) Arrondissement. WILLIAM A. COFFIN.

Binary Stars: See BINARY SYSTEM and DOUBLE STARS.

Binary System: a pair of stars revolving around a common center of gravity. The only distinction we can make between an ordinary double star and a binary system is that motion has been detected in the case of the latter, whereas in the case of the former the relative position of the two bodies appears to remain invariable. There can be no doubt, however, that all double stars, properly so called—that is to say, all stars which are actually very near together—revolve around each other; their mutual attraction alone would necessarily change their relative position. But the period of revolution is usually many centuries, frequently several thousand years. Hence when first discovered no change can be observed, but the longer observations are continued the greater are the number of cases in which some change is found to be going on.

The first exact estimates of the relative positions of such objects were made by Sir William Herschel toward the close of the last century, and the next by Struve, of Dorpat, about the first quarter of the nineteenth century. As ob-

servations of the bodies noted by Herschel and Struve are continued, more and more of them are found to be in motion. The most remarkable binary systems are those which are discovered by the spectroscope, in cases where the motion is too small to be detected by any other means. Thus it is found that the star Algol has an invisible companion revolving around it, which partially eclipses it at every revolution. See ALGOL. S. NEWCOMB.

Binary Theory: See CHEMISTRY.

Bindrabund: same as BRINDABRAN.

Bindweed Family (*Convolvulaceæ*): herbaceous, shrubby, or rarely arboreous dicotyledons, gamopetalous, with superior ovaries. They are related to the nightshades, borages, phloxes, etc. There are 800 species, mostly natives of warm climates. *Ipomœa*, the morning-glories, and *Convolvulus*, the bindweeds, are representative genera. *Cuscuta*, the dodders, is a genus of degraded parasitic species.

CHARLES E. BESSEY.

Binet, bē̆'nay', VICTOR JEAN BAPTISTE BARTHÉLEMY: contemporary landscape-painter; b. at Rouen, March 17, 1849. First-class medal, Paris Exposition, 1889. A realistic painter, whose work is notable for good drawing and truth of atmospheric effect, but is lacking in color quality. *The Plain at St. Aubin-sur-Quillebœuf* (1886) is one of the best of his pictures, and is in the museum at Amiens.

Bing'en (anc. *Vin'cum* or *Bin'gium*): a town of Germany; in Hesse; finely situated on the left bank of the Rhine; at the mouth of the Nahe; 20 miles by rail W. of Mentz (see map of German Empire, ref. 6–D). The Nahe is here crossed by an old bridge supposed to have been built by the Romans. Wine of superior quality is produced in the vicinity. Near Bingen the Rhine passes through a narrow channel called *Bingerloch* (i. e. the hole of Bingen), in which the rocks and rapid current once rendered the navigation dangerous, but in 1834 the obstruction was mostly removed. Bingen is opposite Rüdesheim, from which it is separated by the Rhine. It has manufactures of flannel, fustian, and leather. Here are interesting ruins of an old castle, Klopp, originally founded by Drusus, and of the celebrated chapel of St. Roch on the Rochusberg. A little farther to the south, between Bingen and Bingerloch, rises in the middle of the stream a high rock, the so-called tower of Bishop Hatto. An heroic statue of *Germania* in the Niederwald commemorates the German victories of 1870–71. The surrounding scenery is highly picturesque. Pop. (1890) 7,654.

Bing'ham, Rev. HIRAM: b. in Bennington, Vt., Oct. 30, 1789; graduated at Middlebury College in 1816; at Andover in 1819; and was one of the first Congregational missionaries sent to the Sandwich islands, where he long exercised a powerful influence. He returned to the U. S. in 1841. D. in New Haven, Conn., Nov. 11, 1869.

Bingham, JOHN A.: politician; b. in Mercer, Pa., in 1815; removed to Ohio. He was elected a member of Congress by the Republicans of the Western Reserve in 1854, and was often re-elected. He conducted the prosecution of the assassins of President Lincoln, and was chairman of the managers who conducted the impeachment of Andrew Johnson in Apr. and May, 1868. He was again elected to Congress in 1870. Was U. S. minister to Japan (1873–85). D. in Cadiz, Ohio, Mar. 19, 1900.

Bingham, JOSEPH: Church of England antiquary; b. in Wakefield, Yorkshire, in Sept., 1668; d. at Havant, near Portsmouth, Aug. 17, 1723; studied at Oxford and became a fellow of University College (1689), but in 1695 was compelled to give up his fellowship and leave the university on account of a sermon he preached on the meaning of the word "person" when used by the Fathers, and which brought upon him the false charge of heresy. In the same year, however, he was made rector of Headbourn Worthy, whence he was transferred to Havant in 1712. His great work *Origines Ecclesiasticæ; or, The Antiquities of the Christian Church*, first appeared in English (London, 1708–22, 10 vols.). It has often been reprinted, and has not yet been superseded. The best edition is that included in the complete edition of his works by Richard Bingham (London, 1821–29, 9 vols.; n. e. by J. R. Pitman, 1838–40; reprinted Oxford, 1855, 10 vols.). The *Antiquities* are separately published in the Bohn Series (1845, 1852, 2 vols.). It was translated into Latin by Griscovius (Halle, 1724–38, 10 vols.), and into German, but in the interest of the Roman Catholic Church (Augsburg, 1788–96, 4 vols.). See his *Life* by Richard Bingham, Jr., in his complete works. Revised by S. M. JACKSON.

Bingham, KINSLEY S.: b. at Camillus, Onondaga co., N. Y., Dec. 16, 1801; studied law; went to Michigan in 1833; was a judge of probate; elected in 1837 a member of the Michigan legislature, he continued for eight years a member of that body, and for three years was its Speaker; member of Congress (1849–51), Governor (1855–59), and U. S. Senator (1859–61). D. at Green Oak, Livingston co., Mich., Oct. 5, 1861.

Bing'hamton: city and railroad center; capital of Broome co., N. Y. (for location of county, see map of New York, ref. 6–G): was incorporated as a city in 1867. It is pleasantly situated in a hilly, agricultural country, devoted principally to the dairy industries. The altitude of the city at the rivers is 859 feet above tide-water. The Susquehanna and Chenango rivers form a junction within the city. The Susquehanna is spanned by three iron carriage bridges and a foot bridge; the Chenango is spanned by three handsome and wide full-deck wagon bridges, which unite sections of the principal business streets. All the carriage bridges are crossed by electrical street railroads. The land slopes gently toward the rivers from all directions.

The national census of 1890 showed 702 establishments carrying on 93 industries, including the manufacture of leather, boots, shoes, clothing, cigars, chairs, wagons, carriages, cutters, children's carriages and sleighs, scales, furniture, glass, combs, buttons, brushes, engines, machinery, carriage and harness trimmings, barrels, doors, sash, blinds, flexible shafts, soap, and refined oils. The capital invested in manufacturing industries was in 1890 $9,022,851, and $4,306,862 was paid to 10,077 employees. The cost of materials used was $7,583,413, and the finished products were worth $14,932,001.

Among the conspicuous buildings, besides the business blocks, are 8 large churches, Central High School, county court-house, Municipal Building, Federal Government court-house and post-office, State armory, State insane hospital, 9 large ward-school buildings, opera-house, and 2 orphans' homes. The new Stone opera-house is one of the finest theaters in the State, having a front of 70 feet width, of brown-stone, and a depth of 200 feet. The insane hospital consists of the very large building erected for an inebriate asylum, and a cluster of smaller buildings, all capable of accommodating about 2,000 patients. The city is well equipped with first-class hotels.

Binghamton is at the intersection of two trunk lines (New York, Lake Erie and Western, and the Delaware, Lackawanna and Western). The D., L. and W. has branches to Syracuse and to Utica. The Albany and Susquehanna R. R., owned by the Delaware and Hudson Canal Company, connects here with the other roads.

The incorporated limits of the city contains 6,400 acres. There are 83 miles of streets, lighted by a private electric plant. The bonded debt is $668,500. The total property valuation for 1900 was $21,280,753, and the city taxes were $320,877.89.

There is a very efficient volunteer fire department, having 3 steamers, 1 chemical engine, an aërial truck, and 7 hose-carriages and trucks.

There are 17 public schools, good private schools, Protestant and Catholic, and a fund of $80,000 has been left by will for the establishment of an industrial school. The public library contains 7,827 volumes.

The city contains 34 churches and several chapels.

Water is supplied by the Holly system. The capacity of the works is 18,000,000 gal. in 24 hours. There are 50 miles of water-pipes. The works are valued at $1,500,000.

The financial institutions consist of 1 national bank, representing the consolidation of 3 former banks, with a capital of $400,000, 1 State bank, 1 trust company, 2 savings banks, and 1 private banking house. There is also 1 safe deposit company.

Ross Park, containing about 100 acres, is equipped with driveways and summer buildings. Bennett Grove, of about 50 acres, owned by private parties, is thrown open to the public for a park. The Binghamton Association Driving Park and the Stow Park and Exposition ground are also private property devoted to public use. Annual fairs are held upon the Exposition ground.

There are 33 miles of street-car lines running out to 12 suburbs, consolidated under the Binghamton Railroad Company, and operated by electricity. The rapid growth of the city between 1880 and 1890 is attributable largely to rapid-transit facilities as well as to the prosperity of local indus-

tries. The workingmen live largely in cottages of their own, built upon lots 50 feet front and from 100 to 200 feet deep.

Pop. (1870) 12,692; (1880) 17,317; (1890) 35,005; (1900) 39,647. WM. F. SEWARD, MANAGING ED. "REPUBLICAN."

Bing'ley: a town in the West Riding of Yorkshire, England; situated on an eminence on the river Aire; 15 miles W. N. W. of Leeds (see map of England, ref. 6-G). The Leeds and Liverpool Canal passes by it. Here are manufactures of worsted goods, paper, etc. Pop. (1891) 10,023.

Bin'ney, AMOS, M. D.: naturalist; b. in Boston, Oct. 18, 1803; graduated at Brown University in 1821; was the owner of an ample fortune. He was a liberal patron of artists and men of science, and was president of the Boston Society of Natural History. He wrote *Terrestrial and Air-breathing Mollusks of the United States* (finely illustrated). D. at Rome, Feb. 18, 1847.—His son, W. G. BINNEY, is also a distinguished conchologist.

Binney, HIBBERT, D. D.: b. in Nova Scotia, Aug. 12, 1819; educated in London and Oxford, graduating at the latter university in 1842. In 1851 he was consecrated Bishop (Anglican) of Nova Scotia and Prince Edward Island, which was the first bishopric founded by England in her colonial dependencies, originally including not only Nova Scotia and Prince Edward Island, but also New Brunswick and parts of Lower Canada. Bishop Binney was a visitor at the General Convention of the Protestant Episcopal Church held at Chicago in 1886. D. in 1887.

Binney, HORACE, LL. D.: lawyer; b. in Philadelphia, Jan. 4, 1780. He graduated at Harvard College in 1797, and divided the first honors with his classmate, the late Judge White, of Salem, Mass. Having studied law with Jared Ingersoll in Philadelphia, he was admitted to the bar in 1800, and rose in a few years to the highest rank in his profession. He declined high judicial positions which were offered him, but as a lawyer he took a prominent part in important cases in the higher courts of Pennsylvania, and was several times called to the Supreme Court of the U. S. Elected to Congress in the latter part of Jackson's first administration, he distinguished himself by his eloquence and ability. In 1843 he made his celebrated argument in the Supreme Court of the U. S. in the case of Vidal *versus* the mayor of Philadelphia. This admirable argument is often cited by the bench and bar of the U. S. as authority on questions involving the law of charitable uses, and has been referred to by eminent English jurists in the highest terms of praise. Mr. Binney appeared for the last time before his legal brethren on the occasion of the death of his friend, the Hon. John Sergeant, whose character he delineated in terms of deep feeling and eloquence. Mr. Binney's principal works, besides the argument in the Vidal case, are *An Inquiry into the Formation of Washington's Farewell Address* (1859); eulogiums on Chief Justice Tilghman (1827), and Chief Justice Marshall (1836); and *Reports of Cases in the Supreme Court of Pennsylvania* (6 vols.). D. in Philadelphia, Aug. 12, 1875.

Binney, THOMAS, D. D., LL. D.: an English Dissenting minister; b. at Newcastle-upon-Tyne, Apr., 1798; educated at the Theological Seminary at Wymondley, Hertfordshire; became pastor in Newport, Isle of Wight, 1824; pastor of King's Weigh-house chapel, London (1829–69); wrote many controversial papers, *Conscientious Clerical Nonconformity*; *Service of Song*; and several books for young men, besides several volumes the products of a controversy with the Bishop of Adelaide, and the familiar hymn *Eternal light! eternal light!* D. in London, Feb. 24, 1874.

Binnie, ALEXANDER R., F. G. S., F. R. M. S.: engineer to the London County Council; b. in London in 1839; educated at private academies; pupil and assistant to the celebrated J. F. La Trobe Bateman, F. R. S.; in early life was engaged in railway construction in England and Wales. By public competition he entered the Public Works Department of India in 1868, where he remained six years, discovering coal in the Central Provinces. He designed and constructed the works for supplying Nagpur with water, and for a short time was acting secretary of the department. He was engineer to the Bradford Corporation in England for fifteen years, designing and constructing many large works, among them a reservoir embankment 125 feet in height. He also designed a large extension of the water-works in the Nedd valley. He designed and is now constructing a tunnel under the Thames at Blackwall, to be built by means of a shield through water bearing ballast, and lined with brick inside of a heavy cast-iron shell. Author of a paper on Nagpur water-works, which obtained from the Institution of Civil Engineers the Telford medal; lectures on water-works at Chatham; and *Heat in its Relation to Coal*, an address as president to the Bradford Philosophical Society. WILLIAM R. HUTTON.

Binocular Telescope [*binocular* is from Lat. *bini*, two each + *o'culus*, eye]: a combination of two telescopes the distance of whose parallel central axes is equal to that between the eyes, so that both eyes may be applied at once. An object may then be observed with both eyes at the same time, one looking through each tube. There are also binocular microscopes, having two tubes, one for each eye. In some kinds of work they possess superior defining power.

Binomial [formed from Lat. *bi-*, having two + *no'men*, name, term]: in algebra, an expression having two terms joined by the sign + or −. The "binomial theorem" has for its object the expression of the law for the formation of any power of a binomial. By means of this theorem any power of $x + a$ can be at once written down without going through the actual multiplication. The older mathematicians were acquainted with this method of finding such powers, but Newton first demonstrated the universality of its application. This is considered one of his greatest discoveries, and the formula was placed upon his tomb. It is usually written thus:

$$(x + a)^m = x^m + \frac{max^{m-1}}{1} + \frac{m(m-1)}{1.2} a^2x^{m-2} + \frac{m(m-1)(m-2)}{1.2.3} \times a^3x^{m-3}, \text{ etc.}$$

BINOMIAL COEFFICIENTS: the coefficients of the powers of quantities which occur in the binomial theorem, as

$$\frac{m(m-1)}{1.2}; \frac{m(m-1)(m-2)}{1.2.3}, \text{ etc.}$$

Binomial Nomenclature: the system of naming animals and plants introduced by Linnæus near the middle of the last century, and now in universal use among scientific men. In this system the species or different kinds of animals or plants are gathered together in larger groups or genera. The name of the genus is a Latin substantive, that of the species is adjective or a noun having the force of an adjective.

The genus may contain one or many species, and with the progress of exact knowledge of species the tendency has been to split the genera into smaller and smaller groups by more rigorous definition.

Examples of binomial nomenclature are *Quercus alba*, the white oak; *Felis leo*, the lion; *Sparisoma abildgaardi*, Abildgaard's parrot-fish; *Abies pectinata*, the balsam-fir of Eastern North America. D. S. JORDAN.

Bintang' (Malay *Bentan*, called by Marco Polo *Pentam* and by Camoens *Bintão*): an island on the south side of the Straits of Singapore; central lat. 0° 52′ N., long. 104° 26′ E.; surrounded by rocks and small islands, making navigation dangerous. Area, 440 sq. miles. It is low and swampy, and produces much gambir, for which it is visited by Malay and Chinese traders. It was formerly a nest of pirates, but is now claimed by the Dutch, who founded on it a port, Rhio or Riouw, intended to have been a rival for Singapore.

Binturong' (*Arctictis binturong*): one of the largest of the *Viverridæ*, or civet-cat family; a native of Borneo, Java, Sumatra, and Malacca. Its body and tail are covered with harsh, bristly, black fur. It possesses a long, tapering prehensile tail, which exceeds in length that of any other of the *Æluroids* (cats, civets, and hyænas) except the tiger. D. S. JORDAN.

Bio-Bio, bee'ō-bee'ō: the largest river of Chili; rises in the Andes, and enters the sea at Concepcion, after a course of 200 miles.

Bio-Bio: an interior province of Chili; in lat. 37° S.; on a river of the same name; between Argentina and Arauco, with Concepcion and Nuble on the N. and Malleco on the S. Area, 4,158 sq. miles. It is traversed by a north and south railroad. Capital, Angeles. Pop. (1891) 122,729.

Biogen'esis [from Gr. *βίος*, life + *γένεσις*, birth]: the origin of living organisms from living organisms by some form of reproduction either asexual or sexual; a term used in opposition to *abiogenesis*, or the origination of living things from non-living matter. The term is also applied to that body of doctrine pertaining to the reproduction and development of living things, both with reference to the individual and with reference to the race, of which the fundamental doctrine is held to be that "ontogeny," the history of the

development of the individual, is a short recapitulation of the history of the race, which is called in turn "phylogeny." In other words, the individual in coming from the ovum to the adult stage passes through a series of forms which indicate in a more or less abbreviated way the ancestral forms along the line of its descent. Biogenesis includes investigations of the development of organisms from this doctrine as a basis. D. S. Jordan.

Biograph'ical Dictionaries: The earliest known book at all resembling our modern biographical dictionaries is the *Elucidarius carminum et historiarum*, compiled by Herman Torrentinus (Van Beeck), and published in Deventer in the year 1498. Its popularity during the sixteenth century is attested by more than forty editions. Meanwhile improved dictionaries, likewise containing geographical and other articles, as well as biographies, were made by Robert Estienne (1st edition 1541), by Charles Estienne (1553), and by Louis Moreri (1674). Moreri's book passed through more than twenty revised editions, and remained the standard work for nearly a century, the volumes of Bayle (1697), Chaufepié (1750–56), and Marchand (1758–59) being avowedly but supplements to it. The first comprehensive dictionary exclusively biographical was a meager and inaccurate compilation by the Abbé L'Avocat, published in 1752. It was soon superseded by the *Nouveau Dictionnaire Historique Portatif*, purporting to be compiled by "une société des gens de lettres," and to be published at Amsterdam. In fact, its sole author was the French Benedictine Dom Chaudon, who wished to avoid the press-censorship, and the book was actually printed at Avignon in 1766. Chaudon's work, frequently revised, maintained its position as *the* biographical dictionary until the beginning of the present century. The earliest important English work was *The New and General Biographical Dictionary* of 1761 in 11 volumes 8vo. Upon a later edition of this book was founded *The General Biographical Dictionary*, edited by Thomas Chalmers (1812–17, 32 vols. 8vo), which, in spite of the publication in 1840–47 of *A New General Biographical Dictionary*, by H. J. Rose (in 12 vols. 8vo), remains to this day one of the best comprehensive biographical dictionaries in English. Among its chief rivals are *The Imperial Dictionary of Universal Biography* (Glasgow, 1865, 3 vols. 8vo), and Dr. J. Thomas's *Universal Pronouncing Dictionary of Biography* (Philadelphia, 1886, 2 vols. 4to), which are later and more concise than Chalmers. But none of these books approach in merit either the *Biographie Universelle Ancienne et Moderne*, published by Michaud (first edition 1811–53, 79 vols.; second, greatly improved edition, 1843–65, 45 vols. 8vo), or the *Nouvelle Biographie Générale* (1852–77, 46 vols. 8vo), edited by Dr. Hoefer, but frequently called by the name of its publisher, Didot. The more important of the above mentioned books are indexed in Phillips's *Dictionary of Biographical Reference* (third edition, Philadelphia, 1889), which contains 100,000 names. Even more comprehensive, but likewise exceedingly brief, is Oettinger's *Moniteur des Dates* (Leipzig, 1869–82, 2 vols. 4to). Extensive and valuable biographical dictionaries are also included in the chief encyclopædias, as Appletons' *Universal Cyclopædia*: likewise Knight's *English Cyclopædia* (1861–62); *Appletons' American Cyclopædia* (1881); *Chambers's Encyclopædia* (1888–93); Larousse's *Grand Dictionnaire Universel du XIX^e^ Siècle* (1866–78); and in the *Conversations-Lexica* of Brockhaus and of Meyer.

In addition to the general biographical dictionaries there are numerous excellent books confined to biographies of persons: (1) of a single nation, e. g. Englishmen; (2) of a single period, e. g. the present century; or (3) of a single class, e. g. musicians. Among the more important books of the first class are the following: For Americans, *Appletons' Cyclopædia of American Biography*, edited by J. G. Wilson and J. Fiske (1886–89, 7 vols. 8vo), which has superseded the earlier books by Drake (1872) and Allen (3d ed., 1857). For Great Britain, the *Dictionary of National Biography* (in 60 vols.), begun in 1885 under the editorship of Leslie Stephen, and completed in 1900 by Sidney Lee. For Scotchmen, see J. Irving's *Book of Eminent Scotsmen* (1881); for Irishmen, A. Webb's *Compendium of Irish Biography* (1878); for Germans, the *Allgemeine deutsche Biographie*, begun in 1875, and now (1893) extending in 34 vols. 8vo to the letters "Spa"; and for Austrians, Wurzbach's *Biographisches Lexikon des Kaiserthums Oesterreich* (1856–91, 61 vols. 8vo). The following are the editors of the chief biographical dictionaries for the countries mentioned: for Holland, Van der Aa; for Belgium, the Brussels Royal Academy; for Denmark, Bricka; for Sweden, Pambald; for Russia, Vengerov, also Gennadi; for Spain, Antonio. For Frenchmen the best books are Michaud and Didot. There is no satisfactory book for Italians.

Of books about persons of a single period the most useful are: Dr. William Smith's *Dictionary of Greek and Roman Biography and Mythology* (1844–49, 3 vols. 8vo); Smith and Wace's *Dictionary of Christian Biography* (1877–84, 4 vols. 8vo), reaching to 800 A. D.; and Chevalier's *Répertoire des Sources Historiques du Moyen Âge*: *Bio-Bibliographie* (1877–88, 2 vols. 8vo), which gives no biographies itself, but indexes the biographical material contained in several thousand volumes in various languages so far as it refers to persons living in the Middle Ages. For contemporary and recent biography the best works are: L. C. Sanders's *Celebrities of the Century* (1887, 8vo); *Men and Women of the Time* (15th ed., by V. G. Plarr, 1899); *Who's Who* (English, 53d ed., 1901; American, 1st ed., 1899); *Canadian Men and Women of the Time* (1898); Vapereau's *Dictionnaire des Contemporains* (6th ed., 1892–93); and Boase's *Modern English Biography* (1st vol. 1892). The biographical reference books for persons of single classes include:

For authors, S. A. Allibone's *Critical Dictionary of British and American Authors* (1858–73, 3 vols. 8vo, and supplement by J. F. Kirk, 1891, 2 vols.); De Gubernatis, *Dictionnaire International des Écrivains du Jour* (1888–90, 2 vols. 8vo); and Brümmer's *Deutsches Dichter-Lexikon* (1876–77, 2 vols. 8vo).

For artists, Champlin and Perkins's *Cyclopedia of Painters and Paintings* (1887, 4 vols. 8vo), and M. Bryan's *Dictionary of Painters and Engravers* (new edition by Graves, 1888, 2 vols. 8vo).

For musicians, Grove's *Dictionary of Music and Musicians* (1879–89, 4 vols. 8vo); Champlin and Apthorp's *Dictionary of Music and Musicians* (1890, 3 vols. 8vo); and Fétis's *Biographie Universelle des Musiciens* (second edition, 1860–65, 8 vols. 8vo, with supplement by Pougin, 1878–81, 2 vols. 8vo).

For medical men, Thatcher's *American Medical Biography* (1823, 2 vols. 8vo, with supplement by S. W. Williams, 1845); Atkinson's *Contemporary Physicians and Surgeons of the United States* (1878); and Hirsch's *Biographisches Lexikon der hervorragenden Aerzte aller Zeiten und Völker* (1880–89, 9 vols. 4to).

For theologians, W. B. Sprague's *Annals of the American Pulpit* (1865–73, 11 vols. 8vo); Philip Schaff and S. M. Jackson's *Encyclopædia of Living Divines* (1887, 4to, being a supplement to the Schaff-Herzog *Cyclopædia of Religious Knowledge*, 1882–85, 3 vols. 4to, which also contains biographies); F. Lichtenberger's *Encyclopédie des Sciences Religieuses*, tome 13, containing a *Dictionnaire des Contemporains* (1882, 8vo).

In general those biographical dictionaries are most satisfactory which contain signed articles, and indicate sources of further information. Consult on biographical dictionaries *Quarterly Review*, vol. clvii., pp. 187–230, and *Library Journal*, vol. xiv., pp. 7–20. C. H. Hull.

Biography [from Late Gr. βιογραφία, or formed from Gr. βίος, life + γράφειν, write]: literature which treats of the lives of individual persons. Anciently, the leading incidents of a man's life were narrated in their historical sequence, without elaborate attempts to analyze character. Ancient biography was possessed of a stately dignity, colored but sparingly with eulogy or censure. Modern biography, on the other hand, like modern history, is often full of criticism and disquisition. Of strictly biographical works, the most valuable that have come to us from the ancient Greeks are the *Memoriabilia* of Xenophon and the *Lives* of Plutarch. Roman literature also possesses an admirable *Life of Agricola*, by his son-in-law, Tacitus. Besides these may be mentioned the *Lives* ascribed to Cornelius Nepos; the writings of Suetonius; the *Life of Alexander the Great* by Curtius; *Lives of the Sophists* by Philostratus; and a *Life of Plato* by Olympiodorus. Later, we encounter the *Lives of the Fathers* by St. Jerome and others, while biographies of saints, martyrs, etc., are scattered profusely through ecclesiastical literature. The monks of the Middle Ages worked at the manufacture of biographies in which the hunger for the marvelous was gratified. For modern compilations, see the article on Biographical Dictionaries.

Biol'ogy [from Gr. βίος, life + λόγος, discourse, -λογία, doctrine, science]: that branch of the study of nature which

treats of organized beings under their diverse relations, in contradistinction to mineralogy, which relates to the inorganic or mineral substances; its subjects are therefore animals (zoölogy) and plants (botany or phytology), living and extinct. These agree with each other, and differ from minerals in (1) the physical and chemical characteristics of their primitive constituents or cells, and the concomitant phenomena of life exhibited under certain conditions; in (2) the perpetual change during life in the organism by loss of substance proportioned to the demands on the system of exertion or existence, and the renewal of substance by derivation and assimilation of nutriment from without; in (3) the segregation and specialization, when the demand for rapid growth has been fulfilled, of certain portions of the organism as reproductive organs, differentiated as receptive and procreative (female), and impregnating and vivifying (male); from the former of which (after the conjunction of the two under certain conditions) an organism originates essentially like that from which it proceeds; in (4) the existence, for a vaguely determinate period, of the organism, and finally a disturbance of the equilibrium or conditions of existence, death and dissolution; and in that (5) originating as above indicated, the offspring repeats the same cycle of phenomena as the parent, and in turn contributes to the perpetuation of the race. Our limits will only allow us to briefly consider, in the order indicated, these characteristic features of the great empire of organic nature.

(1) The animal or vegetable organism is in the main constituted of four elements, three of which are separately known in a gaseous state—*oxygen*, *hydrogen*, and *nitrogen*—and one—*carbon*—in a simple condition is only known in a solid form. From this predominance of gaseous elements results the degree of molecular mobility of the constituents of the organism, and, according to Herbert Spencer, "that comparative readiness displayed by organic matters to undergo those changes in the arrangement of parts which we call development, and those transformations of motion which we call function." The same author has also insisted on facts that (1) the elements in question (except oxygen) have affinities which are narrow in their range, but low in their intensity; (2) that in all allotropism (or the ability to assume different states) is inherent; and (3) that they all present certain extreme antitheses (as, for example, between oxygen and nitrogen as to chemical affinity, and between carbon and the gases as to molecular mobility); and that these extreme contrasts "fulfill, in the highest degree, a certain further condition to facility of differentiation and integration." The primary form into which these elements enter is a fluid substance called protoplasm, which may or may not be nucleated, but in most organisms assumes the nucleated condition (that is, of cells); of such elements, more or less modified and disguised according to circumstances (i. e. specialization and complexity of parts), the entire organism is built up.

(2) By the absorption or ingestion of extraneous substances the organism derives a nutriment which is assimilated and converted into its own substance, and supplies the material (1) for the power for work, (2) the repair of the system, and (3) for direct growth. Every action and exertion is attended with a loss of substance, and hence exists the necessity for a corresponding supply of nutriment. For a certain length of time (according to the species or race), in addition to the preservation of an unstable equilibrium, there is also a demand for supply for increase of bulk, or growth, of the organism. The period and extent to which this is carried is, within certain limits, constant for each species.

(3) When the full stature or phase of development has been more or less nearly attained, the organs of reproduction become functionally developed, and provision for the perpetuation of the race is made. In plants, the female element is termed a seed; in animals, an ovum or egg. The male and female elements may be united in the same individual, as in most plants and many animals, but in the highest animals the sexes are always differentiated in distinct individuals. In mollusks, hermaphroditism is almost of ordinal value, but not more, and in at least one case (*Valvatidæ*) hermaphroditism occurs in an order of which the other members are diœcious. Among vertebrates, true hermaphroditism is only known (as an exceptional development) in certain fishes (*Serranidæ*); it is entirely unknown in the higher forms (mammals, etc.), all the reported cases to the contrary being referable to males with the genitalia in an embryonic condition, or females with the clitoris hypertrophied. The homologies of the male and female organs render it impossible that there shall be a union of the sexes in the same individual in the mammals. Actual fecundation of individual germs (seeds or eggs) by the male element is necessary, in most cases, for their development, but in exceptional cases (e. g. certain insects, crustaceous mollusks), females produce broods of young without having had direct previous intercourse with the male. This peculiar capability has been designated *parthenogenesis*; the unimpregnated eggs (in some forms) produce only females. The question of the determination of sex is still involved in obscurity.

(4) After a certain period, if the individual has escaped all the liabilities to death that occur from enemies, accidents, and disease, there is a decline in the activity of the functions, the system becomes disordered, and death ensues. This period, like those of growth and development of the reproductive power, is also, within certain limits, a constant term, and all reports of extreme longevity—such as the reputed ages of H. Jenkins (169 years), T. Parr (150 years), the Countess Desmond (140 years), and others—are either based on very unsatisfactory evidence or demonstrably false.

(5) The offspring, although as a rule very similar to the parent, is never exactly like it, being always distinguishable by some more or less obvious difference or *individuality* of character. Occasionally, however, the offspring differs very markedly in some one character, which may or may not be co-ordinated with other correspondingly important differences. The newly developed peculiarity is apt to be transmitted either to the immediate offspring or to a succeeding generation, and sometimes in an exaggerated degree. But such peculiarities, if the individuals so distinguished pair with those not exhibiting them, generally disappear in their descendants after a longer or shorter course. If, however, the individuals thus characterized are set aside, and their immediate and remote descendants selected in ratio to their possession of some peculiarity, that peculiarity will be indefinitely perpetuated, and a new race distinguished thereby will be thus originated. By means of such *artificial selection*, unintentional or studied, the various races of domesticated animals have been produced. And as, in most cases, there is an obvious fitness of organized beings to the conditions under which they are found, it has been assumed that such relations are the result of the survival of beings possessing characteristics which may have spontaneously arisen, and which have gradually become (relatively) perpetuated in the "struggle for existence"; and hence the hypothesis of *natural selection* has originated. Inasmuch, also, as no offspring is exactly like the parents, it follows that no generation is exactly like the preceding; and although there must be a certain unstable equilibrium, resulting from constant interbreeding, in the incessant surge of variations, the descendants must necessarily depart more and more from their progenitors. While in an historical epoch no very obvious changes may be perceptible, eventually (unless by the interposition of miraculous agency) there must be a contrast between the extremes of a lineage, and the exhibition of such must be merely a question of time, determined to a greater or less degree by the changes of condition. The assumption of this hypothesis, and the inductive evidence furnished by various departments of science, have culminated in the theory of *evolution*, and for an explanation of the *modus operandi* of evolution, natural selection (or Darwinism) has been evoked. The evidence relied upon is chiefly derived from morphology (and the contrast between it and teleology), embryology, the geological succession, and the geographical distribution of organisms.

While animals and plants differ from minerals, and agree with each other in all the characters thus specified, there are no such salient differences between themselves. It is, indeed, easy to distinguish the higher animals and plants, and they are, to a certain extent, antetypes and complementary to each other. On the one hand, plants derive their nourishment by absorption from the inorganic world through the external surfaces of their roots and leaves, and (under most conditions) decompose carbonic acid gas, assimilate carbon (and nitrogen), and eliminate oxygen. On the other hand, animals derive their nutriment, immediately or mediately, from plants, and ingest it either through a provisional or specialized alimentary cavity, imbibe oxygen, and exhale carbonic acid gas. The mode of taking nutriment is the most characteristic feature, and specialization especially tends to that end, but supplemented, in the animal,

by a specialization of other systems to guide it in the selection and pursuit of its food. Some rather high animals (e. g. certain Entozoa) take their nutriment through their external surfaces, but this is rather a teleological modification co-ordinated with atrophy of the intestinal tube, superinduced by peculiar conditions of life. In view of the slight differences between animals and plants, and their contrast with minerals, it is evident that the ternary division of natural objects into animals, plants, and minerals does not express the degree of the relations between them; and hence the animal and plant kingdoms have been combined in an *organic empire* or realm on the one hand, and on the other minerals have been denominated an *inorganic empire*. The impossibility or great difficulty of discriminating the lowest plants and animals has also led some naturalists to separate them from the animal and vegetable kingdoms, and combine them in a peculiar one, which has received, with some varying limits, numerous names—e. g. Infusory world (Infusorienwelt), règne de Zoöphytes, règnes Psychodaire, règne chaotique, règne Plantanimal, regnum Amphorganicorum, règne organique Primitive, kingdom of Protozoa, regnum Primigenium, kingdom of Primalia, and Protistenreichs. Such propositions, however, do not remove the difficulty, but only shift and complicate the questions, and obscure the recognition of the tendencies of the two antitypically functional divisions of nature. It need only be added that there is also, to some extent, a contrast in respect to individuality in the respective kingdoms, numerous individuals (flowers) being developed from the outgrowth of the contents of a single seed, while in all except some of the lower animals a single individual only originates from one egg. The subject of individuality, however, is a somewhat obscure one, and has provoked much discussion; and the question has been involved by the confusion of potential and actual individuality. For more detailed information respecting the various subjects of biology consult Evolution, Hermaphroditism, Longevity, Morphology, Paleontology, Parthenogenesis, Teleology, Zoölogical Geography, and Zoölogy and Botany, and their respective subdivisions. Theodore Gill.

Bi'on (of Smyrna): Greek bucolic poet of the third century B. C.: contemporary and imitator of Theocritus. The longest and most admired of his poems is the *Lament for Adonis* (Ἐπιτάφιος Ἀδώνιδος). The language is beautiful, the tone tender. Reflexes of it are to be seen in the *Adonais* of Shelley. Ed. with Theocritus and Moschus by Gaisford (1821); Ahrens (1855); Meineke (1856); translated with the same by Andrew Lang (1889).

Biondo, bē̆e-ōn'dō, Flavio (1388–1463): the greatest archæologist of the Italian Renaissance; author of *Roma instaurata*, *Roma triumphans*, and *Italia illustrata*, three bulky encyclopædias of archæological information which have constituted the basis of all subsequent dictionaries of Roman antiquities. Contemporary critics severely censured his careless style ("probitas laudatur et alget"). See Alfred Masius, *Flavio Biondo und seine Werke* (Leipzig, 1879); J. A. Symonds, *Renaissance in Italy*. A. Gudeman.

Biot, bē̆e'ō, Edouard Constant: Chinese scholar; son of Jean Baptiste Biot; b. in Paris, July 2, 1803; was first interested in the introduction of railroads in France, but retired from public service on account of poor health, and devoted himself to study of the Chinese; member of the Academy 1847; author of articles on Chinese subjects in the *Journal Asiatique*; *De l'Abolition de l'Esclavage Ancienne en Occident* (1840); and *Dictionnaire des Villes, etc., de l'Empire Chinois* (1842). D. Mar. 12, 1850.

Biot, Jean Baptiste: natural philosopher and astronomer; b. in Paris, Apr. 21, 1774. He became in 1800 Professor of Physics in the College of France. In 1803 he was admitted into the Institute, and in 1805 published *An Elementary Treatise on Physical Astronomy* (2 vols.). An enlarged edition of this appeared in 5 vols., 1841–57. Having been appointed a member of the bureau of longitudes, he was sent to Spain with Arago to measure the arc of the meridian. He contributed many able articles to the *Biographie Universelle* and the *Annales de Chimie et de Physique*; published, besides other works, a *Treatise on Experimental Physics and Mathematics* (4 vols., 1816), which is highly esteemed; and *Researches in Ancient Astronomy* (1829). In 1840 he received the Rumford medal of the Royal Society of London for his researches on the circular polarization of light. He was admitted into the French Academy in 1856. D. in Paris, Feb. 3, 1862.

Bi'otite, called also **Uniax'ial**, or **Magne'sian Mi'ca** [named for *Biot*, a French physicist, 1774–1862]: a mineral occurring in six-sided tubular prisms, having a perfect basal cleavage; generally dark green, brown, or nearly black in color. It has a vitreous luster, varies from transparent to opaque, is sectile, flexible, and elastic when reduced to thin laminæ. It consists chiefly of silica, alumina, magnesia, and oxide of iron, with some potassa.

Bi'pont Edi'tions: certain editions of the Greek and Latin classics, the publication of which was begun in 1779 at the German town of Zweibrücken (Deux-Ponts), called in Latin *Bipontium*.

Bir, beer (anc. *Bir'tha*; Turk. *Bireh-jik*): a town of Asiatic Turkey; on the left (east) bank of the Euphrates; 74 miles N. E. of Aleppo (see map of Turkey, ref. 6–H). It has about 2,000 houses, a citadel or castle on a steep rock, and several mosques. Caravans from Aleppo to Diarbekir and Bagdad cross the Euphrates at this point. Pop. about 6,000.

Birch: a tree or shrub of the genus *Betula* and family *Cupuliferæ*; native of temperate and cold regions in Asia, Europe, and America (several species are found among the Himalayas). The genus *Betula* is distinguished by ten to twelve stamens and winged seeds (achenia); has alternate, simple leaves, and flowers in scaly catkins. The common birch of Europe and Asia (*Betula alba*) is a handsome tree with triangular or deltoid leaves, which are doubly serrate. The bark is smooth and chalky white, and separable in thin sheets or layers. This bark is very durable, and is used for tanning, dyeing yellow, and other purposes. In some countries hats, shoes, and boots are made of it. The wood is firm, tough, and valuable, and is much used by coopers, turners, and wheelwrights. The sap is esteemed as a beverage in Scotland, both in a fresh state and fermented. Europe produces a graceful variety called weeping-birch (*B. penduta* of some botanists), which attains a height of 60 feet, and has very slender and pendulous branches. The American white birch (*B. populifotia*) is a small, graceful tree with tremulous, deltoid, and shining leaves, but is not valuable for timber. Among the other species indigenous in the U. S. are the *B. tenta* (sweet or black birch), and *B. lutea* (yellow birch) and *B. papyracea* (canoe or paper birch). The *B. lenta* is a rather large tree, the bark of which is aromatic, yielding an essential oil identical with that of *Gaultheria*, and the timber is fine-grained and valuable for cabinet-work. The *B. papyracea* grows in the Northern States to the height of about 70 feet, has a fine-grained wood, and a very tough, durable white bark, splitting freely into thin layers, which have been used as paper. The Indians make canoes of this bark. The *B. lutea* sometimes attains a height of 80 feet, and is remarkable for the brilliant yellow tint of its bark or epidermis. The leaves are from 3 to 5 inches long. Besides the above and several less important species, the U. S. have the *B. nigra*, or river birch, which grows on the banks of streams and has remarkably tough wood. Russia leather is tanned with birch bark. "Russian oil" is a tar-like, empyreumatic substance obtained from birch-wood in Russia, and is useful in certain skin diseases.

Birch, Charles Bell, A. R. A.: sculptor; b. at Brixton, England, Sept. 28, 1832; educated at Somerset House School of Design and Berlin Royal Academy; won prize of £600 for his group *A Wood Nymph* (1864); exhibited *The Last Call* (1879); and executed many busts and statues. He contributed drawings on wood and stone to various publications, especially the *Illustrated London News*. D. in London, Oct. 16, 1893.

Birch, Samuel, LL. D.: b. in London, Nov. 3, 1813; was educated at Greenwich and Blackheath; afterward at Merchant Taylors' School, which he left in 1834, and was first employed under the commissioners of public records. In 1836 he was appointed assistant in the department of antiquities of the British Museum, from which he rose to be assistant keeper in 1844, and in 1861 keeper of the Oriental and Egyptian antiquities and ethnographical collections. He was considered one of the best modern Egyptologists; was the author of nearly all the last volume of Bunsen's work on Egypt, which contains the only English translation of the *Book of the Dead*; published a treatise on *Hieroglyphics* (1857); the *Rhind Papyri* (1866), etc. In 1878 he edited Wilkinson's *Manners and Customs of the Ancient Egyptians*, and was editor of *The Records of the Past* from 1873 to 1880. D. in London, Dec. 27, 1885.

Birch, Thomas, D. D., F. R. S.: biographer and historian; b. in London, England, Nov. 23, 1705. He took orders in the Anglican Church (1730), and became rector of parishes in London (1744) and in Depden, Essex (1761); was fellow of the Royal Society from 1735 and its secretary 1752–65. Among his numerous works, besides editions of Cudworth, Robert Boyle, Spenser, Sir Walter Raleigh, the prose works of Milton, and Bacon's *Letters and Speeches*, are *The General Dictionary, Historical and Critical* (10 vols., 1734–41); a *Life of Archbishop Tillotson* (1752); *Memoirs of the Reign of Queen Elizabeth* (2 vols., 1754); and a *History of the Royal Society* (4 vols., 1757). D. in London, Jan. 9, 1766.

Birch, Thomas: portrait and marine painter; b. in London, England, in 1779; d. in Philadelphia, Jan. 3, 1851. He came to the U. S. in 1793 and painted portraits in Philadelphia until about 1807, when he took up marine-painting. Some of his works represent naval battles of the war of 1812.

Birch-Pfeiffer, Charlotte: actress and dramatic writer; b. at Stuttgart, June 2, 1800; married Dr. Birch, of Copenhagen, in 1825. She attained success as a performer and a writer. Among her dramas are *Die Günsttinge*; *Hinko*; *Dorf und Stadt* (1848); and *Anna of Austria* (Anna von Oestreich, 1850). D. in Berlin, Aug. 25, 1868.

Bird, Arthur: See the Appendix.

Bird, Edward: genre-painter; b. in Wolverhampton, England, in 1772; apprenticed to a maker of japanware; became a drawing-teacher in Bristol; in 1809 he exhibited *Good News* in the Royal Academy, and soon after *The Choristers Rehearsing*; in 1814 was appointed painter to Princess Charlotte; the next year became a Royal Academician. D. in Bristol in 1819. His most famous canvas was *The Day after the Battle of Chevy Chase*. He painted some historical and scriptural pictures, among which was *The Death of Eli*; but his reputation rests on his genre work, as *The Village Politicians* and *The Blacksmith's Shop*.

Bird, Frederic Mayer: hymnologist; b. in Philadelphia, June 28, 1838; graduated at University of Pennsylvania 1857, and Union Theological Seminary, New York, 1860; Lutheran minister 1860–67; chaplain in the U. S. army 1862–63; ordained deacon Oct. 25, 1868; some time a rector in Iowa City and in Waterloo, Ia. In Feb., 1881, was appointed chaplain and Professor of Psychology, Christian Evidences, and Rhetoric in Lehigh University, South Bethlehem, Pa., which post he resigned in 1886. He edited *Charles Wesley seen in his Finer and Less Familiar Poems* (1867); with Rev. Dr. B. M. Smucker, *The Lutheran Ministerium Hymns* (1865; revised 1868 as General Council's *Church Book*); revised, with Bishop Odenheimer, *Songs of the Spirit* (1871). He contributed a monograph on the *Hymnody of the Church* to Bishop Perry's *History of the American Episcopal Church*. Editor of *Lippincott's Magazine* (1891–). He is a contributor to encyclopædias and magazines, and engaged in literary pursuits.

Bird, Robert Montgomery: father of F. M. Bird; novelist and journalist; b. in Newcastle, Del., in 1805; studied medicine in University of Pennsylvania; wrote dramas *Oratoosa*; *The Broker of Bogota*; and *The Gladiator*, in which Edwin Forrest won distinction. His first novels were concerned with the Spanish conquest of Mexico, and W. H. Prescott commended them for their antiquarian accuracy. They were *Calavar* (1834) and *The Infidel* (1835). All his books were published in Philadelphia. His most popular novel was *Nick of the Woods* (1837), a tale of frontier Kentucky. *Peter Pitgrim* is a collection of tales. In 1847 he became an editor and joint proprietor with Morton McMichael of the Philadelphia *North American and United States Gazette*. D. in Philadelphia, Jan. 22, 1854.

Bird, Isabella L. (*Mrs. Bishop*, of Edinburgh): traveler; b. in England; has undertaken many long and adventurous journeys in various parts of the world, of which her graphic published accounts have been very popular; author of *The Englishwoman in America* (1858); *Six Months among the Palm Groves of the Sandwich Islands* (1875); *A Lady's Life in the Rocky Mountains* (1879); *Unbeaten Tracks in Japan* (1880); *The Golden Chersonese* (1883).

Bird-catching Spider (*Mygale avicularia*): a large spider; native of Surinam. Its body is nearly 2 inches long, and its legs when stretched out occupy a space almost a foot in diameter. Its mandibles work vertically instead of laterally, and are very strong. It does not construct a net or web for the capture of its prey, but it obtains it by the chase, and hunts only in the night. This spider and other species of *Mygale* are said to attack and kill small birds. It is asserted

Bird-catching spider.

that in some tropical countries there are spiders which feed upon birds caught in their webs.

Bird Cherry: in England the *Pru'nus pa'dus*; a small tree growing wild in Europe, and called *bayberry* in Scotland. It bears racemes of small drupes of a sweetish and bitterish taste, which are used in the north of Europe to make spirituous liquors. In the U. S. the wild *Prunus pennsylvanica* also is called bird cherry.

Birde, or **Byrd**, William: English composer of church music; b. probably at Lincoln, about 1538; and was appointed organist of Lincoln about 1563, and of the Chapel Royal, London, 1569, in conjunction with Thomas Tallis, to whom with him Queen Elizabeth in 1575 granted a monopoly to print and sell music. He produced, among other works, *Cantiones Sacræ* (Sacred Songs) and a magnificent canon entitled *Non Nobis, Domine*. D. probably at London, July 4, 1623.

Birdlime (in Lat. *vis'cus*): a viscous adhesive substance placed on the branches of trees to catch birds which may perch there. It is prepared by boiling the middle bark of the holly (*Ilex*), the mistletoe (*Viscum album*), or other glutinous plants, and concentrating the decoction by evaporation. The gluten of wheat flour is sometimes used as a substitute for birdlime. A tame bird in a cage is sometimes employed to decoy the birds to the tree on which the birdlime is smeared.

Bird of Paradise: any one of several species of birds of the genus *Paradisea* and kindred genera, of the order *Passeres*; natives of Papua and the neighboring islands, remarkable for the beautiful form and splendor of their plumage. The name was originally applied to the *Paradisea apoda*, which was supposed to be destitute of feet, because the skins, which are exported to Europe, are usually deprived of wings and feet. The older naturalists imagined that they passed all their lives floating in the air and feeding on ethereal food or nectar. For these fabulous and fanciful ideas science substitutes the prosaic truth that they are nearly allied to the *Corvidæ* (crow family), and are omnivorous. The value of these birds arises chiefly from the extraordinary development and light and beautiful structure of the plumes which grow from the scapular and lateral portions of the body. The plumage of the males is remarkable not only for brightness of tints, but also for a velvety texture and brilliant


SONG SPARROW.
MOCKING BIRD.
BROWN THRASHER.
HERMIT THRUSH.
CARDINAL RED BIRD.
WOOD THRUSH.
ROBIN.
SCARLET TANAGER.
VEERY.
BLUEBIRD (FEMALE).
BALTIMORE ORIOLE.

SONG BIRDS.

metallic reflections. Tufts of feathers growing from the shoulders are so prolonged that they extend even beyond the

Bird of paradise.

tail, and they constitute the most beautiful part of the plumes of the bird of paradise, which are a highly prized article of commerce. The principal species of this genus are the common bird of paradise (*Paradisea apoda*), the royal bird of paradise (*Cicinnurus regius*), the red bird of paradise (*Paradisea rubra*), the magnificent bird of paradise (*Diphyllodes magnifica* or *speciosa*), and the six-threaded (or golden) bird of paradise (*Parotia sexfilata*), from the head of which grow six long and thread-like feathers, each ornamented with an ovate black raeket, three on each side. The common bird of paradise is about as large as a jay, and is mostly of a einnamon color, with a throat of emerald green, whence it is sometimes called the emerald bird of paradise. The royal bird of paradise has two long feathers or filaments, which extend behind the tail and terminate in disks, like the tail-feathers of a peacock. The red bird of paradise has two very long filaments, extending far beyond its rich and beautiful tail-feathers. Birds of paradise are generally gregarious, and they sometimes fly in flocks from one island to another. It is stated that they ean fly more easily against than with the wind. In confinement they are lively and bold, and bestow great care on their plumage. About twenty-five species are now known.

Red bird of paradise.

A writer, referring to what he calls "the supremely glorious members of the feathered tribe which have by common consent been termed birds of paradise," observes that "the plumage of these birds is wonderfully rich and varied, and not even the humming-birds themselves present such an inexhaustible treasury of form and color as is found among the comparatively few species of the birds of paradise." See Wallaee, *Malay Archipelago.* Revised by Charles H. Gilbert.

Birds (*Aves*): a class of oviparous vertebrate animals; definable as air-breathing vertebrates with a coating of feathers, with the two anterior limbs or wings adapted for flying or swimming, the two posterior limbs or legs adapted for walking or swimming; respiration never effected by gills or branchiæ, but after leaving the egg by lungs which are connected with air-cavities in various parts of the body. Reproduction by eggs fertilized within the body, and hatched externally either by incubation or by exposure to the heat of the sun; the shell calcareous, hard, and brittle. The sole really diagnostic character is this: all birds have feathers, and no other animal has feathers. No other character can be found by which the birds as a whole, living and extinct, can be separated from the reptiles. The plumage serves as clothing, and assists in motion through the air. The feathers entangle among their fibers a considerable quantity of air, and are well adapted to protect the bird from extremes of cold and heat. The internal temperature of birds is from 105° to 112° F., much higher than that of man or mammals generally. Their buoyancy and muscular energy are increased by numerous air-cells which are connected with the lungs. (See Air-cells.) The general form of birds is adapted to aërial navigation, and the body is somewhat boat-shaped. The number of vertebræ in the neck varies from ten to twenty-six, and is always greater than is found in any mammal. Among their peculiar organs are the toothless jaws, covered with a hard, horny sheath, forming the beak or bill. (See Bill.) The head is articulated to the neck by a single condyle. The number of toes of each foot is generally four, of which three extend forward and one backward; but the climbing birds have two before and two behind. The sternum or breast-bone is very large and strong, with a prominent keel, except in the ostrich and its relatives, serving for the attachment of the powerful muscles which move the expanded wings. The wing of a bird is the homologue of the arm of a man, and is composed of bones which correspond to those of a human arm or the fore leg of a quadruped. The wing is furnished with numerous feathers, called quills, which display an admirable combination of strength and lightness. The names of the several varieties of wing-feathers are *primaries*, *secondaries*, *tertiaries*, and *coverts*. The primaries are quill-feathers arising from the first or terminal joint—i. e. the part of the wing which corresponds to the hand and fingers of a man. The form of these indieates the bird's capacity of flight, and birds of powerful flight have long and firm primaries. Next to these are the secondaries, which are attached to the middle bone, the homologue of man's forearm. The tertiaries grow from the part of the wing between the elbow and the shoulder. The leg of a bird is formed of bones which are homologous to those of mammalia, but are subject to modifications. The thigh-bone is very short, and is so concealed within the skin that it is not apparent as a part of the leg on a superficial view. The next division, often mistaken for the thigh, is the *tibia* or proper leg-bone, which is always the largest bone of the limb, the *fibula* being rudi-

mentary. This joint is followed by one usually called the "tarsus," composed of tarsal and metatarsal bones fused together. The "tarsus" is covered with scale-like plates, the arrangement of which furnishes important characters in classification. The feet vary according to the habits of the birds, some of which have strong, hooked claws, fitted for seizing prey; others are adapted for swimming by a membrane which unites their toes; still others for climbing. The perching of birds is facilitated by an interesting adaptation in the structure of the legs, the tendons connected with the toes passing over the leg-joint, so that the bird's weight, by bending the latter, mechanically closes the toes.

The digestive apparatus is modified in accordance with the nature of the food. Birds do not masticate their food, which passes from the mouth into the crop or craw, which is merely an enlargement of the gullet. The *crop*, or first stomach, is present in birds of prey, and also in the larger birds which feed on grain and seeds. It serves to soften the food, and in the pigeons secretes a cheesy substance with which the young are fed. The second stomach, or *proventriculus*, is largest in those birds in which the crop is small or wanting. The third and principal stomach is the *gizzard*, which is a powerful grinding apparatus, especially in those birds which feed on grain and swallow gravel and pebbles, as the common domestic fowl. The sense of sight in this class is exceedingly keen, and is remarkable for its perfect adaptation to near or distant objects. The swallow, when darting through the air with a swiftness which has become proverbial, is capable of accommodating its sight to the insect which it pursues, even in the short time which is occupied by its swoop at its victim. Some birds of prey have an acute sense of smell, and nocturnal birds, such as owls, have sensitive organs of hearing. Birds are distinguished among all dumb animals for their musical powers, and song-birds are doubtless sensitive to sound and differences of pitch. All the best singing-birds belong to the *Passeres*.

Among the most interesting subjects connected with birds are their migrations and the instincts and ingenuity which they exhibit in building nests. (See NESTS OF BIRDS.) The number of eggs in a state of nature varies from one to twenty, and birds generally breed only once a year, which is in spring. Many species of birds are gregarious, but large rapacious birds are quite solitary in their mode of life. They all moult—i. e. change their feathers once a year—and the summer plumage of many birds is very different from the winter dress. The plumage of the males is generally richer and more brilliant than that of the females. Their flesh and eggs are valuable as food for man, and many species render him great service by checking the increase of insects.

The earliest traces of the existence of birds on the globe have been supposed to be the so-called birds' tracks in the Triassic sandstones of the Connecticut valley; but it is now generally conceded that most if not all these tracks were made by reptiles and amphibians. It is especially noteworthy that the earlier birds (Jurassic and Cretaceous) had true teeth in their jaws. In the lithographic slates of Solenhofen (Jurassic) have been found a feather and two nearly complete bodies of birds exhibiting some remarkable features, and representing a peculiar order (*Saururæ*) that is supposed to form a kind of connecting link between birds and reptiles. (See ARCHÆOPTERYX.) The remains of birds have been found in the greensand of England, the Eocene of the island of Sheppy, and the Paris basin, as well as in the more recent Tertiaries at various European localities. In America fossil birds were unknown until quite recently; they have now been found, however, in the greensand of New Jersey, the cretaceous beds of Kansas, and the Tertiary deposits of Wyoming and Idaho. The Cretaceous birds, according to Prof. O. C. Marsh, belong to two distinct orders named *Odontormæ* and *Odontolcæ*. The most important of his discoveries in this branch of palæontology is that of birds with teeth in the Cretaceous beds. In the superficial deposits of New Zealand and Madagascar the remains of several kinds of extinct birds have been met with, some of which far exceed in dimensions the largest now living. The great bird of Madagascar is called *Æpiornis maximus*. It is supposed to have been at least 12 feet in height, and very massive. The egg of this bird was over a foot in length. The contents of one of these eggs were equal to those of six ostriches' eggs or 148 hens' eggs. The largest extinct birds of New Zealand have been described under the name of *Dinornis* by Prof. Owen. They were from 6 to 10 feet in height. See ORNITHOLOGY.

Revised by CHARLES H. GILBERT.

Birdsall, WILLIAM RANDALL, M. D.: b. at Greene, Chenango co, N. Y., Jan. 1, 1852; pursued special scientific studies at the University of Michigan; entered the medical department of that institution, and in 1876 graduated M. D.; removed to New York city the same year; began practice with Dr. Seguin; prosecuted neurological studies in Europe; engaged as a clinical teacher on diseases of the nervous system at different medical colleges and hospitals in New York; for two years lecturer on helminthology at the American Veterinary College, New York. He is the author of a work on *Electro-therapeutics and Electro-diagnosis*, and is a contributor to several medical journals, principally on neurological subjects. D. in New York, June 7, 1892.

Birdsboro: borough; Berks co., Pa. (for location of county, see map of Pennsylvania, ref. 5–I); on Schuylkill river and Phila. and Reading, Wilmington and Northern, and Pennsylvania Railroads; 9 miles S. E. of Reading. Principal industry, iron manufactures. Pop. (1880) 1,705; (1890) 2,261; (1900) 2,264.

Bird's-eye Limestone: a compact, dove-colored stone, with whitish crystalline points, belonging to the lower division of the Trenton group of the lower Silurian strata of North America, apparently corresponding to the Llandeilo flags of Wales. It contains many orthoceratites of enormous size, and fossil brachiopods.

Bird's-eye View: a term used in the fine arts to denote a picture or view arranged according to the laws of perspective, in which the point of sight or situation of the eye is placed at a considerable height above the object. If the eye is considered as looking perpendicularly down while it sweeps over each point of the scene in succession, we have an exact ground-plan, no object covering another, and horizontal angles being exactly delineated. This is a convenient method of representing battles, or of depicting a large city or a small tract of country. In sketching a locality for military purposes this kind of perspective is used. The common kind of bird's-eye view differs from ordinary perspective only in that the horizontal line is placed considerably above the picture.

Bird's-foot: a plant of the genus *Ornithopus* and family *Leguminosæ*; which derives its name from the resemblance of the curved pods to birds' claws. One species, the *Ornithopus sativus*, an annual plant, a native of Portugal, is cultivated in that country, and affords a nutritious green fodder for cattle.

Bird's-foot Trefoil: a plant of the genus *Lotus* and family *Leguminosæ*: native of the temperate and cold regions of the Old World; so called because a cluster of its pods resembles a bird's foot. The *Lotus corniculatus*, common in the pastures of Great Britain and introduced into the U. S., is eaten with avidity by cattle. It bears yellow flowers, which have a honey-like smell, and leaves which are trifoliate, like those of clover. A larger species or variety, called *Lotus major*, is also a native of England.

Revised by CHARLES E. BESSEY.

Birds' Nests: See NESTS OF BIRDS.

Birds' Nests, EDIBLE: the nest of the sea-swift (*Collocalia esculenta*), of the Malay Archipelago, a bird of the size of a common martin. It builds its nest of a glutinous substance which it is said to derive from a seaweed. This weed is swallowed and partly digested, and then disgorged and fashioned into a nest as large as a common coffee-cup. When fresh these nests are of a waxy white color, and are said to be worth twice their weight in silver in the markets of China, where alone they are sold. The poorer sorts bring $5 or more a pound, according to the age of the nests. The taste of dishes prepared from these nests is said to be insipid, but the Chinese prize them, not perhaps so much for their taste as for their supposed tonic and aphrodisiac powers.

Birds of passage: birds which are migratory, passing instinctively and habitually from one country or latitude to another, following the change of the seasons. The migration of birds is in general along north and south lines. Spending the summer in the temperate or polar regions, they leave on the approach of cold weather for the south, where they pass the winter. Migratory birds which breed in the U. S. are called summer birds of passage with reference to those States. They return in autumn to warmer regions, and are winter birds of passage in the countries where they pass the winter. Wild geese and other waterfowl that breed in the Arctic regions in summer annually visit the U. S. and

Great Britain in autumn, and return northward in the spring. Several other species that are not aquatic, as the woodcock, fieldfare, and snowbird, pass the winter in the temperate parts of Europe or the U. S., and spend the summer in a more northern latitude.

Bird-tick: a small insect, regarded as a degraded fly; parasitic on numerous species of birds. *Olfersia americana* is a common species.

Birdwood, Sir George Christopher Molesworth, M. D., LL. D.: b. in Belgaum, Bombay, Dec. 8, 1832; M. D., University of Edinburgh, 1854; appointed to the medical staff of the East India Company the same year; appointed acting Professor of Anatomy and Physiology in Grant Medical College, Bombay, 1857, and retained his connection with the college in various chairs until he left India in 1869; appointed to the companionship of the Star of India Jan. 1, 1877; knighted in 1881; was mainly instrumental in establishing the Victoria and Albert Museum and the Victoria Gardens in Bombay. Author of very many articles on India. C. H. Thurber.

Biren, bee'ren, **Biron**, bee'ron, or **Buren**, boo'ren, Ernest John: Duke of Courland; b. in Kalnzeem, Nov. 12 (22), 1690. He gained the favor of Anna (a niece of Peter the Great), who became Empress of Russia in 1730, and gave him the title of duke. He abused his power during her reign by the execution of many innocent persons. On the death of Anna in 1740 he became regent, but he was exiled to Siberia in 1741. When Elizabeth ascended the throne in 1741 she permitted him to return to Russia, and in 1763 the duchy of Courland was restored to him. D. Dec. 28, 1772. See Ruehl, *Geschichte E. J. von Biron* (1764).

Biretta, or **Birretta**: a cap worn by some Western ecclesiastics. The ordinary Roman biretta is a square stiff-sided cap, with curved ridges, and a tassel at the top, commonly made of the same material as the cassock. It is usually of black for priests, violet for bishops, and scarlet for cardinals. There are also academic forms of it to be seen in use in some parts of Europe. W. S. Perry.

Birgitta, **Brigitta**, or **Bridget**, Saint: a Swedish mystic and religious reformer; b. at Finstad, 1302 or 1303. Her father, Birger Persson, was "lawman" of Upland, and her mother, Ingeborg, was related to the royal family. At the age of fourteen Birgitta married a young nobleman, Ulf Gudmarsson, by whom she had eight children. On the death of her husband in 1344 she retired to the convent of Alvastra and gave herself up to a life of devotion, though she appears never to have joined any religious order. From this time till her death she regulated her conduct entirely according to revelations which (as she believed) were at frequent intervals vouchsafed her from on high. In one of her trances she received from Christ directions for the establishment of a new monastic order. Securing large gifts from the king and queen, as well as from the Swedish nobility, she made arrangements for the erection of a monastery at Vadstena, and in 1349 set out for Rome with her confessor, her eldest son, and a few other companions. Arriving in the jubilee year, 1350, she opened a hospice for Swedish pilgrims and students. Henceforth she devoted all her energies to attacking the corruption of the Church, to urging the restoration of the papal residence from Avignon to Rome, and to securing the pope's authorization for the new order. The influence that she exerted by means of her revelations, which were published from time to time, and in which she did not hesitate to attack the highest ecclesiastical dignitaries, was very great, and no doubt had its part in inducing Urban V. (pope 1362–70) to take up his residence in Rome in 1367. Aug. 5, 1370, just a month before Urban was forced to return to Avignon, she obtained a bull authorizing her order and the foundation at Vadstena. This foundation consisted of sixty sisters and twenty-five brothers, living in different buildings but under the same rule (a modification of the Augustinian). In 1372–73 Birgitta performed a pilgrimage to Jerusalem. Soon after her return to Rome she died (July 23, 1373) in the convent of the nuns of St. Clare at Panisperna. Her bones were carried to Vadstena in 1374. In 1391 she was canonized by Boniface IX.

The *Revelations of St. Birgitta* occupy an important place in the mysticism of the later Middle Ages. They were written down by her from time to time in Swedish, but only two leaves of the original version have been preserved. Her confessor, Peter Alvastra, turned them into Latin, and they were edited by Alfonso the hermit (previously Bishop of Jaen), and in part also by Mathias, Canon of Linköping. Before 1400 they were translated back into Swedish (*Heliga Birgittas Uppenbarelser, efter gamla Handskrifter utgifra af G. E. Klemming*, 5 vols., Stockholm, 1857–84), and from this version into Danish. The Latin text was first printed at Lübeck in 1492, and has been often reissued. From the Latin entire or partial translations were made into Low German (printed between 1484 and 1494), Dutch (printed 1491), High German (printed 1502), French (printed 1624), Italian (printed 1518), Spanish (printed 1676), and English (printed about 1530; another selection London, 1873). A Polish and a Bohemian version exist in MSS. of the fourteenth century. Though vehemently attacked from many quarters, the genuineness and orthodoxy of the *Revelations* were confirmed by the Councils of Constance and Basel.

The monastic order founded by St. Birgitta, known officially as the *Order of the Holy Saviour*, but popularly as the *Birgittine Order*, had great success in the North, especially in Sweden and Denmark, and, from its principle of circulating works of devotion in the vernacular, exercised a powerful influence on mediæval Swedish and Danish literature (*q. v.*). The rule spread to other European countries till there were at one time in all no less than seventy-four establishments professing it (among them several in Spain, and one, Sion House, in England), but it is now almost extinct. The first abbess of the Vadstena convent was the daughter of St. Birgitta, St. Catherine (Katarina) of Sweden, b. about 1335; d. 1381; canonized 1489.

References.—C. Annerstedt, *Scriptores Rerum Svecicarum Medii Ævi*, vol. iii., sect. ii., pp. 188 ff. (Upsala, 1871–76), containing the oldest life of St. Birgitta (by her confessors) and other documents concerning her and her daughter, St. Catherine; *Acta Sanctorum*, Oct. 9, vol. iv., pp. 485–493, containing the *Vita S. Birgittæ* by her contemporary, Birger, Archbishop of Upsala, to which is prefixed a learned editorial commentary; F. Hammerich, *Den hellige Birgitta og Kirken i Norden* (Copenhagen, 1863); C. Rosenberg, *Nordboernes Aandsliv fra Oldtiden til vore Dage*, vol. ii. (Copenhagen, 1880), pp. 634–651; G. E. Klemming, *Birgitta-Literatur*, appended to his edition of *Heliga Birgittas Uppenbarelser*, vol. v. (Stockholm, 1884), pp. 179–275.

G. L. Kittredge.

Birgittine Order: See Birgitta, Saint.

Birk'beck, George, M. D.: English educational reformer; b. in Settle, Yorkshire, Jan. 10, 1776; educated at Edinburgh; Professor of Natural Philosophy in the Andersonian Institution at Glasgow 1779; gave free courses of lectures to the mechanics of Glasgow 1801–04; prominent in founding the London Mechanics' Institute, of which he was made president for life, 1823; d. in London, Dec. 1, 1841. The Birkbeck Institution was rebuilt 1883–84. See his *Life* by J. G. Goddard (London, 1884).

Birk'enhead: a seaport-town of Cheshire, England; on the left bank and near the mouth of the Mersey; opposite Liverpool, and 15 miles N. N. W. of Chester, with which it is connected by railway (see map of England, ref. 7–F). It is about 1½ miles S. W. of Liverpool, and is the residence of many merchants who do business in that city. Steamers cross the river between these places every few minutes, and a railway tunnel to connect them, 1,230 yards long, was opened in 1886. Birkenhead was only a small fishing-village as recently as 1824; it has since increased rapidly in consequence of the construction of extensive docks and important public works. It has wide streets, a fine public park, a college called St. Aidan's (designed for the education of young men for the Anglican ministry), and many handsome villas. One of the docks occupies 120 acres. Shipbuilding is extensively carried on, and here the Confederate cruiser Alabama was built. There are vast works here for turning out iron bridges and other heavy constructions for engineers. Pop. (1881) 83,324; (1891) 99,857; (1901) 110,906.

Bir'mingham: one of the great manufacturing cities of England; in the county of Warwick; on the river Rea; 79 miles by rail S. E. of Liverpool, and 130 miles by rail N. W. of London (see map of England, ref. 7–G). It is built on the eastern slope of three undulating hills, and has a gravelly foundation. Its suburbs extend into Staffordshire and Worcestershire. It returns seven members to Parliament. Birmingham is the chief town of Great Britain for the manufacture of hardware and metallic products made of gold, silver, brass, iron, steel, and mixed metal, including fire-

arms, swords, jewelry, buttons, tools, steel pens, locks, steam-engines, and all sorts of machinery. From a very early period Birmingham has been a seat of manufactures in metal, and from the close of the seventeenth century it became one of the principal centers of that industry, partly on account of its easy access to cheap coal and iron, and partly on account of its freedom, there being no guilds or companies, or restrictions of any kind. The chief variety is the brass-working trade, in which more than 10,000 people are engaged, and which annually consumes more than 50,000 tons of metal. Next comes jewelry, gold, silver, and gilt. Then follow small-arms of all kinds, some of the larger factories being able to turn out 2,000 stand per week. Further specialties are buttons, hooks and eyes, pins, and other articles of dress; screws and nails, of which trade Birmingham has a kind of monopoly; steel pens, of which there are produced about 20,000,000 a week; electro-plating, which was first established there in 1848; bell-founding, the making of steel toys, etc. Here are also extensive manufactures of glass and papier-maché. The city of Birmingham contains about 100 churches; Queen's College, connected with the London University; a free public library; the schools of Edward VI.; a botanic garden; a Roman Catholic cathedral; and a town-hall, which is a handsome edifice with a very fine organ. Among the charitable institutions are an asylum for the deaf and dumb and an asylum for the blind. Pop. (1881) 400,757; (1891) 478,113; (1901) 522,182.

Birmingham: city; capital of Jefferson co., Ala. (for location of county, see map of Alabama, ref. 3–C); one of the most important manufacturing cities of the "New South." It is situated at the foot of "Red Mountain," a formation holding, besides vast limestone deposits, an iron hematite ore vein of remarkable extent and easily accessible to miners, and almost touching the Great Warrior coal-field of 7,800 sq. miles, the Cahaba coal-field, 400 sq. miles, and the Coosa coal-field, also about 400 sq. miles. Iron and steel are manufactured here under the most favorable conditions. Six trunk railway lines (Louisville and Nashville; Queen and Crescent; Southern (two lines); Georgia Central; Kansas City, Memphis and Birmingham) cross each other in this city, giving it as good railway facilities as any interior Southern city.

Birmingham has 32 churches (20 for white and 12 for colored people); 14 public schools (10 for white, 4 for colored children), with school property valued at $500,000; an extensive water-work system, the reservoir on Shade's Mountain, 225 feet above the city, having a capacity of 28,500,000 gal. Birmingham has adopted the Waring system of sewerage, and has about 21 miles of storm-water and 37 miles of sanitary sewers. Suburbs are made accessible by 100 miles of street railroads, 85 miles of which are operated by electric power and 15 miles by steam. Coal, iron, cotton, and lumber industries are the foundation of Birmingham's prosperity. In 1900 there were 300 establishments, employing 5,100 hands and $25,450,000 capital, and producing goods valued at $10,740,000. Of this output, the iron and steel manufactures employed 3,100 hands and turned out goods valued at $6,764,342, to which the foundries and machine-shops added $1,482,314. Area of city proper, 3·19 sq. miles. Pop. (1871) 800; (1880) 3,086; (1890) 26,178; (1900) 38,415; including suburbs about 76,500.

EDITOR OF "NEWS."

Birmingham: manufacturing borough of New Haven co., Conn. (for location of county, see map of Connecticut, ref. 11–F); on railroad and the Housatonic river; at the mouth of the Naugatuck; 9 miles W. of New Haven. A bridge across the Naugatuck connects it with the village of Old Derby, on railroad. It has several rolling-mills, and manufactures of augers, chains, pins, and carriage-axles and springs, pianos and organs. Here is the first pin-factory established in the U. S. Pop. (1880) 3,026; (1890) 4,413. Part of Derby since Jan. 1, 1894. See DERBY.

Birmingham: a former borough of Alleghany co., Pa.; on the left (west) bank of the Monongahela river; 1 mile S. of Pittsburg, with which it is connected by a bridge 1,500 feet long. It derives its prosperity chiefly from manufactures of glass and iron. In 1872 it was united to Pittsburg.

Bir'ney, DAVID BELL: general; b. in Huntsville, Ala., May 29, 1825; son of James G., the Free-soiler; practiced law in Philadelphia. He became a brigadier-general of Union volunteers in 1861; served at Fredericksburg, Dec., 1862. He was raised to the rank of major-general, and commanded a division at Gettysburg in July, 1863, and Gen. Sickles's corps after that officer was wounded, and was at the head of the Tenth Army Corps in several battles in Virginia in 1864. D. in Philadelphia, from disease contracted in the service, Oct. 18, 1864.

Birney, JAMES GILLESPIE: an anti-slavery leader; b. in Danville, Ky., Feb. 4, 1792; graduated at Princeton in 1812, and became a lawyer in Danville, and then a planter in Huntsville, Ala. In the Kentucky and Alabama Legislatures he endeavored to obtain constitutional enactments restricting the slave-trade and providing for emancipation. He served the Colonization Society until the Texas policy of Andrew Jackson convinced him that the methods of that society were inadequate. Then he resolved to attempt to array Kentucky on the anti-slavery side. He had emancipated twenty-one inherited slaves, when he returned to Danville to publish a paper, which he was compelled to print in Cincinnati. Violence led him to remove to the latter city, where he continued his anti-slavery paper, called *The Philanthropist*. His office was several times attacked by a mob, which threw his press into the river, but he maintained his ground and secured toleration for free speech there. Having become secretary of the American Anti-Slavery Society, he removed to New York city about the year 1836. He was nominated in 1840 for the presidency of the U. S. by the Liberty party, which also supported him in the election of 1844. D. in Perth Amboy, N. J., Nov. 24, 1857.

Birney, WILLIAM: lawyer; b. near Huntsville, Ala., May 28, 1819; son of James G. While a student in Paris, he took an active part in the revolution of 1848; and afterward he was appointed, on public competition, professor of English Literature in the college in Bourges. He entered the U. S. volunteer service as a captain in April, 1861, and rose through all grades to the rank of brevet major-general. Lawyer in Washington since 1874. Attorney for District of Columbia. Has written a life of his father.

Biron, bĕĕ'rōñ', CHARLES DE GONTAUT, Duke de: French general; b. in 1561; a son of Armand (d. 1592). He served with distinction at Ivry 1590; became a favorite of Henry IV.; marshal of France in 1595; appointed governor of Burgundy. He was convicted of forming a treasonable plot with the Duke of Savoy, for which he was beheaded July 31, 1602. See De Thou, *Historia sui Temporis*; Martir-Rizo, *Historia de la Vida del Duque de Biron* (1629).

Birrell, AUGUSTINE: See the Appendix.

Birthmarks: See NÆVUS.

Birthworts (*Aristolochiaceæ*): a small family of 200 species of herbaceous (rarely shrubby), mostly climbing dicotyledonous flowering plants. They have inferior ovaries, and a single, often gamophyllous, perianth. Their affinities are difficult to make out, and it is at present impossible to assign them definitely to their proper position among dicotyledons. Many species of *Aristolochia* are cultivated for their odd flowers. Several species of *Aristolochia* and *Asarum* are natives of the U. S. CHARLES E. BESSEY.

Bis'cay, or **Biscaya**, bis-kī'a (Sp. *Vizca'ya*): one of the four Basque provinces of Spain; bounded N. by the Bay of Biscay; E. by Guipúzcoa, S. by Alava, and W. by Santander. Area, 849 sq. miles. It consists partly of mountains and partly of level plains. The chief products are wine, fruits, walnuts, chestnuts, figs, and grain. Pop. (1887) 235,659. Capital, Bilbao.

Biscay, Bay of (in Fr. *Golfe de Gascogne*; anc. *Gal'licus Oce'anus*, or *Aquitan'icus Si'nus*): a portion of the Atlantic Ocean bordering on France and Spain; extends from the French island of Ushant to Cape Ortegal. The depth, which is greatest near the coast of Spain, varies from 20 to 200 fathoms. The southern or Spanish coast is bold and rocky, but the east coast, from the Adour to the mouth of the Gironde, is low and sandy. The largest rivers that flow into this bay are the Loire and the Gironde. The principal ports on it are Nantes, Bordeaux, Bayonne, La Rochelle, the new port La Pallice, and Rochefort in France, and Bilbao and Santander in Spain. Violent currents and winds render the navigation of this bay difficult.

Bisceglia, bĕĕ-shāl'yăă (Lat. *Vigiliæ*): a fortified seaport-town of Italy; province of Terra di Bari; on the Adriatic; 25 miles W. N. W. of Bari (see map of Italy, ref. 6–G). It has a cathedral, a college, and several churches and convents. Excellent currants and olives are raised in

the vicinity. It is connected by rail with Foggia and all the points along the coast S. of Barletta to Brindisi. Pop. 25,127.

Bischof, Karl Gustav: German chemist and geologist; b. in Wörd, near Nuremberg, Jan. 18, 1792; educated at Erlangen; Professor of Chemistry in Bonn in 1819; d. there Nov. 30, 1870. In 1840 he published a prize-essay on the means of avoiding explosions in mines, experimented on inflammable gases, and improved safety-lamps. He wrote treatises on mineralogy, dynamic geology, and chemistry, his principal work being *Elements of Chemical and Physical Geology* (Bonn, 1847–54; 3d ed. in 1866, and supplement in 1871).

Bischoff, Theodor Ludwig Wilhelm: a German physiologist and anatomist; b. in Hanover, Oct. 28, 1807. He became Professor of Anatomy at Heidelberg in 1836, at Giessen in 1843, and obtained a chair at Munich in 1854. He gained distinction by his researches in embryology, on which he wrote several treatises. D. in Munich, Dec. 5, 1882.

Bischweiler, bish'vīler: a town of Alsace; on the river Moder; 14 miles by rail E. N. E. of Strassburg. It has manufactures of linens, coarse woolen cloths, gloves, and earthenware. It is the center of the hop-trade in Lower Alsace. Near it is a rich mine of iron. It was formerly fortified. Pop. (1890) 7,005.

Biscuit [French spelling of older *bisket* (seventeenth century), O. Fr. *bescoit*: Ital. *biscotto*, as if from Lat. **biscoc'tum* (sc. *panem*); *bis*, twice + *co'quere*, cook]: a hard kind of unfermented bread formed into small cakes or flat pieces, and sometimes called ship-bread or sea-biscuit. It is composed of wheat flour, water, and salt, and is rendered hard and dry by baking, in order that it may be preserved for a long time. Biscuits are exposed to the heat of an oven for about twelve minutes, and afterward dried in a warm room for two or three days. "Captain's biscuit" is prepared with butter, in addition to the ingredients mentioned above, and sometimes contains milk. Water or hard biscuits are made of flour, water, with variable quantities of butter, eggs, and sugar. Soft biscuits contain increased proportions of butter and sugar. Several varieties of fermented biscuits are manufactured. Meat biscuit consists of wheat flour, combined with the essential or soluble part of beef, so that the nutritive qualities of the meat may be preserved for a long time. To prepare this biscuit large pieces of beef, with water sufficient to cover them, are subjected to slow ebullition. The fat is skimmed off, the liquor is reduced by evaporation to the consistency of sirup, and is then mixed with wheat flour, rolled out to the thickness of ordinary ship-biscuit, and cut, baked, and dried in the same manner as common biscuits. One pound of meat biscuit contains about one-half pound of flour and the soluble part of 5 lb. of meat. It is used in the form of soup, which is made by boiling the biscuit in twenty times its weight of water for half an hour. See Pemmican.

Biscuit, in pottery, is applied to porcelain and earthenware after it has been hardened in the fire, and before it has received the glaze. In this state it is porous and permeable to water. Biscuit in sculpture is a species of porcelain, of which groups and figures in miniature are formed, which are twice passed through the furnace or oven.

Bishop [O. Eng. *biscop* = O.H.G. *biscof*, an early loan-word from vulg. Lat. form of Lat. *episcopus* = Gr. ἐπίσκοπος, overseer. Adopted in Rom. langs. as Ital. *vescovo*, O. Fr. *vesque*, Mod. Fr. *évêque*, etc.]: an ecclesiastic of the highest rank in the Christian Church—all patriarchs, archbishops, metropolitans, and the pope himself belonging to the order of bishops. In many Protestant denominations the order of bishop is held to be identical with that of presbyters or elders; and in such sects these names are used in preference to that of bishop. The Eastern, Roman, and Anglican Churches, with some minor sects, claim for their bishops, by direct succession, an authority derived from the twelve apostles. Lutherans, Presbyterians, and other denominations also claim a tactual succession for their orders, but do not draw the same dogmatic inferences from it. The principal churches recognizing the superior rank of bishops are the Greek, the Roman Catholic, the Armenian, Coptic, Abyssinian, Nestorian, and Jacobite, the churches of the Anglican communion, the Moravian, the Catholic Apostolic (Irvingite), the Old Catholics, and a part of the Lutheran churches. The Methodist Episcopal churches and some others give their bishops a superiority of office, but not of order. In the Roman Catholic and Anglican Churches bishops have the title of "right reverend," while archbishops and metropolitans are addressed as "most reverend." In Great Britain bishops of the Church of England are called lord bishops. In England and Wales the two archbishops and twenty-four diocesan bishops have seats and a vote in the House of Lords; but the Bishop of Sodor and Man, the bishops of Scotland, Ireland, and of newly created dioceses and suffragan bishops, do not have seats with the peers or court precedence, but are called lords by courtesy. See Vicar Apostolic.

The bishop is required by the ancient canons to be consecrated by three bishops. Consecrations by a single bishop, though valid, are deemed irregular. It pertains to the office of a bishop to administer, ordain, confirm, consecrate churches, etc., and to share in legislating for the church in conjunction with convocations, councils, and conventions, as the canons of the respective churches may direct. His vestments are properly cassock, alb, girdle, rochet, amice, tunic, dalmatic, chasuble, cope, mozzetta, chimere, gremial, and buskins. Anglican bishops use only a portion of these vestments. The bishop's distinctive *ornamenta* are the miter, ring, and pastoral staff. The black or purple chimere (red for convocation) and the white rochet, which with the square cap form the usual episcopal robes of Anglican prelates, were, it is probable, the walking-attire of the bishops during the reign of the Tudors. See Vestments, Ecclesiastical; also Apostolic, Archbishop, Investiture, Ordination, etc.

W. S. Perry.

Bishop, Anna: singer; b. in London in 1814; daughter of Mr. Rivière, an artist. In 1831 she married Sir Henry Rowley Bishop (see below), who was a widower, but eloped from him in 1839 with Robert Nicholas Charles Bochsa, an Italian harpist (b. in Montmedy, France, 1789; d in Australia, 1855). Her *début* was made in 1837. She won the highest distinction in Europe, the Americas, and Australasia, as a singer in classical music and modern opera. She married Martin Schultz, of New York, in 1858. In 1868 she lost her voice. D. in New York, Mar. 19, 1884.

Bishop, Sir Henry Rowley, Mus. D.: English composer; b. in London, Nov. 18, 1786. He produced numerous popular operas, which are commended for their long flowing melodies and animated style. Among them are *Guy Mannering*; *Maid Marian*; *Native Land*; and *The Virgin of the Sun*. His glees are very fine. He was knighted in 1842, and was appointed Professor of Music in the University of Oxford in 1848. D. in London, Apr. 30, 1855.

Bishop, William Henry: novelist; b. at Hartford, Conn., Jan. 7, 1847; graduated at Yale College in 1867; studied architecture in New York and Washington; edited a newspaper at Milwaukee. Resided in New York, 1877 to 1888; Professor of French and Spanish at Yale since 1893. Among his novels are *The House of a Merchant Prince* (1883); *The Golden Justice* (1886); and *Writing to Rosina*. A book of travel, *Old Mexico and her Lost Provinces*, was published in 1884.

Henry A. Beers.

Bishops Suffragan (as distinguished from suffragan bishops, every diocesan bishop being a "suffragan" of his metropolitan where "provinces" are established): bishops consecrated in England under the Act 26, Hen. VIII., enacted to supply the place of the earlier bishops *in partibus* who formerly assisted the incumbents of English sees. Under this act twenty-six places are named as "the sees of bishops suffragan." To these the Act 50 and 52 Vict. permits additions to be made under orders in council. The diocesan presents two spiritual persons to the crown. The crown selects one of the two to be bishop of a suffragan see, and presents him by letters patent under the great seal to the archbishop of the province for consecration. Until the present generation eighteen consecrations appear to have taken place under the act of Henry VIII. The present Bishop of Dover, consecrated in 1890, is the fifth of that title, his predecessor of the Reformation period being Richard Rogers, Dean of Canterbury, and suffragan to Archbishop Parker. A suffragan holds his commission at the will of the diocesan, at whose death it lapses. But the lapse or voluntary resignation of such commission does not affect the "style, title, or dignity" of the suffragan see. James Kemp, D. D., was consecrated suffragan to Bishop Claggett, of Maryland, with jurisdiction of "the Eastern Shore," Sept. 11, 1814. On Bishop Claggett's death he succeeded him as Bishop of Maryland. Suffragans are not allowed in the Protestant Episcopal Churches in the U. S. Dr. Brett's

treatise on *Suffragan Bishops and Rural Deans* (1711) has been republished with notes by James Fendall (1858).

WILLIAM STEVENS PERRY.

Bismarck: city; capital of N. Dakota and Burleigh co. (for location of county, see map of North Dakota, ref. 3–D); very advantageously situated on Northern Pac. R. R. and on east bank of Missouri river. The Missouri is navigable for boats of 250 to 700 tons for 1,200 miles above Bismarck, which contains an immense river-warehouse; 15,000,000 to

State Capitol, Bismarck, North Dakota.

25,000,000 lb. of freight shipped viâ river annually. Bismarck contains the Capitol, which cost over $500,000; the penitentiary, fine court-house, high-school building, water-works, electric light, a large flouring-mill, extensive brewery, etc. The bridge across the Missouri river cost $1,500,000. Pop. (1880) 1,758; (1890) 2,186; (1900) 3,319. EDITOR OF "TRIBUNE."

Bismarck Archipelago: a group of islands off the north coast of the eastern end of New Guinea, including islands formerly called New Britain, New Ireland, New Hanover, and Duke of York group. It was appropriated by Germany in 1884 and 1885 and assigned to the New Guinea Company. Area, 18,200 sq. miles. Pop. estimated at 188,000, of whom only 61 were Europeans, in 1891. New Britain was in 1885 rebaptized as New Pomerania; New Ireland as New Mecklenburg, and the Duke of York group as New Lauenburg.

Bismarck-Schönhausen, bis'maark-shön-how'zen, HERBERT, Prince von: German diplomat; son of Prince Otto Bismarck; b. at Berlin, Dec. 28, 1849. Prince Bismarck is a major in the German army; has served as secretary to the embassy in London and as minister at The Hague. He sits in the Reichstag for Schleswig-Holstein, and was (1886–90) at the head of the German Foreign Office, but retired upon the resignation of his father. His marriage, June 21, 1892, to Countess Margaret Hoyos, in Vienna, was the occasion of a great popular demonstration in favor of his father, who attended the wedding.

Bismarck-Schönhausen. OTTO EDUARD LEOPOLD, Prince von: Prussian statesman and the unifier of Germany; b. on the knight's estate of Schönhausen, near Stendal, in Prussian Saxony, Apr. 1, 1815. His father's family belonged to the lower order of Prussian nobility, and several of his paternal ancestors distinguished themselves in war and diplomacy. His mother was the daughter of Ludwig Menken, a liberal-minded privy counselor of Frederick the Great. A year after Bismarck's birth his father moved to one of his estates near Stettin in Pomerania, and it was there that the future statesman received his first impressions of life. At the early age of six he was sent to the boarding-school of Herr Plamann at Berlin, where, as he afterward said, he had "elastic meat with parsnips as the invariable dish," and where in matters of discipline "a spurious Spartanism was the rule." At twelve he went to a gymnasium, where he fell under the influence of Dr. Prevost and Dr. Bonneil, both of whom seem to have had much influence on his methods of thought and life. History was his favorite study, though he acquired at this time such thorough knowledge of the elements of English and French that he ever afterward used these languages with ease, and surprised both Napoleon III. and Beaconsfield with his mastery over them. During this period, and especially in his vacations, he devoted himself to all kinds of manly sports, and thus developed those remarkable physical powers for which he was afterward so famous. In 1832, at the age of seventeen, he was entered as a student of law at the University of Göttingen. That he did not devote himself very assiduously to study may be inferred from the fact that in the course of three semesters he fought twenty-eight duels, in all of which he drew blood from his opponent, while in one only did he receive a scar, the one observable on his left cheek. In 1833 he went to the University of Berlin, where a little later he passed the requisite examinations for professional life. But instead of entering upon the practice of law he returned to Pomerania, and devoted himself to the care of his estates and the life of an energetic country squire. It was not until 1847 that he was elected to the Prussian House of Burgesses. He remained a member until 1851, when he was chosen a representative of the Germanic Diet. It was here that his remarkable public career began, for immediately after he appeared in the Diet he outlined the characteristics of all the most important of his political doctrines.

At the beginning of the nineteenth century there was about as little representative government in Germany as in Asia. The Napoleonic campaign which shattered Prussia at Jena, however, led to many reforms under the inspiring leadership of Von Stein. Frederick William III. not only issued an edict of emancipation, but a little later he also promulgated at the Congress of Vienna an ordinance promising his people a written Constitution and a representative Assembly. It was largely from the inspiration of these edicts that Germany aroused herself to throw off the Napoleonic yoke. But a reaction soon came on under the baleful influence of Metternich. In all the German states the prospect of constitutional government grew less and less as the years went on. In Prussia the reign of Frederick William IV. seemed to give no hope whatever. It was owing to the general feeling resulting from the faithless promises of royalty that the Revolution of 1848 took so strong a hold in Germany. Though Bismarck entered the Prussian Parliament in 1847, it was not till he entered the Germanic Diet in 1851 that he exerted strong influence. From the first, however, he not only opposed all revolutionary measures, but demanded that in the Diet Prussia should have the same rights as Austria. He remained at Frankfort till 1859, when he was sent as minister to St. Petersburg. His diplomatic experience, begun in Russia, was continued in France, whither he was sent in 1862 in order that he might obtain an insight into the politics of the Tuileries. In the autumn of the same year he was recalled to take the portfolio of foreign affairs, and became president of the cabinet. A period of turbulent parliamentary disagreements ensued. The Government was unable to induce parliament to make the needed appropriations for a reorganization of the army, whereupon parliament was repeatedly dissolved, after being told that the king would be obliged to act without its sanction. In this way the reorganization of the army went on in spite of parliament. The death of the King of Denmark soon afforded the opportunity for showing Prussian strength. The Schleswig-Holstein duchies were claimed for the Duke of Augustenburg by Prussia, with a view to detach them from Denmark and incorporate them with Germany, and Bismarck was adroit enough to enlist in behalf of the claim the general sympathy of the empire. Austria and Prussia soon came to dissension over the occupation of these duchies, with the result that the conflict was brought to a crisis at the battle of Königgrätz in 1866, where Austria was so disastrously defeated that Prussia was able to place herself at the head of the North German Confederation, from which Austria was excluded. The war had carried Prussia to the very front of military nations, and Bismarck was universally recognized as the leading spirit in the movement. The result of the war was disastrous, however, to the friendly relations of France and Prussia. The French people saw the aggrandizement of their old foe with great alarm, and seized upon the first pretext for declaring war. The events of 1870–71 afforded Bismarck the opportunity he desired. The military prestige of France was humbled, if not broken; but, what to him was doubtless of far more consequence, the result intensified the national feeling among the Germans to such an extent that the new German empire was established, with the King of Prussia at its head. Bismarck himself was given the rank of prince, and made chancellor of the empire. At his dictation France was obliged, at the Treaty of Frankfort, May 10, 1871, to cede to Germany the greater

part of Alsace-Lorraine, and pay an indemnity of $1,000,000,000.

At the close of the war Bismarck entered upon what was in many respects the most remarkable part of his career. Having accomplished the consolidation of the German states into a federal union, he saw that the welfare of the country demanded that development of German resources which could only come from a long term of peace. He held that the sentiment of France was such that there could be no security against another outbreak of war except the general belief that an attack by France could have no chance of success. In order to secure this end he sought, on the one hand, by all the means at the command of diplomacy to isolate France, and on the other to form strong alliances between Germany and other European powers. In both of these efforts he was signally successful. While he made it impossible for France to form any advantageous union, he succeeded in uniting Germany with Austria and Italy in the firm bond of a triple alliance. He also strengthened the German army so far as to make it obvious that even a hostile alliance between France and Russia would not be able to cope with the combined forces of Germany, Austria, and Italy. Meanwhile, for the purpose of developing home industries, he secured the adoption of a law establishing a high protective tariff on foreign goods. In this and in many other ways he fostered the German spirit of solidarity and independence. This was done, however, at the expense of much opposition. He desired to make every party and power in the state subordinate to the general interest, and therefore incurred the violent opposition of the Liberal party on the one hand and of the Ultramontanes on the other. But his parliamentary skill was equal to the task of playing one party against another, and thus defeating all his enemies. When it became apparent that the reign of William I. was near its end, the hopes of the Liberals were very much encouraged by the political attitude and sympathies of the Crown Prince Frederick. But the prince, when he ascended to the throne, was too ill to urge his policy with success, and his death, which soon occurred, left the power of Bismarck apparently unshaken. The turmoils of Frederick's short reign, however, made a deep impression on the vigorous mind of the crown prince unfavorable to the chancellor, and when William II. succeeded his father it became apparent that the emperor and the chancellor were not in harmony, so the latter resigned Mar. 18, 1890. On his retirement he received many honors at the hands of the emperor. D. July 30, 1898. See *Prince Bismarck*, by Charles Lowe (2 vols., London, 1885); *Our Chancellor*, by Moritz Busch (2 vols., New York, 1884); *Bismarck and the Franco-Prussian War*, by Moritz Busch (New York, 1878); *The Two Chancellors* (Gortschakoff and Bismarck), by Julian Klaczko (London, 1876). C. K. Adams.

Bismuth [loan-word from Germ., which has also the form *Wismuth*]: a brittle metal (symbol Bi; specific gravity about 9·8; atomic weight 208) of a crystalline texture and of a grayish-white color, with a red tinge; occurs native in Australia, Germany, France, Cornwall, California, Texas, and Sweden. It is also found in combination with oxygen, sulphur, and arsenic. It fuses at about 500° F. When strongly heated it burns with a bluish-white flame, and is rapidly oxidized. This metal is not often used in the arts in a pure state, but its alloys are of considerable importance. Some of them are extremely fusible. A compound of 8 parts of bismuth, 5 of lead, and 3 of tin melts in boiling water, and is called *fusible metal*. Other alloys are even more fusible. Bismuth is an ingredient of some kinds of stereotype metal. The most important of several compounds it forms with oxygen is the trioxide (Bi_2O_3), which is employed in the manufacture of porcelain as an agent for fixing the gilding and for increasing the fusibility of fluxes. The sub-nitrate is a tasteless, heavy powder of pure white color, called pearl white, pearl powder, blanc de fard, etc. This is used as a cosmetic. As a medicine it acts as a tonic and antispasmodic. Revised by Ira Remsen.

Bismuthine: a trisulphide of bismuth, composed of 81·6 per cent. of bismuth and 18·4 of sulphur. It occurs in lodes and beds in the older rocks with ores of arsenic, copper, iron, and lead, either crystallized in acicular prisms or massive with a foliated structure. It is a rare mineral.

Bison: a genus of animals of the order *Ungulata* and family *Bovidæ*; nearly allied to the ox; natives of Europe and North America. The bisons have short horns, which are curved inward at the point. They are distinguished from the ox by an additional pair of ribs (having fourteen pairs), and by long woolly or shaggy hair, which covers the neck and shoulders of the males. They differ from the true buffaloes in having a hump upon the back, and in the absence of the dewlap. The buffaloes have cavities in their horns communicating with the nasal passages—bisons have not; the horns turn outward in the true buffaloes and inward in the bisons. (See Buffalo.) At least six species of fossil bison have been discovered. (For the European bison, see Aurochs.) The American bison (*Bison americanus*) is known in the U. S. by the incorrect name of buffalo. This is the only species of the ox family indigenous to America, except the musk ox. It is similar to the European bison, but the fore parts are more shaggy, and it is a powerful and ferocious-looking animal. The color of its hair is mostly brown. Vast herds of bisons formerly roamed over the plains and prairies between the Mississippi river and the Rocky Mountains, feeding on grass and brushwood. They were generally inoffensive and would not attack men, but preferred to run rather than to fight. During their migration they moved in herds, which were innumerable and irresistible. Great numbers of them were killed by Indians, who pursued them on horseback and subsisted on their flesh. Their hides were also valuable, and under the name of buffalo robes were an important article of commerce. The flesh of the cows was highly esteemed and similar to beef, being very juicy and savory. The bisons are swift in running, and have so keen a sense of smell that the hunter found difficulty in approaching them. The Indians sometimes circumvented them by setting fire to the prairie grass on several sides, and thus drove them in confusion toward a central position. They also drove them over precipices in large herds, the momentum of which was such that the leaders could not stop or retreat, being forced forward by the mass behind them. The chase of bisons was attended with some danger, as they sometimes turned upon an assailant, who was liable to be trampled under the feet of the herd. Numerous tribes of aborigines were mainly dependent on bisons for their food and clothing. The skins, which are covered with soft hair or fur, were much used for blankets, and their flesh and fat were converted into pemmican, the favorite food of the fur-hunters and *voyageurs* of North America. Bisons are nearly extinct, and only a few small herds now exist in North America. The largest of these, in Yellowstone Park, is reduced to fifty. Experiments in crossing the bison with domesticated cattle have led to no practical results.

Bison.

Revised by David S. Jordan.

Bissagos, bis-saa'gōs, **Islands**: a group of small volcanic islands in the Atlantic; near the west coast of Africa, between lat. 10° and 12° N., and between lon. 15° and 17° W. (see map of Africa, ref. 4–A). They have several good ports. Some of them are densely peopled with a savage Negro race, who cultivate maize, bananas, etc., and raise cattle. Bissao, an island of the above group, is a settlement of Portuguese who formerly traded in slaves, and who export hides, wax, and rice. It has about 8,000 inhabitants.

Bissell, Edwin Cone, D. D.: Congregationalist; b. at Schoharie, N. Y., Mar. 2, 1832; graduated at Amherst College 1855, and at Union Theological Seminary 1859; pastor successively at Westhampton, Mass. (1859–64), San Francisco, Cal. (1864–69), Winchester, Mass. (1870–73); missionary in Austria, sent by the A. B. C. F. M. (1873–78); professor in Hartford (Congregational) Theological Seminary from 1881 until 1892, when he became professor in the McCormick (Presbyterian) Theological Seminary, Chicago, Ill. He commanded company K, Fifty-second Massachusetts, in the civil war, 1862–63. He was the author of *The Historic Origin of the Bible* (New York, 1873), a critical work; revised translation and commentary, in the Lange Series, on *The Apocrypha of the Old Testament* (1880); *The Pentateuch, its Origin and Structure* (1885); *Biblical Antiquities* (Philadelphia, 1888; 2d ed. 1892); *A Practical Introductory Hebrew Grammar* (1891); *Genesis printed in colors, showing the original sources from which it is supposed to have been compiled, with an introduction* (Hartford, 1892). D. in Chicago, Ill., Apr. 9, 1894. George P. Fisher.

Bissell, William Henry Augustus, D. D.: second Bishop of Vermont; b. at Randolph, Vt., Nov. 10, 1814; graduated at the university of his native state in 1836. He was ordained deacon 1839, priest 1840, and held charges at West Troy, Lyons, and for nearly twenty years at Geneva, N. Y. He was consecrated bishop of the diocese of Vermont June 3, 1868. D. at Burlington, Vt., May 14, 1893.

Bissell, Wilson Shannon: lawyer; b. in New London, Oneida co., N. Y., in 1847; at five years of age accompanied his parents to Buffalo, N. Y., where he has since resided. Graduating at Yale in 1869, he took up the study of law in the office of Laning, Cleveland & Folsom, in Buffalo; was admitted to the bar in 1871, and in the following year entered into partnership with Lyman K. Bass. Mr. Grover Cleveland joined the firm in 1874, and remained senior partner until his election as Governor of New York State in 1882, Mr. Bass retiring in 1876. After Mr. Cleveland's withdrawal Mr. Bissell headed the firm. He was chiefly interested in railroad litigation, and became president of some of the smaller branches of the Lehigh Valley system. In 1893 he was appointed Postmaster-General in Mr. Cleveland's second administration, but resigned in Feb., 1895, and resumed his law practice.

Bis'sen, Herman Vilhelm: a Danish sculptor; b. in Schleswig, Oct. 13, 1798. He went to Copenhagen in 1816, where he made such wonderful progress in his studies that he took the great gold medal in 1823, and was sent to Thorwaldsen in Rome. His works are numerous, and he ranks second only to Thorwaldsen in Denmark, and, inasmuch as he devoted all his time and talents to his native country, his influence upon Danish art has been even greater than that of Thorwaldsen. In 1850 he became director of the Academy in Copenhagen, and there died Mar. 10, 1868.

R. B. Anderson.

Bissextile [from Lat. *bis(s)ex'tilis*, deriv. of *bis(s)extus*; *bis*, twice + *sextus*, sixth]: the year which contains 366 days; usually called in English Leap-year (*q. v.*). In the Julian calendar the length of the year was fixed at 365¼ days, about 11 minutes more than the actual length. In order that the year should always begin with the beginning of a day, it was directed that every fourth year should contain 366 days, and the other years 365. The additional day was given to February, and was inserted next after the 24th, which the Romans called *Sexto Kalendas Martii*. This was reckoned twice, and the repeated day was *Bis Sexto Kalendas*; hence the name *bissextile*. See Calendar.

Bistineau, bis-te-nō': a lake in the northwest part of Louisiana; forms the boundary between Bienville and Bossier parishes. It is about 25 miles long, and has a mean width of nearly 2 miles. Its water is discharged through a short outlet into Red river. It is navigable by steamboats.

Bistort (*Polygonum bistorta*): a perennial herbaceous plant of the family *Polygonaceæ*; a native of Europe and Asia. It bears flowers in a dense terminal spike. The whole plant is astringent, containing much tannin. The tortuous root is one of the most powerful vegetable astringents, and is used both internally and externally.

Bister, or **Bistre**: a pigment of a warm brown color, or reddish brown; used by painters in water-colors. It is prepared from the soot of wood, especially the beech.

Bistritz, bis'trĕts: a town of Transylvania; situated in a beautiful valley on the Bistritz river; 52 miles N. E. of Klausenburg (see map of Austria-Hungary, ref. 6–L). It has two monasteries, a gymnasium, and several large cattle-fairs every year. Near it are the ruins of an ancient castle, the former residence of the family of Hunïades. It was of great commercial importance in the fifteenth and sixteenth centuries. Pop. 9,150.

Bit, or **Bitts**: two short but strong vertical timbers fixed upon the deck of a ship. They are used for fastening the cable when the ship rides at anchor, and for "leading" the principal ropes of the rigging. To "bit the cable" is to fasten it round the bit. "Topsail-sheet-bits" are for belaying or fastening the topsail-sheets. To resist strains, the bits are strongly bolted to the beams that support the deck.

Bithur, bē-thoor': a town of India; in the Northwestern Provinces; on the right bank of the Ganges, about 12 miles N. W. of Cawnpore (see map of N. India, ref. 6–F). It has numerous pagodas, and is visited by multitudes of pilgrims. During the mutiny of 1857 it was a stronghold of Nana Sahib, and was taken by Gen. Havelock in Aug., 1857. Pop. about 8,000.

Bithyn'ia: an ancient country of Asia Minor; bounded N. by the Pontus Euxinus (Black Sea), E. by Paphlagonia, S. by Galatia and Phrygia, and W. by the Propontis (Sea of Mármora), which separated it from Europe. The chief towns were Nicomedia, Chalcedon, Nicæa, Prusa, and Heraclea. Bithynia was annexed to the Persian empire in 543 B. C., but afterward became an independent kingdom. Nicomedes I. began to reign over it in 278 B. C., and d. in 246. Prusias II. was King of Bithynia in the time of Hannibal, who sought refuge at his court. In 74 B. C. Bithynia became a province of the Roman empire. Nicomedia was for a long time the capital of the kingdom. In 1298 the Turks conquered the country, and in 1328 made Prusa the capital of their whole empire.

Bitlis', or **Betlis'**: a town of Turkish Armenia; on the Bitlis river; a sub-tributary of the Tigris; on the northern slope of the Armenian Taurus, a few miles southwest of Lake Van. It is on very rough ground, and the houses are scattered and surrounded by gardens and orchards. In the center is a very steep eminence, on which stands an ancient fortress, now in ruins. The dancing dervishes have twelve monasteries in the place. Gold and silver ware, cotton cloth, carpets, and tobacco are manufactured here. The town is said to have been founded by Alexander the Great; it came into the possession of Turkey in 1514, and for about three centuries has been held as a fief of a powerful Kurdish family. Pop. about 25,000, one-fourth Armenian.

M. W. H.

Bitonto, bē-tōn'tō (anc. *Butuntum*, or *Bituntum*): a town of Italy; in the province of Bari, 11 miles W. of Bari (see map of Italy, ref. 6–G). It is well built, and has a fine cathedral and several monasteries. Good wine is made in the vicinity. The Spaniards gained a decisive victory over the Austrians here May 25, 1734. Pop. 27,000.

Bitsch, beech (in Fr. *Bitche*; Lat. *Bicina*): a small fortified town of Lorraine; in a pass of the Vosges, about 36 miles N. N. W. of Strassburg, and 64 miles E. of Metz (see map of German Empire, ref. 6–C). Here is a citadel that is nearly impregnable, on a steep isolated rock. The town was originally a countship held by the Counts of Alsace and Flanders, but was given to the Duke of Lorraine by Frederick III., and finally passed to France with the duchy of Lorraine in 1738. It was in the French department of Moselle until 1870, when possession was taken of it by the Germans at the general cession of the country; for, in spite of a long siege and bombardment, it was not surrendered. Pop. (1890) 2,764, one-quarter military.

Bittenfeld, Herwarth von: See Herwarth von Bittenfeld.

Bitterfeld, bit'ter-felt: a town of Prussia; province of Saxony; on the Mulde river; 20 miles by rail N. of Leipzig. It is on the railway from Berlin to Leipzig, with branches to Halle and other places. It has important manufactures of cloth, iron, machines, etc. Pop. (1890) 9,047.

Bitter-king (*Soulaurea amara*): a shrub or small tree of the family *Polygalaceæ*; derives its name from its intense bitterness. It is a native of the East Indian islands, has large oval leaves and axillary racemes of regular flowers. It is used as a remedy for fevers and other diseases.

Bittern [from same source as *bitter*, adj.]: the mother-liquid remaining after the removal of common salt from brines which have been partially evaporated. The bitter taste is due to the magnesium salts present. Sea-water and many salt-wells yield a bittern which is valuable in the production of Epsom salts (sulphate of magnesia), and especially of bromine.

Bittern [from O. Fr. *butor*; of uncertain origin]: a wading-bird allied to the heron; belonging to the genus *Botaurus* and family *Ardeidæ*. It has a long, straight, and sharp bill, long legs, and a long neck; frequents marshy fens and reedy shores of rivers and lakes, where it lies hid during the day, and feeds by night on frogs, fish, etc. The common bittern of England is widely diffused in Europe, Asia, and Africa. It utters a peculiar hollow and booming sound, which is noticed in Goldsmith's line, "The hollow-sounding bittern guards its nest." When assailed it

Bittern.

defends itself bravely with its sharp bill, which is about 4 inches long. In the U. S. are found two bitterns similar in habits to *Botaurus stellaris*—viz., *Botaurus lentiginosus* (bittern or bog bull) and *Ardetta exilis* (least bittern).

Revised by D. S. JORDAN.

Bitter Root River: in the State of Montana; rises in the Rocky Mountains; flows northward, and enters Clark's river in Missoula County. Length, estimated at 110 miles. Gold is found near it.

Bitter-rot: See ROT.

Bitters: certain medicines, simple or compound; chiefly of vegetable origin, characterized by a bitter taste, and for the most part having tonic virtues. There are two classes: *aromatic bitters*, having a fragrant odor, due to volatile oils, and *simple bitters*, which possess no peculiar properties beyond their bitterness. "Bitters," as popularly used, are generally compounds of dilute alcohol with various drugs, as aloes if a cathartic effect be desired; if a tonic effect is sought, the bitters used are calisaya bark, gentian, quassia, columbo, and others. An aromatic is often added.

Bitter Spar: a variety of DOLOMITE (*q. v.*) of easy cleavage. It usually occurs in obtuse rhombohedrons, and consists of about 55 per cent. of carbonate of lime and 45 of carbonate of magnesia. Fine transparent crystals of it are found at Gap in France and Traversella in Piedmont.

Bitter-sweet, or **Woody Nightshade** (*Solanum dulcamara*): a perennial plant with a shrubby stem, nearly allied to the potato; is a native of Europe and Asia, and is naturalized in the U. S. It has ovate, heart-shaped leaves, the upper ones halberd-shaped or with two ear-like lobes at the base, and purple flowers. The fruit is a poisonous red berry. The stems or twigs gathered in autumn are sometimes used in medicine in chorea and some cutaneous disorders.

The name bitter-sweet is frequently given in this country to a climbing woody vine, the *Celastrus scandens* of the family *Celastraceæ*, which grows wild in the Northern and Atlantic States. This vine is also called wax-work and staff tree. It has been used in medicine, and is popularly believed to have great virtues as an alterative.

Bitter-sweet Family: See SPINDLE-TREE FAMILY.

Bitterwood: a name given to several trees and shrubs of the genus *Xylopia* and the family *Anonaceæ*; natives of Brazil and the West Indies. They are remarkable for the bitterness of their wood. The fruit of *Xylopia sericea* is aromatic and pungent like pepper. The term is also applied to the *Picræna excelsa* and *Quassia excelsa*, the wood of which is used in medicine as a tonic. See QUASSIA.

Bit'tle, DAVID FREDERICK, D. D.: founder of Roanoke College; b. in Frederick co., Md., Nov. 19, 1811: graduated at Pennsylvania College 1835; studied theology at the seminary of the Lutheran Church at Gettysburg, Pa.; pastor in the valley of Virginia, and afterward in Middletown, Md.; president of Roanoke College, Salem, Va., from 1853 until his death, Sept. 25, 1876.

Bitu'men (Lat. *bitu'men*): generically, a term applied to a variety of substances, from natural gas through naphtha, petroleum, and mineral tar, to solid asphaltum, containing for the most part carbon and hydrogen, with more rarely oxygen, nitrogen, and sulphur. No general chemical formula can be assigned to it.

Bitumen has been known to man in all its varied forms from the dawn of history. The Hebrew word translated "slime" in Gen. xi. 3 is rendered ἄσφαλτος in the Septuagint and bitumen in the Vulgate.

Geographical Distribution.—Nearly all forms of bitumen are very widely distributed over the surface of the earth. On the Western continent a basin in the central and northern portion of the Mississippi valley, said to embrace 200,000 sq. miles, yields natural gas and petroleum in enormous quantities. In the central valleys of the eastern slope of the Rocky Mountains, from the mouth of Mackenzie river to Mexico, outcrops of maltha and asphalt occur at intervals. They occur in the valley of the Mackenzie for a distance of 1,500 miles. Along the Athabasca river a mass of asphaltic sand outcrops in bluffs 150 feet high for 60 miles. In Western Louisiana and Northeastern and other parts of Texas maltha and asphalt are frequently met. In Southern Central Texas an extensive deposit of calcareous asphalt has lately been reported similar to that of Val de Travers. In Eastern Mexico asphalt and maltha are of frequent occurrence. In Utah extensive deposits of ozokerite and gilsonite occur. On the Pacific coast of California, from San Luis Obispo to San Diego, but chiefly in the valley of the Santa Clara river, springs of asphaltum, maltha, and petroleum are very numerous.

In the islands of Cuba, Barbadoes, and Trinidad asphaltum and petroleum in commercial quantities have long been known as Cuban asphalt, Barbadoes tar, and Trinidad asphalt, from the celebrated pitch lake. On the mainland in Venezuela another and larger "pitch lake" is known, and in Peru and Bolivia petroleum occurs in large quantities.

On the Eastern continent a line of bituminous outcrops occur from Hanover on the North Sea through the Carpathians, the peninsula of Taman, the Caucasus, the peninsula of Apsheron at Baku, the table-lands of Armenia and Persia, the environs of the Dead Sea, the valleys of the Tigris and Euphrates, the mountains of Baluchistan and Hindustan, Burma, and the islands of Java and Sumatra. Petroleum occurs in China and Japan, Egypt, Italy, the Ionian islands, Sicily, and the Pyrenees. Asphalt and maltha occur in Dalmatia, on the eastern shores of the Adriatic, and in many localities in France. In the Val de Travers, in Switzerland, and in the Tyrol and Sicily a peculiar limestone occurs impregnated with asphalt, which is widely used for pavement under the name of asphalte. The magnificent avenues of the city of Washington are covered with this material and asphaltum from the island of Trinidad. In England petroleum springs have been observed yielding small quantities of oil, but not in commercial quantity.

Geological Occurrence.—There are two well-marked geological eras noted for the occurrence of bitumen, although it may be said to occur from the Silurian up to the Tertiary. On the North American continent, east of the Mississippi river, the Devonian in Pennsylvania, the sub-carboniferous in Eastern Ohio and West Virginia, the upper Silurian in Tennessee and Kentucky, and the Trenton limestone in Western Ohio, Indiana, Michigan, and Canada, form an ellipse around the Cincinnati anticlinal, from which these newer formations slope upon all sides. In this ellipse occur the great petroleum and natural-gas regions of Canada and the U. S. At Great Manitoulin island, in the northern part of Lake Huron, and in the peninsula of Ontario, lying between Lakes Huron and Erie, petroleum has been observed. In Western New York, from Lake Erie as far east as Canandaigua Lake, natural gas is abundant, especially at Fredonia, where it has been used to light the town since La Fayette's visit in 1824. Near the boundary line between New York and Pennsylvania the oil regions of Pennsylvania commence, and extend through the western counties of that State, reaching into the eastern counties of Ohio, and extending southwestward into West Virginia and Kentucky. At one place in Wood co., West Va., a sort of asphalt called grahamite, that has been described as hardened petroleum, was mined until the deposit was exhausted. A similar mineral called gilsonite has lately been found in Utah. The formations throughout this region, inclosing the oil and gas, range from the Devonian in the northern portion to the sub-carboniferous in the southern portion, everywhere lying beneath the coal or coal-measures, if they are present. Through all the eastern counties of Kentucky into Tennessee petroleum and gas are frequent, as also along a line extending through Central and Western Kentucky into Indiana. Although both oil and gas occur at many points throughout these last-named regions, the developments are as yet unimportant, the oil and gas issuing for the most part from the upper Silurian. Asphalt also occurs in Tennessee in small quantity. In Northwestern Ohio and Northeastern Indiana, around Lima, a very prolific oil and gas field has been developed within the last ten years from the Trenton limestone. Limestone impregnated with petroleum occurs near Chicago, Ill., and throughout the southern peninsula of Michigan oil in small quantities is of frequent occurrence. Natural gas everywhere accompanies the petroleum, and many localities, both within and along the borders of this area, yield gas without oil, usually under an enormous pressure, at which no doubt the gas exists in a liquid state in the containing rocks. So far as is known, the deposits of the central valleys are cretaceous, the asphalt deposit of Texas lying in the Permian. The deposits of California, the West India islands, and South America are, so far as is known, in the Tertiary.

On the Pacific coast of California all forms of bitumen, from petroleum to half-decayed asphalt, occur, issuing from Miocene rocks, and gradually passing from the liquid to solid forms under the influence of the sun and rain. On the coast near Santa Barbara veins of asphalt mixed with very

fine sand occur in the Quaternary, apparently injected from below into crevices formed by some upheaval.

In Cuba asphalt is mined from veins in rocks supposed to be cretaceous. The great pitch lakes of Trinidad and Venezuela lie in the Tertiary, and the petroleum of South America issues from rocks of that age.

The small amount of petroleum observed in England has sprung from the coal-measures. In France the extensive deposits of asphalt occur in relation to what has been called by the French geologists an *époque asphaltique*, which has been assigned to the cretaceous. The vast region embracing the Carpathians, the Caucasus, and the table-lands of Persia yields every known form of bitumen from Tertiary formations. The petroleum of Italy and asphalt of Dalmatia and Albania also proceed from the Tertiary. But little is known of the geology of the occurrence of bitumen in other and less important localities.

Chemistry.—Bitumens consist of various mixtures of hydrocarbons, usually of very complex nature. A few are simple substances, having a definite chemical composition, and for the most part contain oxygen. Natural gas consists largely of marsh gas. With this are mixed in various proportion free hydrogen, and the members of the series next below marsh gas with traces of carbonic acid and carbonic oxide. The petroleums of the New York, Pennsylvania, Ohio, and West Virginia regions consist of the marsh gas or paraffine series, ranging from marsh gas in the dissolved gas to the solid paraffines. The lightest of these oils are yellow or red in color (amber oils), through brown and dark green to black. The more dense and dark oils hold in solution in small quantity solid substances, containing but little hydrogen, of high boiling-point and coloring power, only a few drops of which added to a colorless oil suffice to give the oil a high fluorescence. The Burmese oils contain in addition notable portions of the benzole series. The Russian oils contain the additive compounds of the benzole series. All of these varieties contain also more or less of the olefine series. The initial members of these several series are as follows:

Marsh gas.....	$CH_4 - C_nH_{2n+2}$.
Olefiant gas.....	$C_2H_2 - C_nH_n$.
Benzole.....	$C_6H_6 - C_nH_{2n-6}$.
Hexa benzole.....	$C_6H_{12} - C_nH_{2n-6} + H_6$.

Many varieties of petroleum have been studied very little, if at all. It is observed, however, that some are very permanent in the air, undergoing no change when exposed in masses or flowing upon the ground or water, while others soon become dark-colored and viscid, passing into maltha, and finally into asphaltum. The petroleums from Tertiary formations are mainly of this character. Those from the cretaceous are of uncertain composition, and, while very widely distributed, are of minor importance. The Tertiary petroleums that form asphaltum rarely contain paraffine, except in the Carpathians, where immense quantities of native paraffine, called ozokerite, occur in masses in the rocks. In Utah ozokerites occur, not associated with other forms of bitumen. Asphaltum usually occurs in beds, where petroleum or maltha has flowed over the surface, and gradually gives up hydrogen to the oxygen of the air until the asphaltum, with a large excess of carbon, becomes solid and firm, in many instances resembling splint coal. Other forms of asphalt occur in veins, where they have apparently been intruded in a pasty or semi-fluid form at a high temperature and have become solid upon cooling. The material contained in these veins is identical only in a general manner. The albertite of New Brunswick, the grahamite of West Virginia, and gilsonite of Utah yield on distillation the paraffine series; but veins occurring in the region of Tertiary bitumens yield products, and partake of the characteristics of those substances. As a rule, asphalts of all kinds are soluble in benzole, but there are a few exceptions. The asphaltic sands of the Athabasca river are really petroleum sands, as the mass is not solid, but may be cut like marmalade. These natural mixtures of bitumen and sand are more complete than can be made by any artificial means, and for that reason are preferred to artificial mixtures for some purposes. When subjected to the action of chlorine, California petroleum may be converted into asphalt with liberation of hydrochloric acid. California petroleum contains a notable quantity of nitrogen, which appears to be a constituent element. Other petroleums contain sulphur, but it appears to be an accidental impurity rather than a constituent. Such petroleums are often very difficult to refine, as the sulphur forms substitution compounds at high temperatures.

The word naphtha is of Arabic origin, and in Persia the native name is used to designate the most fluid variety of petroleum, often nearly colorless. In the U. S. the word has no similar meaning, but is always applied to some artificial product, usually the most volatile products of the distillation of petroleum.

The Origin of Bitumen.—This is a subject of pure speculation, but a careful study of the occurrence of bitumen in various parts of the world leads to conclusions well-nigh final.

Some of the most distinguished chemists of recent years have succeeded by very elaborate and ingenious experiments in producing from materials entirely inorganic oily fluids resembling petroleum. Reasoning from these results, they have assumed that nature's laboratories furnish the alkali metals, metallic iron, spiegel eisen, fluoborates, etc., and that the reaction of steam and carbonic acid at a white heat upon these produces the forms of bitumen as they appear at the earth's surface. Too much is required of nature's laboratories not sustained by observed phenomena to warrant the acceptance of such theories.

The occurrence of geodes filled with petroleum or other forms of bitumen, including anthracitic residues, in strata filled with fossil remains of animals, leads to the conclusion that in some instances the bitumen is the product of the decomposition of animal remains *in situ*, probably under great pressure and at a comparatively high temperature, perhaps beneath a deep sea. Large orthoceratites (an animal that may be compared to an uncoiled nautilus) have been observed with the cavities filled with fœtid petroleum. Many facts observed in the vicinity of the pitch lake of Trinidad lead to the conclusion that the bitumen there is the product of the decomposition of wood or other vegetable matter under conditions that render the product wholly different from that of ordinary decay.

An examination of those regions that furnish bitumen in its various forms in greatest abundance, and particularly petroleum, leads irresistibly to the conclusion that by far the larger portion of the petroleum of the world is a distillate produced by natural causes. The Pennsylvania oil regions furnish oil from deposits of coarse sandstone and quartz conglomerate often consisting of water-worn pebbles of white quartz, of a lenticular or nearly spherical form, connected only at their points of contact, leaving the interstitial spaces open. The surrounding rock does not contain petroleum, and the rocks overlying these deposits are very hard silicious shells that hermetically seal the petroleum beneath them. It is impossible that the oil should have passed downward or laterally against such pressure, nor could it have penetrated the shells. The pebble sand is entirely destitute of organic remains, or of anything that would suggest them. The coarse sandstone of the Bradford field contains a few fossil shells. In seeking a source for the petroleum, it is found below in the immense deposits of shale that underlie that entire region, from 1,000 to 1,500 feet in thickness. At Erie, Pa., the shales come to the surface, and are there found to contain enormous quantities of fossil seaweeds. They have been made to yield 50 gal. to the ton of an oil resembling crude petroleum, and also hold petroleum in small quantities in their deeper layers. The cubic miles of this formation that underlie the oil region in Northern Pennsylvania and Southern New York and the black shales of Kentucky furnish a perfectly adequate source from which the vast supply of this material might be drawn. This theory is further strengthened by all of the facts observed in the destructive distillation of organic material in the arts. The hydrocarbons found in the more liquid forms of bitumen have also been found in artificial distillates from wood, bituminous coal, a lime soap made with menhaden oil, peat, shale, and other substances of organic origin. The lower the temperature at which such distillation is made, especially when steam is injected into the still, the closer is the resemblance between the distillate and the forms of bitumen. It is impossible that distillation could proceed from any natural cause, except it be at the lowest possible temperature and accompanied by all the possible effects of the presence of steam. As is the case when artificial distillates are produced from various organic materials and at different temperatures, we find that the various bitumens found in different formations and at different geological epochs partake in many respects of the peculiar composition of the organic remains from which the distillation proceeded. In

illustration it may be mentioned that the simple vegetable remains (*fucoids*) found in the shale on the western slope of the Alleghanies have furnished a distillate made up of the pure hydrocarbons of the paraffine series, rich in hydrogen and almost entirely free from nitrogen and sulphur. On the other hand, the Miocene formations of Southern California, inclosing remains of animals, furnish a bitumen consisting of compounds rich in carbon and containing nitrogen and sulphur. Again, the petroleum of Galicia, which issues from formations lying upon the slopes of the Carpathians, where the rocks contain both animal and vegetable remains, possesses the characteristics of both the Palæozoic and Tertiary petroleums of the American continent.

Bitumen is one of the most permanent substances in nature. It resists decay in nearly all its forms, and has remained unchanged in its natural deposits often through countless cycles of geological time. In the constructions of mankind in various parts of the world it forms a part of the oldest existing monuments. It was used to cement in their places the magnificent sculptured slabs of alabaster that adorned the temples and palaces of Babylon and Nineveh. The cisterns in the rock-hewn city of Petræa of unknown antiquity (perhaps three thousand years) are still intact. Cisterns and silos in Egypt, perhaps older than Petræa, might still be used. It was employed in the vineyards of the Levant, in building boats on the Tigris and Euphrates, in the perpetual fires of the Guebres and Parsis, and for other purposes; and the "fire wells" (natural gas) of China are mentioned in the oldest records of that ancient country. In the Middle Ages it was of considerable importance in Persia, Italy, and Sicily, and nearly all travelers overland to India from Europe mention the fire-worshipers of Baku. Peruvian mummies prepared before the conquest also attest the universality and antiquity of its use.

In modern times all forms of bitumen have become of great importance in ministering to the wants of man, and have assumed an influence scarcely to be estimated upon the civilization of the last half century.

The amount of natural gas produced and marketed in the U. S. in 1899 was valued at $20,024,873. The production of petroleum reached 57,070,850 bbl., valued at $64,603,904; of asphaltum and bituminous rock, 75,085 short tons, valued at $553,904. Total value of bituminous minerals for 1899, $85,182,681.

See ALBERTITE, ASPHALT, NATURAL GAS, GILSONITE, GRAHAMITE, HYDROCARBONS, MALTHA, NAPHTHA, OZOKERITE, PARAFFINE, and PETROLEUM. S. F. PECKHAM.

Bituminous Coal: See COAL, COKE, and GAS.

Bitzius, bit'si-oos, ALBERT (*Jeremias Gotthelf*): Swiss author; b. in Murten, canton of Freiburg, Oct. 4, 1797; educated for the church at Bern, and from 1832 till his death, Oct. 22, 1854, pastor of Lützelflüh in Emmenthal. He is very popular among the Swiss for his masterly tales of Swiss life, among which are *Käthi die Grossmutter* (1847); *Uli der Knecht* (1841); *Uli der Pachter* (1849); and *Erzäldungen und Bilder aus dem Volksleben der Schweiz* (1852–55.) Translated is his *Joys and Sorrows of a Schoolmaster* (London, 1864; 2d ed. 1867). See his *Life* by C. Manuel (Berlin, 1857).

Bivalve [formed from Lat. *bi-*, double + *valvæ*, double or folding doors]: a shell which consists of two concave calcareous plates or valves joined together by a hinge and an elastic ligament, as the oyster.

BIVALVE SHELLS, or BIVALVES, are those coverings of mollusks which consist of two concave plates or valves, united by a hinge. (See CONCHOLOGY.) A majority of recent bivalve shells belong to the acephalous or lamellibranchiate Mollusca. There are also worm-like animals of the class Brachiopoda which possess bivalve shells. The structure and chemical composition of the shell, however, is different in the two classes. A very large proportion of the bivalve shells of the older fossiliferous rocks belong to the class Brachiopoda. In the Brachiopoda one valve is ventral and the other dorsal; in the Lamellibranchiata both are lateral.

Bivouac, biv'wăk [Fr. *bivouac*, prob. originally loan-word from Swiss Germ. *Beiwacht*, supplementary night-watch]: a French word signifying an encampment of soldiers by night in the open air, without tents, or the system by which soldiers on a march, or in expectation of a battle, remain all night in the open air, resting with their arms by their side and ready for action. This practice is said to have been common among the crusaders. The generals of the French Republic or the First Empire introduced the plan of dispensing with the use of tents and passing the night *en bivouac*. The same system was adopted by the other great powers on the Continent of Europe. In recent times it has been common for soldiers on the march to use the *tente d'abri*, or shelter-tent.

Bixby, JAMES THOMPSON, Ph. D.: Unitarian minister; b. at Barre, Mass., July 30, 1843; educated at Harvard College and Harvard Divinity School; held various charges in the Unitarian Church in Massachusetts and Maine 1870–79; Professor of Religious Philosophy in Meadville Theological School 1879–83; traveled in Europe 1883–85; became pastor of the Unitarian church at Yonkers, N. Y., 1885; received degree of Ph. D. at Leipzig, 1885; author of *Similarities of Physical and Religious Knowledge* (1876); second edition under the title *Religion and Science as Allies* (Chicago, 1889); and *The Crisis in Morals* (Boston, 1891).

Bixin: the coloring principle of annotto, the paste obtained by bruising the seeds of *Bixa orellana*.

Bizerta, bĕe-zăr'ta, or **Benzert**, ben-zărt' (anc. *Hippo Zarytus*): a fortified seaport of Tunis, and the most northern town of Africa; about 38 miles N. W. of Tunis (see map of Africa, ref. 1–D). The port, which was formerly good, has been filled up, so that it will now admit only small vessels. It is surrounded by walls and defended by two castles, but is commanded by the adjacent heights. This place was fortified by Agathocles about 308 B. C. Pop. 8,000.

Bizet, bĕe'zay', ALEXANDRE CÉSAR LÉOPOLD: commonly called *Georges Bizet*; b. Paris, Oct. 25, 1838; best known as the composer of the popular opera *Carmen*; studied under Halévy, whose daughter he married in 1869. He gained the Prix de Rome for composition, and was a brilliant pupil of the Paris Conservatory from 1848 to 1857. His operas include *Vasco da Gama* (1863); *Les Pêcheurs des Perles* (1863); *La Jolie Fille de Perth* (1867); *Djamileh* (1872); *Carmen* (1875), his last work. He also completed Halévy's opera *Noé*. He died quite suddenly near Paris, June 3, 1875.
D. E. HERVEY.

Bjerregaard, byār're-gaărd, HENRIK ANKER: a Norwegian poet; b. Jan. 1, 1792. His national songs represent the enthusiasm of the new-born nation in the early part of the century. His drama *Fjeld-eventyret* is still very popular. D. Apr. 7, 1842.

Björneborg, byör'ne-bōrg, or **Biornborg**, byōrn'bōrg: a seaport of Finland; at the mouth of the Kumo; 115 miles S. of Vasa; lat. 61° 29′ N., lon. 39° 23′ E. (see map of Russia, ref. 4–B). It has various manufactures and a considerable trade. Pop. (1888) 9,632.

Björnson, byörn'son, BJÖRNSTJERNE: dramatist and novelist; b. Dec. 8, 1832, in a lonesome and dreary parsonage in Kvikne, Northwestern Norway, where his father was a minister. He was educated in the Latin School at Molde, from which he went to the University of Christiania in 1851. But in the next year he broke off his scientific education and turned his attention to literature. His first book, published in 1857, was a little novel, *Synnøve Solbakken*, descriptive of peasant life in Norway. It made a very deep impression. The plot was simple, but at every movement it touched the deepest laws of life. The characters were pure psychological developments, never marred by explanations or comments from a merely individual moral point of view. The style was the short, pithy sentence of the saga, with all its power of signification, all its strength of passion, and all its sweetness of feeling. The effect of this book was wonderful, and the impression it made was both deepened and widened by the novels which followed, *Arne* (1858); *En glad gut* (A Happy Boy, 1859); *Fiskerjenten* (The Fisher Lass, 1868), etc. In spite of the great variety of characters and situations which they depict, they are all so singularly alike that in the reader's mind they melt into one book, into one charming picture of life in Norway. Alternating with the novels he wrote dramas, and in this field he experienced some opposition. When his first tragedy, *Halte-Hulda*, was published in 1858, there were people who felt that a dramatic genius had arisen, but the Scandinavian theaters were at first singularly unwilling to try the new author. Moreover, the young poet had not yet learnt to say unimportant things in an unassuming manner. His next drama, *Kong Sverre* (1861), was better in this respect, but it was not until he published his great trilogy, *Sigurd Slembe* (1862), that the public thoroughly felt the greatness of his dramatical powers. *Sigurd Slembe* is a grand conception, executed in

a masterly way; and when in 1865 the Royal theater in Copenhagen presented his lovely little comedy, *De Nygifte* (The Newly Married), and in 1867 his tragedy, *Maria Stuart* (published 1864, translated in *Scandinavia*, Chicago, 1883–84), the impression was irresistible. With 1870 the first period of his literary activity may be said to have closed. Between this year and 1875 he underwent a great mental and spiritual change, due in the main to the influence of foreign literature and thought, to the study of which he devoted himself with ardor. He was particularly affected by the works of Darwin, John Stuart Mill, and Taine, as well as by the "modern" movement in Danish letters. In his second period, which begins with 1874, he appears as the foremost Norwegian advocate of republicanism in politics, and of free thought in religion. His principles have found expression not only in a succession of pamphlets, newspaper articles, and public addresses, but in a series of remarkable dramas dealing with social, religious, and political problems. These are *Redaktøren* (The Editor, 1874); *En Fallit* (Bankruptcy, 1875); *Det ny System* (The New System, 1879); *Kongen* (The King, 1879); *Leonarda* (1879); *En Hanske* (A Glove, 1883); *Over Evne* (Overstrained, 1883). Björnson's activity as editor and political leader has been of much importance. He has always been an earnest advocate of Norwegian independence, and his influence as the greatest popular orator of Norway has been especially marked since his American tour in 1880–81. Of the non-dramatic works of his second period the following deserve mention: *Magnhild* (1877); *Kapitejn Mansana* (1879); *Det flager i Byen og paa Havnen* (1884); *Paa Guds Veje* (1889). See Georg Brandes, *Moderne Geister* (1882, pp. 389–436).

Björnstjerna, byörn-styär'na, Magnus Fredrik Ferdinand, Count: Swedish general and author; b. in Dresden, Oct. 10, 1779. He fought against the French in 1809–13, and negotiated the treaty by which Sweden and Norway were united. He was ambassador at London for many years (1828–46). Among his works is *The Theogony, Philosophy, and Cosmogony of the Hindoos* (1843). D. in Stockholm, Oct. 6, 1847.

Blacas, blăă'kaa', Pierre Louis Jean Casimir, Duke of: a French statesman; b. at Aups, in the department of Var, Jan. 12, 1771; a faithful adherent of the Bourbons. He negotiated the concordat of 1817, and was employed on various important embassies. He founded the Egyptian Museum in Paris, and became a member of the Institute. D. in the castle of Kirchberg, Lower Austria, Nov. 17, 1839.

Black: color. See Dyestuffs and Paints.

Black, Adam: publisher; b. in Edinburgh, Feb. 20, 1784; with his nephew, Charles Black, established the publishing-house in Edinburgh which gained control of the *Encyclopædia Britannica* in 1829, and of Scott's novels in 1851. Mr. Black was provost of Edinburgh 1843–48, declining the honor of knighthood; Liberal M. P. for his city 1856–65. D. in Edinburgh, Jan. 24, 1874.

Black, Jeremiah Sullivan: jurist and Democratic politician; b. in Somerset co., Pa., Jan. 10, 1810; became a judge of the Supreme Court of Pennsylvania in 1851; Attorney-General in the cabinet of Buchanan in 1857; and Secretary of State in 1860, where he exerted himself to keep the Government from disruption by the secessionists. He was retained in many celebrated cases. D. in York, Pa., Aug. 19, 1883.

Black, Joseph: chemist; of Scottish extraction; b. at Bordeaux in 1728. He graduated as doctor of medicine at Edinburgh in 1754, and became Professor of Anatomy at Glasgow in 1756. His reputation is founded chiefly on the theory of latent heat, which he propounded between 1759 and 1763. He obtained in 1766 the chair of Chemistry in the University of Edinburgh, where he lectured for thirty years, and acquired great popularity. D. in Edinburgh, Dec. 6, 1799. His *Lectures on Chemistry* were published in 1803 (2 vols. 4to).

Black, Warren Columbus, D. D.: minister of M. E. Church South; b. in Copiah co., Miss., May 24, 1843; educated at Centenary College, Jackson, La.; joined the Mississippi Conference in 1871; has filled pastorates at Raymond, Madison, Camden, Natchez, Meridian, and Jackson; author of *Temperance and Teetotalism* (1886); *Christian Womanhood* (1888).

Black, William: Wesleyan divine; b. in England in 1760; removed to Nova Scotia in 1775; founded there the Wesleyan Church. He was subsequently general superintendent of the Wesleyan missions in British America. His purity of life and eminent services to his denomination made him one of its most memorable characters. D. Sept. 8, 1834.

Black, William: novelist; b. in Glasgow, Scotland, in 1841; educated at private schools; studied for a short time in the Government school of art, Glasgow, but soon engaged in journalism for the *Glasgow Weekly Citizen*: in 1864 went to London and wrote for magazines; in 1865 was attached to the staff of the *Morning Star*, and was its special correspondent in Prusso-Austrian war of 1866; afterward wrote numerous novels, among which are *In Silk Attire* (1869), descriptive of peasant life in the Black Forest; *Monarch of Mincing Lane*; *A Daughter of Heth* (1871); *The Strange Adventures of a Phaeton* (1872); *A Princess of Thule* (1873); *Macleod of Dare* (1878); *White Wings* (1881); *In Far Lochaber* (1888); *New Prince Fortunatus* (1890). His books range from Bohemian art life in London to outdoor sporting life and Scotch scenes and characters. He was for several years assistant editor of the *Daily News*. D. Dec. 10, 1898.

Black, William Henry, D. D.: minister in the Cumberland Presbyterian Church; president of Missouri Valley College, Marshall, Mo.; b. in Centreville, Ind., Mar. 19, 1854; educated at Waynesburg, Pa., and the Western Theological Seminary, Pittsburg; pastor in Pittsburg and in St. Louis. He was moderator of General Assembly at the age of thirty-four. He has published *God our Father* (Nashville, Tenn., 1889); *Womanhood* (1890); *Sermons for the Sabbath School* (1892). W. J. Beecher.

Black Acts: the acts of the Scottish Parliaments passed between 1425 and 1586—so called because they were printed in the characters known as *black letter*. In English law books the term "black act" is applied to the 9 Geo. I. c. 22 (1722), because it was occasioned by the outrages committed by persons whose faces were blackened. They destroyed the deer in Epping Forest, and committed other offenses. The act was repealed in 1827.

Black Art: See Magic.

Black Band: a variety of clay ironstone or compact carbonate of iron, containing 25 or 30 per cent. of carbonaceous matter. It occurs abundantly in the coal-fields of Scotland, and is the ore almost exclusively used for the production of certain grades of iron in that country. It is not very rich, but it is easily reduced. Black band also occurs in the coal-measures of Ohio, and is used to a moderate extent for the production of iron.

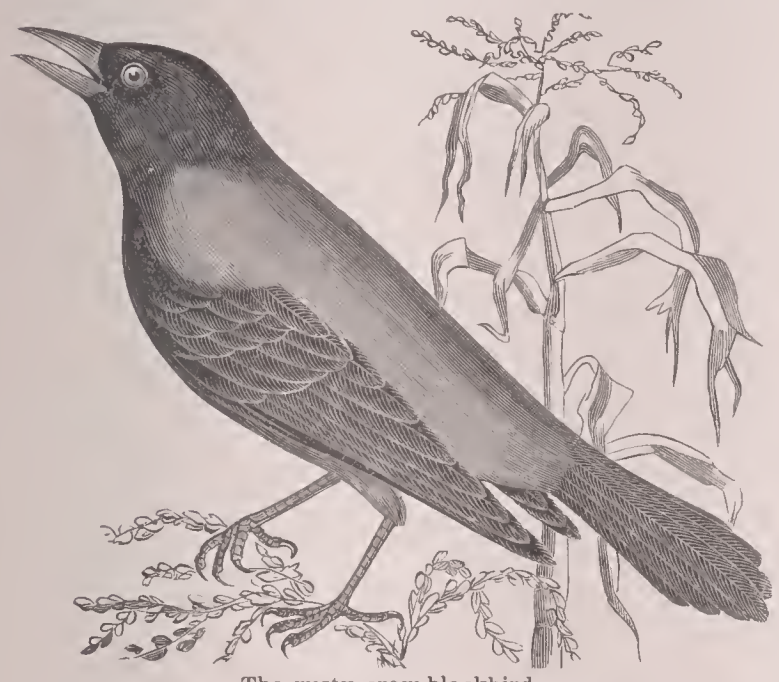
Black-bass: a common name for two American fishes of the genus *Micropterus*; highly esteemed as game-fishes. The small-mouthed species is now known as *M. dolomieu*, and the large-mouthed one as *M. salmoides*. The two species are well known to anglers, and are found in almost all streams of the U. S. east of the Rocky Mountains. The small-mouthed species abounds in clear or swift streams; the other in sluggish waters or lakes. See Bass.

Black'berry: one of several brambles belonging to the family *Rosaceæ*; the drupelets adhere to the receptacle or "core." The common blackberry of America, which is the most important commercial species, is *Ru'bus villos'us*, a native over a large part of the country. In a wild state it is exceedingly variable, and many of the cultivated varieties are simply selected wild variations. The greater part of the garden sorts belong to the variety *Sati'vus sativus*; certain early and lower growing small-leaved varieties, as the Early Harvest, belong to the var. *frondo'sus*; while the "white" blackberry is the var. *albi'nus*. The blackberry first began to attract attention as a market fruit about fifty years ago. The New Rochelle (or Lawton) and Dorchester were the first prominent sorts introduced. The latter was brought to notice in 1841. For the trailing blackberry, see Dewberry.

Blackberries bear their fruit upon the canes or stems of the preceding year's growth, and these canes bear but one crop. It is therefore necessary to cut them out after they have borne, either immediately after the fruit is picked or sometime before growth begins the following spring. In the meantime new canes for the next crop are growing from the crown or root of the plant, and their tops are cut off when they reach a height of 3 or 4 feet, in order to increase their strength and productiveness. This heading-in induces the formation of lateral branches, which are usually cut off to a length of a foot or 18 inches the following fall or spring. Blackberries grow readily from root-cuttings (see Cuttings),

or the sprouts which spring naturally from old plants may be used. The plants are set in rows 8 or 9 by 4 to 5 feet apart. A good blackberry plantation will last from eight to twelve years. The greatest drawbacks to blackberry culture are borer insects which attack the canes, drouth at fruiting-time, and the orange-rust. The latter is a fungus (*Cæo'ma lumina'tum* or *C. ni'tens*). This appears as an orange-red coating upon the leaves. There is no remedy but to destroy the plants. Leading varieties of blackberry are Wilson, Snyder, Taylor, Kittatinny, Agawam, Ancient Briton. L. H. Bailey.

Blackbird, or **Merle**: a popular name in the British islands of the *Merula merula*; a species of thrush which abounds in Europe. In size it is intermediate between the song-thrush, or mavis, and the missel-thrush. The plumage of the male is all deep black, but that of the female is brown. It has a powerful voice, and its song is more mellow than that of the song-thrush, but inferior in compass and variety. The blackbird is often kept in cages, and is



The rusty crow-blackbird.

very easily trained. It feeds on worms, insects, and fruits, and frequents hedges, woods, and thickets. Its nearest American relative is the common robin, from which it differs little except in color. Quite distinct from this bird is the blackbird of the U. S. (*Quiscalus quiscula*), sometimes called "crow-blackbird," or purple grackle. The "rusty crow-blackbird" (*Scolecophagus ferrugineus*) is a rather less common bird of the U. S. It is a great depredator of corn-fields. The swamps and meadows of the U. S. are frequented by the *Agelaius phœniceus*, or red-winged blackbird. It is gregarious, and feeds on insects and grain. Several other related species are also called blackbird in America. Revised by D. S. Jordan.

Black'burn: a manufacturing town of Lancashire, England; situated in a barren district on a small stream called "The Brook"; 24 miles by rail N. N. W. of Manchester (see map of England, ref. 7–F). It has a beautiful Gothic parish church, a fine new exchange, also in the Gothic style, and numerous chapels of the Dissenters, a grammar school founded by Queen Elizabeth, a hospital, a theological academy, and a theater. The principal business of the town is the manufacture of cotton stuffs, chiefly coarse calicoes and muslins, in which 10,000 or more persons are employed. Coal and lime are abundant in the vicinity. James Hargreaves, who invented the spinning-jenny in 1767, was born here. Railways extend from this point in various directions. Blackburn sends two members to Parliament. It has a public park which is 700 feet above the level of the sea. Pop. (1881) 104,012; (1891) 120,064; (1901) 127,527.

Blackburn, Joseph Clay Styles: U. S. Senator; b. in Woodford co., Ky., Oct. 1, 1838; graduated at Center College, Danville; admitted to the bar in 1858; served through the war in the Confederate army; entered Congress as a Democrat in 1875; four times re-elected; elected Senator from Kentucky Feb. 4, 1884.

Blackburn, William Maxwell, D. D.: b. at Carlisle, Ind., Dec. 31, 1828; graduated at Hanover College, Ind., in 1850, and at Princeton Theological Seminary 1854. He was Professor of Biblical and Ecclesiastical History in the Presbyterian Theological Seminary at Chicago 1868–81, when he became a pastor in Cincinnati, O. President of University of North Dakota 1884–85: from 1885 president of Pierre University, North Dakota. He published *William Farel, or The Swiss Reformation* (1865); *Aonio Paleario* (1866); *Ulrich Zwingli* (1868); *Admiral Coligny and the Rise of the Huguenots* (1869); *St. Patrick and the Early Irish Church* (1869); *History of the Christian Church from its Origin to the Present Time* (1879). D. Dec. 29, 1898.

Blackburn's Pendulum: a device for tracing the curves resulting from the composition at right angles of two simple harmonic motions. (See Wave-motion.) It is a pendulum the rates of vibration of which in two planes at right angles to each other are independent and variable within certain limits at the will of the experimenter. When these rates are adjusted to any exact ratio, the Lissajous figure for that ratio is traced by the bob, which carries a pencil or point.

Blackcap, Blackcap Warbler, or **Fauvette** (*Curruca atricapilla*): a European bird of the family *Sylviidæ*; nearly allied to the nightingale, which it rivals in sweetness of song. Its note is rich in tone, and has a great variety of sweet and gentle modulations. It is a summer bird of passage in Great Britain, which it enters in early spring, and from which it migrates in September. It is highly prized as a cage-bird, not only for its song, but for its pleasant manners and temper.

Blackcap is also the name applied to a species of raspberry (the *Rubus occidentalis*), of which several varieties have recently been introduced for cultivation into gardens in the U. S.

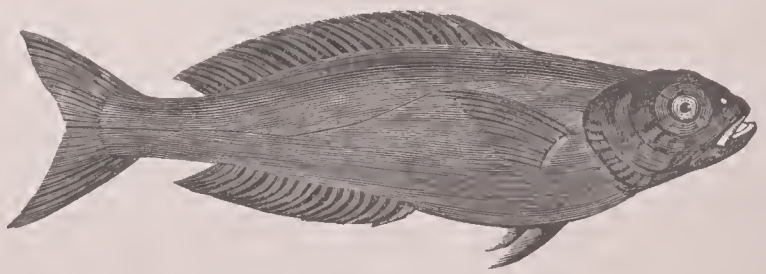
Blackcock, Heath-fowl, or **Black Grouse** (*Lyrurus tetrix*): a bird of the family *Tetraonidæ*; abundant in Scotland and the north of England. It also occurs in the mountains and marshy parts of the continent of Europe, and abounds in Scandinavia and Russia. Its favorite haunts are moors, bogs, and morasses covered with rank herbage. The male, which weighs nearly 4 lb., is of a shining bluish-black color, with a conspicuous white bar on the wings below the ends of the great wing-covers. The female is of a rust color, and is called the "gray hen." This species of grouse is gregarious, but in winter the males and females form separate flocks. They build nests of very simple construction on the ground, and lay in each six or eight eggs, which are about 2 inches long. Their food consists of seeds, berries, insects, and the young shoots of the pine, fir, and birch. Their flesh is highly esteemed for food.

Black Death: See Plague.

Black Duck (*Anas obscura*): one of the best known and most highly prized of American wild ducks; breeds abundantly throughout the Eastern U. S. from Texas to Labrador. Its range is known to extend westward to Kansas and Iowa. It is of a generally blackish-brown color, with white lining to the wings, the speculum or wing-patch violet bordered with velvety black.

Blackfeet Indians: See Algonquian Indians, Siouan Indians.

Blackfish: (1) the blackfish or tautog of the Northern U. S. (*Tautoga onitis*); a species of the family *Labridæ*, of an oblong form, with smooth scaly skin. It is one of the chief market-fishes of New York. (2) In Great Britain the



European blackfish.

Centrolophus pompilus, a species of the family *Stromateidæ*; found most abundantly in the Mediterranean and contiguous waters. The name blackfish is also applied to cetaceans of the genus *Globicephalus*—e. g. *G. melas* of the Atlantic coast, and *G. scammoni* of the Pacific coast, of the U. S.

Black Flags: a name given to the more desperate survivors of the Taiping rebel army who, on its defeat, took refuge in Tonquin. In 1868 they were in possession of the valley of the Red river as far as Hanoi, but soon after were

repressed to the upper part of the valley, where they have settlements and chiefs of their own. They have usually promoted Chinese interests in Tonquin. The Black Flags were called upon by the Tonquinese in 1873 to aid in expelling the French from Hanoi, and under their leader, Liu Yung-Fu, they defeated a sortie under Garnier, and killed that commander. In 1882 they inflicted a like disaster upon Rivière in the same locality and under similar circumstances. In 1885, China having become engaged in the war for the expulsion of the French from Tonquin, the Black Flags, with Chinese troops from Yunnan, held the passes above Tuyen-Kivan for nearly a month against repeated assaults, and until negotiations put an end to the war. The previous year the Black Flags became notorious everywhere because of their destruction of French mission stations and the appalling massacre of priests and native Christians, of whom it was estimated that nearly 10,000 fell victims. The Black Flags number about 5,000, and the Yellow Flags are regarded as twice as numerous. The latter are peacefully disposed; the former comprise many desperadoes, and are given to pillage.

Black Flux: a mixture of potassium carbonate and finely divided carbon or powdered charcoal. It is prepared by mixing in a crucible one part of niter with two or three parts of crude cream of tartar, and deflagrating the mixture by ignited charcoal; or by heating in a covered crucible cream of tartar or potassium bitartrate, when the tartaric acid is decomposed and charred, forming carbonic acid, which remains in combination with the potash. It is a valuable flux in reducing ores. The metal potassium can be obtained by heating this flux in iron vessels.

Black Forest (Germ. *Schwarzwald*; anc. *Hyrcinia Sylva*): a mountainous and wooded region in Baden and Würtemberg, with a chain of mountains which extends about 85 miles, and separates the basin of the Rhine from that of the Neckar. It was a part of the ancient Hercynian Forest. This region is remarkable for its extensive forests and its mines of silver, copper, zinc, lead, and iron. The highest point of this chain is the Feldberg, which rises 4,903 feet above the level of the sea. The Danube, Neckar, Kinzig, Murg, and Elz rise in the Black Forest. A number of small lakes are found here at elevations of 2,500 to 3,500 feet. Granite and gneiss form the foundations of these mountains, and porphyry occurs on their sides, which are also covered with abundance of fir-trees. The descent is precipitous on the western side, but the eastern slope is very gentle. A valley called Murgthal, situated in this forest, is famous for its beautiful scenery. In the vicinity of Neustadt is the mountain-pass of Hölle, which was celebrated in connection with Moreau's retreat in 1796. The soil of these highlands is not adapted to tillage. The inhabitants are extensively employed in the manufacture of wooden clocks and toys.

Blackfriars: a term applied, on account of the color of their garments, to the Dominican order of monks, who first went to England about A. D. 1220, and settled at Oxford. Their second house was the Blackfriars in London, and from it the district still bears the name of the order, which had nearly sixty houses in England and Wales at the time of the abolition of monasteries. See DOMINICAN.

Black Fungi (*Pyrenomycetæ*): an order of degraded plants of the class *Ascomycetes* (*q. v.*), often of a black color (whence the name) and usually of a hard texture. They are essentially parasitic plants, although many are saprophytic. They number fully 7,000 species, which are distributed among a number of families, viz.: (1) *Sphæriaceæ*, of which *Valsa* and *Hypoxylon* are common genera; (2) *Hypocreaceæ*, represented by *Claviceps purpurea*, the ergot of rye; (3) *Dothidiaceæ*, of which the best-known representative is *Plowrightia morbosa*, the black knot of plum-trees; (4) *Microthyriaceæ*, minute parasitic fungi, scarcely represented in U. S.; (5) *Lophiostomaceæ*, minute parasitic fungi, with few representatives in U. S.; (6) *Hysteriaceæ*, represented in U. S. by many species of *Hysterium* and *Hysterographium*; (7) *Laboulbeniaceæ*, microscopic, greatly degraded black fungi, which are parasitic upon insects. CHARLES E. BESSEY.

Black Grouse: See BLACKCOCK.

Blackguard: It is said that when the Kings of England made a progress with the court from one royal residence to another, it was customary for the scullions and other menials to follow with loads of kitchen utensils, and even coals; and from their dirty appearance they received the derisive name of *blackguard*, which has come to be applied to any person of a vile character, or one who uses vulgar or ruffianly language. See Trench, *English, Past and Present*.

Black-gum: a popular name of the *Nyssa multiflora*; an American tree, sometimes called pepperidge, hornpipe, tupelo, and sour gum. It has oval or obovate leaves, commonly acuminate, which turn bright crimson in autumn. The fruit is a bluish-black drupe, the wood close-grained, tough, and very difficult to split. It is used for cog-wheels, hatter's blocks, and wheel-naves. It belongs to the family *Cornaceæ*.

Black Hawk: city; on Union Pacific R. R.; Gilpin co., Col.; 36 miles W. of Denver (for location of county, see map of Colorado, ref. 2–D). It contains, and is adjacent to, rich mines of gold and silver. It has numerous quartz-mills and also smelting-works. Pop. (1880) 1,540; (1890) 1,067; (1900) 1,200.

Black Hawk: an American Indian; chief of the Sac tribe; b. in Kaskaskia, Ill., 1767. He waged war against the U. S. in 1832 for the recovery of lands which certain chiefs of the Sacs and Foxes had ceded to the whites. D. on the Des Moines river, Oct. 3, 1838. See J. B. Patterson, *Life of Black Hawk* (1834); also one by W. J. Snelling.

Black'heath: an elevated open common in the county of Kent, England; 5 miles S. E. of London, adjoining Greenwich Park; a favorite holiday resort for Londoners. It commands an extensive view, and is bordered by numerous handsome villas. The Roman Watling Street crosses this heath, which is the site of Morden College. This heath was the scene of the insurrections of Wat Tyler and Jack Cade, and was formerly infested by highway robbers.

Black Hills: an oval group of low mountains lying chiefly in South Dakota, but partly in Wyoming. The summits rise from 2,000 to 3,000 feet above the surrounding plains, and the culminating point, Mt. Harney, has an altitude of 7,400 feet. The hills are due to a local uplift in the form of a flat dome, from which erosion has removed the cretaceous strata of the plains and laid bare in successive rings carboniferous and Cambrian rocks, with a nucleus of crystalline schists. In 1875 the hills were ceded to the U. S. by the Dakota Indians, and an important mining industry immediately sprang up. The Black Hills district in South Dakota produced in 1898 gold to the value of $5,699,700, and silver to the value of over $196,913. Deposits of tin have been discovered. G. K. G.

Black Hole: the name of a small dungeon or cell in Calcutta, which was the scene of a nefarious crime committed by the nabob Suraja Dowlah in June, 1756. Having captured the English garrison of a fort at Calcutta, he confined the prisoners, 146 in number, in a cell 20 feet square, with only two windows. They suffered great agonies from thirst, heat, and foul air, and 123 died from suffocation in the first night. The twenty-three survivors were taken out the next morning. One of them, John Z. Holwell, published a narrative of their sufferings.

Black'ie, GEORGE STODART, A. M., M. D., Ph. D.: b. at Aberdeen, Scotland, Apr. 10, 1834; educated at the universities of Bonn, Paris, and Edinburgh, graduating A. M. and M. D. at the last in 1855; obtained the gold medals for botany and his thesis; removed to the U. S., and became Professor of Natural History at the University of Nashville 1856–61; served in the civil war as surgeon, medical inspector, etc.; has been Professor of Botany in Tennessee College of Pharmacy, and of Chemistry in Nashville Medical College since 1875; held prominent positions in Masonry, among them that of grand commander of the State; has published *Cretins and Cretinism* (Edinburgh, 1855); *Botany the Ally of Medicine* (Nashville, 1859); *Medical Flora of Tennessee* (Nashville, 1859); *History of the Knights Templar* (Nashville, 1871); besides numerous other works; and edited the *Nashville Medical Journal* 1858–70, and the *Masonic Record* 1870–71.

Blackie, JOHN STUART: Scottish classical scholar; b. in Glasgow, July, 1809; studied at Edinburgh and Göttingen; Professor of Greek in the University of Edinburgh 1852–82. He translated Goethe's *Faust* into English verse (1834), and produced in 1850 an able translation of the works of Æschylus. He contributed to the *Encyclopædia Britannica* and the *Imperial Dictionary of Biography*. Among his other works are *Lays and Legends of Ancient Greece* (1856; 2d ed. 1880); *Lyrical Poems* (1860); *Homer and the Iliad*, with a translation in ballad meter (4 vols., 1866); *War Songs of the Germans* (1870); *Lays of the High-*

lands and Islands (1872); *The Wise Men of Greece* (1877); *Natural History of Atheism* (1877), a plea against Agnosticism; *Lay Sermons* (1881); *Altavona* (1882); *The Wisdom of Goethe* (1883); *Life of Robert Burns* (1887); and *Essays on Subjects of Moral and Social Interest* (1890). Through his efforts a chair of Celtic was established in the University of Edinburgh. D. in Edinburgh, Mar. 2, 1895.

Black-jack: the name given by miners to blende (sulphide of zinc). It is also a popular name of a small species of American oak (*Quercus nigra*), sometimes called barren oak and iron oak. Its wood is very hard and makes a good firewood, but is rather perishable.

Black Lead: See GRAPHITE.

Black Leg: See BLACK QUARTER.

Black Letter: a term applied to the Gothic or Old English types or letters, which were used in the typography of the first books ever printed in England. Books printed before 1500 are generally in this character, which was commonly used in manuscripts by Europeans long before the invention of the art of printing. A form of type similar to this is still used by the Germans.

Black-letter Days: (1) Holy days recorded in the calendars of the service-books in "black-letter" type, rather than in the same type printed in red, consequently holy days of an inferior dignity. (2) In the English Prayer-book the black-letter days are days of observance for which no special collects or services are provided.

Black List: the name familiarly applied in Great Britain to printed lists of bankruptcies, assignments, dissolution of partnership, decrees in absence, judgments for debt, protested bills, and other matters affecting the credit of firms and individuals, issued weekly and circulated for the guidance of the mercantile community. These lists, which serve an important purpose, are well known by commercial men in the United Kingdom. Similar information is furnished in the U. S. and Canada by commercial agencies in the "Reports" and "Weekly Correction Sheets." See MERCANTILE AGENCIES.

Blackmail: an impost formerly submitted to in parts of Scotland and the north of England as a compromise with robbers. A class of men, often belonging to families in good standing, levied a tax upon their neighbors (generally about 4 per cent. of the rental of their property), on the pretext of protecting them from cattle-thieves. The celebrated Rob Roy was one of these blackmailers. The practice ceased in Scotland after the rebellion of 1745. It had already been long extinct in England. In modern usage, blackmail signifies money extorted from a person by threats of accusation or exposure in the public prints. Those who practice this extortion are said to "levy blackmail."

Blackmore, Sir RICHARD: a court-physician of William III. and of Queen Anne; a voluminous writer of prose and verse; b. in Corsham, Wiltshire, about 1650. He was the object of the satire of Pope and of the ridicule of the wits of his time. His chief works are *Prince Arthur* (1696) and *The Creation* (1712). D. in Boxted, Essex, Oct. 8, 1729.

Blackmore, RICHARD DODDRIDGE: novelist and poet: b. at Longworth, Berkshire, England, in 1825. He graduated at Exeter College, Oxford, in 1847, and practiced law in London. *Lorna Doone* (1869), a romance of Exmoor in the seventeenth century, is the most successful of his novels, among which are *The Maid of Sker* (1872); *Cripps the Carrier* (1876); *Erema* (1877); *Springhaven* (1877), and others. Besides several volumes of original verse, he has published a translation of Vergil's *Georgics* (1871). D. in London, Jan. 21, 1900.

HENRY A. BEERS.

Black Mountains: a group of mountains in Yancey co., N. C., a few miles W. of the Blue Ridge. It derives its name from the forests of dark balsam firs which crown its summits. It has the shape of a horseshoe. The highest of its peaks rises to 6,688 feet, and is called the Black Dome, Mt. Mitchell, or Mitchell's High Peak, in honor of Dr. Mitchell of the University of North Carolina, who perished while exploring this inhospitable region, and was buried on its top. This is the highest point of the U. S. east of the Rocky Mountains.

Black Oak: a large tree of the U. S.; common E. of the Mississippi; now considered a variety (*tinctoria*) of the scarlet oak (*Quercus coccinea*). It is a handsome tree, affording useful timber, but is best known for its thick yellow bark, which is prized for tanning purposes, and yields quercitron, a valuable yellow dye. It is also called yellow oak and dyer's oak.

Blackpool': a municipal borough of Lancashire, England; incorporated in 1875 and extended in 1879 (see map of England, ref. 6–F). It is situated on the Irish Sea; 20 miles by railroad W. of Preston; has an electric railway, and is much frequented for sea-bathing. Pop. (1891) 23,846.

Black Quarter, Quarter Evil, or **Black Leg**: a disease which attacks animals, especially thrifty young neat cattle, which are kept on fertile but undrained land. It is characterized by swelling of a joint, leg, or quarter, diarrhœa, extravasation of blood, and formation of abscesses. It is usually fatal. It is probably the same disease which is known in man as malignant pustule. Its causes are not well understood. It is a disease hard to cure, but stimulants, free incision in the affected part, with the application of weak solutions of chloride of zinc and carbolic acid, may prove useful. The best preventive is thorough underdrainage of pastures.

Black River of Louisiana: that part of Washita river below the mouth of the Tensas river, and between it and Red river, is sometimes called Black river.

Black River, or **Big Black River**: in Missouri and Arkansas; rises in Iron co., Mo.; flows nearly southward to the north line of Arkansas. It afterward runs southwestward, and enters the White river at Jacksonport, Ark. Length about 350 miles. It is navigable by steamboats 100 miles, except when the water is low.

Black River of New York: rises in Herkimer County; flows in a general N. W. direction, and enters Lake Ontario about 6 miles below Watertown. The whole length is about 125 miles. It falls 63 feet near Turin, in Lewis County.

Black River of Wisconsin: rises in Marathon County; flows southward and southwestward through Clarke and Jackson Counties, and enters the Mississippi about 15 miles above La Crosse. Its length is about 225 miles.

Black River of Vermont (Indian name *Kaskatuac*): rises in ponds in the town of Plymouth, Windsor co.; flows S. by E., and empties into the Connecticut river. It furnishes abundant water-power, which is employed in numerous manufactories.

Black River Falls: city; capital of Jackson co., Wis. (for location of county, see map of Wisconsin, ref. 5–C); on railroad and on Black river, 50 miles N. of La Crosse. It has a large flouring-mill, wagon-factory, sash and door factory, water-works, and electric lights; has one of the best water-powers in the U. S. Iron-ore deposits have been found in the vicinity, but with the veins badly faulted. There are many sawmills in the vicinity. Pop. (1880) 1,427; (1890) 2,261; (1900) 1,938. EDITOR OF "BADGER STATE BANNER."

Black Rock (Conn.): See BRIDGEPORT (Conn.).

Black Rood (OF SCOTLAND): a cross of gold which was alleged to contain a piece of the true cross: brought into Scotland in 1067 by Margaret, sister of Edgar Atheling, queen of Malcolm III. It was regarded as a national palladium. It was taken twice, at least, by the English, who after 1346 kept it in Durham Cathedral. It disappeared at the Reformation.

Blacksburg: town (founded in 1879); York co., S. C. (for location of county, see map of South Carolina, ref. 4–D); situated at junction of Rich. and Dan. and Chas., Cin. and Ch. R. Rs.; 1,500 feet above the sea-level, 221 miles N. of Atlanta. It has a heathful, invigorating climate, and is sheltered from severe north winds by the mountains. There are here deposits of magnetic and hematite iron ores, baryta, plumbago, and silver; and sulphur, lithia, and magnesia mineral springs. The industrial establishments of the town are mostly connected with the development of its natural resources, and include iron-works, furnace, foundry, machine-shops, railroad repair-shops, cotton-mill, wood-working factory, brick-yard, etc. There are here 4 churches, 2 graded schools, and 4 hotels. The surrounding country is one of the best developed agricultural regions of the State. Pop. (1880) 145; (1890) 1,245; (1900) 1,285.

EDITOR OF "NEWS."

Black Sea, or **Eux'ine** (anc. *Pontus Euxinus*; Turk. *Kara Diegis*): a large inland sea between Europe and Asia. It extends from lat. 40° 45′ to 46° 45′ N., and from lon. 27° 30′ to 41° 50′ E. The extreme length is about 700 miles, and its greatest breadth about 380 miles. Area, estimated at 185,000 sq. miles. It communicates with the Sea of Már-

mora by the Bosphorus, and with the Sea of Azof by the Strait of Kertch. The shores of this sea are high and bold on all sides except the N. W., between the Crimea and the mouth of the Danube. In the middle of it no soundings were obtained at 160 fathoms. It incloses no islands except a few small ones at the mouth of the Danube, and the Symplegades, near the Bosphorus. The largest rivers that flow into it are the Danube, Dniester, Bug, Don, Dnieper, Kuban, and Kizil Irmâk. This sea has no tide, but strong currents are produced by the influx of the large rivers, in consequence of which the water is fresher than that of the Mediterranean. The navigation of the Euxine is not dangerous, except during violent storms. It is supposed that this sea once extended much farther E. than it does now. In ancient times it was an important highway of commerce. The Turks excluded the ships of all foreign powers from it until 1774, when the Russians obtained the right to navigate its waters. By the treaty of Paris, 1856, this sea was neutralized—that is, the Russians and Turks were not permitted to keep ships of war in it. In 1871 the Russians again were permitted to have men-of-war on this sea.

Black-snake, or **Blue-racer**: a species of snake (*Bascanion constrictor*) common in nearly all parts of the U. S. Its length varies from 4 to 6 or 7 feet. It is remarkable for agility, climbs trees with ease, and moves along the ground very swiftly. It feeds on frogs, mice, lizards, eggs, birds, etc. Although it is harmless and has no poison-fangs, it will sometimes attack or resist its human enemies.

Blackstone, Sir WILLIAM: jurist and eminent commentator on law; b. in London, July 10, 1723. He was admitted to the bar in 1746, but obtained little practice. In 1758 he became Vinerian professor of law at Oxford, of which he was a graduate; in 1761 was elected to Parliament. He was appointed solicitor-general in 1763, and a justice of the court of common pleas in 1770. His principal work is *Commentaries on the Laws of England* (4 vols., 1765–69), which acquired a high reputation and is extensively used by students of law. His style is clear, ornate, and graceful, but his method is not scientific, and he was not well qualified to judge of the law from a legislator's point of view. D. Feb. 14, 1780. His *Commentaries* were severely criticised by Bentham. According to Horne Tooke, his work is "a good gentleman's law-book—clear, but not deep." See Clitheroe, *Life of Sir W. Blackstone* (1780); Foss, *The Judges of England*.

Blackstone, or **Blaxton**, WILLIAM: clergyman of the Church of England; the first white inhabitant of Boston, Mass.; settled at Shawmut, now Boston, in 1623, but left the place in 1634, not liking his Puritan neighbors. An account of Blackstone's sale of the land on which the city of Boston now stands will be found in the *Mass. Hist. Soc. Coll.*, 2d series, iv. 202. See also *The Memorial History of Boston*, vol. i., and Perry's *History of the American Episcopal Church*. D. in Rehoboth, Mass., May 26, 1675.

Blackstone River of Massachusetts: rises in Worcester County; flows southeastward into Rhode Island, and enters through Providence river into Narragansett Bay. The name Pawtucket river is given to that part of it which is below the town of Pawtucket. It affords abundant water-power, and flows through several manufacturing villages.

Blackthorn: See SLOE.

Black Tin: tin ore ready for the process of smelting.

Black Vomit: the hæmorrhagic discharge from the stomach peculiar to YELLOW FEVER (*q. v.*)

Black Wad: a name sometimes given to the native black oxide of manganese. See MANGANESE.

Black Walnut (the *Juglans nigra*): a valuable timber tree of the U. S.; belonging to the family *Juglandaceæ*; growing from Florida northward, and especially westward, being rare at present in New England. It is a handsome tree; produces a nut which, though edible, is less so than that of the European walnut, while its timber is even more valuable. The wood is employed for gunstocks, furniture, the finishing and flooring of rooms, and a great variety of purposes.

Black Warrior: a river of Alabama; formed by the junction of the Locust Fork and Mulberry Fork, which unite near the S. extremity of Walker County. It flows southwestward, and enters the Tombigbee about 2 miles above Demopolis. Its length is estimated at 175 miles. Steamboats ascend this river from its mouth to Tusealoosa. Bituminous coal is found on this river.

Black Water: See RED WATER.

Blackwell, ANTOINETTE LOUISA (*Brown*): preacher and reformer; b. in Henrietta, Monroe co., N. Y., May 20, 1825; graduated at Oberlin 1847; preached on her own orders; in 1853 became pastor of orthodox Congregational churches in Wayne co., N. Y.; became a Unitarian; champion of women's rights; married Samuel C., a brother of Dr. Elizabeth Blackwell, in 1856. Among her published books are *Shadows of our Social System* (New York, 1855); *Studies in General Science* (New York, 1869); *The Market-woman* (1871); *The Island Neighbors* (1871); *Sexes Throughout Nature* (1875); *Physical Basis of Immortality* (1876).

Blackwell, ELIZABETH, M. D.: b. in Bristol, England, 1821; the first woman who ever obtained the degree of M. D. in the U. S. She came to the U. S. with her parents in 1831, and taught school at Cincinnati from 1838 to 1847. Having studied medicine in private, she applied for admission to the medical colleges of Philadelphia, New York, and Boston, without success. She was at last admitted by a unanimous vote into the College of Geneva, N. Y., in 1847, and graduated as M. D. with honor in 1849. She afterward studied midwifery in Paris, and began to practice in New York city in 1851. In 1854, with her sister Emily, she opened the New York Infirmary for Women and Children. In 1859 she delivered a course of medical lectures in London, and in 1868 settled there in connection with the Women's Medical College. She wrote *Laws of Life* (1852); *Counsel to Parents on the Moral Education of their Children* (1879).

Blackwell's Island: in the East river; a part of New York city; has a lunatic asylum, workhouse, almshouse, penitentiary, smallpox, charity, and fever hospitals, one for incurables, one for epileptics and paralytics, and an asylum for the blind, all city institutions. The island has an area of 120 acres, and was named from a family which long owned it. At its north end is a stone lighthouse, with a fixed red light, which is 54 feet above the sea; lat. 40° 46′ 15″ N., lon. 73° 56′ 08″ W.

Blackwood, WILLIAM: Scottish publisher; b. in Edinburgh, Nov. 20, 1776; was the founder of *Blackwood's Magazine*. He began business as a bookseller in 1804, and issued the first number of his magazine in 1817. It obtained speedy success and a high reputation, to which the writings of Scott, John Wilson, and J. G. Lockhart greatly contributed. Its editors advocated the political creed of the Tories with powerful sarcasm and considerable virulence. Mr. Blackwood was chief manager of the magazine until his death, Sept. 16, 1834.—His son JOHN, b. in 1818, d. Oct. 29, 1879, succeeded him in the business.—He was succeeded by WILLIAM; b. in Lucknow, India, July 13, 1836; son of Major William Blackwood. He was educated at Edinburgh University, College de Sorbonne, Paris, and Heidelberg University. Entered the publishing business in 1857.

Bladder: a musculo-membranous sac contained in the anterior part of the pelvis, containing the urine or secretions from the kidneys. It is absent in all invertebrate animals. A few cartilaginous fishes possess it; so do *Batrachia* (frogs, etc.) and *Chelonia* (turtles). No birds have it, although the ostrich and cassowary have a dilatation of the cloaca somewhat resembling it. It is present in all mammalia. In man the bladder is nearly triangular when empty, oval when full. The ureters (one on each side) convey the urine to it from the kidneys; and this is voided, by the contraction of the bladder, through the urethra. The entrance to the latter is guarded by a valve, partly muscular, called by some anatomists the *sphincter vesicæ*. Distention of the bladder (retention of urine) from any obstruction of the urethra is a very painful and sometimes dangerous affection. It may be spasmodic, but it is more often the effect of a stricture or contraction of the passage from local disease. In low fevers it is not uncommon for a kind of paralytic distention of the bladder to occur. In either of these cases the removal of the urine by means of a catheter is of great importance. The bladder is also liable to inflammation (*cystitis*) and to chronic irritability. For stone in the bladder, see CALCULUS.

Bladder-nut: a popular name of several plants of the genus *Staphylea* and family *Sapindaceæ*. They are so called because the fruit is a bladdery, membranous, and inflated capsule, inclosing hard, bony seeds. They are shrubs or small trees with pinnate leaves, five stamens, and five

petals. The *Staphylea pinnata* is a native of Europe, and is planted as an ornamental tree in British shrubberies. Another species, the *Staphylea trifolia*, or American bladdernut, is a native of the U. S. It is a shrub about 10 feet high, having three ovate leaflets. The seed of these species is aperient, and the wood is suitable for turning.

Bladderwort: an aquatic plant of the genus *Utricularia* and family *Lentibulariaceæ*, which comprises numerous species abounding in tropical and temperate parts of both hemispheres. Their flowers adorn the surface of lakes, ponds, and stagnant or shallow waters. Seventeen species are found in the U. S. They are remarkable for a provision by which the plant, which is ordinarily submerged in water, is raised to the surface, in order that the flowers may expand in the air. The leaves and stems are furnished with little bladders or vesicles, which become filled with air at the time of flowering. The air is afterward removed, so that the plant sinks again, and ripens its seeds at the bottom. A few species which do not grow in the water have no bladders. It has been discovered recently that these bladders act as traps for minute water animals, and it appears probable that the plants are benefited by absorbing the juices of the decaying organic matter. See INSECTIVOROUS PLANTS.

Revised by CHARLES E. BESSEY.

Blagoweshtshensk, blăă-gō-ves-chensk′ (i. e. good news): the capital of the province of Amoor, in Siberia (see map of Asia, ref. 3–H). It was founded in 1858, and consists mostly of government buildings. Some trade is carried on here between the Chinese and the Russians. Pop. (1888) 20,212.

Blai'kie, WILLIAM GARDEN, D. D., LL. D., F. R. S. E.; a minister of the Free Church of Scotland; b. at Aberdeen, Feb. 5., 1820; graduated at Aberdeen; ordained in the Scotch Kirk, but came out at the Disruption in 1843 and became pastor of the Free Church at Pilrig, Edinburgh, 1844; Professor of Apologetics and Pastoral Theology, New College, in 1868; president of the meeting of the Alliance of Churches of the Presbyterian order, Toronto, 1892. Between 1849 and 1883 he was editor successively of the *Free Church Magazine*, the *North British Review*, the *Sunday Magazine*, and the *Catholic Presbyterian*. Among his best-known works are *Bible History in Connection with General History* (London, 1859; rev. ed. 1882); *Better Days for Working People* (1863, 1882); *Heads and Hands in the World of Labor* (1865); *Counsel and Cheer for the Battle of Life* (1867); *For the Work of the Ministry* (1873; 4th ed. 1885); *Personal Life of David Livingstone* (1880; 4th ed. 1884); *Public Ministry and Pastoral Methods of Our Lord* (1883); *Leaders in Modern Philanthropy* (1884); *The First Book of Samuel*; *The Second Book of Samuel*; *The Preachers of Scotland, from the Sixth to the Nineteenth Century* (1888), etc. D. in North Berwick, June 10, 1899.

Blaine: city; Whatcom co., Wash. (for location of county, see map of Washington, ref. 1–C); on Gt. Nor. R. R. and on Gulf of Georgia; 24 miles S. E. of New Westminster, British Columbia; has fishing industry, sawmills, and a canning-factory. Pop. (1890) 1,563; (1900) 1,592.

Blaine, JAMES GILLESPIE, LL. D.: statesman; b. in West Brownsville, Pa., Jan. 31, 1830; graduated at Washington College in 1847; soon after removed to Maine, where he became editor of the *Portland Advertiser*. Chosen to Congress in 1862, he immediately achieved distinction as a debater, and was five times re-elected. His position and influence in the House are indicated by the fact that he was chosen Speaker in 1869, 1871, and 1873. During all this period he exerted a powerful influence in shaping the legislation of Congress. The encouragement of railroads in the West by governmental appropriations was one of the means by which he believed the country was to be most successfully developed; and his interest in this method of internal improvement brought him into intimate relations with many of the great railroad enterprises of the time. His vigorous methods aroused many animosities. In 1876 he was charged with having received $64,000 from the Union Pacific Railway Company for legislative services rendered; but he produced letters from officers of the company declaring that he had never received a dollar from the company for any purpose whatever. He was accused of having received bonds from the Little Rock and Fort Smith R. R. as a gratuity, and that lands had been sold through the Union Pacific Railway Company for his benefit. To this he replied that all the bonds of that company he ever possessed he had bought at the market price, and had held at a pecuniary loss. He was charged with having received a certain gift of bonds of the Kansas Pacific R. R., and that he had been party to a suit concerning them in one of the courts of Kansas. To this charge he replied that his name had been confounded with that of a brother who had held stock in that railroad for many years. A resolution was adopted in the House of Representatives to authorize a committee to investigate the alleged sale of certain bonds of the Little Rock and Fort Smith R. R. to the Union Pacific. Evidently the investigation was aimed at Mr. Blaine. The committee ascertained that an extended business correspondence had for many years been carried on between Mr. Blaine and Mr. Warren Fisher, of Boston, and that a number of important letters, constituting a part of this correspondence, had fallen into the hands of a clerk by the name of Mulligan. This clerk was summoned to Washington; but on his arrival Mr. Blaine obtained possession of the letters, and on June 5, 1876, produced them in the House of Representatives. A memorable scene followed. Asserting that the letters were private, and that the House had no right to them, he held them up and exclaimed: "Thank God, I am not ashamed to show them. There is the very original package; and with some sense of humiliation, with a mortification I do not attempt to conceal, with a sense of outrage which I think any man in my position would feel, I invite the confidence of forty-four millions of my countrymen, while I read these letters from this desk." After reading the letters Mr. Blaine asked the Speaker if he had received a dispatch from Josiah Caldwell, one of the originators of the Fort Smith R. R., who was familiar with the whole transaction. The Speaker gave an answer which was considered evasive. Mr. Blaine then exclaimed: "Within my positive knowledge you received such a dispatch, completely and absolutely exonerating me from this charge, *and you have suppressed it.*" The effect of this charge was electric. Seldom in the history of the House has so tumultuous a scene been witnessed. This event occurred on June 5, 1876. On the following Sunday, just as Mr. Blaine was entering church, he was prostrated with extreme heat, and his condition for a time created serious alarm. At the National Republican Convention, held during the same week, he was earnestly supported by his friends as candidate for the presidency, and up to the eighth ballot led all other candidates. On the seventh ballot he lacked only twenty-eight votes of a majority. But at that point his opponents united, and gave the nomination to Gov. Hayes, of Ohio.

Soon after the convention, Senator Morrill, of Maine, resigned his place in the Senate to accept the secretaryship of the Treasury, and Mr. Blaine received the appointment as his successor. In the Senate his power as a debater gave him great prominence. He was an ardent supporter of the Republican policy in the South; and there, as in the House of Representatives, he advocated with great power the policy of generous appropriations for the assistance of railroads and other means of internal improvements. As the presidential convention of 1880 approached, he was once more a prominent candidate for the Republican nomination. His most formidable opponent seemed to be Gen. Grant, who was now put forward for a third term. On the first ballot Grant received 304 votes, Blaine 284. The convention continued through six days. On the thirty-sixth ballot the friends of Blaine and the other opponents of Grant united on Gen. Garfield, and gave him a majority.

On the election of Garfield, Blaine took the position of Secretary of State. It immediately became evident that his administration of this department of the Government would be characterized by two important lines of policy. He endeavored in the first place to secure and preserve peace throughout this continent. His second purpose was to extend commercial relations, and cultivate close habits of trade and intercourse between all the nations and peoples of the New World. For the accomplishment of these ends he proposed the assembling of a Universal Peace Congress at Washington. The project met with great favor. The letter of invitation, issued Nov. 29, 1881, called for a meeting on Nov. 24, 1882. But the assassination of President Garfield interrupted all plans for the meeting, and on Dec. 19 Mr. Blaine resigned his position. His successor reversed his policy after nearly all the powers had accepted the invitation, and the congress had to be abandoned.

The leisure afforded Mr. Blaine by his retirement from the cabinet gave him opportunity for literary work. He now entered upon an elaborate historical composition, which

was published in two volumes in 1884 and 1886, under the title *Twenty Years of Congress*. The work was brilliantly written and had a wide sale. As the time of the National Republican Convention of 1884 approached it became evident that he would once more be a popular and powerful candidate. On the first ballot he received 334½ votes, only about 70 less than a majority. On the fourth vote he received 541 out of 813. But the canvass that followed was one of peculiar bitterness. The "Mulligan letters" played a conspicuous part in the campaign. Mr. Blaine entered personally into the canvass, speaking in Ohio, Indiana, and New York. The result depended upon the vote in New York, and New York voted for Mr. Cleveland by a majority of 1,047. In 1888 Mr. Blaine declined to be a candidate for the presidency and took no active part in the campaign, but on the election of President Harrison he once more became Secretary of State. He now had the opportunity of developing the policy he had advocated in the first months of the presidency of Garfield. He pursued a vigorous policy in regard to the "Fisheries Question," and also to the protection of the sealing industry off the coast of Alaska. (See Bering Sea Controversy.) In accordance with his former purpose, he brought about a congress at Washington of all the American powers, for the purpose of encouraging a more friendly commercial intercourse. But the most important of his measures was his advocacy of the doctrine of commercial reciprocity. When the McKinley Tariff Bill was before Congress, Mr. Blaine took the ground that, although he was earnestly in favor of fostering the industries of the U. S. by means of a protective tariff, yet he believed the interests of those industries would be best subserved by a policy of reciprocity, by which it should be in the power of the Government to admit free of duty staple goods of those nations which made equivalent concessions in imposts upon the products of the U. S. In consequence of Mr. Blaine's advocacy a provision was adopted in the McKinley Tariff Bill authorizing the President, under certain restricted conditions, to waive the operations of the protective measures of the statute. (See Reciprocity.) Mr. Blaine's administration of the affairs of state increased his popularity to such an extent that in 1890 and 1891 it seemed certain that he would be nominated by the Republican party in 1892. In the autumn of 1891, however, he published a letter positively withdrawing his name from consideration. Whether this withdrawal was due to a sense of loyalty to President Harrison, or whether it was owing to the precarious state of Mr. Blaine's health, was the subject of much speculation during the winter and spring before the convention of June, 1892. On June 3 he unexpectedly resigned, in order, it was alleged, that he might be free to accept the presidential nomination if offered to him, as his friends confidently expected it would be. Unquestionably he could have received the nomination if he had not positively declined to be a candidate. His subsequent resignation subjected him to the charge of finesse and insincerity. The nomination, after a short contest, was given to President Harrison. During the summer Mr. Blaine's health was precarious, and he abstained from active participation in the political canvass. It was popularly supposed that his relations with President Harrison were not friendly; but this supposition seems to have had very little foundation. At the end of the summer he returned from his summer home in Maine to Washington, where, after many weeks of severe illness, he died on Jan. 27, 1893.

Mr. Blaine throughout his political career was remarkable for the personal charm of his manners, the breadth and readiness of his knowledge, and the magnetic fascination which he exercised over those with whom he was associated.

C. K. Adams.

Blainville, blăn'veel', Henri Marie Ducrotay, de, M. D., F. R. S.: French zoölogist and anatomist; b. at Arques, near Dieppe, Sept. 12, 1777. He studied comparative anatomy under Cuvier, who employed him as his assistant; in 1808 received the degree of doctor of medicine; was appointed Professor of Anatomy and Zoölogy in the Faculty of Sciences of Paris in 1812; admitted into the Institute in 1825. In 1832 he succeeded Cuvier as Professor of Comparative Anatomy in the Museum of Natural History. He acquired a high reputation as a teacher and writer. Among his works are *Lectures on General and Comparative Physiology* and *Osteography, or a Comparative Iconographic Description of the Skeleton and Dentary System of the Five Classes of Vertebrated Animals* (unfinished). D. May 1, 1850.

Blair: city and railroad junction: capital of Washington co., Neb. (for location of county, see map of Nebraska, ref. 10–H): about 25 miles N. of Omaha: in a beef, pork, and grain raising district. Pop. (1890) 2,069; (1900) 2,970.

Blair, Andrew George: See the Appendix.

Blair, Francis Preston, Jr.: lawyer; b. at Lexington, Ky., Feb. 19, 1821. He graduated at Princeton in 1841; was elected a member of Congress by the Free-soil Party of St. Louis, Mo., in 1856, after which he acted and voted with the Republicans for several years. He joined the Union army in 1861, and obtained the rank of major-general. In 1864 he commanded a corps of Sherman's army in the campaign which resulted in the capture of Atlanta. Having joined the Democratic party, he was selected as a candidate for the vice-presidency by the convention which nominated Horatio Seymour for the presidency in 1868. He was chosen a U. S. Senator for Missouri in Jan., 1871. D. at St. Louis, Mo., July 8, 1875.

Blair, Hugh, D. D.; Scottish divine; b. in Edinburgh, Apr. 7, 1718; licensed as a minister of the Church of Scotland in 1741. In 1743 he became one of the ministers of the Canongate church, Edinburgh, and in 1758 was transferred to the High church of Edinburgh. His sermons were admired for their polished style, but were not remarkable for originality or profoundness. In 1760 he was appointed Professor of Rhetoric and Belles-Lettres in the University of Edinburgh (regius professor 1762). He published five volumes of sermons (1777–1800), which were once very popular, but their reputation has declined. His *Lectures on Rhetoric* were published in London 1783 (2 vols.), on his retirement from his professorship, and were used in many schools. D. in Edinburgh, Dec. 27, 1800. See his *Life* by James Finlayson (1801).

Blair, James, D. D.: b. in Scotland, probably in Edinburgh, 1656; entered the Anglican ministry; removed to America in 1685; in 1689 became commissary of the Bishop of London for Virginia and Maryland; was founder and first president of William and Mary College (charter granted Feb. 14, 1692, but he did not enter formally on his duties as president till 1729), and rector of Williamsburg, holding all these and other important offices till his death, in Williamsburg, Va., Aug. 1, 1743. Another account gives the date of the commissary's death as Apr. 18. Besides other works, he published a commentary on the *Sermon on the Mount* (4 vols., 1722), highly commended by Waterland, Doddridge, and Bickersteth. A second edition was issued in 1732.

Blair, John: jurist; b. at Williamsburg, Va., in 1732. He graduated at William and Mary College, and studied law in London. Having previously filled several high offices, he was appointed by Washington judge of the Supreme Court of the U. S. (1789); resigned in 1796. D. Aug. 31, 1800.

Blair, John Insley: See the Appendix.

Blair, Montgomery: lawyer and politician; b. in Franklin co., Ky., May 10, 1813; graduated at West Point in 1835, serving in artillery in Florida war till he resigned, May 20, 1836; counselor-at-law in St. Louis, and U. S. attorney for the district of Missouri 1839–43; judge of the St. Louis court of common pleas 1843–49; solicitor of the U. S. in the court of claims 1855–58; counselor-at-law in Montgomery co., Md., 1853–61, and since 1863, being counsel for plaintiff in the famous Dred Scott case; president of the Republican committee of Maryland 1860; and Postmaster-General of the U. S. 1861–64. D. in Silver Spring, Md., near Washington, D. C., July 26, 1883.

Blair, Robert: Scottish poet; b. in Edinburgh, 1699: a relative of Hugh Blair. He was ordained minister of Athelstaneford in 1731. He wrote a poem of undoubted merit, entitled *The Grave*, which was not printed until after his death. D. in Athelstaneford, Feb. 4, 1746.

Blairsville: borough and railroad junction; Indiana co., Pa. (for location of county, see map of Pennsylvania, ref. 5–C); on the Conemaugh river, 56 miles E. of Pittsburg. Grain, pork, lumber, and coal in great quantities are shipped here. Pop. (1880) 1,162; (1890) 3,126; (1900) 3,386.

Blake, Edward, LL. D.: Canadian statesman; b. in township of Adelaide, Middlesex, Ont., Oct. 13, 1833. He was educated at Upper Canada College and University of Toronto, where he took first-class honors in classics, and received the degree of M. A. in 1858. He was admitted to the bar in 1856; appointed queen's counsel in 1864; was for a short time an examiner and lecturer on equity law for the Upper Canada Law Society. He was elected for South Bruce, in the Liberal

interest, for the Ontario Legislative Assembly in 1868; was leader of the opposition in that body from 1867 till 1871, when he became Premier of Ontario; resigned that office and his seat in the Assembly in 1872. He was a member of the Mackenzie cabinet 1873–74; Minister of Justice 1875–77; and president of the Council 1877–78, all of which portfolios he resigned before the expiry of his term of office. He was elected leader of the Liberal party in 1880; represented South Bruce and West Durham in the Dominion Parliament; and in July, 1892, was elected to represent South Longford, Ireland, in the British Parliament. He was elected chancellor of Toronto University in 1876. His father, the late Hon. William Hume Blake, jurist, was solicitor-general of Upper Canada, and subsequently chancellor of that province.

NEIL MACDONALD.

Blake, ELI WHITNEY, LL. D.: manufacturer and inventor; b. in Westboro, Mass., Jan. 27, 1795; graduated at Yale in 1816; became associated with his uncle, Eli Whitney, in the manufacture of arms on the plan of machine-made and interchangeable parts, which revolutionized the art of manufacturing complex constructions. (See ELI WHITNEY.) Established a pioneer factory of domestic hardware near New Haven, Conn., 1834, and introduced many of those improvements in metallic house-furnishings which have given to American hardware its acknowledged superiority; invented (1857) the "Blake crusher," his most important invention, now in general use throughout the world. In this machine for reducing stone and ores to small fragments, he devised a new mechanical principle, that of crushing between upright convergent jaws, having a short and quick vibration. The machine may be said to have introduced a new era in road-making and mining industries. Mr. Blake was the author of numerous scientific papers. Received the degree of LL. D. from Yale in 1879. D. at New Haven, Conn., Aug. 17, 1886.

C. H. THURBER.

Blake, GEORGE SMITH: commodore, U. S. navy; b. in Worcester, Mass., in 1803. He served in the Mexican war. Was superintendent of the U. S. Naval Academy at Annapolis and at Newport, R. I., from 1857 to 1865. D. in Longwood, near Boston, June 24, 1877.

Blake, ROBERT: b. in Bridgewater, Somersetshire, England, in 1599; elected to Parliament in 1640; when the civil war began in 1642 raised a troop with which he fought against the royalists. He gained distinction by his defense of Taunton in 1645. In 1649 he was appointed "general of the sea." He destroyed or captured nearly all of Prince Rupert's fleet in the Tagus in 1651. In 1652 he became chief admiral, and in May of that year gained a victory over Van Tromp, who attacked Blake in the ensuing November near Goodwin Sands. Blake was defeated, but in Feb., 1653, he attacked Van Tromp and gained a victory in a running fight of three days. In 1654 he chastised the Dey of Tunis. He destroyed the Spanish plate-fleet at Santa Cruz in 1657. D. at Plymouth, Aug. 17, 1657.

Blake, WILLIAM: poet and artist; b. in London, England, Nov. 28, 1757. In 1783 appeared *Poetical Sketches by W. B.* This was printed and published in the ordinary way, and was without illustrations. In 1789 came *Songs of Innocence*; in 1793 *The Gates of Paradise*; in 1794 *Songs of Experience*; and later several volumes of poetic rhapsody. All these were published by the author, and all were illustrated. Both text and illustrations were engraved, and when printed off Blake tinted both text and border in a style of his own, making each page a picture. Much of his loveliest and sublimest work is in these illustrations. But he produced so much that a mere list of his engravings, water-colors, and drawings in distemper would fill a page of this work. He is best known to the public by his *Canterbury Pilgrims*, his *Inventions to the Book of Job*, and his designs to Blair's *Grave*. D. in London, Aug. 12, 1827. *Life* by Alexander Gilchrist; Cunningham's *Lives*; *William Blake*, by A. C. Swinburne. *The Poetical Sketches* and *The Songs of Innocence and Experience* were reprinted in 1874. *The Inventions to the Book of Job* have been reproduced by heliotypy by James Osgood (Boston, Mass.).

Blake, WILLIAM PHIPPS, A. M., Ph. B.: b. in New York city, June 1, 1826; graduated at the Sheffield Scientific School, New Haven, Conn., in 1852. In 1853 he was mineralogist and geologist for the U. S. Pacific R. R. exploring expedition in California, in connection with which he wrote several reports; was editor of the *Mining Magazine* 1859–60; he was, 1861–63, mining engineer for the Japanese Government, and with his associate, Mr. Raphael Pumpelly, organized the first school of science in Japan under the auspices of the Japanese Government. Returning to America by the way of China, the Aleutian islands, and Sitka, he accompanied a Russian expedition up the Stickeen river, and described a series of glaciers not before known. In 1863 he engaged in explorations in California and Nevada; became Professor of Mineralogy, Geology, etc., in the College of California, and geologist to the State board of agriculture; in 1867 was commissioner of California to the Paris Exposition; removed in 1867 to New Haven, Conn.; was chosen executive commissioner of the Centennial Commission, and in 1873 went as special agent to the Vienna Exhibition; made a series of reports to the U. S. commission for the Centennial Exhibition; was the chairman of the committee on classification and member of the special committee for the selection of judges. He was also appointed by the Smithsonian Institution director of the U. S. mineral collection in 1876. In 1878 he attended the Paris Universal Exposition as commissioner of the U. S., as secretary of the additional commissioners, and as one of the jurors, receiving from the French Government the cross of the Legion of Honor. He also co-operated in the exhibition of 1889 by securing an official and representative series of minerals and ores from the U. S. He was called to Chicago to advise in regard to the system of classification for the Columbian Exposition, and drafted the grouping which was adopted by the commission. He has been actively engaged in the exploration of the chief mining regions of the U. S., and is the author of numerous professional reports and opinions, and of papers of general scientific and practical interest, which may be found in the pages of the *American Journal of Science* and in the *Transactions of the American Institute of Mining Engineers*. He is the inventor of an automatic roasting furnace, which has been successfully applied in metallurgical operations. Among his published works are *Silver Ores and Silver Mines* (1861); *California Minerals* (1863); *Production of the Precious Metals* (1867); *Iron and Steel* (1873); *Ceramic Art and Glass* (1878); *History of the Town of Hamden, Conn.*; *Life of Captain Jonathan Mix*, etc.

C. K. ADAMS.

Blake, WILLIAM RUFUS: b. at Halifax, Nova Scotia, in 1805; studied medicine, but in 1825 (after playing some time in the theater at Halifax) he appeared at the old Chatham Street theater, New York. He soon attained the first rank as a comedian, excelling particularly in eccentric characters. D. in Boston, Apr. 22, 1863.

Blake'ley, JOHNSTON: naval officer; b. near Seaford, County Down, Ireland, Oct., 1781. He removed with his parents to the U. S.; graduated at the University of North Carolina in 1800; entered the U. S. navy Feb. 5, 1800, and obtained command of the sloop Wasp in 1813. In June, 1814, he captured the British sloop-of-war Reindeer, and in the ensuing September defeated and sunk the sloop Avon. The Wasp never returned to port, and the fate of Capt. Blakeley and his crew was never ascertained.

Blakelock, RALPH ALBERT: landscape-painter; b. in New York, Oct. 15, 1847. His father was a physician and he was destined for the same profession, but his strong taste for music and the arts induced him to take up painting, and he began without instruction from a master. His work is notable for its general aspect, which is striking on account of strong color-schemes which he sometimes succeeds in harmonizing with considerable truth to nature's forms. Studio in New York.

WILLIAM A. COFFIN.

Blakes'ley, JOSEPH WILLIAMS, D. D.: Dean of Lincoln; b. in London, Mar. 6, 1808; graduated at Trinity College, Cambridge, 1831; fellow of Trinity College 1831–45; select preacher 1840–43; Canon of Canterbury 1863; member of the New Testament Company of the Bible Revision Committee 1870; Dean of Lincoln 1872. Author of *Thoughts on the Recommendations of the Ecclesiastical Commission* (1837); *Life of Aristotle* (1839); *Conciones academicæ* (1843); *Four Months in Algeria* (1859); and edited *Herodotus* in 2 vols. (1852–54). D. at Lincoln, Apr. 18, 1885.

Blanc, blăṅk, AUGUSTE ALEXANDRE PHILIPPE CHARLES: critic of the fine arts; b. at Castres, France, Nov. 15, 1813. He was a brother of Louis Blanc. Besides many valuable contributions on subjects connected with the fine arts to various French journals, and the text of several important books of art illustration, he was the most important contributor to the *History of the Painters of all the Schools*, a very complete and extensive work begun in 1849 by Armen-

gand, and continued till its completion in 1859, under the editorship of Blanc, with the assistance of able writers, such as Delaborde, Mantz, Silvestre, and P. Chasles. Blanc was twice director of fine arts in France—once in 1848, when he replaced M. Garraud, and again in 1871. D. in Paris, Jan. 18, 1882. Revised by Russell Sturgis.

Blanc, Jean Joseph Louis: a French historian and radical; b. in Madrid, Oct. 28, 1813; educated in France. He founded in Paris in 1839 the *Revue du Progrès*, which advocated social and political reform. In 1840 he published an able work on the *Organization of Labor*. His next important work was a *History of Ten Years—1830–40*, which had a very damaging influence on the popularity of Louis Philippe. He was a member of the provisional government formed in Feb., 1848, and was very popular with the socialists and workingmen of Paris, who revolted and were defeated in June, 1848. He then went into exile, and resided in England for many years. Early in 1871 he was elected to the National Assembly by the voters of Paris. Among his works is a *History of the French Revolution* (12 vols. 8vo, 1847–62), the style of which is eloquent and dignified. D. at Cannes, Dec. 6, 1882.

Blanc, Paul Joseph: genre-painter; b. in Paris, Jan. 25, 1846; pupil of Bin and Cabanel; Grand Prix de Rome 1867; first-class medal, Paris Salon, 1872; Legion of Honor 1878; first-class medal, Paris Exposition, 1889. One of his most celebrated works is a decorative composition depicting the consecration, baptism, and triumph of Clovis.

Blanchard, Albert G.: See the Appendix.

Blanchard, blaăn'shaar', François: French aëronaut; b. in Andeleys in 1753; noted for his mechanical ingenuity. He constructed a balloon with wings and a rudder, with which he ascended in Mar., 1784. In 1785 he crossed the Channel in this balloon and landed in England, for which exploit the King of France gave him a pension. He made many other ascents. D. Mar. 7, 1809. His wife, who had been his companion in several aërial voyages, was killed in consequence of the burning of her balloon in 1819.

Blanche of Castile: Queen of France; daughter of Alphonso IX. of Castile; b. in 1187. She was married in 1200 to the dauphin of France, who became King Louis VIII., and she acquired much influence in affairs of state. When Louis died in 1226, she became regent of the kingdom, which she governed with ability during the minority of her son, St. Louis. She was eminent for virtue and wisdom. D. Dec. 1, 1252. See Macheco, *Vie de Blanche de Castile* (1820); T. Nisard, *Histoire de la Reine Blanche* (1842).

Blanching [from Fr. *blanche*, white]: a process by which gardeners arrest the progress of secretions in the leaves of plants, in order to render them more wholesome and palpable as food. Celery, sea-kale, and other plants are usually blanched by the exclusion of light from them, which deprives them of their natural green color and of certain bitter properties. The blanching is effected in various modes, as heaping up the earth against the growing plants, or covering them with boxes or blanching-pots made of earthenware and perforated with many holes.

Bland, Richard Parks: Congressman; b. near Hartford, Ky., Aug. 19, 1835. By working during the summer and attending school in winter he finished his academic education; studied law; moved West, and in 1860 became treasurer of Carson co., Nev.; returned to Missouri in 1865 and settled at Rolla; elected to Congress as a Democrat in 1873, and was regularly returned till the time of his death. In 1875 he became chairman of the committee on mines and mining. Silver coinage having been discontinued in 1873, he introduced into Congress in 1878 the famous "Bland Bill," providing that the Secretary of the Treasury should purchase sufficient bullion to coin the minimum amount of $2,000,000 a month in silver dollars of 412½ grains each, and that these dollars should be legal tender. He was an active champion of the free coinage of silver. D. in Lebanon, Mo., June 15, 1899.

Bland, Col. Theodoric, M. D.: b. in Prince George co., Va., in 1742; was an uncle of John Randolph, of Roanoke; studied medicine in Edinburgh, Scotland; opposed Gov. Dunmore under the pen-name of *Cassius*. He entered the army in 1777, and gained the confidence of Washington, who employed him in several important affairs. In 1780 he was elected a member of Congress, in which he remained till 1783, and was again chosen a member of that body in 1789. D. in New York, June 1, 1790. The *Bland Papers* were collected and published by Charles Campbell (Petersburg, 1840).

Bland, Theodoric: b. in 1777; was for twenty-two years chancellor of Maryland. He commenced his judicial life as judge of the county court of Baltimore, and afterward became judge of the U. S. district court of Maryland; published *Reports of Cases Decided in the High Court of Chancery, Maryland*. D. in Annapolis, Md., Nov. 16, 1846.

Blane, Sir Gilbert, F. R. S.: physician; b. in Blanefield, Ayrshire, Aug. 24, 1749. He became private physician to Lord Rodney, who took command of the fleet in the West Indies in 1780. Dr. Blane served as chief physician to that fleet during the war, and published in 1783 *Observations on the Diseases of Seamen*. He was physician to St. Thomas's Hospital, London, from 1785 to 1795, and became first physician to William IV. in 1830. Among his works is *Elements of Medical Logic* (1819). D. in London, June 26, 1834.

Blank Verse: the heroic verse of five iambic feet without rhymes. Blank verse is peculiar to the Italian, English, and German languages, having been imported into the two latter from the first. In Italian the line is of eleven syllables, and is used invariably in the drama, and frequently in serious poetry, epic or didactic. In England it was first adopted by the Earl of Surrey in his translation of the fourth book of the *Æneid* (1547); first applied to dramatic uses by Lord Buckhurst in his tragedy of *Gorboduc* (1561); popularized by Christopher Marlowe in his tragedy of *Tamburlaine* (1585). It has since been the accepted meter of English dramatic and heroic verse. The Miltonic verse is constructed with closer attention to the melody of the cadence and cæsura than the dramatic; it admits also less frequently of the eleventh syllable, which in English poetry must be regarded as a sort of license; while Shakspeare and other dramatists occasionally double the short syllable at the end, and thus extend the number to twelve. Blank verse fell into comparative disuse in England after the Restoration (1660), and was revived by John Philips in his *Splendid Shilling* (1703) and *Cider* (1706), and by James Thomson in his *Seasons* (1726–30). Among the most successful of modern writers of blank verse are Bryant in *Thanatopsis*; Tennyson in his *Idyls of the King*, *Ulysses*, and *Tithonus*; and Aldrich in *Wyndham Towers*.

Henry A. Beers.

Blanqui, blaăn'kee', Jérôme Adolphe: French political economist; b. at Nice, Nov. 20, 1798. He became in 1833 Professor of Economy in the Conservatory of Arts and Trades in Paris. He advocated free trade. Among his works are a *Summary of the History of Commerce and Industry* (1826) and a *History of Political Economy in Europe from the Ancients to the Present Time* (2 vols., 1837–38), which is highly esteemed. D. in Paris, Jan. 28, 1854.

Blanqui, Louis Auguste: communist: a younger brother of the preceding; b. in Paris, Feb. 7, 1805. He was a member of the Society of Political and Moral Sciences. He studied for the law; affiliated with the rabid members of French revolutionary societies; underwent his first imprisonment at the age of twenty-one. A year later he took part in the insurrection of Rue St.-Denis, receiving his first wound. In the revolution of 1830 he took up arms against Charles X.; was again wounded; received the decoration of July; became an active member of the Society of Friends of the People; tried for participating in the "conspiracy of the Nineteen," and incarcerated for a year; accused in 1835 of a conspiracy to manufacture gunpowder for revolutionary uses; sentenced to imprisonment for two years and to pay a fine of 3,000 francs, but was amnestied in 1837. The insurrection of the Montagnards, with Blanqui and Barbes at their head, followed, and upon its prompt suppression Blanqui was condemned to death. The sentence was, however, commuted to perpetual imprisonment. The revolution of 1848 set him free, and he immediately organized the Central Republican Society, productive of the great popular agitation resulting in the three days' insurrection and an attempt to dissolve the National Assembly, May 15, 1848. Blanqui was sentenced to ten years' imprisonment at Belle Isle. At the age of fifty-three he returned to France, but in less than a month he was in exile again. He ventured back to Paris, and his incarceration followed; upon his release was conveyed to the frontier. Again he was an exile for a period of eight years. In 1870 Blanqui was once more in Paris, the editor of a journal whose influence

culminated in the Commune. He was captured by the Versaillists; the communists offered in exchange for him the Archbishop of Paris, but he was considered too dangerous a man to be released. He was sentenced to transportation for life to New Caledonia, but in consideration of his old age and his feeble health he was imprisoned at Clairvaux instead. In 1880, while still a prisoner, Blanqui was returned to the Chamber of Deputies by the radical Republicans of Bordeaux, but the chamber refused to ratify this election. He was soon afterward released, and lived in seclusion till his death, which occurred in Paris, Jan. 1, 1881.

Blantyre, blăn't'r: a mission station in East Africa; in the valley of the Shire river, S. of Lake Nyassa, and about 10 miles S. W. of Lake Shirwa; lat. 16° S., lon. 35° E (approximate). It was founded in 1876 under the auspices of the Established Church of Scotland, and has become a center for British colonization and trade, though it is close to the boundary of Portuguese East Africa. It is named after Blantyre, in Lanarkshire, Scotland, the birthplace of David Livingstone.

Blar'ney: a village and castle of Ireland; in Munster; on a rivulet of its own name; 4 miles N. W. of Cork, and surrounded by beautiful scenery. The castle and groves of Blarney are celebrated in song. The castle, which once belonged to the Earls of Clancarty, stands on a steep rock, at the base of which is a deep valley. Among the relics of this ruined castle is the famous "Blarney stone," which, according to the popular opinion, imparts to those who kiss it a peculiar style of eloquence, or great skill in the use of complimentary speech.

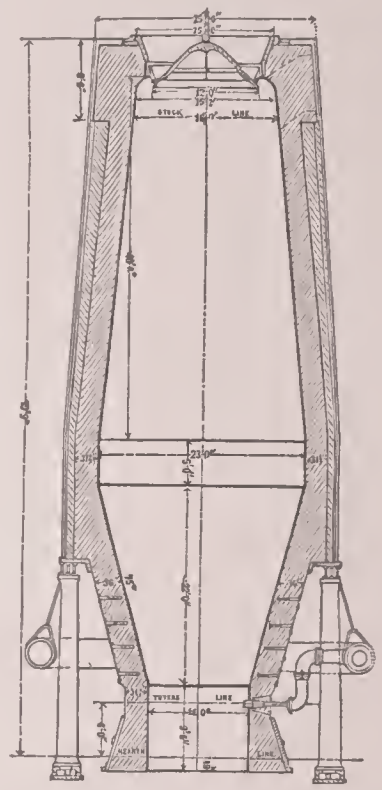
Blash'field, Edwin Howland: genre, historical, and portrait painter; b. in New York, Dec. 15, 1848; pupil of Léon Bonnat, Paris; National Academician; member of the Society of American Artists (1882); of the American Water-color Society and the Architectural League, New York; third-class medal, Paris Exposition, 1889. He has done excellent work in decorative painting, and is well known as an illustrator and writer of descriptive articles for *Scribner's* and other magazines. His works, such as *The Emperor Commodus Leaving the Amphitheater at the Head of the Gladiators* (1878) and *Roman Ladies—a Lesson in the Gladiators' School* (1879), are scholarly and well painted. His color-schemes are harmonious, and his work in general is remarkable for good drawing and pleasing arrangement. He spent eleven years in Paris, from 1867 to 1878, and passed three years in Paris and Italy (1889–92), when he painted, among other works, a large composition called *Christmas Bells*. Studio in New York. William A. Coffin.

Blasphemy [viâ Fr. and Lat. from Gr. βλασφημία, slander. *Blaspheme* and *blame* are doublets, the former representing the learned, the latter the popular, adoption into French of Lat. *blasphema're*]: an indignity offered to the Deity or to religion. According to Blackstone, it is denying the being and providence of God, contumelious reproaches of our Saviour Christ, and profane scoffing at the Holy Scriptures, or exposing it to contempt and ridicule. It has been otherwise defined to be the act of wantonly uttering or publishing words casting contumelious reproach or profane ridicule upon God, Jesus Christ, the Holy Ghost, the Holy Scriptures, or the Christian religion. If the words were written or printed, there might be a case of blasphemous libel. If oral, the case would be one simply of blasphemy. The law does not brand as a crime serious discussion or the promulgation in a temperate manner of opinions opposed to Christianity. Blasphemy is an offense punishable as a misdemeanor at common law. In many of the States the crime is punishable by statute.

Christianity is declared by the courts to be a part of the common law, which recognizes that the good morals and orderly conduct of the community are closely connected with a respect for religion, and that insults to the Author of Christianity and malicious attacks on his religion tend to the dissolution of civil government.

Blass, blaas, Friedrich Wilhelm: Greek scholar; b. in Osnabrück, Jan. 22, 1843; professor at the University of Kiel; called to Halle in 1892; author of *Die Geschichte der attischen Beredsamkeit* (3 vols.); *Die Aussprache des Griechischen* (Eng. trans. by W. J. Purton, 1890); *Criticism, Hermeneutics, and Palæography* (in J. Müller's *Handbuch d. class. Alterth.* (vol. i. 2); editor of *Antiphon, Andocides, Hypereides, Demosthenes*, Aristotle's Πολιτεία 'Αθηναίων, and some of the *Lives* of Plutarch. Alfred Gudeman.

Blast Furnace (Germ. *Hochofen*; Fr. *haut fourneau*): In its primary signification the term blast furnace implies an elevated shaft lined with a refractory material, designed for the reduction of metals from their ores. The shaft is open at the top, where the ore, fuel, and fluxes are charged, and supplied with a blast of air near the bottom, where openings are provided for removing the metal and cinder. In its essential details a blast furnace consists of a stack in whole or in part of masonry, surrounding a vertical chamber or shaft of circular section. The diameter of the shaft usually increases from the top downward and from the bottom upward. The lower part of the furnace is called the *hearth*, and has the smallest diameter. At its upper part are one or more openings through which the blast of air is introduced, and in the lower part, or *crucible*, the molten iron and cinder collect. The hearth is prolonged toward the front of the furnace, and is closed by the *dam*, and covered in on top by the *tymp-arch*. The dam is formed of firebrick or other refractory material. It slopes inward toward the interior of the furnace, and has its outer vertical face covered with a cast-iron plate, called the *dam-plate*. At the bottom of the dam is a channel communicating with the interior of the furnace, through which the molten iron is tapped off, and on its upper edge is a notch, called the *cinder-notch*, over which the cinder flows. The tymp-arch is covered by the *tymp*, a long, hollow casting, through which water constantly circulates. The blast is supplied through *tuyeres*, from one to eight in number, which are set into the masonry of the furnace. They are hollow truncated cones, supplied with a constant current of water to prevent the bronze or iron of which they are composed from melting. Into these *water-tuyeres* are fitted the *nozzles* of blast-pipes, which are connected with the *blast main* which encircles the furnace. The sloping walls connecting the hearth with the widest part of the furnace are called the *boshes*. This term is very generally, though incorrectly, used to express the greatest diameter of the furnace. In many cases there is no sharp line of demarkation between the hearth and the boshes, the former being simply a continuation of the curved walls of the boshes.



Edgar Thomson furnace "F," 1886.

In constructing a blast furnace, the upper portion is built on iron pillars, and is entirely independent of the boshes and hearth, which can be removed and reconstructed without interfering with the body of the stack. The top or *mouth* of the furnace, where the materials are charged, is provided with an arrangement which closes the furnace except during charging, when it is opened by some simple mechanism. The gases of the furnace, which were formerly allowed to escape and burn at the mouth, are now almost universally utilized. This is effected by making openings in the walls near the top of the furnace, and conducting the gases by suitable channels to the boilers and hot-blast stoves, where they are burned.

The essential accessories of a blast furnace are the blowing-engine, hot-blast stoves, and hoist. There are three varieties of blast-engines in use: the vertical-beam engine, the horizontal, and the upright. The latter have the steam cylinder either directly above or below the blast cylinder. They are rapidly gaining in favor, owing to their compactness and efficiency. The blast, on leaving the blowing cylinder, passes to the hot-blast stoves. These consist of a series of cast-iron pipes, through which the blast passes, heated on the outside by the combustion of the gases of the furnace. The gases are usually burnt in a combustion chamber under the chamber containing the pipes. In this way the heat is more uniformly distributed, and there is less danger of the pipes being injured by the heat. Re-

cently Siemens's system of regenerative heating in many different forms is generally superseding the cast-iron pipe stoves. In this system the gases are burned in a chamber, and the products of combustion pass through a network of firebrick, which becomes intensely heated. The gases are then caused, by means of valves, to pass into a second stove like the first, and burned as before, while the blast is conducted through the first stove. The blast and gases are made to alternate in this way at regular intervals. The temperature of the blast as it enters the furnace varies within wide limits. There are very few furnaces at the present day driven with cold blast, the temperature employed varying from 800° to 1,500° F. With the firebrick stove above mentioned a temperature of from 1,500° to 1,600° F. has been attained. The blast on leaving the stoves passes through the main to the furnace, and is there distributed to the tuyeres. The pressure employed varies with the kind of fuel used. Charcoal furnaces usually are blown with ½ to 1½ lb., though sometimes as high as 4 lb. are used. Coke furnaces are blown with 6 to 10 lb., while anthracite furnaces require 7 to 10 lb.

Hoists or lifts serve to raise the ore, fuel, etc., from the ground to the level of the mouth of the furnace, where they are charged. There are many varieties, as the pneumatic, hydraulic, and steam hoist.

The illustration shows a section of a modern furnace at Pittsburg. Its height is 79′ 9″; greatest diameter, 23 feet; yield, 3,000 tons iron per week. The gases are taken off at the top of the furnace, and descend by a vertical flue, then by an underground channel to the boilers and hot-blast stoves. The contrivance for closing the mouth of the furnace is known as the cup and cone, or bell and hopper. This arrangement is one of the simplest, and the one most generally adopted.

The blast furnace of the present day is an outgrowth of the small primitive furnaces still to be met with in Eastern countries for reducing iron ores. It differs from them, however, in three essential particulars. The low furnaces produce an unmelted mass of soft iron, and a cinder rich in oxide of iron, and the process is intermittent. A blast furnace produces a compound of iron and other substances, principally carbon, which is fluid at the temperature of the furnace; the cinder is composed of earthy ingredients, and is almost entirely free from iron, and the process is continuous.

The history of the development of blast-furnace construction for the last half century is almost entirely a record of increasing dimensions, both in height and diameter, having for a consequence greater yield, and, within certain limits, greater economy of fuel. During the past decade progress in blast-furnace practice has developed in the direction of faster work, closer watchfulness of details, and more careful study, chemically, of stock and of product. The flat boshes of the older furnaces and the rapid narrowing upward toward the mouth have been generally replaced by steeper boshes and wider mouths. There have been, however, no universally accepted principles of blast-furnace construction developed, as far as regards the interior outline. The Cleveland district of England affords a striking instance of the growth of furnaces in height and capacity. Furnaces were built

In 1851,	42	feet	high,	15	feet	diameter,	capacity	4,566	cubic	feet.
" 1861,	62	"	"	20	"	"	"	12,778	"	"
" 1870,	90	"	"	30	"	"	"	41,149	"	"

Since then a reaction has taken place against an increase in the dimensions, and furnaces 75 to 85 feet high are now the standard.

The Blast-furnace Process.—The charge introduced into the mouth of a blast furnace consists of iron ore, which varies greatly in richness and purity in different regions; fuel, either anthracite, raw bituminous coal, coke, or charcoal, and, ordinarily, limestone, the latter serving to unite with the earthy matters of the ore and form a fluid slag or cinder. The action of the furnace, expressed in its simplest form, is as follows: Air is blown through the tuyeres, and comes in contact with incandescent fuel. The oxygen of the air is speedily converted into carbonic oxide gas, which, together with the nitrogen of the air, rises through the descending charge. The reaction of the carbonic oxide and oxide of iron of the ore results in the formation of metallic iron and carbonic acid gas; the latter, ascending, escapes at the mouth of the furnace, while the former descends to the hottest part of the furnace, where it melts and drops into the hearth. The earthy matters of the charge fuse likewise, and collect in the hearth, floating on top of the molten iron. At regular intervals the slag and iron are tapped off: the former is thrown away, and the latter is cast in molds of sand or iron, and forms "pigs," or is conveyed in large ladle cars, in a fluid state, to adjoining steel-works. Although this simple statement of the blast-furnace process is correct as far as the end result is concerned, yet the reactions which occur in the furnace are, in reality, very complex and dependent on many conditions. The reducibility of different varieties of ore is very dissimilar: while some varieties require a high temperature and long exposure to an atmosphere rich in carbonic oxide gas, other varieties yield up their oxygen at a comparatively low temperature and short exposure to an atmosphere relatively poor in carbonic oxide. According to Sir Lowthian Bell, a gaseous mixture of 40 to 45 volumes of carbonic acid to 100 of carbonic oxide fails to exert any appreciable effect on Cleveland ironstone at a temperature of melting zinc (782° F.), but the same mixture possesses decided reducing power at a red heat. Again, some ores are rapidly reduced with the above gaseous mixture at a temperature at which Cleveland ironstone is unaffected.

The reduction of iron ores, or the removal of the oxygen of the oxide of iron, does not simply consist in the abstraction of oxygen by carbonic oxide. The investigations of Bell prove that reaction of carbonic oxide and oxide of iron is a very complex one. The first effect is the formation of some carbonic acid and some metallic iron. The further action of carbonic oxide on the metallic iron thus formed causes the carbonic oxide to break up into carbonic acid and carbon, the latter being deposited in the form of a black powder on the reduced metal. This combined process of reduction and carbon deposition continues until the iron is nearly all in the metallic state; but absolute reduction is never attained by the action of the carbonic oxide alone. As this product, composed of iron and carbon and some oxide of iron, descends into the hotter regions of the furnace, the carbon thus deposited is partially removed by the carbonic acid, but it is not until the point of fusion is reached that the last traces of oxygen are removed. It is probable that the carbon found in the pig iron is a part of the carbon deposited in the ore. The amount and rate of carbon deposition depend on the temperature and the relative amount of carbonic acid present in the gases. It may begin as low as 392° F., but decreases rapidly as soon as a red heat is reached. The most favorable temperature is between 752° F. and 842° F. The temperature of incipient reduction of sesquioxide of iron by carbonic oxide is variously given by different observers. Bell's determination is the lowest by far—viz., 284° F.—while the oxidation of metallic iron, according to the same observer, does not begin below 752° F.

It is evident that the economical production of iron in the blast furnace is mainly a matter of the amount of fuel used. A saving of the fuel in the process can be effected in two ways: first, by increasing the heat of the descending charge; and, second, by increasing the heat of the ascending blast. The first of these conditions is realized by adding to the height or diameter of the furnace; in other words, increasing its capacity, so as more effectually to intercept the heat of the escaping gases; and the second condition is accomplished by direct heating of the air forced into the furnace. It was long considered that there was no limit to the saving that could be effected by increasing the capacity of the furnace and temperature of the blast, but Bell has shown that the profitable limit has probably been attained in both instances, at least in so far as the smelting of Cleveland ore is concerned. The practical limit of capacity in a blast furnace is reached when the gases which are given off at the mouth no longer have the power to abstract oxygen from the ore—a condition dependent on the temperature of the gases and the relative amount of carbonic oxide they contain. But gases which are inactive on one ore at a given temperature may still have power to reduce another ore at the same temperature; consequently the height and capacity of a blast furnace are dependent on the kind of ore smelted in it.

The cause of the great economy of fuel effected by the hot blast—say, on an average, 10 to 11 cwt. per ton of iron—has long puzzled metallurgists, and the subject can not be said to be yet entirely removed from the sphere of speculation. The researches of Bell in England and Åkerman in Sweden have, however, thrown great light on the subject. The following considerations show where the principal

sources of economy lie; in other words, why the combustion of a given amount of fuel, outside of the furnace and conveyed through the blast, is more than equivalent to the same amount of fuel burnt in the furnace itself. The fuel burnt before the tuyeres is oxidized merely to carbonic oxide, and gives per unit of carbon only 2,400 heat-units; while the fuel in the hot-blast stoves is burnt to carbonic acid, and gives, per unit of carbon, 8,000 heat-units, or more than three times the amount in the first instance. Although not more than one-half of this heat is available, owing to loss by the chimney and by radiation, yet there is still a gain from this source. The principal source of saving, however, is to be found in the fact that the heat brought into the furnace by the blast is unaccompanied by any increase in the bulk of the gases in the furnace; whereas the same amount of heat produced by the combustion of the fuel before the tuyeres would have been accompanied by the amount of air necessary for its combustion. This decrease in the bulk of the gases, consequent upon the use of hot blast, acts, first, by diminishing the rapidity of the upward current, thus allowing longer contact of the gases with the ore; and, second, as there is less gas escaping from the furnace, less heat will be carried off in this way.

As the reduction of the ore is dependent upon the temperature and composition of the gases, it is evident that the amount of heat which we may supply by the blast has a limit, for this heat is unaccompanied by the production of carbonic oxide. When, therefore, the fuel used in the furnace has been so far reduced in amount as only to supply the minimum amount of carbonic oxide needed for the reduction of any given ore, further increase of the temperature of the blast can be of no advantage, as the heat thus conveyed to the furnace will either escape at the mouth, or it will, by increasing the heat of the furnace, cause a loss of fuel by enabling the escaping carbonic acid to take off another equivalent of carbon.

The product of the blast furnace is *pig* or *cast iron*. Its composition is dependent on the ores and fuel used, the principal constituents being carbon, silicon, manganese, sulphur, phosphorus, copper, and titanium. It always contains 3 to 4 per cent. of carbon, and in some varieties as high as 5 per cent. The carbon exists in two forms in pig iron—chemically combined, and in the form of graphite. The darker and more highly graphitic varieties are formed at the highest temperatures. The higher the temperature the more silicon will be reduced and unite with the iron, and its presence induces the segregation of carbon in its graphitic form.

Sulphur is more readily removed in the cinder at an elevated temperature, while the total phosphorus of the charge goes almost entirely into the pig iron, whatever the temperature may be. The presence of manganese, copper, and titanium depends upon their occurrence in the ore.

The production of a blast furnace depends on its capacity, the richness and reducibility of its ores, the nature of the fuel, and the volume and temperature of blast. While some small furnaces yield but 3 tons daily, the production of some of the modern furnaces of the U. S. is 400 tons daily, American practice having in this respect far outstripped the records of iron-makers in other countries. The composition and character of the cinder or slag from a blast furnace depends on the nature of the ore and the temperature of the furnace. It consists mainly of a double silicate of lime and alumina.

T. M. Drown.
Revised by C. Kirchhoff.

Blasting: The use of gunpowder in quarrying stone probably dates back almost to the invention of that explosive. In ordinary practice the blocks of stone are separated from the mass in the quarry by means of one or more *blasts*, each blast being made by first drilling a hole into the rock by the use of a *drill*, operated either by hand or—as is now the general practice in large works—by machinery driven by steam or compressed air.

In removing very large masses of rock quickly, to make way for a railroad, to furnish stone in sufficient quantities for the rapid construction of an important breakwater, or to prepare the site for a fort, it has become the custom to run galleries into the rock, and to place in chambers prepared for the purpose very large charges of powder of sufficient power to bring down the whole face of a cliff or side of a mountain, as was the case at Dover and Holyhead in England, at Lime Point, entrance to San Francisco Bay, Cal., and at Hell Gate, New York harbor.

In hand-drilling the operation is performed by means of a *drill* or *jumper*, which is formed from a bar of steel, or of iron tipped with steel at one end, which is flattened out into a fan shape, with a sharp cutting edge extending on each side a little beyond the body of the drill, so that the drill may have free play in working. The drills are of lengths suited to the depths of the holes to be drilled, it being customary to use a short drill in commencing a hole, and longer ones in succession as the hole is deepened. Their diameters also vary, generally with the depths of the hole, but are also much modified by the kind of explosive used, blasting powder requiring much more space for the charge than nitro-glycerine and its compounds. To prevent the cutting edge of the drill becoming heated, and thereby softened, water is frequently poured into the hole. From time to time the fragments and powdered stone have to be taken out of the drill-hole by means of a *spoon* or *scraper*.

The next step, after finishing the drilling and removing the chips, powdered stone, etc., from the bottom of the drill-hole, is to determine the *strength of the charge*. In former times an inferior kind of gunpowder, called blasting powder, was generally used, and is still employed in many quarries in preference to the quicker and stronger explosives.

The necessity for a more active agent for use in mining, and in excavating railroad tunnels and large cuttings in solid rock, has brought into use more powerful explosives. Nitro-glycerine, first invented and used in Europe, was introduced at the Hoosac tunnel by Prof. Mowbray, in 1868.

Nitro-glycerine, chemically known as tri-nitro-cellulose, is glonoin oil, $C_6H_5N_3O_{18}$, made by treating glycerine with nitric and sulphuric acids at a low temperature. It is very rarely used in the pure state, the general practice being to mix it with an inert or with a chemical absorbent material, which renders it perfectly harmless so long as exudation of the oil does not take place. The generic term for these mixtures is *dynamite*, although originally that term was applied to the nitro-glycerine powder in which infusorial earth was employed as the absorbent. When increased strength is required, explosive bases, notably guncotton, are added. Atlas, Dualine, Forcite, Tonite, Rendrock, Hercules, Rackarock, and Vulcanite are different dynamites largely in use.

After the strength of the charge has been determined, and all moisture removed from the bottom of the drill-hole by means of wisps of straw, hay, or bits of rags, the powder is either poured in from a can, or inserted as a cartridge. A wooden rod is used to press down the powder and to dislodge any grains that may have attached themselves to the sides of the hole.

The method now generally practiced is to use the cartridge, from which projects the copper *priming-needle*. Above the powder, around the needle, and filling up the hole, a very soft, clayey material, called tamping, is rammed gas-tight by a copper-tipped "*tamping-bar*." After the needle has been withdrawn a "*fuse*" is inserted, which, when ignited, fires down into the powder. The "*fuse*" or "*squib*" is a thread of powder wrapped in tarred hemp or in cotton, and waterproofed outside. Though not essential, it is the practice in many localities to have the end of the fuse in the cartridge fitted with a fulminating cap, which fires the powder by detonation. Dynamite is charged in cartridges with a safety fuse or electric wire and cap slightly tamped. All high explosives are now fired with the use of strong detonators, and it is the general practice to arrange several holes for simultaneous firing. This synchronous firing can only be well attained by electricity. The holes are charged, the fulminating cap is inserted, two wires take the place of the fuse, and slight tamping is done. The different holes are connected in series, and a current of electricity is sent through the wire by means of a small, portable hand-power dynamo or frictional machine.

Steam Drilling-machines.—The length of time required, as well as the great labor and expense of drilling by hand, has led to the introduction, in large private and public works, of drilling-machines driven by steam or compressed air. Sommeiller invented a machine which was used with success at the Mont Cenis tunnel. This was driven by compressed air conveyed into the headings in pipes, the compressors being situated near the east and west entrances to the tunnel. Subsequently the Burleigh drill, similar to the above, was patented in the U. S., followed by the Rand, Ingersoll, and Sergeant, which are the types that have survived the active competition in this country. Broadly, the mechanism consists of a power cylinder, sliding in a guide bed-

plate, mounted on a tripod or column, and a cutting tool clamped as an extension of the piston rod. The apparatus must possess the mechanical provisions for carrying out these movements: the blow of the cutting tool, the rotation of the cutting tool through a small arc to produce a round hole, so as to prevent rifling and jamming, and the advancement of the cylinder and boring tool to follow the growing depth of the drill-hole, and to admit of withdrawing it. The principal distinguishing feature between the different drills in use is the method of moving the valve of the power cylinder. The older system is that of causing the valve to oscillate by means of tappets, which being a positive movement is considered safer in the hands of unskilled labor. The other system is that of a steam-moved valve, which admits of a higher rate of speed. The rotation of the drilling tool, which usually has an X-shaped bit, is in nearly all modern American machines accomplished by a fluted bar and nut, constituting a ratchet. The feed is done by hand, the power cylinder and the drilling tool sliding in a guide-way, the movement being controlled by a screw. Usually steam is employed above ground, while compressed air, which possesses incidental advantages as concerns ventilation, is adopted for underground work, the pressure ranging between 50 and 80 lb. per sq. inch, while the average speed is 200 blows per minute. The conditions under which drilling is done vary so widely that it is impossible to make any specific statement concerning the work performed. It is a fact acknowledged by all authorities that high explosives and power-drilling have led to a marked lowering in the cost of mining and tunneling, and have greatly increased the rapidity of working.

The diamond drill has been used very little in mining and tunneling for drilling blasting holes, being employed chiefly in prospecting. See MINING.

Efforts have been made recently, chiefly by the late C. Van Depoele and by H. N. Marvin, of Syracuse, N. Y., to introduce electric percussion drills, the reciprocating motion being produced by the solenoid. There is still a good deal of uncertainty concerning their successful introduction, from an economical point of view.

Revised by CHARLES KIRCHHOFF.

Blastoderm: See EMBRYOLOGY.

Blastoi'dea [from Gr. *βλαστός*, sprout + *εἶδος*, form]: an order of extinct Crinoids, in which the head is armless, on a short stalk, its general form like that of a closed lily-bud. The chief genus is *Pentremites*, which occurs in the Upper Silurian. The blastoids are most abundant in the Carboniferous measures.

Blatchford, SAMUEL, LL. D.: son of Richard M.; b. in New York city, Mar. 9, 1820; graduated at Columbia College, New York city, in 1837; in 1839 became private secretary of Gov. William H. Seward, of New York; in 1845 practiced law in Auburn, N. Y.; in 1854 removed to New York city; practiced law and continued the publication of reports of cases in the circuit courts of the U. S. in the second circuit, which he had commenced publishing in 1852; in May, 1867, became judge of the district court of the U. S. for the southern district of New York; in Apr., 1878, became circuit judge of the second judicial circuit; and on Mar. 27, 1882, was appointed by President Arthur an associate justice of the Supreme Court of the U. S. D. July 7, 1893.

Blathwayt, or **Blathwayte**, WILLIAM: politician; b. at St. Martin-in-the-Fields, London, about 1649. He was in the English diplomatic service as early as 1668, was clerk of the privy council, and an important witness in the libel trial of the seven bishops in the reign of James II. in 1688. Under William III. he was a member of the board of commissioners of trade and plantations, created by the king in May, 1696, for the purpose of making the colonies "most useful and beneficial to England," and to aid in "diverting them (the colonies) from trades which may prove prejudicial to England." Blathwayt drafted a new charter for Massachusetts. Many of his manuscripts have been preserved in the British Museum and elsewhere. D. in August, 1717.

Blau'velt, CHARLES F.: genre-painter; b. in New York in 1824; pupil of the National Academy and of Charles L. Elliot; National Academician 1859; made Professor of Drawing at U. S. Naval Academy at Annapolis in 1878. W. A. C.

Blauw-boc, blow'bok [Dutch, blue buck; so named from its blue-black color]: the *Antilope leucophæa*; an exceedingly swift antelope whose habitat extends from Cape Colony to Senegambia. It is 6 feet long and 3½ feet high. It fights when at bay, and is then dangerous. Its flesh is poor. The name is also given to the pygmy antelope (*Cephalophus*

The blauw-boc.

pygmæa), which is only a foot high. It is found in South Africa, and is of a bluish slate color.

Blavatsky, Madame HELENA PETROVNA: founder of the Theosophical Society; b. in Ekaterinoslaw, Russia, in 1831; daughter of Col. Peter Hahn, and of noble descent on both her father's and her mother's side; married when seventeen Nicephore Blavatsky, forty-three years her senior, a councilor of state; separated from him after three months by mutual agreement. An ardent love of travel and a thirst for curious knowledge then led her to travel to all parts of the world. In the course of her travels she succeeded in 1855 in entering Thibet. In 1858 she met with an accident in which she sustained a fracture of the spine by being thrown from her horse, which caused a strange psychological experience, and for eighteen months she led a complete dual existence. In 1873 she visited New York, where she remained for six years, and founded in 1875 the Theosophical Society, with which her name has since been closely associated. Author of *The Secret Doctrine, the Synthesis of Science, Religion, and Philosophy*; *The Key to Theosophy*; *The Voice of Silence*; *Isis Unveiled, a Master Key to the Mysteries of Ancient and Modern Science.* D. in London, May 8, 1891.

C. H. THURBER.

Blazonry: See HERALDRY.

Bleaching [deriv. of vb. *bleach*; O. Eng. *blæcan*; Germ. *bleichen*]: the process by which the natural colors of various substances are discharged, so as to whiten them. Bleaching is extensively applied to the textile fibers; linen, cotton, wool, and silk; and to straw, paper-stock, ivory, wax, animal and vegetable oils, etc. Until the close of the eighteenth century the agents employed were air, light, and moisture, aided by weak alkalies and acids. More recently the process has been wonderfully hastened by the use of such powerful agents as chlorine and sulphurous acid. Numerous other agents possessing bleaching properties have been from time to time recommended, but they have not as yet been used to any extent. Such are bromine, ozone, permanganates, chromates, etc. The selection of the bleaching agent depends as much upon the properties of the article to be bleached as upon the coloring-matters to be removed. Cotton, flax, and many other vegetable fibers, being composed of cellulose, one of the most permanent of all organic bodies, are capable of withstanding the action of acids, alkalies, and chlorine, while the animal fibers, silk and wool, being of very different composition, are destroyed by these agents, and must be bleached by the milder sulphurous acid.

Modern bleaching includes much more than the mere application of chlorine or sulphurous acid. The goods are subjected to certain preliminary cleansing processes, such as washing in cold or hot water, boiling with alkaline lyes or soaps, and treatment with acids. By these operations many resinous, fatty, and other impurities, either natural or in-

troduced during the preparation of the yarn, cloth, etc., are removed from the fiber. The more powerful agents are then used for removing the last traces of coloring-matter.

Special Methods.

Bleaching Linen.—This is a very ancient art. We read in the Scriptures of "fine linen, white and clean." The old method, still practiced in some localities, consisted in the alternate treatment of the cloth with alkaline and acid liquids, and exposure on the grass to air, light, and moisture. Holland long enjoyed the reputation of possessing the best bleacheries. The brown linen of Scotland was sent over early every spring to be bleached, and on its return in the late autumn was sold under the name of "Hollands," a name still retained in the trade for certain kinds of bleached linen. The word "lawn" is another name of similar origin, having been applied to a finer quality of linen cloth bleached on better grass-plots, or lawns. The Dutch process lasted from March till September, and consisted of the following distinct operations, often repeated: (1) Steeping in water four or five days, or in an alkaline lye forty-eight hours. (2) Bucking or bawking, boiling in an alkaline lye. (3) Crofting, or exposing on the grass for several weeks, and sprinkling from time to time with water. (4) Souring with buttermilk. After every dipping the cloth was washed with soap, then with water. The process was necessarily very expensive and laborious. In 1749 the Dutch method was introduced into Scotland, where it was considerably shortened by the employment of dilute solutions of sulphuric acid in place of buttermilk. In 1784 Berthollet investigated chlorine, publishing his results in 1787, and announcing the bleaching properties of this element. Prof. Copeland introduced this agent at Aberdeen. Chlorine was first used in aqueous solution, then in alkaline solution, and finally, in 1798, Charles Tennant, of Glasgow, introduced chloride of lime, which has been almost exclusively used ever since. Bleaching linen is still a tedious operation, as the fibers are heavily incrusted with impurities; the actual loss during the operations of bleaching being one-third the original weight, while cotton loses only one-twentieth. Steeping, washing, bawking and crofting are still found necessary, and are several times repeated. Souring is effected with hydrochloric or sulphuric acid. The goods are then chlorinated with hypochlorite of potash, made by mixing chloride of lime with carbonate of potash. Washing, souring, soaping, scalding in soap-suds and weak lye, and crofting complete the operation. A fortnight is the shortest time in which the bleaching can be effected, and often a much longer time is necessary.

Bleaching Cotton.—Cotton is either bleached in the yarn or in the cloth. The following description of the process employed in American print-works will sufficiently illustrate the methods in common use: The cloth is (1) "singed" by a shearing-machine or by passing over a red-hot roll or over a series of gas-flames; (2) it is "limed," boiled for a night with milk of lime; (3) washed; (4) soured with dilute sulphuric acid; (5) washed; (6) bawked, boiled for a night with soda-ash and rosin; (7) washed; (8) bawked with a weak soda-ash lye for seven or eight hours; (9) washed; (10) chemicked with a weak solution of chloride of lime; (11) washed: (12) soured with dilute sulphuric acid; (13) washed—the entire series of operations being completed in three or four days.

Bleaching Wool.—Wool is (1) washed on the sheep, to remove sweat and much of the dirt, including a peculiar substance called suint, which is a neutral salt of potash with a peculiar organic acid. Owing to the high price of potash, this suint has recently attracted considerable attention, and a special industry has been established in the French wool districts for its preservation and utilization. The wool contains from 15 to 33 per cent. of suint, a 9 lb. fleece containing 20 oz. of suint, or 6 to 7 oz. of potash. This can be recovered from the water in which the sheep are washed. It is estimated that 3,000,000 lb. of potash can be manufactured annually in the French districts alone. (2) The wool is steeped in soap and water, weak alkaline lye, or putrid urine to remove a peculiar lime-soap which it contains, and other impurities. It is then oiled for spinning, and finally cleansed and bleached, either in the yarn or in the cloth. The operations consist in passing it (3) through a weak warm solution of carbonate of soda and soap; (4) washing with lukewarm water; (5) exposing to sulphurous acid gas. Operations 3, 4, and 5 are sometimes repeated once or twice. The goods may then be blued with carmine of indigo in a weak solution of soap containing a little hydrate of alumina.

Silk Bleaching.—Raw silk contains about 40 per cent. of gummy matter, consisting of albumen, gelatinous substances, wax, fat, resin, and yellow coloring-matter. This is removed by boiling the silk in a solution of soap, and washing with pure water. Bran is sometimes added to the soap to neutralize by the lactic acid it yields any free alkali present. When the silk is to be left white, or dyed or printed with very light colors, it is exposed for a few hours to sulphurous acid gas.

Bleaching Paper-stock.—Cotton and linen rags are bleached in the same manner as cotton yarn and cloth. Old paper is treated with caustic soda to loosen the ink, then with soap-suds, and finally with chloride of lime. Tow and straw are treated with caustic soda and lime, and finally bleached with chloride of lime.

Bleaching Straw.—For the manufacture of hats, bonnets, etc., straw is bleached by (1) exposing it on a meadow to air, sunlight, and dew, with occasional turning; (2) steaming; (3) fumigating with sulphurous acid gas.

Jute is bleached by caustic soda and a chlorine bath made by mixing chloride of lime and sulphate of magnesia in equivalent proportions, and dissolving them in cold water. *Human hair* is said to be bleached on the head to a blonde by the action of hydrogen dioxide, or peroxide. *Feathers* are bleached by immersion (1) in a dilute solution of potassium bichromate containing a little nitric acid, and (2) in a weak solution of sulphurous acid. *Sponges* are bleached by immersion in a warm solution of caustic soda, followed by washing in water and treatment with a hyposulphite of soda solution, to which a little hydrochloric acid has been added. *Ivory* is bleached by rubbing it with pumice-stone and water, and placing it under a glass shade in the sun. It may also be bleached by immersion (1) in a solution of sodium carbonate, (2) in pure water, (3) in a solution of sodium sulphite; (4) to the sulphite is added dilute hydrochloric acid (5) in pure water. *Beeswax* is bleached by exposure to air, sunlight, and moisture in thin ribbons. *Animal and vegetable oils* are often bleached by heating them with a little caustic alkali, by which a small quantity of soap is formed, which settles to the bottom, carrying with it some of the coloring-matter. They are also bleached by exposure in shallow vessels to the sun under glass. *Old engravings* which have turned yellow may be cleansed or bleached by exposure to ozone, generated in a capacious vessel, by a stick of phosphorus partly immersed in water. Immersion for a minute in Javelle water, hypochlorite of soda, is said to answer equally well, though, to prevent injury to the paper, it must be subsequently dipped in water containing hyposulphite of soda.

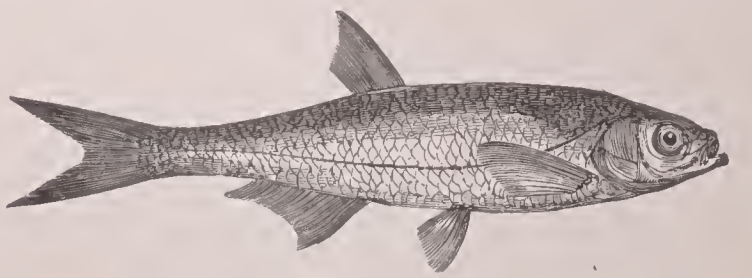
The Chemistry of Bleaching.—The exact chemical character of the changes which occur in bleaching is not fully established. When the coloring-matter is absolutely destroyed, it is probable that it is generally due to the action of active oxygen, ozone, formed by the agents employed. In some cases, however, sulphurous acid unites with the coloring-matter, forming a colorless compound, the color of which can be restored again. A red rose bleached by this agent returns to its original color when placed in dilute sulphuric acid.

Antichlore.—If free chlorine is allowed to remain in the articles bleached, it is liable to injure their strength and damage the metallic parts of machinery. To prevent this, substances such as hyposulphite or sulphite of soda, stannous chloride, coal-gas, etc., are employed, but the first mentioned is generally used. These are called Antichlore (*q. v.*).

Revised by Ira Remsen.

Bleaching-powder: See Hypochlorites.

Bleak (*Alburnus alburnus*): a small and beautiful fresh-water fish of the family *Cyprinidæ*; allied to the minnow and



The bleak.

dace. It is about 6 inches long, is found in many European rivers, and is esteemed as a delicate article of food.

Bled'soe, Albert Taylor, LL. D.: metaphysician and teacher; b. in Frankfort, Ky., Nov. 9, 1809; graduated at West Point in 1830; served as lieutenant of infantry at Fort Gibson till he resigned Aug. 31, 1832. He was Adjunct Professor of Mathematics and teacher of French in Kenyon College, O., 1833–34; Professor of Mathematics in Miami University, O., 1835–36; counselor-at-law in Springfield, Ill., 1840–48; Professor of Mathematics and Astronomy in University of Mississippi 1848–53; Professor of Mathematics in the University of Virginia 1853–61; and during the civil war Assistant Secretary of War of the Southern Confederacy. He was author of an *Examination of Edwards on the Will* (1845); *A Theodicy, or Vindication of the Divine Glory* (1856); *Philosophy of Mathematics* (Philadelphia, 1862), and other works; contributor to the principal literary, scientific, and theological reviews of the U. S.; principal of a female academy at Baltimore, Md., and editor of the *Southern Review* (Methodist). D. in Alexandria, Va., Dec. 1, 1877.—His daughter, Sophia McIlvaine, b. in Gambier, O., Mar. 26, 1837, married James Burton Herrick, of New York, in 1860, and became distinguished as a writer for magazines on microscopical botany.

Bleeder: See Hæmophilia.

Bleeding, or **Hæmorrhage** [*hæmorrhage* is from Gr. αἷμα, blood + ῥεῖν, flow]: in surgery, the escape of blood from the vessels which normally contain it. When the escape takes place into the tissues it is called "extravasation." Hæmorrhage into an internal cavity is said to be "concealed." A slight cut through the integument is usually followed by loss of blood, chiefly from the capillaries. Capillary bleeding will in many cases cease spontaneously, or it may require compression or the application of medicines, such as persulphate of iron or tannic acid. These medicines are called hæmostatics or styptics. Arterial bleeding is recognized by the fact that the blood escapes in jets, and is of a bright-red color. Arterial bleeding tends spontaneously to grow less, both from the feebleness of the heart's action which naturally follows, and from the retraction and contraction of the arterial walls, and the consequent formation of a clot of blood, which plugs the wound; but it may be necessary to resort to ligation or tying, to acupressure or compression of the artery by needles, or to pressure, mechanical or by hand, upon the course of the artery between the heart and the wound. A handkerchief may be tied around and then twisted with a stick. The wounded part should be elevated if possible. Venous bleeding is not generally very formidable. It may be recognized by the steady flow of dark blood. A great source of danger when large veins are cut is that air may enter the circulation; in which case death may immediately follow.

Hæmorrhage from an internal and inaccessible surface may be treated by astringents, as gallic acid, or by ergot, which is especially important in hæmorrhage after childbirth. Some individuals have what is known as the hæmorrhagic diathesis—a disposition to bleed excessively even after a slight injury. (See Hæmophilia.) A tendency to hæmorrhage from the mucous surfaces is characteristic of some diseases, such as typhoid fever.

Bleeding, or **Blood-letting**: the abstraction of blood from the circulation as a means of curing or preventing disease. This operation is performed either by opening a vein (venesection or phlebotomy), by abstraction from the capillaries by means of leeches or cups, or more rarely by opening an artery (arteriotomy). Bleeding was formerly in extensive use in the treatment of many diseases, and no doubt was greatly overused. The striking results obtained in certain cases and ignorance concerning many physiological and pathological processes led to this abuse of an agent which in cases, now much better discriminated, is capable of the greatest good. Thus in the early stage of a pneumonia, when the lungs are surcharged with blood, the right heart distended, the general venous system overfilled, judicious letting of blood may alter materially the progress of the case. The reaction which set in when attention was first directed to the evils of bleeding has, however, overshot the proper mark, and physicians are still loath to practice a procedure which they feel is called for but which popular opinion condemns. New procedures, as also popular opinion concerning them, always thus overshoot the level on the side of the sanguine, only to swing back, pendulum-like, to the opposite extreme when doubt is raised; but always at the end judicious afterthought establishes the place of rest.

William Pepper.

Bleek, blayk, Wilhelm Heinrich Immanuel: philologist; son of Friedrich (1793-1859), the New Testament commentator; b. in Berlin, Mar. 8, 1827; settled in Cape Town in 1856, where he became librarian of Sir George Grey's valuable library. He wrote, among other works, a vocabulary of the Mozambique languages (1856); a *Handbook of African, Australian, and Polynesian Philology* (London, 1858); *Comparative Grammar of the South African Languages* (vol. i., 1862); *Reynard the Fox in South Africa, or Hottentot Fables and Tales* (1864); and *Ursprung der Sprache* (1868). Bleek was probably the first to suggest a rational explanation of grammatical gender. D. in Cape Town, Aug. 17, 1875.

Blende [loan-word from a deriv. of Germ. *blenden*, deceive]: the native sulphide of zinc, which British miners call blackjack. It abounds in primary and in secondary rocks, and occurs both massive and crystallized in octahedrons and rhomboidal dodecahedrons. Pure blende is composed of 67 per cent. of zinc and 33 of sulphur. It is a valuable ore, but is more difficult to reduce than calamine. This is the chief ore employed in the important zinc industry of Illinois, Missouri, and Kansas. The term is sometimes applied to sulphides of antimony and of manganese, the former of which is a rare mineral called red antimony. Revised by C. Kirchhoff.

Bléneau: a village in the department of Yonne, France; about 29 miles W. S. W. of Auxerre; famous as the place where Turenne defeated the Prince of Condé in 1652. Pop. (1891) 2,084.

Blenheim, blen'im, Germ. pron. blen'hīm, or **Blindheim**, blint'hīm: the name of a small village of Bavaria, near the Danube; 23 miles N. N. W. of Augsburg. From it the English have named the famous battle which occurred at the neighboring village of Hochstädt, Aug. 13, 1704. Here the allied armies, commanded by the Duke of Marlborough and Prince Eugène (who had about 52,000 men), attacked the French and Bavarians (about 56,000 men), who were commanded by Tallard and the Elector of Bavaria. The Duke of Marlborough and Prince Eugène gained a decisive victory, and took about 13,000 prisoners, including Tallard. The French and Bavarians also lost nearly 10,000 killed and wounded, besides many that were drowned in the Danube. The French and Germans call this the battle of Hochstädt. The name Blenheim is also given to the estate at Woodstock, Oxfordshire, and the palace, conferred by Parliament on John Churchill, first Duke of Marlborough.

Blenheim, blen'im: village of Harwich township, Kent co., Ontario, Canada (for location, see map of Ontario, ref. 6–B); 12 miles from Chatham and 75 from London. Has churches of seven denominations, large public school, a mechanics' institute, large flour-mills, bending and planing mills, fire department, good streets, electric lights, and water-works. There is a large supply of natural gas 3 miles away, which is now (1893) being piped to the village. The surrounding country is settled by wealthy farmers, and Blenheim is the chief bean-market in Canada. Pop. (1881) 1,212; (1891) 1,708.

Editor of "News."

Blenheim-dog, or **Marlborough-dog**: a small and beautiful variety of spaniel. It closely resembles the cocker in form and appearance, but is generally white, with spots and markings of a red color. The muzzle is also fuller. It derives its English name from Blenheim Palace, in Oxfordshire, where the breed has been preserved since the beginning of the eighteenth century.

Blennerhassett, Harman: a victim of Aaron Burr; b. in Hampshire, England, Oct. 8, 1764 or 1765; educated in London and Dublin; settled on an island in the Ohio river, below Parkersburg; gave his time to scientific recreation and luxury; supplied Burr with a rendezvous and equipment for his Southern schemes; involved in litigation and confiscations; tried in vain to recover his fortunes in Canada and England; d. in Guernsey, Feb. 1, 1831. His wife wrote some books, and died in the U. S. while endeavoring to recover losses from the Government. See *Blennerhassett Papers* (New York, 1864).

Blennorrhœa [from Gr. βλέννος, mucous + ῥοία, -ρροια, flux]: an abnormally copious discharge from any mucous membrane. In discharges termed blennorrhœal there is a mixture of epithelial scales in large quantities from the mucous membrane, with numerous pus-cells. After inflammation of the urinary mucous membrane a gleety discharge frequently continues for a long period. The treatment consists in establishing health by tonics, fresh air, and careful

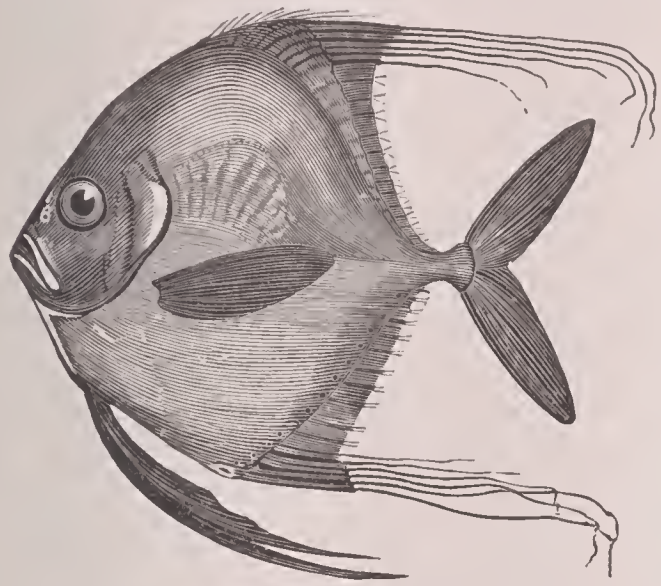
regimen, with astringent lotions to lessen the secretion, and occasional local stimulants to alter the depraved condition of the mucous membrane.

Blenny [from Lat. *blennius*, name of a fish; Gr. βλέννος, slime]: a fish of the genus *Blennius*, order *Acanthopteri*, and family *Blenniidæ*. The true blennies are small, naked fishes, often gayly colored, abounding in seaweeds, tide pools, and among rocks near the shore, especially in warm regions. They are seldom used as an article of food, but are in request for the aquarium, on account of their tenacity of life and their activity. They feed chiefly on small crustaceans. The eyed-blenny (*Blennius ocellaris*), called also the butterfly-fish, has a large and prominent dorsal fin, in which is a spot resembling an eye. This fish is common in the Mediterranean.

Eyed-blenny.

Some of the blenny family retain their eggs within the oviduct until they are hatched, so that the young are produced alive, and capable of seeking food for themselves. Several blennies are found on the American coasts.

Bleph'aris [Gr. βλεφαρίς, eyelash]: a genus of fishes of the family *Carangidæ*; with a short, deep body, and long



Blepharis crinitus.

streamers on the fins. The American species (*B. crinitus*) reaches the length of a foot or more, and is found in warmer parts of the Atlantic.

Bléré, blāy'ray' (Lat. *Bliriacum*): a town of France; department of Indre-et-Loire; on the river Cher; 16 miles E. S. E. of Tours. It has a bridge built about 1150. Pop. (1891) 3,272. Near it is the château of Chenonceaux, which Henry II. of France gave in 1535 to Diana of Poitiers, who, having sumptuously embellished it, was compelled to transfer it to Catherine de Médicis. In 1733 it was purchased by M. Dupin, the wit and beauty of whose widow caused it to be frequented by Fontenelle, Voltaire, Buffon, Rousseau, and others. The castle is in good preservation.

Bles-bok (*Damalis albifrons*): an antelope of South Africa. Its name is derived from the *blaze* (Dutch, *bles*) of white in its face.

Blessed Thistle (*Cnicus benedictus*): a plant of the family *Compositæ*; a native of Europe, sparingly naturalized in the U. S. It was formerly regarded with great veneration on account of its supposed medicinal virtues, which are celebrated by Burton in his *Anatomy of Melancholy*, and by Shakspeare, under the name of *Carduus benedictus*. It is tonic and diaphoretic.

Bles'sington, Margaret Gardiner, Countess of: an accomplished and beautiful Irish lady; b. near Clonmel, in Tipperary County, Sept. 1, 1789. Her maiden name was *Power*. She was married in 1818 to the Earl of Blessington, who was her second husband. She traveled with him extensively on the Continent, and after he died in 1829 she lived in Gore House, London, where her soirées were attended by many literati and other eminent persons. She published *Conversations with Lord Byron* (1834); *The Idler in France*; and other works. D. in Paris, June 4, 1849. See R. R. Madden's *The Literary Life and Correspondence of Lady Blessington* (3 vols., 1855).

Blicher, blee'cher, Steen Steensen: Danish poet and writer of tales; b. Oct. 11, 1782. His tales, the first of which appeared in 1824, deal chiefly with life in Jutland, where he was pastor for many years. They are remarkably true to life, and have had no small influence on Danish literature. A collected edition was published in 1882 (*Samlede Noveller og Skizzer, ordnede efter Tidsfølgen af P. Hansen*, 4 vols.). He translated Macpherson's *Ossian* into Danish. He wrote also in the Jutland dialect. D. Mar. 26, 1848.

G. L. Kittredge.

Blida, blee'dăă: a town of Algeria; province of Algeria; about 30 miles S. W. of Algiers. It is pleasantly situated on the border of the Metidjah, is a station on a railway, and is said to be very flourishing. It has been occupied by the French since 1838. Pop. (1891) 23,686.

Bligh, blī, William: an English naval officer; b. of a Cornish family in 1753. He commanded the ship Bounty, with which he was sent to Tahiti in Dec., 1787, to procure plants of the breadfruit tree, in order to plant them in the West Indies. During his voyage for Jamaica with a cargo of these plants a part of his crew mutinied, Apr. 28, 1789, on account of his harsh treatment. The captain and eighteen of his men were sent adrift in the launch, and after much suffering arrived at the island of Timor in June, having traversed 3,600 nautical miles in an open boat. The mutineers settled on Pitcairn's island. Bligh was appointed governor of New South Wales in 1806, but his conduct was so tyrannical that he was expelled in 1808. D. in London, Dec. 7, 1817.

Blight: a name given to many parasitic fungi and to the diseases which they produce. It has been particularly applied to the *Erysipheæ*, a family of *Ascomycetes*, which are in some publications called "the blights," but latterly these have borne the much better name of powdery mildews. (1) *Apple blight* is a disease of apple-trees affecting the twigs, leaves, branches, and even the trunk. When the twigs are affected the leaves suddenly turn brown and die, and a gummy exudation appears here and there upon the bark. On the larger branches and the trunk the blight appears in the form of dead and sunken patches of bark. It has been demonstrated within the past few years that this blight is due to the presence of bacteria, *Bacillus amylovorus*, or, according to some, *Micrococcus amylovorus*. Inoculations, made by inserting these bacteria into the living tissues of apple twigs, are followed by the development of blight. The bacteria live upon the cell-substances, and, by robbing the cells, finally cause their death. (2) *Pear blight* is identical with apple blight. (3) *Pear-leaf blight* appears upon the leaves, producing yellowish or reddish spots, marked in the center by minute black pimples. It attacks the fruit also, causing it to crack open and become stunted. This disease is due to *Entomosporium maculatum*, one of the so-called "imperfect fungi," of the order *Sphæropsideæ*. The fungus appears to pass the winter upon the fallen leaves. (4) *Quince-leaf blight* is identical with pear-leaf blight. (5) *Strawberry-leaf blight* produces upon the leaves red spots, which develop later into larger diseased, whitish areas, bordered with red. This is caused by *Sphærella fragariæ*, one of the black fungi (*Pyrenomyceteæ*) of the family *Sphæriaceæ*. Here again the fungus appears to pass the winter in the dead leaves. (6) *Tomato blight* forms rusty brown patches on the under side of the leaves, followed by wilting and death. It is caused by *Cladosporium fulvum*, one of the "imperfect fungi" of the order *Hyphomyceteæ*. Most of these fungus diseases are prevented by spraying with solutions of copper sulphates or carbonates. (7) *Grape blight*, see Mildew. (8) *Potato blight*, see Rot.

Charles E. Bessey.

Blim'bing, or **Bilimbi** (variously written also *blimbi* and *bilimby*): the native name for the berries of an East Indian tree (*Averrhoa bilimbi*) belonging to the *Oxalideæ* or Sorrel family. They are extremely acid, but are esteemed and much used as a preserve and a pickle. The juice is used as a remedy for certain diseases of the skin. *Averrhoa bilimbi* and its congener *Averrhoa carambola* have been introduced into cultivation in the West Indies. They exhibit to a moderate degree the phenomena of "sleeping" and "waking," exhibited by other members of the same order.

Blind, Education of the: Previous to the eighteenth century no systematic effort was made to educate the blind

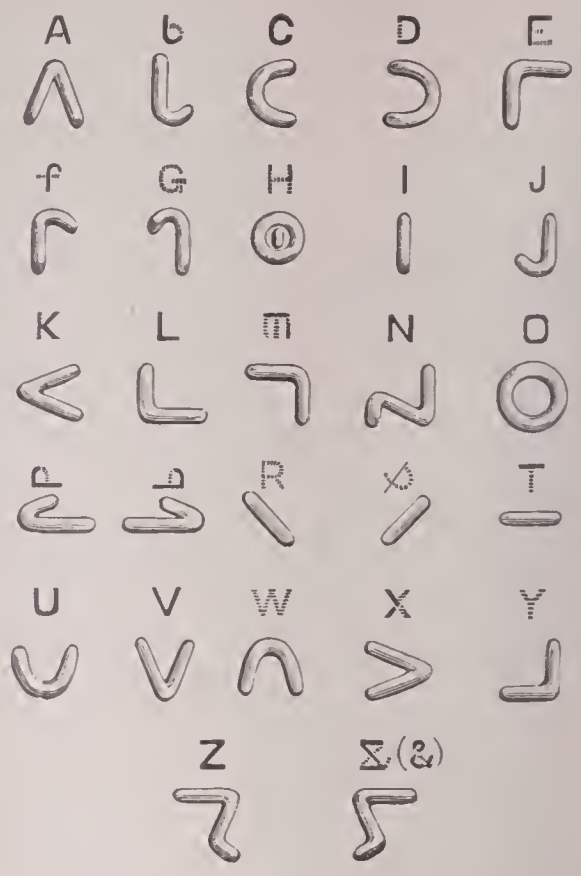
as a class. In 1646 an Italian published a book drawing attention to their condition, and in 1670 Lana Terzi, a Jesuit of Brescia, discussed the possibility of their education. In the latter part of the seventeenth and early part of the eighteenth centuries two causes tended especially to awaken thought on this subject—viz., the philosophical discussions of Locke, Leibnitz, and Reid concerning blindness and the appearance of a few blind persons of remarkable talent, whose achievements were greatly admired, of whom Saunderson, Blacklock, and Theresa von Paradis are illustrations. The first school for the blind was organized and taught by Valentine Haüy in 1784 at Paris; similar schools were soon instituted in Great Britain, Russia, and other European countries. The first in the U. S. was established by legislative enactment of Massachusetts at Boston in 1829, and schools of this character are now in operation in most of the principal States in the Union. They are essentially a part of the school system of the respective States in which they are situated. Dr. Samuel G. Howe was the pioneer in the work in this country. Others who have labored in this field are Messrs. Chapin, Williams, Wait, Lord, Little, Morrison, Huntoon, and Anagnos, the son-in-law of Dr. Howe.

The U. S. Government has shown interest in this work; and Congress in March, 1879, passed an act to promote the education of the blind, by virtue of which $250,000 was set apart as a perpetual fund, the interest of which should be appropriated to the purchase of suitable books and apparatus to be distributed annually among the various institutions for the blind in the U. S. The American Printing-house for the Blind, situated at Louisville, Ky., has charge of this fund, and is constantly sending forth excellent books and maps adapted to the use of the blind. Prescott's *Conquest of Peru*, Motley's *Peter the Great*, Steele's *Chemistry*, Perry's *Political Economy*, and other similar works, are among the books made available by this admirable institution. Music adapted to the use of the blind is also published by this house. The Perkins Institution publishes books from the Howe Memorial Press, and a few books are printed by various other institutions in the country.

An organization known as the American Association of Instructors for the Blind holds a meeting biennially in some part of the U. S. to discuss methods of teaching, and to consider other questions connected with their work. The most noted schools for this class in foreign countries are at Paris, Amsterdam, Vienna, Berlin, Copenhagen, and London. At London is the Royal Normal College for the Blind, the principal of which is a blind man who was born and educated in the U. S.

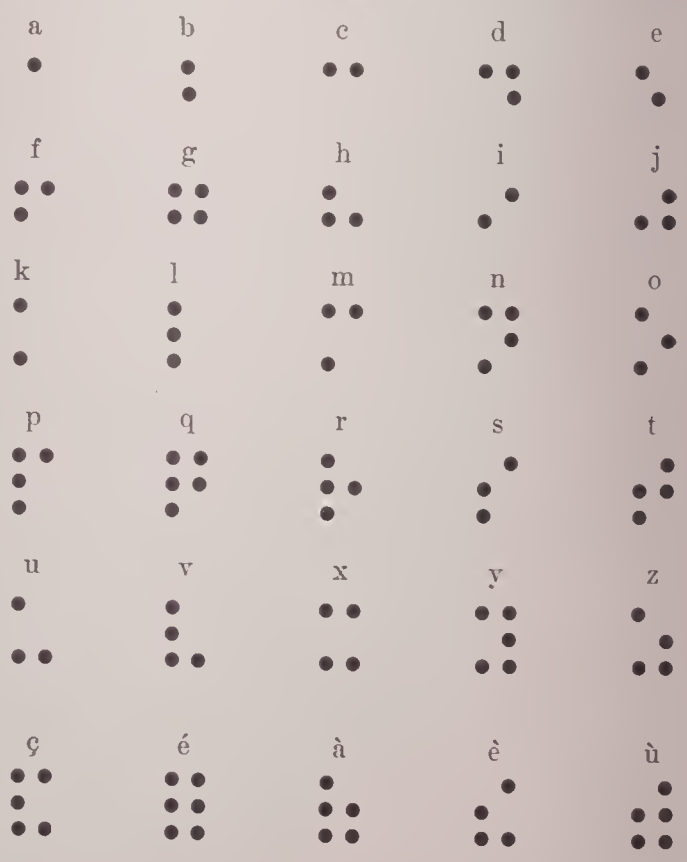
In Great Britain there are many societies organized for the purpose of alleviating the condition of those devoid of sight. The Association for Promoting the General Welfare of the Blind, founded in London by Miss Gilbert in 1856, has for one of its objects the teaching and training of blind persons who on account of age or other cause are not eligible for admission to the schools. Outside of schools more is done for the sightless in Great Britain through the medium of this and similar societies than in other countries.

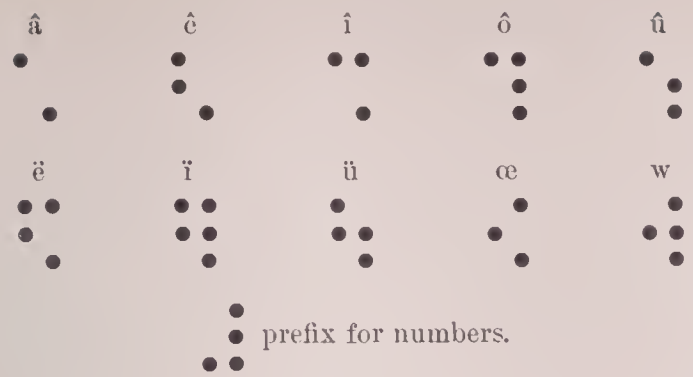
Beginning with the little school of Haüy at Paris, the idea of educating the blind has become cosmopolitan. In most of the schools there are three departments—viz., literary, musical, and industrial. The education in the literary department is about equal to the English course in academies. In teaching reading various alphabets have been used. In Edinburgh two blind men invented and used a string alphabet, by which the different letters were designated by the form and distance of knots on a cord, on which events could be recorded or letters written and the manuscript rolled into a ball and preserved or sent to a friend, as the occasion might demand. The alphabets commonly used, however, consist of letters, or characters representing letters, raised about one-thirty-second of an inch above the level of the page and read with the tips of the fingers. Stenographic systems have been invented, but not extensively used. The Moon type—so called from the name of the inventor, Dr. Moon, of Brighton, England—is extensively used, especially in Great Britain. The alphabet consists of six Roman letters unaltered and twelve with parts left out; the others are designated by new but simple forms. The Scriptures and many volumes of history, science, poetry, and biography have been issued in this type. The following large shaded characters are the Moon Alphabet for the blind. The dotted marks of the letters printed over this alphabet show what portions of the common letter are taken away in order to lay the characters open and clear to the touch. The large shaded characters when printed for the use of the blind are in relief (embossed), without ink:



The Roman letter and the point or dot system are the most popular. There are two methods of distinguishing letters by points, the Braille and the New York, in use both for literary and musical composition. In Boston only the Roman letter is employed in printing. At the American Printing-house for the Blind the Roman letter and the New York point are used. In foreign countries both books and music are embossed in the Braille point. The Braille system has also been successfully adapted to the needs of the blind of China by the Rev. William H. Murray, of the National Bible Society of Scotland, Peking, China. In Japan the katakana form of the forty-eight letters of the Japanese syllabary has been modified somewhat in the Moon fashion, but in a less degree, and introduced successfully by Dr. Henry Faulds and another, and portions of the Scriptures and other books have been produced.

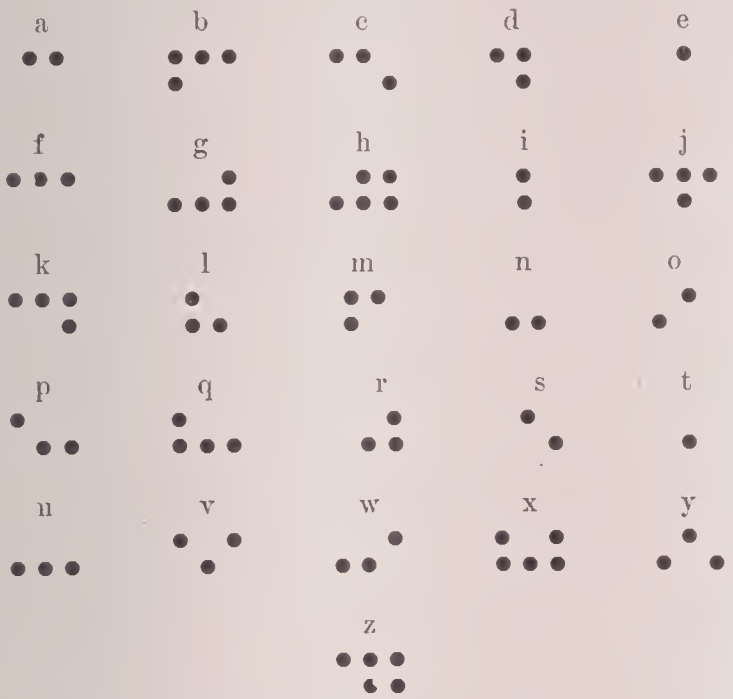
The following is the Braille Alphabet as employed in France, Switzerland, Germany, and other foreign countries:



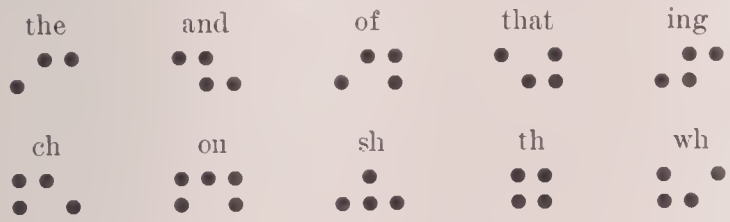


The characters for the first ten numerals in this system are the same as those for the first ten letters of the alphabet.

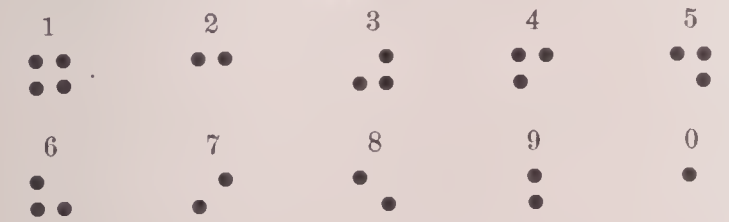
The NEW YORK POINT ALPHABET is as follows:



Word and Part-word Signs.



Numerals.



Prefix indicating that the characters which follow are numerals:  The decimal point is  The capital letters are derived from the small letters by suffixing to each of them *as many points* as will form a new character *four points* in length, in the following manner: 1st. When the small letter ends with a point in the upper row, as in the letter "a," add the suffix in the lower row; 2d. When the small letter ends with a point in the lower row, as in "c," or in both upper and lower rows, as in "d," add the suffix in the upper row.

Both methods are used by pupils in the schools of the U. S. in taking notes and for the purpose of correspondence. The Braille, as used in the U. S., is, however, somewhat modified. The apparatus for writing the point-system consists of a board with a grooved surface, over which a frame is fitted. Sheets of paper are placed over the board, and the points are made with a stiletto through a rule of perforated metal. The writing is done from right to left, as the sheets are reversed when read. An improvement on the form of stiletto which was originally used has facilitated this method of writing. It attaches a sliding-bar supplied with small keys to the rule, which upon being pressed marks the points on the paper below. An instrument has been invented by M. Pephan, director of a school in Paris, which is of use to blind people. It is a small press which enables them not only to print the raised characters which they read with their fingers, but also the ordinary ink characters, on the same sheet of paper, at the same time. By its use they are able to communicate by letter with their friends without asking the assistance of others. Several instruments for writing point print, which are similar in construction to typewriters, have been invented in the United States, and will be of invaluable service to the blind in acquiring their education.

Every well-equipped school for the blind contains a great variety of articles for object-teaching; the propriety of having such a collection is apparent when it is considered that the blind acquire a great deal of knowledge through the sense of touch, and many quite common objects will escape their attention unless they are allowed to handle them. Blind persons who are endowed with musical capacity are taught to become organists, teachers of singing, instructors on the pianoforte, cornet, or other instruments. They are taught to tune pianos, in which they are especially successful. The pianos of the public schools in Boston are tuned by pupils of the Perkins Institution. The industries taught the blind are basket-making, broom-making, mattress-making, carpet-weaving, sewing, knitting, and crocheting. There are individual cases on record where blind men have learned the trades of clockmaker, wagonmaker, and other mechanical pursuits.

The education of blind children is often seriously neglected at their homes before they attain an age (usually about nine years) suitable to begin their study in an institution especially adapted to their wants, sometimes not even being taught to wash, dress, and feed themselves.

At Hubertsburgh, in Saxony, there is a preparatory school for young blind children from which the institution at Dresden receives them, having been properly cared for and taught in early childhood. There is a school of similar character in Copenhagen. In 1886 a kindergarten with a like purpose was opened in Boston, Mass., where children receive training before they enter the Perkins Institution. This is the only one of its kind in the U. S., and its establishment is due to the efforts of Mr. Anagnos. It is hoped that more such schools may soon be organized. In the U. S. there are about 3,000 blind pupils in the schools established for their education. ARTHUR G. CLEMENT.

Blind, blint, KARL: a German liberal politician; b. at Mannheim, Sept. 4, 1826; had a prominent part in the revolutions of 1848 and 1849, and in 1852 took refuge in London. Having been pardoned by the Government of Baden in 1867, he returned to Germany, where he has since distinguished himself as a zealous opponent of the policy of Bismarck. Besides writing biographies of Ledru-Rollin, Déak, and Freiligrath, he has been a student of the sagas and published many articles on Scandinavian folk-lore.

Blindage, in fortification: a term applied to a screen made of timber and earth, or any fixture designed to shelter the garrison or conceal their operations from the enemy. The blindage is sometimes formed of fascines, placed on the inner crest of a battery and continued over the top of the embrasures. Other blindages, used to protect the gunners of a battery from a vertical fire, consist of plain and strong timbers, one end of which is placed on the inner crest of the parapet and the other end on the ground.

Blindfish: any fish of the genus AMBLYOPSIS (*q. v.*).

Blindheim: See BLENHEIM.

Blindness: the absence of the sense of sight, caused by disease, defect, or injury of the eye, of the optic nerve, of the optic tracts, or of the cortical centers of vision in the brain. Blindness may be congenital or acquired, complete or incomplete, and transient or permanent. Congenital blindness may be due to absence of the globes (anophthalmos), deficient development of the globes (microphthalmos), excessive development of the globes (megalophthalmos), complicated cataract, inflammation of the choroid coat, atrophy of the optic nerve, degeneration of the retina, anomalies of the cornea, tumors, and undetermined conditions. Among the last are classed those cases of blindness which occur

from deficient development of the nervous apparatus. The most important idiopathic diseases of the eye which may produce permanent blindness are ophthalmia of the newly born, granular lids, inflammations of the cornea, iris, choroid, and retina, atrophy of the optic nerve, glaucoma, and tumors of the eye and its vicinity. Blindness the result of injuries may be due to a wound of the eye, to unsuccessful operations, to injuries of the head, and to sympathetic inflammation. Blindness may be produced by general diseases—for example, scrofula, syphilis, inflammation of the brain and its membranes (including insanity and epilepsy), disease of the spinal cord, the various eruptive fevers, intermittent fever, heart disease, Bright's disease, and toxic influences (lead, tobacco, alcohol).

Amblyopia and Amaurosis.—Both of these terms signify dimness of vision, the former being used to describe obscurity of sight, and the latter the more advanced condition of loss of vision. Modern methods of examination have greatly lessened the number of instances to which older writers applied the words amblyopia and amaurosis. Amblyopia is a symptom, and describes the defective vision from which the patient suffers. This may be due to functional disturbance, or to disease of the visual apparatus (retina, optic nerve, or visual centers), and may be unassociated with changes in the eye; or there may be atrophy of the optic nerve. Amblyopia and amaurosis may be congenital or acquired, temporary or permanent, and symmetrical or non-symmetrical. Congenital amblyopia is a term generally applied to instances of defective vision uncomplicated by evident disease of the coats of the eyes. The faulty vision has always existed, and often there are high grades of farsightedness and astigmatism, and clear images have never been focused on the retina. Squint is usually present in eyes of this character. Sometimes the amblyopia is present only for colors, and is then known as *color-blindness*. Other causes for amblyopia are injuries, the toxic action of certain drugs (alcohol, tobacco, quinine, sulphide of carbon), and various diseases—for example, Bright's disease, diabetes, and malaria. A curious form of amaurosis occurs in connection with hysteria. Blindness is sometimes simulated by those who desire to escape distasteful duties (malingering).

Night-blindness (*Nyctalopia*, often incorrectly termed hemeralopia).—This is a functional complaint consisting in an imperfect adaptive power of the retina, due to exposure of the eye to strong light, together with a debilitated and often scorbutic state of the system. It affects residents in tropical countries, often soldiers and sailors, and has been occasionally observed in large schools, usually in the early spring or summer. It prevails as an endemic in certain countries, especially in Russia during the Lenten fasts. The patients are unable to see well in the dusk, or even on dull days, although their vision is good enough in a bright light. Night-blindness is also a symptom of a very serious disease of the retina which is called pigmentary degeneration, quite distinct from the functional disorder which has just been described.

Day-blindness (*Hemeralopia*, often incorrectly termed nyctalopia).—This is an affection characterized by the fact that its subjects see better on dull days and in the dark than in a bright light. Sometimes it is a symptom of diseases of the retina and of the optic nerve; sometimes it is found in certain congenital faults of the eye, particularly albinism, and sometimes it is an idiopathic affection, and may develop in those who have long been excluded from the light. Among noeturnal animals, as owls, bats, etc., it is the normal condition. George E. de Schweinitz.

Blindstory: See Triforium.

Blindworm: a popular name of *Anguis fragilis*, which is not blind, nor is it a worm. It is a lizard, closely related to typical forms, differing in the snake-like body and in the absence of external limbs, but having shoulder-bones and pelvis in a rudimentary state. It is found in nearly all parts of Europe, is inoffensive and timid, and moves very slowly, and is sometimes called slowworm. Its length varies from 10 to 15 inches. Its eyes are small but well developed, with movable lids. Its tail is very brittle, hence the popular name of glass-snake for the American species of *Anguidæ*. See Glass-snake.

Bliss, Cornelius Newton: See the Appendix.

Bliss, George: See the Appendix.

Bliss, Philemon: jurist; b. in Canton, Conn., July 28, 1814; educated at Hamilton College, Clinton, N. Y. In 1861 he became chief justice of Dakota, and afterward a judge of the Supreme Court of Missouri. For a number of years he was dean of the Law School of the State University of Missouri. He was the author of a work on code pleading. D. in St. Paul, Minn., Aug. 25, 1889.

Henry Wade Rogers.

Bliss, Philip Paul: b. at Clearfield, Pa., July 9, 1838; received instruction in music from George W. Root; became the chorister of the First Congregational church of Chicago, and superintendent of the Sunday-school; joined afterward in the lay evangelistic labors of Maj. Whittle, and perished at the Ashtabula, O., railway accident, Dec. 29, 1876. His hymns *Hold the Fort*, *Hallelujah, 'tis done!*, *More to Follow*, etc.—of which he generally composed both text and melody—became very widely used.

Bliss, Porter Cornelius: journalist and diplomat: b. on the Cattaraugus reservation of Seneca Indians, Erie co., N. Y., Dec. 28, 1838; studied at Hamilton and Yale Colleges; traveled in Maine, New Brunswick, and Nova Scotia 1860–61, investigating the condition of the Indian tribes in behalf of societies at Boston; was employed for some months as clerk in the Indian bureau, and subsequently in the post-office department at Washington 1861; took part in volunteer organizations for the defense of the capital; visited England the same year; accompanied Gen. J. W. Webb as private secretary on his mission to Brazil 1861–62; was commissioner of the Government of the Argentine Republic for the exploration of the Indian country called the Gran Chaco 1863; edited at Buenos Ayres a monthly periodical, *The River Plate Magazine* (1864); was appointed by President Lopez historiographer of Paraguay; became secretary to Hon. C. A. Washburne, U. S. minister to Paraguay, 1866; aided him in collecting materials for his *History of Paraguay* (2 vols., 1871); was imprisoned by command of Lopez on a charge of treason and conspiracy for his assassination Sept. 10, 1868; rescued by a U. S. squadron Dec. 10, 1868; appointed translator to the State department at Washington, Mar., 1869; editor of the Washington *Chronicle* 1869–70; secretary of legation in Mexico 1870–74, and acting minister several months 1872–73. He afterward resided in New York, and was vice-president of the American Philological Society and an editor of the *New York Herald*. D. in New York, Feb. 1, 1885.

Bliss, William Wallace Smith, A.M.: soldier; b. in Whitehall, N. Y., Aug., 1815; graduated at West Point in 1833; assistant adjutant-general (rank of major) July 7, 1846. He served in the Cherokee nation, 1833–34; assistant professor at the Military Academy 1834–40; in the Florida war 1840–41, being chief of staff to commanding general; assistant adjutant-general at headquarters of Western military departments 1842–45; chief of staff of Maj.-Gen. Taylor in the military occupation of Texas 1845–46; in the war with Mexico 1846–48; in command of the Western division 1848–49; engineer at Palo Alto, Resaca de la Palma (brevet major), Monterey, and Buena Vista (brevet lieutenant-colonel); private secretary of President Taylor, Mar. 4 to July 9, 1850; assistant adjutant-general of the Western division, headquarters at New Orleans, La., 1850–53. D. in East Pascagoula, Miss., Aug. 5, 1853.

Bliss'field: village (founded in 1825); Lenawee co., Mich. (for location of county, see map of Michigan, ref. 8–J); on L. S. and M. S. R. R. (old line); 23 miles W. of Toledo; has 2 graded schools, 6 churches. Its only industry is farming. Pop. (1880) 1,222; (1890) 1,132; (1900) 1,268.

Editor of "Advance."

Blistered Steel: See Steel.

Blisters [in Early Modern English also *blyster* and *bluster*; from Middle English *blister*; perhaps from Old French *blestre*, *blostre*, a swelling]: a term applied in *medicine* either (1) to thin vesicles filled with serum produced upon the skin by certain applications, or (2) to the applications themselves. The material most frequently employed is cantharides or Spanish-fly (*Cantharis vesicatoria*), which may be mixed with oily substances, or, incorporated in collodion, painted upon the surface. Ordinarily from four to six hours are required for a satisfactory blister, but in persons with delicate skin a shorter time may suffice, and it is well in such cases to have a thin sheet of gauze between the skin and the application. Poultices over the blister hastens its action. Ammonia is also useful in some cases, but the resulting blisters are more severe.

Blizzard [of doubtful etymology]: a storm characterized by a high wind, extreme cold, and an air filled with fine,

hard, sharp crystals of snow. Blizzards generally follow an unusually deep "low" or storm-area of winter when the pressure rises rapidly. They appear first in the plains of Canada E. of the Rocky Mountains and pass into the U. S. through Eastern Wyoming, North Dakota, and Minnesota, and rarely pass E. of the region of the Great Lakes, unless the ground has a continuous covering of snow. They are very destructive to unprotected stock, and are dangerous to human beings exposed to them. The fine snow fills the air and prevents the traveler from seeing his way and stings the skin, the mind becomes confused, and the sufferer may perish even within the hearing of a call from his own door. Fortunately, severe blizzards are rare, and when they occur they seldom continue more than a day or two. M. W. H.

Block: a heavy piece of timber; a massy body, solid and heavy; the piece of wood on which criminals are beheaded; the wooden mold on which a hat is formed; any obstacle or obstruction; also a continuous row of buildings. The term is applied in New York and other cities to the space and buildings between two consecutive streets.

Block: in the rigging of a ship, is the part of the apparatus for raising sails and yards, tightening ropes, etc. The uses of blocks are very numerous on shipboard, and to subserve these uses they are distributed about the masts and yards. The block comprises a *shell* or exterior, a *sheave* or wheel on which the rope runs, a *pin* on which the sheave turns, and a *strap* to fasten the block in its place. A single block contains only one sheave; a double block, two; and so on. Besides the designation of blocks according to the number of sheaves they contain (as single, double), they receive other names—such as cheek block, clew-garnet block, clew-line block, etc. Elm is used for blocks, and lignum vitæ for sheaves.

Until 1781 ship's blocks were made by hand. But it required unusual skill and practice to fashion the pieces and put them together so as to possess the requisite strength and facility in working. More than 1,400 blocks were required for one of the old seventy-fours, and a proportionate number for other vessels. In 1781 a Mr. Taylor began to make the sheaves and shells of blocks by machinery for the British navy. Sir M. I. Brunel in 1801 invented machinery for making blocks, which was put into successful operation in 1808. Thomas Blanchard, an American mechanician, invented most ingenious machines for block-making. For his invention and superintending the work, Brunel received from the British Government £20,000.

Block, Moritz: a French writer on statistics and political economy; b. in Berlin, Feb. 18, 1816. Among his works are *Statistics of France* (2 vols., 1860); *Europe, Political and Social* (1869, both in French); *Die Bevölkerung des Französischen Kaiserreichs* (1861); and *Die Bevölkerung Spaniens und Portugals* (1861). Since 1856 he has published the *Annuaire de l'économie politique et de la statistique.*

Blockade': the act of shutting out all trade by sea with certain specified ports or coasts of one belligerent by another. It is a war right only, arising not from the theory that one state by occupation of certain waters of another has acquired sovereignty over them, but from the right which either party in a war has of weakening his enemy's power of resistance by cutting off his neutral trade. Being a recognized belligerent right, there exists a corresponding duty on the part of the neutral to observe it. This duty, however, the neutral government is not bound to enforce through its municipal law, for this burden is held to lie upon the shoulders of the blockading power, the neutral merely warning its subjects of the fact of blockade and its penalty. Blockade, unlike siege, implies no attempt to gain possession of a port or town; it is rather an act of prevention, restricting trade from within as well as from without the blockaded waters. By comity, at the commencement of a blockade a certain delay is usually granted to enable ships inside either already loaded or in ballast to leave the country. In the U. S. Civil War this delay was fifteen days. Neutral men-of-war on a diplomatic errand and ships driven in by stress of weather may also be granted the privilege of entrance in spite of blockade. When a navigable river like the Rio Grande is a boundary between two states, the enemy of one of them can only apply his blockade to the trade of that one; vessels bound for a neutral port up river must be allowed passage. Declaration of blockade is an act of sovereignty which is rarely delegated to the subordinate officers of a state. Being a serious limitation of the neutral's right to trade freely with *his* friends, that neutral has insisted that due notice of it shall be given him, and that the declaration of blockade shall be substantiated by the stationing of a suitable force at the blockaded point. There are then three essentials to a valid capture for breach of blockade. (1) Due notification must have been given. (2) The blockade must be effective. (3) There must be an attempt to break it.

I. *Notification of Blockade.*—This may be given in two ways: by diplomatic announcement to all neutral powers, or by a warning at the blockaded port inscribed upon the register of the ship trying to enter. The diplomatic notice after a reasonable length of time implies presumptive knowledge of the blockade on the part of all ship-owners, particularly now when the telegraph is so freely used in commerce. The notice at the blockaded port may precede the other or supplement it, as when the blockade of Southern ports was instituted by the Northern fleet during the war of rebellion in the U. S. By proclamation all ports of the Confederacy from South Carolina to Texas were put under blockade Apr. 19, 1861, and a week later the ports of Virginia. But since there was not at first force enough to make this effective, the special notice at the harbor's entrance was allowed for a while also. This was loose practice, savoring of paper blockades, and an injustice to the neutral shipper, who was warned away from *all* Southern ports, while some only were actually closed. He did not lose his ship, it is true, since she was granted the special notice, but he was likely to lose his voyage, because he could not know for a while which ports were still open.

The French rule is to give both these notifications—the diplomatic one and that communicated to the vessel at the mouth of the harbor—and at no stage of the operation to neglect the latter. M. Molé, Minister of Foreign Affairs, wrote in 1838 to another French minister of state: "I will not recall here the reasons why, independently of the official and diplomatic notice of a blockade, every ship showing itself before the blockaded port ought to receive the warning from the commanding squadron." The French, however, hold, if we are not mistaken, that at the outset of a war, before notice has had time to travel over the commercial world, a simple warning to a ship is sufficient, and that an attempt to break through into the port after this would expose the vessel to seizure and trial. The English and our own rule does not require the double notice. It is enough to send the diplomatic notice to all neutrals, and only at the very commencement of a war, especially before notice has had time to fly abroad, to warn off any approaching vessel. If, meanwhile, a vessel should seek to enter the blockaded harbor under the plea of ignorance, the length of its voyage and other circumstances must decide whether the plea is just. The diplomatic notice must be sent everywhere, and if only common fame has carried it to a particular country, that is not sufficient to involve in guilt a vessel of that country when seeking the blockaded port. If we compare the two rules, we shall give the preference to the English. The diplomatic notice is intended to prevent voyages, which may be useless or losing, to places in an actual condition of siege. Should a vessel now appear at the harbor's mouth with the claim of not knowing the state of facts, the presumption is against the story, and she must prove her words as she can. But why give a new warning here, any more than to a burglar at your door? It is highly criminal to break blockade; the purpose to do it is a hostile purpose, and no indulgence is called for by such traffic.

If a blockade is raised even temporarily by the approach of the enemy's fleet, for instance, or by any cause except stress of weather, and then resumed, a new diplomatic notice is necessary, and no captures are valid at that point until such notice can have been received and spread. Here again we notice loose practice in the blockade of 1861, for on certain occasions several days elapsed between the departure of the blockading ship from its post and the arrival of the relieving one, but no new notice was given. In case a blockade is abandoned, notification of the fact should be given as widely and publicly as of its commencement.

II. *Effective Blockade.*—The amount of force necessary to make blockade legal and effective is somewhat indefinite. The fourth rule of the Declaration of Paris of 1856 is that "blockades, in order to be binding, must be effective; that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy."

This definition of "effective blockade" is a little misleading. It does not mean that occasional evasions of a block-

ade will vitiate it. It is enough if there is so great risk of capture as to make blockade-running very dangerous. The rule of the Declaration of Paris was aimed at those abuses of the right which are called cabinet or paper blockades, of which the best known examples occurred at the beginning of the present century. Prussia had treacherously seized Hanover, and closed her ports against Great Britain. Great Britain soon after declared the coast from the Elbe to Brest under blockade. This was not, and could not be, made effective by force. Napoleon in reply, by a decree dated Nov. 21, 1806, at Berlin, laid the whole British coast under blockade. Then by a British order in council the European coast from the Elbe to Italy was put under blockade, and France in turn renewed the Berlin decree with fresh penalties. Such a blockade on Napoleon's part was ridiculous, except for the fact that occasionally the penalty could be exacted for its breach from a neutral ship touching at some British port and then trading with the continent; and the blockade of all the European seaports was far beyond the power of the English fleet. Both sets of orders bore very hard upon the neutral, who saw his legitimate trade ruined, not by the exercise of a belligerent right, but by the mere threat of it, a threat impossible of execution. The growth of the neutral interest secured the abrogation of such a species of blockade in 1856, and as the U. S. has consistently professed the same doctrine, it may be considered maritime law to-day.

III. *Breach of Blockade.*—Lastly, there must appear an attempt to break the blockade after it has been announced and made effective. This may be inferred by the court from the lading-papers, course of the ship, the owner's instructions, any attendant circumstances, even at the outset of the voyage. By the doctrine of continuous voyages, even if a ship is bound for a neutral port, in case her real eventual destination is clearly proven to be a blockaded port, it may be considered one continuous voyage and the penalty attach. But on account of the extreme difficulty of inferring this eventual destination, great fault has been found with courts applying this principle.

The penalty for breach of blockade is confiscation of the ship first and then of the cargo, unless it can be removed from complicity in the act of the ship.

The presumption is against the innocence of the cargo, for it will probably be for the sake of the cargo that the ship makes the venture. If both belong to the same owner, the guilt of the cargo is conclusive. This penalty rests on the vessel until the end of the return voyage. No punishment can be visited upon the crews of blockade-runners. The restrictions of a blockade are paramount to the rights acquired under a license to trade granted by the same government.

On the proclamation of peace, or from any political or belligerent cause, the continuance of the investment may cease to be necessary, and the blockade is then said to be *raised*. The blockading force then retires, and the port is open as before to all other nations.

Revised by T. S. Woolsey.

Blockade: in military art, an operation and an effort to reduce and capture a fort or town without a bombardment or regular siege, relying solely upon the stoppage of supplies. The attacking party throws up redoubts or other works on the neighboring heights and roads. A part of the investing army sometimes remains in a temporary camp, ready to repel a sortie of the garrison. Forts built on steep and rocky eminences may be reduced more easily by blockade, because the roads or paths by which supplies can be received are few, and can be guarded by a small force.

Block Books: books printed from blocks of wood on which the letters have been cut in relief. Previous to the invention of printing, besides the calligraphists and illuminators who prepared and adorned the books of scholars and clerics, there existed a separate guild for the fabrication of school-books and books of devotion, as well as calendars and popular medical books for the lay public. These were ornamented with rude paintings. The card-painters were identical with this craft until the beginning of the fifteenth century. As the demand for the products of their art increased, they invented the process of block-printing, cutting into blocks of wood, and sometimes plates of metal, so as to leave the letters and pictures standing out, and applying colors to these and taking impressions. In these xylographic books sometimes one, sometimes both sides of the sheet were printed

Block-house: a wooden redoubt or temporary fort; it is always covered. It is usually rectangular, is built of logs, and has two stories, one of which is sunk several feet below the surface of the ground. The upper story projects a few feet beyond the lower on all sides. It is loopholed for the use of muskets. Block-houses have been much employed in the U. S. as a defense against Indians. If exposed to the fire of artillery they should be formed of double rows of logs, 3 feet apart, with well-rammed earth between them.

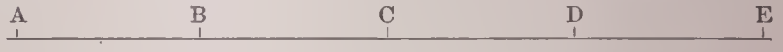
Block Island: an island belonging to the State of Rhode Island; situated between Montauk Point, the east extremity of Long Island, and Point Judith (see map of Rhode Island, ref. 12–M). It constitutes the township of New Shoreham in Newport County. It is 8 miles long and from 2 to 5 miles wide. Block island light, at the north extremity, is in lat. 41° 13′ 46″ N., lon. 71° 34′ 17″ W. Pop. (1880) 1,203; (1890) 1,320; (1900) 1,396.

Blockley: a former township of Philadelphia co., Pa.; on the west side of the Schuylkill river; is now included in the city of Philadelphia. It is the site of the Blockley Insane Asylum, and of a large almshouse occupied by the paupers of the city.

Block-printing: See Block Books and Printing.

Block System: a method of controlling railway trains which are moving in the same direction on the same track, so as to prevent rear collisions. The name originated either from the blocking of the track by stopping the trains, or from the fastening or blocking of the handle of the signal which was used when the system was first introduced. The system, however, does not depend upon any particular kind of signals, or upon any especial mode of transmitting messages. It can indeed be operated by men using flags and lanterns alone, although this would require numerous block stations and hence be very expensive. Usually the block stations are several miles apart, and communication between them is made by the electric telegraph.

To operate the block system a railroad is divided into sections *AB*, *BC*, *CD*, etc., of equal or unequal length, as may be most convenient, and a signalman is stationed at



each of the signal stations *A*, *B*, *C*, etc., who is able to communicate with the signalmen at the two adjacent stations. If a train is on the section *BC* a danger signal remains displayed at *B* until the train has passed *C*. The signalman at *C* then informs the signalmen at *B* and *D*, the danger signal is lowered at *B*, and one is displayed at *C*, and so on in succession; thus only one train can be upon one section at the same time. If a train should be derailed between *C* and *D* the train next following would be stopped at *C*, and this would cause the danger signal to be put out at *B*, so that the third train would stop there. The system, therefore, keeps a certain space interval between all trains on the track, and thus prevents rear collisions if its rules and regulations are observed by the signalmen and enginemen.

The block system as just described is often confounded with the automatic block system. The latter may be defined as an attempt to perfect the former by the use of signals electrically controlled and working automatically, so as to remove as far as possible the danger due to the fallibility of human agencies. For instance, in the simple block system a train might be derailed between *C* and *D*, and the signalman at *C* might turn his danger signal to safety, dreaming perhaps that *D* had given this order; then the following train would go on and collide with the derailed one. In the automatic system, however, the signals are so connected or interlocked that it is impossible for the danger signal at *C* to move until the track is clear between *C* and *D*. This system, moreover, by passing the electric current through the rails, can be made to display a danger signal at *C* if a rail should be broken or a switch be opened between *C* and *D*.

The principles of the block system were enunciated by Sir W. F. Cooke in 1842, in a pamphlet entitled *Telegraphic Railway*, but it was first practically applied in 1851 on the South Eastern Railway of England, and it is now extensively used on European railways. In the U. S. the block system is still in its infancy, and is used only on a few leading railroads, but every rear collision emphasizes its importance, so that its introduction is now rapidly going on. The "absolute block system" is that where the rules absolutely forbid more trains than one on the same section at the same time.

as described above. The "permissive block system" is that where a second train is permitted to enter upon the section, with a warning that it is already occupied and with instructions to go cautiously. The permissive system is manifestly far less secure than the absolute, but is still often used, particularly under the pressure of extra traffic.

According to the statistics kept by the *Railroad Gazette*, the only ones obtainable for the U. S., there occurred during the year 1892 a total of 2,327 train accidents, of which 1,062 were collisions. The latter are classified as 485 rear collisions, 25 butting collisions, and 326 crossing and miscellaneous. In these train accidents 672 persons were killed, of which number 362 perished in the collisions. As the railway mileage is constantly increasing, the total number of train accidents per annum also increases (the number of collisions alone having doubled since 1885), so that the attention of the traveling public is every year more forcibly directed to the necessity of insisting upon an efficient system of protection by means of the block system. See *American Practice in Block Signaling* (New York, 1892) and *Railway Equipment* under RAILWAYS. MANSFIELD MERRIMAN.

Block-tin: a name of a variety of tin which is inferior in quality to grain-tin. During the process of melting or reduction in a reverberatory furnace the purest tin first fuses, and is withdrawn. The residue, being melted at a higher temperature, is poured into molds, and is called block-tin.

Blodg'et, LORIN: scientist and writer; b. in Chautauqua co., N. Y., May 23, 1823. In 1851 he became assistant professor at the Smithsonian Institution at Washington. He may be said to have laid the foundation of American climatology. In 1855 he published a quarto volume of climatological observations, and in 1857 *Climatology in the United States*, a work extensively circulated and very favorably received in Europe. He was editor of the *North American*, published in Philadelphia, and secretary of the Philadelphia Board of Trade from 1858 to 1864. He contributed articles on finance to the *North American Review* in 1866 and 1867, besides making contributions to various other publications.

Blodgett, HENRY WILLIAMS, LL. D.: jurist; b. in Amherst, Mass., July 21, 1821. His parents removed with him to the State of Illinois in 1838. He studied for a time in the Amherst Academy. In 1842 he began the study of law in Chicago, and was admitted to the bar in 1845. In 1853 he was a member of the House of Representatives of the Illinois Legislature, and in 1858 he was a member of the State Senate. In 1870 he was appointed judge of the U. S. district court for the northern district of Illinois. In June, 1892, he was appointed one of the counsel to represent the U. S. before the board of arbitrators between the U. S. and Great Britain in regard to the fur-seal interests in the Bering Sea.

Bloemfontein, bloom-fon'tīn: the capital of the Orange Free State, in South Africa; on a tributary of the Modder, in about lat. 29° 10′ S., lon. 26° 40′ E. (see map of Africa, ref. 9–F). It is the see of a large diocese of the Church of England. Pop. about 3,459 whites and 1,000 blacks.

Bloemfontein was the scene, May 31, 1899, of a conference between Sir Alfred Milner, in behalf of the British Government, and the Presidents of the two Boer Republics, looking toward a settlement of the grievances of the Outlanders. The conference resulted in no agreement, and in the war that followed upon the subsequent negotiations the Free State cast its lot with the Transvaal. The town was taken by Lord Roberts March 13, 1900, and made his base of supplies for the movement on Johannesburg and Pretoria. The Orange Free State was proclaimed the Orange River Colony of Great Britain, May 28, 1900.

Blois, blwăă (anc. *Ble'sæ*): a town of France; capital of the department of Loir-et-Cher; finely situated on high ground on both sides of the Loire, and on the railway from Orleans to Tours; 36 miles by rail S. W. of Orleans, and 112 miles by rail S. W. of Paris (see map of France, ref. 4–E). It has a fine cathedral, a college, a public library, a botanic garden, an episcopal palace, and a town-hall. Here is the celebrated castle of Blois, the scene of many interesting historical events, and once the favorite residence of the Kings of France. Francis I., Henry II., and Charles IX. held their courts in this castle, which has been inhabited by many princes. Blois is a place of great antiquity, and was once more important than it is now. It has manufactures of gloves and porcelain, and a trade in brandy, wine, and timber. Here is an aqueduct cut in the rock by the ancient Romans. Pop. (1896) 23,542.

Blomfield, CHARLES JAMES, D. D.: a learned English prelate; b. at Bury St. Edmunds, in Suffolk, May 29, 1786; graduated at Trinity College, Cambridge, B. A. 1808, and was elected a fellow. He edited several dramas of Æschylus and the works of Callimachus (1815), and of Euripides (1821). He became Bishop of Chester in 1824, and Bishop of London in 1828. He was an efficient promoter of the erection of new churches in London. D. at Fulham, Aug. 5, 1857. See G. E. Biber, *Bishop Blomfield and his Times* (London, 1857); A. Blomfield, *Life of C. J. Blomfield* (1863).

Blom'maert, PHILIPPUS: Belgian author and philologist; b. in Ghent, Aug. 27, 1808; an eager advocate of the revival of the Flemish language and of a Flemish national life. He published editions of old Flemish poems (*Theophilus*, 1836; *Oude vlämische gedichten*, 3 vols., 1838–51), and translated parts of the *Nibelungen* into Flemish iambics. His most important work is a history of the Belgians, *Aloude geschiedenis der Belgen of Nederduitschers* (1849). D. in Ghent, Aug. 14, 1871. Revised by A. R. MARSH.

Blood: the principal nutritive fluid of the body. It consists of a clear liquid, the *plasma* or *liquor sanguinis*, and numerous small bodies, the *corpuscles*, also nearly transparent, but of different refractive power from the plasma, and therefore the two commingled make an opaque mixture. In most of the invertebrates and in the amphioxus, a fish of low type, the blood is clear and transparent. In many invertebrates it is colored, red, green, or yellowish. The red fluid seen when the head of a fly is torn off or crushed is not blood, but comes from the eyes. In vertebrates only are corpuscles found. There is usually a faint odor characteristic of the animal.

In man the blood is light red in the arteries, and is designated as *arterial*; in the veins it becomes dark bluish or even blue-black, and is called *venous*. The color is due to an organic substance, *hæmoglobin*, which is contained in the red corpuscles. The oxygen of the air entering at the lungs combines with this substance, and gives rise to the bright red color of arterial blood. In the tissues the oxygen is consumed, the hæmoglobin becoming "reduced"—that is, deprived of oxygen—and the bluish color of the venous blood results. The temperature of the blood is about 100° F. in the deep-seated vessels, but becomes rapidly cooled in those of the exterior. Its specific gravity is about 1·055, but varies in different conditions of health and disease.

The plasma is an albuminous fluid containing various substances, including carbonates, phosphates, sulphates, and chlorides of sodium and potassium, sulphates and phosphates of lime and magnesium, certain organic salts, and undetermined "extractives." Sugar occurs in small proportion in the venous blood, especially that leaving the liver. Urea, urates, carbonic acid gas, and various other substances meant for excretion are also found in the blood in small quantities.

The corpuscles are the red, the white and the blood plaques or plates. The *red corpuscles* are small bi-concave disks about $\frac{1}{3200}$ of an inch in diameter, of amber color when seen separately, but when in mass of the red color characteristic of the blood. In the lower vertebrates they are of oval or elliptical outline, and often nucleated; in man and the mammals, excepting the camel tribe, the outline is circular. The *white corpuscles* or *leucocytes* vary in size, but are generally somewhat larger than the red. The leucocyte consists of a protoplasmic mass, possessed of amœboid motion, and containing one or more nuclei. They are much less numerous than the red, the proportion being variously stated at from 1 : 250 to 1 : 700. Besides these two well-defined corpuscles there is a third form, the *blood plaques* or *plates*, small circular disks, pale amber in color, and about half the size of the red corpuscles. They are by some considered young red corpuscles, but their true nature is much in doubt.

The blood is a peculiar tissue in that its cells are not reproduced from the pre-existing ones, but supplied by certain blood-making organs, among which the bone marrow, the spleen, and the lymphatic glands are important. At the same time destruction of corpuscles also occurs in various places, but principally in the spleen and liver.

The functions of the blood are distributed among its different elements. The plasma, aside from the mechanical purpose of furnishing a circulating medium, serves to con-

vey *to* the tissues the various nutritive substances derived from digestion, and *from* them the excrementitious products of tissue waste and oxidation. The red corpuscles consist largely of the substance called *hæmoglobin*, the coloring-matter of the blood. This substance, chemically albuminous and containing iron, has the property of readily uniting with oxygen and setting this free again. It thus accomplishes the chief purpose of the red corpuscle, that of carrying oxygen from the lungs to the tissues. The functions of the white corpuscles are more obscure, but they doubtless bear a close relation to the processes of growth and tissue repair.

When blood is let it rapidly undergoes clotting or coagulation, certain chemical substances uniting to produce fibrin which catches red and white corpuscles in its meshes to produce a clot or *crassamentum*.

The so-called diseases of the blood are not such, strictly speaking, but rather diseases of the blood-making organs or other structures, whereby the blood becomes deteriorated secondarily. The general term *anæmia* includes a number of such conditions. (See Anæmia, Chlorosis, and Leucæmia.) Excessive amount of blood or *plethora* was formerly regarded as of great importance and very common in those of full habit; but we are at present inclined to attach much less significance to the amount of blood in these cases. See Histology. William Pepper.

Bloodbird (*Myzomela sanguinolenta*): a beautiful little species of honeysucker which receives its name from the rich scarlet color of the head, breast, and back of the male. It inhabits the thickets of New South Wales.

Bloodflower: a bulbous plant of the genus *Hæmanthus* and family *Amaryllidaceæ*; native of South Africa; so called from the red color of the flowers. Bloodflowers are cultivated in greenhouses for the beauty of their flowers, which grow in heads or clusters. The leaves of some species are linear, and those of others nearly round. The inspissated juice of *Hæmanthus toxicarius* is used by the natives of South America to poison their arrows.

Bloodhound [so called because formerly employed to track wounded game by their blood]: one of several varieties of dog, distinguished for the keenness of their scent and the persistency with which they will follow the track of game. They have been employed in many petty wars to track small forces of partisans, also to follow escaped prisoners, etc., as in time of peace they have been trained to hunt felons, poachers, and fugitive slaves. When kept for these purposes they acquire a peculiarly ferocious and bloodthirsty character, but when employed for the chase they are sagacious and trusty. The Cuban and Russian hounds are celebrated for their ferocity. They differ much from the English hounds, but like them have pendulous ears and lips and a compact and muscular build.

Blood-letting: See Bleeding.

Blood-money: the reward for betraying a criminal to justice. More commonly, however, the compensation by a slayer to the slain person's next of kin. With primitive peoples, who can not understand how taking a life is compensation for life, the practice prevails of paying a fine to surviving relatives in cases of homicide. The amount is fixed by custom or law. The laws of the ancient Germanic races which settled in the various countries of Europe elaborately fix the fines for homicide of different degrees.

Blood-poisoning: the condition produced by the absorption of injurious substances from a wound, from a local disease, or from an intact mucous membrane. Using the word in its broadest sense the condition occurs in almost every disease, certainly in all infectious diseases. In every disease and in every wound there are substances produced which are absorbed into the blood, and which, when present in sufficient amount, or when sufficiently virulent, manifest their action by the production of fever and other disturbances of the general constitution. The substances which are absorbed may be of the most varied character. They may be living micro-organisms which are capable of multiplying in the blood, or they may be chemical substances which are produced by the bacteria or by the local inflammatory or degenerative processes. Ordinarily the word is not used in such a general sense, but only to denote the constitutional disturbances which result from the absorption of injurious substances from *wounds*. A number of terms have been used to designate the various diseases so produced, which have reference chiefly to the nature of the substances absorbed. They have been divided into two groups, with the distinction that in one, *septicæmia*, no abscesses are produced in distant localities, in the other, *pyæmia*, abscesses are produced.

Under septicæmia three conditions have been distinguished. (*a*) *Fermentative fever*. This is the simplest of the wound complications. It is due to the absorption of fibrin or other ferments from effused blood or from the products of dead tissue. It is seen in perfectly aseptic, non-suppurating wounds, as after a simple fracture of a bone. It is present in every wound if it is sufficiently large and if the conditions favor absorption. Open wounds, where the products can easily escape, are naturally not so liable to be followed by fever as wounds in which the products are retained. The fever is of greater or less intensity and the constitutional disturbance is slight. (*b*) *Sapræmia*, or *putrid intoxication*. This is the condition produced by the absorption of the chemical products of bacteria. They may be the chemical substances known as ptomaines, which are produced by the vital activity of the bacteria in the same way as alcohol is produced by the yeast fungus, or they may be albuminous substances (toxic albumen) resulting from the action or degeneration of the bacteria themselves. There are numerous examples of poisoning by the absorption of such substances when taken in with the food: ice-cream poisoning, meat poisoning, etc. The products of the different bacteria vary greatly in virulence. The violence of the symptoms is in direct ratio to the amount of the material absorbed and its virulence. There are usually severe chills at the onset, followed by fever reaching 103° or more. (*c*) *Progressive septicæmia*. The condition produced by the entry of bacteria into the blood and their multiplication there. The bacteria may enter the blood either through the walls of the blood-vessels or by the lymphatics. They multiply in the blood, and after death are found in the various organs. The symptoms resemble those of sapræmia. (*d*) *Pyæmia*. In this abscesses are produced in various parts of the body. The manner of their production is as follows: In a suppurating wound the blood-vessels become filled with clots which contain bacteria. When portions of these clots break off they get into the general circulation, and if they are too large to pass through the capillaries they become lodged in various organs, and produce suppuration. These abscesses are called metastatic, or secondary. The difference between progressive septicæmia and pyæmia is probably due to the association of the bacteria with the blood clot. There is marked constitutional disturbance, and the onset is noted by severe rigors. W. T. Councilman.

Blood-root (*Sanguinaria canadensis*): a plant of the family *Papaveraceæ*; growing wild in many parts of North America. It is one of our most beautiful early spring flowers. It takes its name from the orange-colored sap of the root, which contains the alkaloid sanguinaria, remarkable for the fine red color of its salts. The root of this plant is a valuable stimulant expectorant, but its use requires caution, for its administration has been followed by the symptoms of acro-narcotic poisoning.

Blood-stone: See Jasper.

Blood-sucker: See Leech.

Bloom: waxy or resinous matter frequently developed on the surfaces of leaves and other parts of higher plants. It may consist of (1) a continuous layer, or (2) of multitudes of vertical rods, or (3) of minute rounded grains, or (4) of needles scattered irregularly over the surface. Bloom is common upon many fruits, as grapes and plums; it is abundant upon the leaves of the cabbage, and is well developed upon the young stems of blackcap raspberries (*Rubus occidentalis*). Its use is not certainly known. In some cases it appears to preserve the surface from wetting, and possibly may prevent too great a rise in the temperature of the underlying tissues. Charles E. Bessey.

Bloomary, bloom'a-ri, **Bloomery**, or **Blomary** [deriv. of *bloom*, mass of iron < O. Eng. *blōma*; prob. same as word for flower; but history of the signification unknown]: a furnace for converting pig or cast iron into malleable or "wrought" iron, or for producing malleable iron from iron ore directly. In the latter case it differs from the Blast Furnace (*q. v.*), in reducing the ore and producing the iron in a mass or "bloom" without melting it, while the blast furnace produces an impure molten iron, which is tapped off and cast into pigs; the blast furnace working continuously, the bloomary (in many cases) interruptedly. The

change of cast into malleable iron by the bloomary process is generally superseded by puddling, but the former is used to a very limited extent in the U. S. and Sweden in the production of the better kinds of metal. Bloomaries for the direct production of iron are of various forms. The process is one of the oldest known in metallurgy, and rude forms of it are at present used in many barbarous countries. The two best known modern forms of the bloomary (the Catalan furnace and the German bloomary) are at present used in Spain, Sweden, Russia, and parts of the U. S. for the reduction of ores, chiefly by means of charcoal. Only the richest ores can be profitably used, and the loss of iron is much greater than by the blast furnace. In the true Catalan forge the charcoal, with a great part of the charge of iron ore, is heaped on the small square hearth opposite to the tuyere, fine ore and charcoal being thrown in from time to time. A moderate blast is maintained, and the whole is stirred at proper times; and in about six hours the iron is removed, and forged at once into a bloom. In the ordinary or German bloomary the ore is first made fine, and then thrown in small quantities upon a charcoal fire with a blast. See IRON (*Manufacture*). Revised by C. KIRCHHOFF.

Bloom'er, AMELIA: a dress reformer whose maiden name was *Jenks*; b. in Homer, N. Y., May 27, 1818; married Dexter C. Bloomer in 1840, and settled at Seneca Falls, N. Y.; Jan. 1, 1849, established *The Lily*, a semi-monthly publication, which attained a circulation of over 4,000. From 1855 until her death, Dec. 30, 1894, she resided in Council Bluffs, Ia., where she took part in the woman's suffrage work of that State. Mrs. Bloomer did not originate the costume which bears her name, but after seeing it worn by Elizabeth Smith Miller, daughter of Hon. Gerrit Smith, she, with Elizabeth Cady Stanton, Lucy Stone, and others, adopted it.
SUSAN B. ANTHONY.

Bloom'field: town (founded in 1834); capital of Greene co., Ind. (for location of county, see map of Indiana, ref. 9-C); on branch of L., N., A. and C. R. R. and E. and I. R. R., 80 miles S. W. of Indianapolis. Bloomfield has a high school, four churches, steam flouring-mill, and a sawmill. It is situated in an agricultural district, 10 miles W. of the mining district of Greene County, and has an active trade. There are hereabouts abundant unworked deposits of iron and coal. Pop. (1880) 988; (1890) 1,229; (1900) 1,588. EDITOR OF "NEWS."

Bloomfield: city; railroad junction, and capital of Davis co., Ia. (for location of county, see map of Iowa, ref. 7-I); has manufactures of plows, wagons, and furniture. It has a high-school building costing $30,000, and is the center of a rich farming district; has a public library and a large trade. Pop. (1880) 1,531; (1890) 1,913; (1900) 2,105.

Bloomfield: township; Essex co., N. J. (for location of county, see map of New Jersey, ref. 2-D); 4 miles N. N. W. of Newark; on branch of D., L. and W. R. R. and N. Y. and Greenwood Lake Ry.; has superior high school, nine churches, a German Presbyterian Theological Seminary, extensive manufactures of woolen cloth, tissue and photographic paper, hats, shoes, safety-pins, saddlery hardware, rubber goods, church pipe-organs, cabinet-organs, mantels, and perfumery; here are also brass rolling-mills. Bloomfield was founded as early as 1685, under the name of Watsesson; named Bloomfield in 1796 from Gen. Joseph Bloomfield. Pop. (1880) 5,748; (1890) 7,708; (1900) 9,668.
EDITOR OF "RECORD."

Bloomfield, JOSEPH: b. at Woodbridge, N. J.; studied law; entered the Revolutionary army in the Third Regiment of New Jersey troops as captain, serving bravely throughout the war; became attorney-general of New Jersey; Governor of New Jersey (1801–12); brigadier-general in the war with Great Britain (1812–15); and an influential Jeffersonian member of Congress (1817–21). D. in Burlington, N. J., Oct. 3, 1823.

Bloomfield, MAURICE, Ph. D.: philologist; b. at Bielitz, Austrian Silesia, Feb. 23, 1855; removed to the U. S. with his parents 1867; studied at the University of Chicago; A.M., Furman University, Greenville, S. C., 1877; studied Sanskrit and comparative philology at Yale 1877–78; fellow of Johns Hopkins University 1878–79; Ph. D. 1879; studied in Berlin and Leipzig 1879–81; associate in Johns Hopkins University 1881, where he now is professor of Sanskrit and comparative philology. He has edited from the MSS. the ritual book of the *Atharva-Veda*, the *Kāuçika-Sūtra*, and published some forty *Contributions to the Interpretation of the Veda*, besides numerous papers on the history, religion, mythology, and literature of ancient India, on Sanskrit, Latin, and Greek comparative grammar, and on the science of religions.

Bloomfield, ROBERT: English pastoral poet; b. in Honington, Suffolk, Dec. 3, 1766; worked as a shoemaker in London, and wrote in a garret *The Farmer's Boy* (1798), a rural poem which obtained great popularity, and was translated into French, Latin, and Italian. Among his other works are *Wild Flowers* and *Ballads and Songs*. D. Aug. 19, 1823. See *Pursuit of Knowledge under Difficulties*, vol. ii.; *Blackwood's Magazine* for June, 1822; W. H. Hart, *Selections from Correspondence* (1871).

Bloomfield-Zeisler, FANNY: See the Appendix.

Bloom'ington: a city and railroad center; capital of McLean co., Ill. (for location of county, see map of Illinois, ref. 5-E): 60 miles N. N. E. of Springfield. It has manufactures of stoves, furnaces, grain-separators, ice, flour, and plows; car-works and repair-shops (employing some 1,200 hands), a coal mine, elevators, tile-factories, brick-yards, and several furnaces. Ten nurseries and twenty-five firms of horse importers are located in Bloomington and Normal. Ten miles of electric street railway are in operation, and 15 miles of the streets are paved with brick. It is connected by a street railroad with Normal, 2 miles distant, which is the seat of the State Normal University and the Soldiers' Orphans' Home. Bloomington is the seat of the Illinois Wesleyan University and a Roman Catholic college. Pop. (1880) 17,180; (1890) 20,484; (1900) 23,286.

Bloomington: city; railroad junction, and capital of Monroe co., Ind. (for location of county, see map of Indiana, ref. 8-D); 51 miles S. W. of Indianapolis. It is the seat of the State University: has important limestone quarries and manufactures of hard wood, and contains large tanneries. Pop. (1880) 2,756; (1890) 4,018; (1900) 6,460.

Blooms'burg: town (incorporated as such in 1870); capital of Columbia co., Pa. (for location of county, see map of Pennsylvania, ref. 4-H); on Del., Lack. and W. and Phil. and Reading R. Rs., and on north branch of Susquehanna river, 56 miles S. W. of Scranton. Iron and limestone abound in the vicinity. The town has a State normal school, 3 public schools, 8 churches, iron furnaces and foundries, silk-mill, carpet-factory, brass and copper tube-works, furniture and desk factories. Pop. (1880) 3,702; (1890) 4,635; (1900) 6,170.
EDITOR OF "COLUMBIA COUNTY REPUBLICAN."

Blossburgh: borough; Tioga co., Pa. (for location of county, see map of Pennsylvania, ref. 2-F); on railroad and Tioga river, 41 miles S. of Corning, N. Y.; has mines of semi-bituminous coal and of iron. Pop. (1880) 2,140; (1890) 2,568; (1900) 2,423.

Blouet, bloo'ay', PAUL (*Max O'Rell*): author; b. in Brittany, France, Mar. 2, 1848; educated in Paris (A. B. 1864; B. Sc. 1865); commissioned in French army 1869; taken prisoner at Sedan in Franco-Prussian war 1870; was badly wounded in fighting against the Commune; newspaper correspondent in England 1873; head French master in St. Paul's School 1876–84; lectured much in Great Britain and the U. S. 1887–90. Author of *John Bull and his Island* (1883); *John Bull's Daughters* (1884); *Drat the Boys* (1886); *Jonathan and his Continent* (1889). C. H. THURBER.

Blount, blŭnt, WILLIAM: Senator; b. in North Carolina in 1744; member of the Continental Congress; in 1790 became governor of territory south of the Ohio. In 1796 he was elected a U. S. senator for Tennessee, and in 1797 was expelled from the Senate on a charge that he was implicated in a plot to surrender a part of Louisiana to the British. D. in Knoxville, Tenn., Mar. 21, 1800.

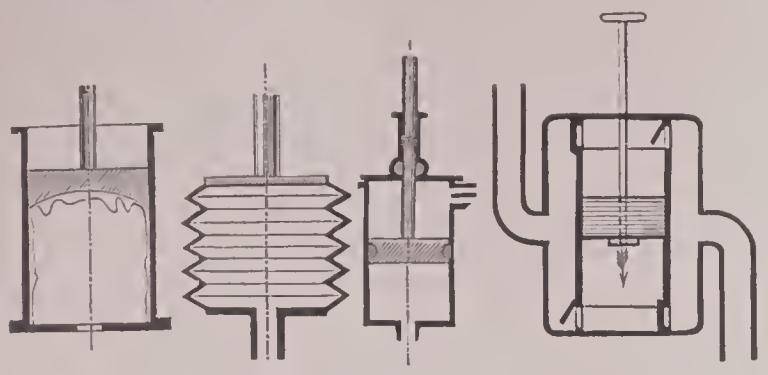
Blow, HENRY T.: legislator; b. in Southampton co., Va., July 15, 1817; graduated at the University of St. Louis, Mo.; prominent Unionist and anti-slavery man before the civil war; U. S. minister to Venezuela (1861–62); member of Congress (1863–67); minister to Brazil (1869–71). D. in Saratoga, N. Y., Sept. 11, 1875.

Blow-fly: a large fly; black and steel-blue in color; attracts attention by its loud buzzing; is readily attracted by the smell of meat, on which it lays its eggs or "fly-blows." *Caltiphora vomitoria* is the common species. See FLESHFLY.

Blowing-machines: machines for producing blasts of air, as for a fire or furnace, or for exhausting air or other gases, as for ventilation.

Probably the earliest form was a bag of skin or leather. From this was developed the common blacksmith's bellows.

(See Bellows.) A form of bag-blower, in which the bag is inclosed in a cylinder and operated by a piston, is shown in Fig. 1, a form of bellows in Fig. 2, and a double-acting piston-blower in Fig. 3. These are shown in an elementary form without valves.



Figs. 1 to 4.

It is stated by Reuleaux in his *Konstructeur* that, contrary to Wilkinson and Ewbank, the bellows shown in the Egyptian wall-paintings have not flap-valves, but the inlet is closed by the heel of the workman, and in the bellows used in India to-day the heel or thumb of the operator serves for an inlet valve.

Piston-blowers.—The modern piston blowing-machine is essentially a pump, with inlet and outlet valves, as in Fig. 4. Such machines are commonly called blowing-engines, and they may, like pumps, be driven by a crank and pitman from a rotating shaft or wheel, such as an overshot water-wheel, or by a steam-cylinder, either directly or through the medium of gearing. When designed to furnish air at high pressures, as for pneumatic transmission to drive rock drills or other machinery, the blowing-machine becomes an "air-compressor." The construction of a blowing-engine and of a compressor is practically identical, except that the latter is provided with a water-jacket or with a spraying apparatus in the air-cylinder for cooling the air heated by the compression.

Prior to about 1870 the cylinders of blowing-engines for blast furnaces were made of great size, and run at a low speed, say ten to fifteen double strokes per minute. When driven by a steam-engine they were either horizontal, in which case they were driven through cog-wheel gearing, the steam-cylinder having a higher speed than the blowing-cylinder, or vertical, in which case the engine was a beam-engine, with the steam-cylinder at one end and the blowing-engine at the other end of a huge walking-beam. The valves were usually large flap-valves of leather, backed with wood or metal. Since 1876, however, the direct-acting vertical blowing-engine has come into almost universal use, with smaller valves, allowing the use of much higher speeds, fifty double strokes per minute for an engine of 4-feet stroke being not uncommon. It is customary to place the blowing-cylinder above the steam-cylinder.

Fig. 5 shows a modern blowing-engine of this type, built by the Weimer machine works, Lebanon, Pa. The valves are of sheet rubber, perforated with slots, and rest upon iron seats having alternating slots. They lift against iron guards having slots corresponding to those in the valves. As these valves work equally well on any plane, they may be placed horizontally, vertically, or obliquely, and may therefore be so disposed as to secure the maximum area of opening. The blowing cylinder-heads are devoted to the inlet valves placed in the sides and bottoms of recessed segmental boxes. The outlet valves are placed in the periphery of the cylinder, and work against vertical slots in its shell of such length as to give the desired area of opening into the air-jacket surrounding the cylinder.

Engines of the type shown in Fig. 5 are built as large as 48 inches stroke, with steam-cylinder 42 inches and air-cylinder 84 inches in diameter, discharging 307 cubic feet per revolution, or 15,350 feet per minute, at a speed of 50 revolutions per minute, and an air-pressure as high as 14 lb. per square inch.

In the ordinary form of vertical blowing-engine the air and the steam piston are on the same rod. In the steam-cylinder, when the steam is cut off before the end of the stroke, in order to realize the economy due to expansion, the pressure on the steam-piston is highest during the earlier portion of the stroke, and lowest at the end of the stroke; while in the air-cylinder the pressure increases from the pressure of the atmosphere at the beginning up to a maximum at that portion of the stroke at which the air-discharge valves open, that is at the pressure in the air-receiver or main, and continues constant during the remainder of the stroke. The fluctuations of energy during a stroke, due to the differences in pressure upon the air and steam pistons,

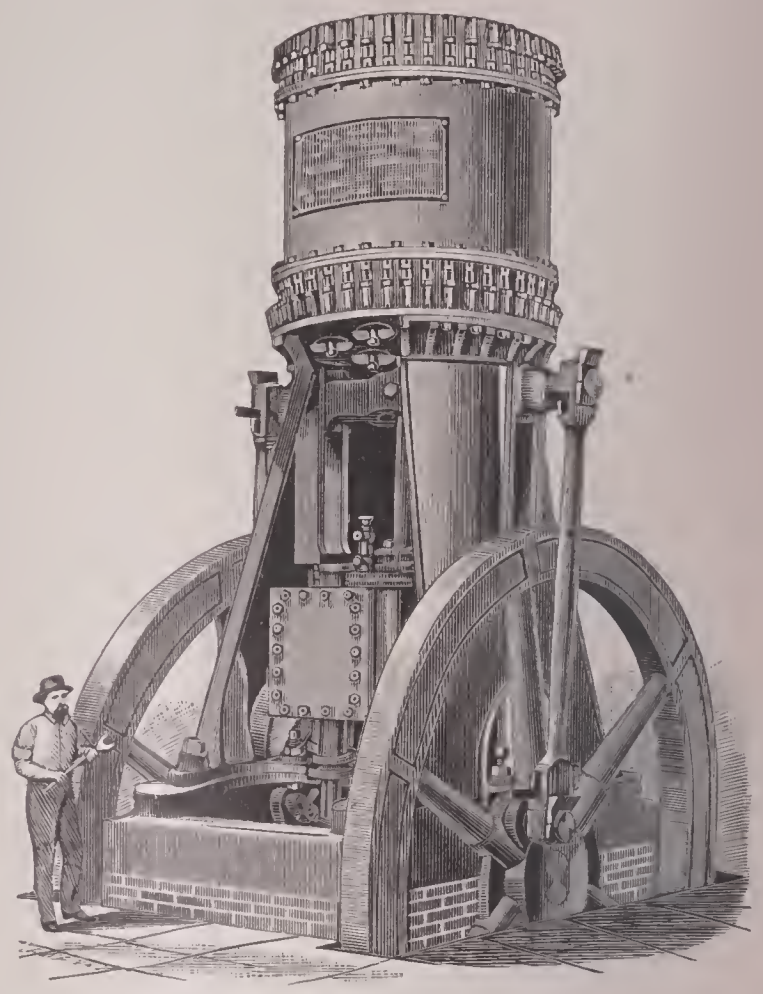


Fig. 5.—Direct-acting piston-blower.

are absorbed and then given out by two large and heavy fly-wheels, which alternately receive force from and give it back to the reciprocating piston-rod through two pitmans connected with a heavy cross-head, which is rigidly attached to the piston-rod. The massive fly-wheels and their connections make this form of blowing-engine a very heavy and costly piece of apparatus relatively to the horse-power developed by it, although not so heavy or costly as the earlier forms of engines which it has displaced. It is likely ere long to be displaced by a compound engine, with cranks at 90 or 120 degrees, carrying the initial steam-pressure to a greater distance in each cylinder, thus more nearly equalizing the strains, balancing the fluctuations in energy through the crank-shaft instead of storing and restoring it by means of heavy fly-wheels, and at the same time realizing the economy of steam due to compounding.

Rotary Blowing-machines.—The blowing-machines above described may be classed as reciprocating machines, being driven by the to-and-fro motion of a piston or of a bellows-frame. Another class is that of rotary machines in which the apparatus is driven directly by a rotating shaft. Of this type there are three sub-classes, viz., disk-blowers, fans, and positive blowers. Disk-blowers are used for moving large quantities of air at the lowest pressures, as for exhausting air from heated rooms or for ventilation. A form of such blower is shown in Fig. 6. It is built in various sizes, from 12 to 96 inches in diameter. A 12-inch fan, driven at 1,000 to 2,000 revolutions per minute, will absorb $\frac{1}{16}$ to $\frac{1}{4}$ horse-power, and will exhaust from 1,500 to 3,000 cubic feet of air per minute, while a 96-inch fan, driven from 200 to 300 revolutions per minute, will require from 4 to 10 horse-power, and will exhaust from 60,000 to 90,000 cubic feet per minute. The operation of a disk-blower in air is similar to that of a screw propeller in water.

A fan is somewhat similar to a rotary disk-blower, but the wings or vanes are parallel with the shaft, and are inclosed in a sheet-metal box or case, which has an opening at the axis to receive the air and another at the periphery of the case to discharge it. For a further description, see Fans.

Root's rotary positive blower is shown in section in Fig. 7. It consists of an oblong metal case closed at the ends, con-

taining two parallel shafts geared together at each end outside of the case, and each carrying what is known as "revolvers." The action of these revolvers, in taking air from the lower half of the case and pushing it outward and upward through the exit, is clearly shown in the cut.

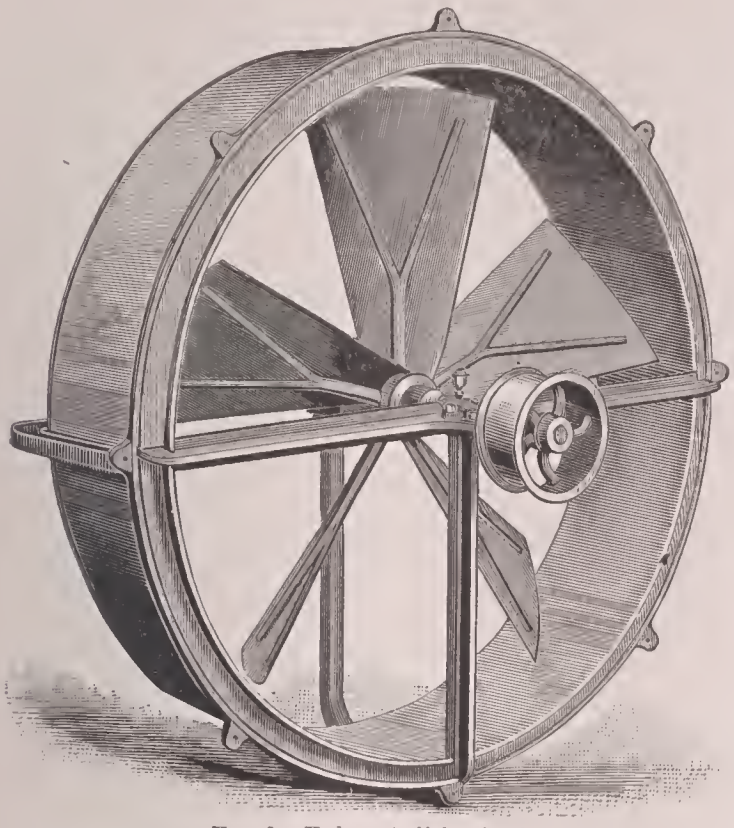


FIG. 6.—Exhaust disk-wheel.

The Baker positive blower is composed of three drums, each of which is a single casting, turned and balanced. The upper drum to which the pulley or engine is attached does all the work of blowing or exhausting. The two lower drums are merely valves for the purpose of preventing the air from escaping or returning.

Both fans and positive blowers are used for blowing cupolas for melting iron. Positive blowers are capable of giving much higher pressures than fans, while the fans, being run at higher rotative speeds, are cheaper in first cost for a given quantity of blast.

Steam-jet Blowers.—Steam escaping at high pressure through a small nozzle creates induced currents in the surrounding atmosphere, on the principle of the injector, and a steam-pipe of small diameter inserted in an air-pipe of considerably larger diameter, which is open at both ends, makes a simple form of blower. Such an apparatus is occasionally used to increase the draft in steam-boilers by blowing a forced blast under the grate-bars. A steam-pipe inserted into a chimney, and discharging steam in a vertical direction, constitutes the steam-jet blower commonly used in locomotives and steam fire-engines for producing a powerful draft. For this purpose the steam-nozzle requires to be given a proper shape and dimensions, depending upon the size and shape of the chimney pipe and the quantity of the chimney gases. For blowing air into furnaces certain shapes of nozzles and of air-pipes have been found advantageous. A furnace-blower of the steam-jet type, known as the Korting, is shown in Fig. 8.

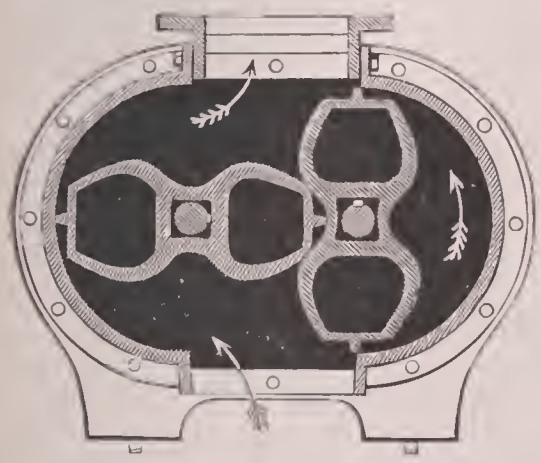


FIG. 7.—Root's positive blower.

Water-blast Blowers.—A jet or falling stream of water may also be used to create a blast of air by means of induced currents. The *Trompe*, described in early works on metallurgy of iron, is an apparatus based on this principle. In it a stream of water falls through a vertical wooden tube into a large air-tight chamber below. Numerous small holes are cut in the tube, through which air is drawn by the descending stream, which air is set free in the chamber, whence it is led by a pipe to the furnace. The efficiency of this apparatus is much lower than that of a blowing-machine driven by a water-wheel.

A more efficient form of water-blower, applicable in situations where the quantity and fall of water bear proper relations to the quantity and pressure of air to be supplied, consists of two air-tight tanks placed at the level of the tail-race, which are alternately filled through tubes from the head-race. While being filled the air displaced in them is forced into the blast main, and while being emptied a valve admits air from the external atmosphere.

The *D'Aubisson Oscillating Cylinder* is a peculiar form of blowing-machine of limited application. It comprises a barrel with a diaphragm, central through the entire length and of nearly the whole diameter, and two valves alternately aspiring and expiring. In its normal position the diaphragm is vertical; the barrel is filled half full of water, and is then set in slow oscillation by means of a crank and pitman. During each oscillation the water passes from one half of the barrel to the other, drawing air into the emptying half and expelling it from the other.

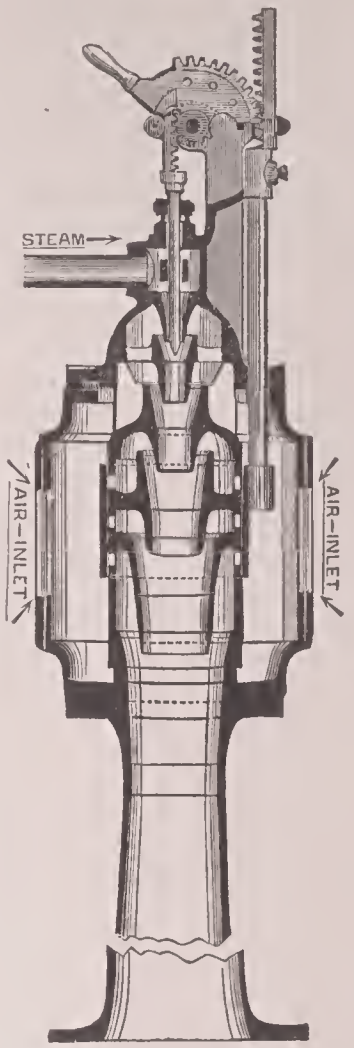


FIG. 8.—Steam-jet blower.

WILLIAM KENT.

Blowpipe (in Fr. *chalumeau*; Germ. *Löthrohr*): a tube bent at right angles and terminating in a fine nozzle, for directing a current of air from the mouth across the flame of a lamp, candle, or gas-jet. It produces a conical-pointed flame, intensely hot, which can be readily directed upon small objects by the operator. It is constantly used by the jeweler in soldering, but in the hands of the chemist and mineralogist it is the basis of a distinct and comprehensive system of analysis, both qualitative and quantitative. By using a gentle current of air, and not permitting the nozzle to enter the flame, the entire flame is brought into a horizontal position, but its chemical character is not changed; it is still composed of combustible gases rich in carbon; and as these, when directed upon many metallic oxides, reduce or liberate the metals, this flame is called the *reducing* flame. If, on the other hand, a more powerful current of air is blown into the interior of the flame, a sharp-pointed jet of a blue tint is the result. Many metals, placed just beyond the point of this flame, are rapidly oxidized; hence it is called the *oxidizing* flame. The chemist is thus enabled by the aid of the blowpipe to expose small quantities of minerals or other substances either to a reducing or an oxidizing influence. By holding the substance in platinum-pointed forceps its fusibility can be determined, or it may communicate to the flame some characteristic color. By placing it upon charcoal many important facts can be learned with regard to it; i. e. it may produce white or colored deposits upon the coal, or evolve a characteristic odor, etc. By subjecting it at the same time to the action of carbonate of soda it may yield metallic globules or powder, with or without a coating. By the aid of a loop of platinum wire the body under examination may be exposed to the action of borax or salt of phosphorus, when glassy beads of characteristic colors may result. Thus with the aid of the blowpipe the analyst subjects the substance to a series of tests, by which its exact character is revealed. By the use of the balance, clay crucibles, cupels of bone-ash, and a great variety of reagents, the percentages of certain metals can be determined, such as copper, cobalt, nickel,

gold, and especially silver. The art of keeping up an uninterrupted current of air through the blowpipe is easily acquired. See Eldeshorst's *Manual of Blowpipe Analysis*, and Plattner's *Manual of Qualitative and Quantitative Analysis with the Blowpipe*; also OXYHYDROGEN BLOWPIPE.

Blowpipe-and-Arrow, called also **Gravata'na-and-Pocu'na**: a weapon used by some of the Indians of South America, both in war and for killing game. It is a straight tube, in which a poisoned arrow is placed and forcibly expelled by the breath. The tube, etc., is from 2 to 12 feet long, the bore not large enough to admit the little finger. It is made of reed or of the stem of a palm. The arrows are from 1 or 2 to 18 inches long, made of the spines of a palm, sharp, notched so as to break off in the wound, and their points covered with curare or other poison. A little down is twisted round each arrow, to fit the tube. In the hand of a practiced Indian it is a very deadly weapon. As his weapon makes no noise, the hunter often does wonderful execution.

Blubber: the cellular membrane in which the oil or fat of the whale is inclosed; the layer of fat which lies just beneath the skin of the whale. A single whale often contains 30 tons of blubber, from which about 20 tons of oil are extracted. The blubber serves to protect the whale from cold and to diminish its specific gravity. It is an important article of food to the Esquimaux.

Blücher, blü'cher, GEBHARD LEBERECHT, von: Prince of Wahlstadt; Prussian general; b. at Rostock, Dec. 16, 1742. He entered the service of Prussia in 1760; became a captain in 1771, and a colonel in 1790. In 1794 he distinguished himself as a cavalry officer in the war against the French, and was raised to the rank of major-general. He led the vanguard at the battle of Auerstadt (1806), from which he retreated to Lübeck. He was defeated and taken prisoner near Lübeck in Nov., 1806. When the war between the allies and Napoleon was renewed in Mar., 1813, Blücher was appointed commander-in-chief of the Prussian army, which he led at Lützen and Bautzen. He defeated Macdonald at the Katsbach in August, and took many prisoners. On Oct. 16 he gained a victory over Marshal Marmont at Möckern, and then formed a junction with the allied armies, which, with his co-operation, defeated Napoleon at the battle of Leipzig, Oct. 17–19, 1813. He was raised to the rank of field-marshal in 1813, and led the Prussian army, about 60,000 strong, which invaded France early in 1814. Between Feb. 10 and 15 he was defeated by Napoleon at Champaubert, Montmirail, Veauchamps, etc., and lost about 15,000 men, but he defeated the same enemy at Laon, Mar. 9, entered Paris at the end of that month, and here received from his king the title of Prince of Wahlstadt. On the renewal of the war in 1815 he took command of the Prussian army, and was defeated at Ligny, June 16, but reached Waterloo in time to decide the victory, June 18, 1815. D. in Krieblowitz, Silesia, Sept. 12, 1819. He was noted for his energy and rapid movements, and was surnamed Marshal Vorwärts (Forward). In 1826 a large bronze statue by Rauch was erected to him in Berlin, and another in Breslau in 1827. See Foerster, *Blücher und seine Umgebung* (1821); Pischon, *Blüchers Leben, Thaten, und Ende* (1842); Varnhagen von Ense, *Blüchers Lebensbeschreibung* (1827); *Life and Campaigns of Blücher* (London, 1815); Scherr, *Blücher, seine Zeit und sein Leben* (2 vols., 1862); Bieske, *G. L. Blücher von Wahlstadt* (1862); and Chesney, *Waterloo Lectures* (1874).

Blue: one of the three primary colors, and one of the seven prismatic colors, of which the complementary is orange. The *blue coloring-matter of flowers* has been called anthokyan or cyanine; little is known of its chemical constitution. *The blue pigments* are (1) ultramarine, obtained originally from lapis-lazuli, now manufactured artificially; (2) Prussian or Berlin blue, the sesquiferro-cyanide of iron; (3) smalt, glass colored blue by oxide of cobalt; modifications of this pigment are called azure blue, cerulean blue, indigo blue, deep blue, king's blue, etc.; (4) Thenard's or cobalt blue, a compound of alumina and oxide of cobalt; (5) verditer or Bremen blue, mountain blue, etc., a basic carbonate of copper; (6) blue ochre or iron blue, native Prussian blue, is a phosphate of protoxide of iron found in many places.

The blue dyes are (1) indigo. This is applied as Saxon blue, or indigo extract, a solution of indigo in fuming sulphuric acid. Chemic, or chemic blue, is the very acid solution; indigo carmine is the extract neutralized by an alkali, as the indigo vat, indigo reduced to a colorless solution by protoxide of iron or grape-sugar, which becomes blue again in the air. (2) Prussian blue, already mentioned as a pigment. (3) Logwood blue, produced by logwood extract on goods mordanted with alum and cream of tartar. (4) Azuline, or phenol blue, prepared from phenol or carbolic acid. (5) Aniline blues, (*a*) bleu de Lyons, triphenylrosaniline; (*b*) Nicholson's, or alkali blue, etc. (6) Toluidine blue. (7) Diphenylamine blue. (8) Quinoline blue, etc. C. F. C.

Blue-Beard (Fr. *Barbe-bleu*; Germ. *Blaubart*): the epithet applied to the central figure of a famous popular tale, first given literary form by Charles Perrault in his *Contes de ma mère l'oye* (1697). The story runs that a certain rich nobleman, named Raoul, distinguished by a blue (i. e. blue-black) beard, married a young and innocent wife. Soon after, going away for a time, he left with her the key to a chamber, which he forbade her to enter. Curiosity made her disobey, and she found in the room evidences of the murder of his six previous wives. Raoul returns, discovers what she has done, and is about to slay her also, when her two brothers arrive upon the scene, kill the husband, and save her life. Since Perrault this tale has had universal currency, both as a nursery tale and as a literary theme. Its origin has been sought in very different places. Perrault seems to have obtained his material from local Low Breton sources. Hence attempts to find the original theme among Celtic traditions. K. Hofmann thinks he has found it in the tale of Aristor and the sister of Percival in the prose Grail. Others point to the story of Cômor, a Breton king of the sixth century, and St. Triphine. The most elaborate theory, however, identifies Blue-Beard with Gilles de Laval, Marshal de Rais RETZ (*q. v.*), who, after winning great renown as a soldier and comrade-in-arms of Jeanne d'Arc, fell into the depths of depravity, and enticed into his power a great number of young boys and girls, whom he debauched and then murdered. See the Abbé Bossard's work, *Gilles de Rais dit Barbe-Bleue* (Paris, 1886). A. R. MARSH.

Bluebell: the name in Great Britain of two widely different wild flowers: (1) the *Hyacinthus non-scriptus*, a hyacinth with beautiful blue flowers, and a root which was formerly gathered for the starch it contains; (2) the *Campanula rotundifolia*, the harebell, very common throughout Europe, and having a wide range in Asia and North America. This and other blue-flowered species of *Campanula* are sometimes called "bluebell" in the U. S., where the name is also in some places incorrectly given to the blue-fringed gentian.

Bluebird (*Sialia sialis*): a bird of the family *Turdidæ*; a general favorite in the U. S., which it visits as a summer bird of passage, and is welcomed as a harbinger of spring. It prefers the vicinity of human habitations, and often

The bluebird.

builds in orchards and gardens. The upper part of it is a rich sky-blue color; the breast and throat are a reddish chestnut. Its song is a mellow, sweet-toned, and agreeable warble. This bird lays about five pale-blue eggs. The male and female both defend their nest and young with remarkable courage when attacked by serpents or other animals. They generally build their nest in the hollow limb of a tree or in a box about the house or garden kindly provided by the farmer, whom they repay partly by the

cheerfulness of their song, partly by the multitude of injurious insects which they daily destroy. In the summer their food consists of insects and spiders; in the winter, of berries. In the month of October their song changes, and the pleasant warble shrinks into one single plaintive note. Even after the trees are stripped of their leaves they still linger for a short time over their native fields. Two other species occur in the U. S., *S. arctica* in the northwest and *S. mexicana* in the southwest.

Bluebooks: the term applied in Great Britain and the U. S. to certain official government publications, the name alluding to the fact of such books in Great Britain usually have blue paper covers. In Great Britain the bluebooks are reports and other papers printed and issued under the authority of Parliament, or the Privy Council, or other chief department of government, primarily for the information of Parliament. As applied to the official publications of the U. S., the term is generally restricted in meaning to (*a*) the publications containing the rules and regulations for the general government of the U. S. navy, and (*b*) to the published official list of the names and salaries of all the government employees. The term is therefore popularly used also as the name for any list of names of an exclusive character, either financially or socially. The official publications containing the reports of the heads of departments, etc., in France have yellow and blue covers, in Italy green, and in other countries various other colors, but they are all popularly designated as bluebooks.

Bluebreast: See Bluethroat.

Blue Earth City: village; capital of Faribault co., Minn. (for location of county, see map of Minnesota, ref. 11–E); on C., M., St. P. and O. R. R., and on Blue Earth river, 120 miles S. S. W. of St. Paul; has a fine school, seven churches, and an opera-house. There are manufacturing, milling, and extensive farming industries. Pop. (1880) 1,066; (1890) 1,569; (1900) 2,900.

Editors of "Post."

Blue-eye (*Entomiza cyanotis*): sometimes called *Blue-cheeked honey-eater*; a beautiful bird abundant in New South Wales. It is a species of honey-sucker, and feeds on insects and honey, which it obtains chiefly from the blossoms of the *Eucalyptus*. It is gregarious, and remarkable for its graceful movements.

Bluefield: village; Mercer co., West Va. (for location of county, see map of West Virginia, ref. 11–F); on Norf. and West. R. R.; 100 miles W. of Roanoke; has 3 graded schools, 6 churches, machine-shops, electric lights, and water-works. A street-railway company has now (1893) been organized. Bluefield is a center of trade for the soft-coal region of the Virginias. Pop. (1890) 1,775; (1900) 4,644.

Editor of "Journal."

Bluefields, or **Blewfields**: a river of Nicaragua, in the Mosquito Territory; flows eastward, and enters the Caribbean Sea at the town of Bluefields, which has a good harbor, and is in lat. 12° N., lon. 83° W. (see map of Central America, ref. 6–J).

Bluefish (*Pomatomus saltatrix*): a fish of the family *Pomatomidæ*; allied to the mackerels. It derives its specific name from a habit of leaping out of the water. It frequents the coasts of the U. S. in spring and summer, is very swift and voracious, and preys on the weakfish and other fishes. It weighs from 5 to 10 lb., and is a fine fish for the table.

Blue Gowns: an order of paupers formerly existing in Scotland. They received annually from the king a largess of alms on condition that they prayed for his welfare; hence also called the king's *bedesmen*, or beadsmen. Every year after his accession to the throne the king elected a member of the order. The alms consisted chiefly of a blue gown or cloak (hence the name), and a purse containing as many Scotch shillings, equivalent to pennies sterling, as the years of the king's life, besides a pewter badge bearing the words "pass and repass," which gave them protection against the laws interdicting mendicity, and gained them among strangers alms or a night's lodging. They continued to be appointed up to 1833, but the order did not become finally extinct until 1863.

Blue Grass, called also **Green Meadow Grass** and **June Grass**: a species of grass (*Poa pratensis*) which is a native of both Europe and America; distinguished from other species of its genus by its flat panicles, smooth culms and sheaths, and short, blunt ligules. Though common in many regions, this grass attains its chief value in that part of Central Kentucky which is called the "blue-grass region," where it is considered to afford the most important crop that can be raised by farmers. It is chiefly cultivated for pasturage and lawns, though on certain soils it makes excellent hay. To this grass Kentucky owes her great reputation as a stock-raising State.

Blue-gum: See Eucalyptus.

Blue Laws: laws of puritanical strictness in religious or sumptuary matters; in particular, certain fanatical and meddlesome laws said to have once existed in the colony of New Haven, now a part of the State of Connecticut. They are the fabrication of Samuel Peters, an Episcopal clergyman, and are found in *A General History of Connecticut, from its first Settlement by George Fenwick, Esq.*, which was written by Peters, and published in London in 1781. (See Peters, Samuel.) The book was not generally well received at the time, and a review of it said: "We . . . observe in it so many marks of party spleen and idle credulity that we do not hesitate to pronounce it altogether unworthy of public attention." It has, however, been quoted as authentic by numerous writers, not without prominence, even so late as 1870. Blue was a symbol of constancy in Chaucer's time, and in his *Court of Love* he speaks of "folke that knele in blew . . . in signe they ever were and ever will be true." Later the phrase true blue came to be applied to rigid adherence to one's convictions, and then to bigotry and fanaticism. The laws of the New Haven colony had been called "blue laws" in New York early in the eighteenth century, undoubtedly in allusion to the strictness of its religious and moral laws, and to the fact that only church-members could vote or hold offices. By the laws of the first constitution and code of Connecticut the penalty of death was inflicted for witchcraft, blasphemy, idolatry, adultery, rape, kidnaping, and cursing and smiting one's parents; and it was a penalty punishable by fine to play at shuffle-board, to be an idler, to lie, to indulge in profane swearing, to take tobacco in public places, to tarry in a tavern longer than half an hour, or later than 9 o'clock P. M. According to the alleged laws of Peters, "No one shall run upon the Sabbath day, or walk in the garden or elsewhere, except reverently to and from meeting." "No woman shall kiss her child on the Sabbath or fasting days." "No minister shall keep a school." "No one shall read Common-Prayer, keep Christmas or Saints' days, make mince pies, dance, play cards, or play on any instrument of music, except the drum, trumpet, and jew's-harp." "Every male shall have his hair cut round, according to a cap," etc. This will serve to illustrate the character of the real and the fictitious blue laws. See J. Hammond Trumbull's *True Blue Laws of Connecticut and New Haven, and the False Blue Laws invented by Samuel Peters* (8vo, Hartford, 1876).

F. Sturges Allen.

Blue Light: See Bengal Light.

Blue Monday: so named from an ancient custom in some parts of Europe of decorating churches with blue on the Monday before Lent, this particular Monday, and afterward all Mondays, being considered holidays for men whose business obliged them to work on Sundays. This practice led to riotous excesses still traditionally remembered, and it was generally suppressed by legal enactments.

Blue Mountain, Pennsylvania: See Kittatinny.

Blue Mountains: a range in the eastern part of New South Wales, and N. of the Australian Alps. It is nearly parallel with the seacoast, from which it is about 100 miles distant. The highest peaks of this range rise over 4,000 feet above the level of the sea. The range long formed a barrier between the settlements on the coast and the interior. In 1815 a road was opened through these mountains to the rich pastures of Bathurst Plains; and now a railroad connects Sydney and Bathurst, crossing the Blue Mountains at an elevation of over 3,000 feet.

Blue Nile: See Bahr-el-Azrek.

Blue Pill (called also *Blue Mass*, or *Massa Hydrargyri*): a drug made by rubbing up metallic mercury with liquorice and other excipients. Each grain of the mass contains one-third grain of mercury, and the dose of the mass is from one to twenty grains. It is used in medicine for the purpose of stimulating the liver to greater secretion, and so increases the flow of bile. In Great Britain, the mass is mixed with both liquorice and confection of roses. In the U. S., the use of a saccharine fluid, such as honey, is recommended in place of the confection of roses.

Blue Ridge: the range of the Appalachians which is nearest to the Atlantic Ocean. It extends in a N. E. and S. W. direction through Pennsylvania, Maryland, Virginia, North Carolina, and Georgia. The part of this ridge in Pennsylvania is called the South Mountain. In Virginia it forms the S. E. boundary of the Great Valley, and is remarkable for beautiful scenery. The Peaks of Otter, which are the highest points of this ridge in Virginia, rise about 3,993 feet above the level of the sea. From North Carolina southward the name of Blue Ridge is invariably applied to the watershed which divides the waters flowing into the Atlantic from those of the Gulf of Mexico.

Blue River, Africa: See BAHR-EL-AZREK.

Blue River, Col.: See BUNKARA RIVER.

Blue River: of Indiana; rises in Henry County, in the east part of the State, and flows southwestward. After it has united with several streams it receives the name of Driftwood or East Fork of White River.

Bluestocking (in Fr. *bas bleu*): a term applied to literary ladies, and generally with the imputation of pedantry. It originated in England in Dr. Johnson's time, when there existed bluestocking clubs, at which literary ladies met to converse with distinguished literati. According to Boswell, they were so called because Mr. Stillingfleet, one of the prominent members, always wore blue hose.

Blue Sulphur Springs: a post-village of Greenbrier co., West Va.; 22 miles W. of the famous White Sulphur Springs. The springs afford a copious supply of valuable saline chalybeate waters, useful in the treatment of many diseases.

Bluethroat, sometimes called **Bluebreast**, or **Blue-throated Rob'in** (*Phœnicura suecica*): a beautiful bird of the family *Sylvidæ*; is common on the continent of Europe as a summer bird of passage, and is supposed to pass the winter in Africa. It resembles a redbreast in form, but is rather larger, and has a brilliant sky-blue plumage on its throat, below which is a black bar. It sings sweetly, and imitates the notes of many other birds. This is one of the birds which the Italians calls BECCAFICO (*q. v.*).

Blue Vitriol: the sulphate of copper. See COPPER.

Bluewing-duck, or **Bluewing-teal**: a species of duck (*Anas discors*); an abundant game-bird of America. Vast numbers spend the winter in the marshes near the mouths of the Mississippi, to which they congregate both from the North and the East; the summer migrations of the species extend as far N. as the 57th parallel, and it is plentiful on the Saskatchewan in the breeding-season. It breeds also in the marshes of the South, and is common in Jamaica, where it is a permanent resident. No duck is in higher esteem for the table. In the summer plumage of the male the upper part of the head is black; the other parts of the head are of a deep purplish blue, except a patch of pure white before each eye; the plumage on the upper part is brown mixed and glossed with green, except that the wings exhibit various shades of blue, the lesser wing-covers being of a rich ultramarine, with an almost metallic luster; the lower parts are reddish orange spotted with black; the tail-feathers are short and pointed. It is a bird of extremely rapid and well-sustained flight.

Bluff: a high bank or cliff presenting a steep or abrupt front toward a river, lake, or sea. The term is often applied to the high banks of the Mississippi and other Western rivers. Between the bluff and the river sometimes occurs a flat tract of considerable width called a bottom. On the Mississippi below Lake Pepin the bluffs of magnesian limestone rise about 350 feet above the river.

Bluff'ton: city and railroad junction; capital of Wells co., Ind. (for location of county, see map of Indiana, ref. 4–G); on L. E. and W. and T., St. L. and K. C. R. Rs., and on Wabash river; 25 miles S. of Fort Wayne. Bluffton has 3 schools, 7 churches, city water-works, natural gas, electric lights, and macadamized streets. It has planing-mills, corn-planter manufactory (steam), barrel manufactories, foundries and machine-shops, stave and heading factories, flouring-mills, furniture-frame factory, furniture-factory, boot and shoe factory, washing-machine factory, and a large grain, lumber, and stock trade. Pop. (1880) 2,354; (1890) 3,589; (1900) 4,479.

EDITOR OF "BUGLE."

Bluffton: village; Allen co., O. (for location of county, see map of Ohio, ref. 3–D); situated at junction of Lake Erie and West., and Pitts., Akron and West. R. Rs. Bluffton has flouring and saw mills and lime-kilns, and horse-breeding and poultry-raising farms. There are outcropping magnesium-limestone formations, and extensive and valuable quarries have been developed. The surrounding farming region is populated by one of the largest exclusively German settlements in the U. S. Pop. (1890) 1,290; (1900) 1,783.

EDITOR OF "NEWS."

Bluhme, bloo'me, FRIEDRICH: German jurisconsult; b. in Hamburg, June 29, 1797; d. at Bonn, Nov. 5, 1874. He studied law at Halle, Göttingen, and Jena, and made in 1821 an extensive tour in Italy, the results of which are found in his essay, *Die Ordnung der Fragmente in den Pandektentitlen*, in the *Zeitschrift für geschichtliche Rechtswissenschaft*, vol. iv., in his edition of Gaius, his *Iter Italicum* (Berlin, 1824–37, 4 vols.), etc. He successively filled the chairs of jurisprudence at Halle, Göttingen, and Bonn, and published *Das Kirchenrecht der Juden und Christen* (Halle, 1826; 2d ed. 1851); *Grundriss der Pandektenrechts* (Halle, 1829; 2d ed. 1843), and *Encyclopädie und System der in Deutschland geltende Rechte* (Bonn, 1847–58, 3 vols.), his chief work.

Blum, bloom, ROBERT: democrat and popular orator; b. of poor parents at Cologne, Nov. 10, 1807. He founded the Schiller-Verein (Schiller Society) at Leipzig in 1840, and the German Catholic Church at Leipzig in 1845. In 1848 he was the master-spirit of the Saxon liberals or democrats, and a member of the Frankfort parliament, in which he was the leader of the Left or moderate opposition. Having been sent by this party to Vienna, he joined the insurgents of that city, which was soon captured by the Austrian army. Blum was arrested and shot at Vienna, Nov. 9, 1848. See Eduard Duller, *R. Blums Leben und Tod*, 1848; E. Franke, *Leben des R. Blum*, 1848.

Blum, ROBERT FREDERICK: figure-painter; b. in Cincinnati, O., July, 1857; studied in New York, Italy, Holland, and Spain. Member of the Society of American Artists (1882) and of the American Water-color Society; associate National Academy, New York; third-class medal, Paris Exposition, 1889. He first exhibited in New York in 1879, is well known as a water-color and pastel painter, and is a talented American illustrator. Aside from various single figures and compositions painted in oil, the most notable feature of which is harmonious and delicate color, he has painted a number of pictures of Venice and of life in Italy and Spain. His picture of *Venetian Bead Stringers* was awarded a prize of $2,500 at an exhibition held under the auspices of the American Art Association at New York in 1889. He is one of the most brilliant technicians among American water-color painters. Studio in New York.

WILLIAM A. COFFIN.

Blumenbach, bloo'men-bäk'h, JOHANN FRIEDRICH, M.D.: naturalist; b. at Gotha, May 11, 1752. He graduated as M. D. at Göttingen in 1775, and wrote for that occasion a remarkable thesis *On the Varieties of the Human Race*. In 1778 he became Professor of Medicine and Anatomy in the University of Göttingen, where he lectured for fifty years. He published a *Manual of Natural History* (1780), often reprinted. He may be said to have first placed natural history on the scientific basis of comparative anatomy. Among his works is a *Manual of Comparative Anatomy* (1805), which was translated into many languages. He advocated the doctrine of the unity of the human species, which he divided into five races—the Caucasian, Mongolian, Malay, American, and Ethiopian. D. Jan. 22, 1840. See C. F. H. Marx, *Zum Andenken an J. F. Blumenbach* (1840).

Blumenthal, bloo'men-täl, JACOB, von: composer; b. at Hamburg, Germany, Oct. 4, 1829; studied music there and at Paris and Vienna; became an excellent pianist. In 1848 he took up his residence in London, where he has since remained and is known as Jacques Blumenthal. His compositions are entirely of a light class, and include brilliant and effective parlor piano pieces and many songs which have become extremely popular.

D. E. HERVEY.

Blumenthal, LEONARD, von: b. in Schwedt, July 30, 1810; educated at the military academies of Culm and Berlin; entered the Prussian army as second lieutenant at seventeen; became first lieutenant in 1846; captain in the general staff in 1849, and in the same year captain in the general staff of the Schleswig-Holstein army; was made colonel in 1860; was distinguished in the war against Denmark; became major-general in 1864, serving with distinction in the war with Austria, and was appointed chief of

the general staff of the crown prince at the beginning of the war with France. He was appointed field-marshal in 1888. D. at Cassel, May 15, 1892.

Blumhardt, bloom'haart, CHRISTIAN GOTTLIEB: b. in Stuttgart, Apr. 29, 1779; d. in Basel, Dec. 19, 1838. He studied theology at Tübingen; was appointed secretary of the German Missionary Society in Basel in 1803; pastor of Bürg 1809, and director of the missionary school in Basel in 1816. Since 1816 he edited the *Missionsmagazin*, from 1828 also the *Heidenbote*, and published *Versuch einer allgemeinen Missionsgeschichte der Kirche Christi* (Basel, 1828–37, 5 vols.).

Blunt, GEORGE WILLIAM: hydrographer; b. in Newburyport, Mass., Mar. 11, 1802; educated in New York city. He was the author of various charts, *Atlantic Memoir*; *Sheet Anchor*; *Harbor Laws of New York*; *Plan to Avoid the Center of Violent Gales*; and compiler of the *American Coast Pilot*. He was a commissioner of emigration (1852–54), a pilot commissioner in 1845, and became a harbor commissioner in 1867. D. in New York, Apr. 19, 1878.

Blunt, JAMES G., M. D.: general; b. in Trenton, Me., July 20, 1826; took degree of M. D. in 1849, and practiced in Ohio till 1856, when he removed to Kansas; was appointed in 1861 brigadier-general and commander of the department of Kansas; major-general in 1862. In 1863 he commanded the army of the frontier. D. in Washington, D. C., in 1881.

Blunt, JOHN HENRY, M. A., D. D., F. S. A.: a clergyman of the Church of England; b. in Chelsea, England, Aug. 25, 1823; educated at University College, Durham; filled various curacies in the dioceses of Durham, Oxford, Exeter, and Ely; appointed Rector of Beverton, Gloucestershire, in 1873. He was a very prolific writer, especially of books of an encyclopædic character. Most widely known perhaps are *A Dictionary of Doctrinal and Historical Theology* (1870) and *A Dictionary of Sects, Heresies, Ecclesiastical Parties, and Schools of Religious Thought* (1874). Among his other works are *Directorium Pastorale* (1864), a volume on the principles and practice of pastoral work in the Church of England; *Household Theology* (1865), a handbook of religious information; *The Annotated Bible* (1878), in three large 8vo vols.; *The Annotated Book of Common Prayer* (1866), an historical, ritual, and theological commentary on the devotional system of the Church of England; *The Reformation of the Church of England, its History, Principles, and Results* (2 vols.), the sixth edition of which appeared in 1885. D. in London, Apr. 11, 1884.

Bluntschli, bloont'shlĕe, JOHANN KASPAR: b. in Zurich, Mar. 7, 1808; d. at Carlsruhe, Oct. 21, 1881. He studied jurisprudence in his native city, and in Berlin under Savigny, and was appointed Professor of Law at Zurich in 1833 and at Heidelberg in 1859. He took a very active part in the politics of both Switzerland and Baden, but always as a conservative. His writings are partly historical: *The History of Zurich* (1838, 2 vols.); *The History of Uri, Schwyz, and Unterwald* (1847), etc., partly juridical; *Geschichte des algemeinen Rechts* (1864); *Das moderne Kriegsrecht* (1866); *Das moderne Völkerrecht* (1868); *Die Lehre vom Staat* (1875), etc. He presided over the congress of jurists in Dresden in 1861, and enjoyed a great reputation in the juridical world.

Blythe, SAMUEL: a British naval officer; b. in 1784; commanded the brig Boxer in an engagement off Portland, Me., with the U. S. brig Enterprise, Sept. 4, 1814, during which he was killed by a cannon-ball. His remains were interred in Portland with the honors of war by the side of Lieut. Burrows, who commanded the Enterprise, and was also killed.

Bo'a: a genus of large non-venomous serpents; devoid of poison-fangs, they kill their prey by constriction. They are all natives of the warm parts of America, the similar large serpents of Asia and Africa forming the genus *Python*, though formerly the name was applied without any distinction to both genera. The family *Boïdæ* (containing the *Pythons*, etc., of the Old World, as well as the true *Boas*, anacondas, etc., of the New) is almost exclusively tropical, and nearly all the species are of great size and strength. It is related by Livy that a serpent 120 feet in length devoured several soldiers and caused alarm to a Roman army in Africa; the skin is said to have been long preserved at Rome. Their teeth are long and directed backward, to prevent the escape of the prey, which is first seized by the mouth, and then the serpent, with a rapidity of motion which the eye of the observer fails to follow, coils itself around it; the muscles of the body afterward compress it, so that in a few minutes life is extinct. Deglutition then takes place, accompanied with a flow of saliva, not only for lubrication, but to hasten the process of digestion. The food is always swallowed entire, and the process seems to require no small effort. The neck is distended to an enormous degree as the prey passes through. After a repast these serpents spend a considerable time in a state of torpidity—several weeks elapsing before they require a new supply—and in this state they are easily killed.

The lungs consist of two lobes, one much larger than the other, and at the extremity of the larger is a capacious air-bag, supposed to serve for the aëration of the blood during deglutition. There are two claws, one on each side of the anus, which are the representatives of the hinder limbs of the superior vertebrate animals, and which, on dissection, are found to be connected not only with strong muscles, but with bones entirely concealed within the serpent. The head, which has great prehensile power, is thick and somewhat elongated; the eyes small; the tail blunt; the scales numerous and rather small; the colors in many species bright and elegantly disposed. The true boas have the plates under the tail single, while in the pythons they are double. They are of four species. The *Boa constrictor* is far from being one of the largest, seldom obtaining a length of more than 12 feet. It is common in parts of South America, where its skin is used for making boots and saddles. Uric acid is prepared in Europe from the excrement of the boa. The name boa constrictor is, however, popularly extended to any very large non-venomous serpent. The only members of the boa family in the U. S. are two or three small species found in Arizona and neighboring regions.

Revised by DAVID S. JORDAN.

Boabdil, bō-ăăb-deel' (properly *Abu-Abdallah*): last Moorish King of Granada; wrested the throne from his father 1481; defeated by the Castilians and made to pay tribute 1483; weakened by contest with his father and uncle; finally surrendered Granada to Ferdinand of Aragon 1491; soon after crossed to Africa, where he died in battle.

Boadice'a, written also **Voadica**: a warlike British queen; wife of Prasutagus, King of the Iceni, who died about 60 A. D. Soon after this date she and her subjects, exasperated by the rapacity and outrages of the Roman soldiers, took arms against them. The Britons took the Roman colonies of Camalodunum and Londinium (London), and killed about 70,000 Romans. She was defeated in 62 A. D. by Suetonius Paulinus, and then killed herself. See Tacitus, *Annales*.

Boar: the male of the *Sus scrofa*, or swine. When applied to the wild stock of swine found in various countries, the term is used without particular reference to the sex of the animals. The native country of this species is in the Old World, where the wild stock abounds in parts of Europe, in Asia, and in Africa. The wild boars found in the Southern States (especially in Florida) are descended from the domestic swine; but have reverted quite to the wild type in respect to the form of the body, ears, and tusks, the bristly crest on the back, the black or red color, and the striped young. Most writers make all the domestic breeds of swine descendants of the wild stock. Others think the small native pig of the Pacific islands is of a separate species; but it is asserted by some that no swine were known on these islands till after they were visited by European ships, which certainly left swine and other domestic animals in many parts of Polynesia. A few writers regard the East Indian boar as of a distinct species. Swine with solid hoofs have been long known, the variety being produced through the coalescence of the last joint of the foot with the hoofs of the middle toe. No true swine are native to America or Australia. Boar-hunting has long been regarded as one of the most exciting sports of the chase. It is practiced in Europe, India, and Syria—in some places with toils or nets, in others with dogs, which bring the boar to bay, when he is dispatched with a spear or long knife. In India he is hunted on horseback and killed with a boar-spear. It is held unsportsmanlike to shoot the boar. When at bay the wild boar is a very dangerous animal.

Board: a piece of timber sawed thin; if more than 1½ inches thick, it is called a plank. The word *board* has many other meanings, e. g., a table; entertainment or food; the deck of a ship or vessel; a table at which a council or court is held; a body of public men constituting a quorum in

session. Board is a general term applied to persons in a collective capacity who have the management of some public office or department, bank, etc.; thus the directors of a bank or railroad are called the board of directors; the British lords of the treasury, the board of treasury. In nautical language, board is the space or portion of sea over which a ship passes on one tack when beating.

To go aboard or on board is to enter a vessel, to embark in it. The mast is said to go by the board when it carries away and falls into the water.

To board, in naval warfare, signifies to enter a ship by force in order to capture it. The assailants sometimes throw on the enemy's deck combustibles, etc., in order to confuse the crew, and then board the ship, armed with boarding-pikes, pistols, and cutlasses. Some of the most desperate naval conflicts have been determined by boarding, as in the case of the Bon Homme Richard and Serapis.

Board'man, George Dana: Baptist missionary; b. in Livermore, Me., Feb. 8, 1801; graduated at Waterville College (now Colby University) in 1822, and at Andover Theological Seminary in 1825. He sailed for Burma July 16, 1825, and distinguished himself by his zeal and devotion to the work among the Karens, being practically the founder of the Karen mission. D. near Tavoy, Feb. 11, 1831. His widow, Sarah Hall, married Adoniram Judson, June 10, 1834.

Boardman, George Dana, D. D., LL. D.: Baptist minister and author; son of the preceding; b. at Tavoy, in Burma, Aug. 18, 1823; graduated at Brown University (1852), and at Newton Theological Institution (1853). He has been the pastor of the First Baptist church in Philadelphia since 1864. Dr. Boardman has held positions as president of the American Baptist Missionary Union, president of the Christian Institution and Peace Society of America, secretary of the Society for Providing Christian Literature for the Blind, chaplain of the University of Pennsylvania, overseer of Columbian University, and trustee or manager of numerous other corporations, institutions, and societies. He has published *Lectures on the Creation Week* (1878); *Studies in the Model Prayer* (1879); *Epiphanies of the Risen Lord* (1879); *Studies in the Mountain Instruction* (1880); *The Divine Man* (first volume of expected *Life of our Lord*, 1887); *University Lectures on the Ten Commandments* (1889); besides numerous sermons and articles in reviews.

Boardman, Richard: one of Wesley's first missionaries to America; b. in England in 1738; joined Wesley's conference in 1763; volunteered for America in 1769; preached in New York and generally through the Middle States till 1774, when he returned to England, and continued his itinerant ministry till his death at Cork, Ireland, Oct. 4, 1782. He is esteemed as one of the founders of Methodism in the U. S.

Board of Admiralty: the commissioners for executing the office of Lord High Admiral of the United Kingdom of Great Britain and Ireland. James II. declared himself Lord High Admiral, and took the management of the navy in his own hands. But by Act 2, William and Mary, 1690, his Majesty was moved "to constitute a commission of admiralty of persons of known experience in maritime affairs, that for the future all orders for the management of the fleet do pass through the admiralty that shall be so constituted."

The board as now constituted consists of six members and three secretaries, as follows: First lord, a civilian, member of the cabinet, and responsible to the crown and to Parliament for the management of the navy. His assistants are: First naval (or sea) lord, who has general supervision of maritime defenses, mobilization of fleet, and the direction of its military movements, etc. Second naval lord, *personnel*, mobilization of naval reserves, etc. Third naval lord and controller, general supervision of *matériel*. Junior naval lord, transport service, victualing, etc. Civil lord, Works Department, buildings, etc. See Admiralty.

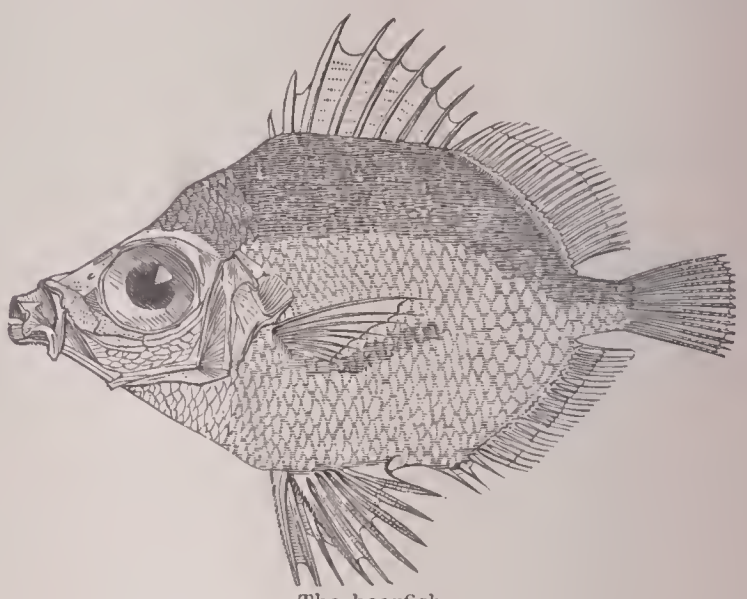
S. B. Luce.

Board of Ordnance: See Ordnance Department.

Board of Trade: in the U. S. a voluntary association of business men of a city to promote the commercial interests of the place; also called chamber of commerce. In 1868 a national board of trade was organized, consisting of delegates from the local boards, holding annual meetings for the discussion of questions of general interest. Local boards of trade or chambers of commerce have even more importance and more legal recognition in Europe than in the U. S. See Chambers of Commerce.

In Great Britain the Board of Trade is a branch of the Government dealing with commerce and statistics. It is controlled by a president, who is an important member of the cabinet, and two general secretaries. One of its departments deals with general trade questions; another with railway appliances, accidents, and, since 1888, with railway rates; a third, and most important, with harbors, shipping, officers' certificates, and marine accidents; a fourth with financial and commercial statistics. A. T. Hadley.

Boarfish: a fish of the genus *Capros* and dory family, or *Zeïdæ*; differing from fishes of the genus *Zeus* in the



The boarfish.

still more protractile mouth (the resemblance of which to the snout of a hog is supposed to have given origin to the name), in the want of spines at the base of the dorsal and anal fins, and of long filaments to the dorsal spines. The body has the usual oval, much-compressed form of the family. The common boarfish (*Capros aper*) is a well-known inhabitant of the Mediterranean, rarely caught on the coasts of England. The flesh is little esteemed.

Boas, bō'ăs, Franz, Ph. D.: ethnologist; b. in Minden, Westphalia, Germany, July 9, 1858; pursued his education from 1877 to 1882 at the universities of Heidelberg, Bonn, and Kiel, and in the latter year prepared at Berlin for an Arctic voyage. In June, 1883, he sailed to Cumberland Sound, Baffin Land; traveled in that region until Sept., 1884, and returned by way of St. John's, Newfoundland, to New York. Assistant in the Royal Ethnographical Museum at Berlin, and privat-docent of geography at the University of Berlin 1885–86, making, however, a journey to British Columbia in the winter of 1885–86 for the purpose of studying the Indians of that region; assistant editor of *Science* 1886–88; and teacher of anthropology at Clark University, Worcester, Mass., 1889–92. During these years he made repeated journeys among the Indian tribes. His principal publications are *Baffin Land* (Gotha, 1885); *The Central Eskimo*, in Sixth Annual Report of the U. S. Bureau of Ethnology (Washington, 1888); *Indians of British Columbia*, Reports to the British Association for the Advancement of Science (London, 1888–92); *Volkssagen aus Britisch Columbien*, Verh. der Ges. für Anthropologie, Ethnologie und Urgeschichte in Berlin (Berlin, 1891).

Boat: any kind of water craft, but, in a particular sense, a small open vessel propelled by oars, sails, steam, or electricity. The name is variously compounded, as steamboat, canal-boat, etc. The boats used on board ship are the launch (both sailing and steam), longboat, barge, pinnace, cutter, yawl, jollyboat, dinghy, gig, lifeboat, whaleboat. There are also quarter-boats, waist-boats, and stern-boats, according to the place where the boat is habitually carried. A *carvel*-built boat has the planking running fore and aft, with flush joints; *clinker*-built, the planking running fore and aft, and lap-jointed. The *diagonal* built has the planking running diagonally, the direction of the inside planking crossing that of the outside, and flush-jointed. The seats for the crew of a boat are called the thwarts; a *single-banked* boat has one rower or oarsman to a thwart; a *double-banked* boat has two. The strips running fore and aft on which the thwarts rest is the *rising*. The *stern-sheets* is the space abaft the after thwart; the *fore-sheets*, the space forward of foremost thwart. The spaces in the wash-streak for the oars are the

rowlocks. The *frames*, *knees*, *hooks*, *stern*, and *stern-posts* of wooden boats are generally of oak; the planking of cedar. Oars are made of ash. The *blade* of the oar is the flat part that goes in the water; the *loom* is the rounded part, at the inner extremity of which is the *handle*. The rigs for boats are the *sloop-rig*, *sliding-gunter*, sprit, and lug. In the U. S. navy the barge is for the exclusive use of the commander-in-chief; the gig for the commanding officer of the ship. All other boats are for general service of the ship, such as conveying passengers to and fro, bringing off stores, etc. For military operations all the boats of a ship are put in requisition for landing the naval brigade formed of the ship's company; also, as many as may be necessary, for "cutting out" expeditions; and, organized as a fleet, for the practice of naval tactics. In these and similar operations the sailing launch carries a Howitzer, and the entire flotilla is often taken in tow by the steam-launch. It is now the practice to allow an admiral a steam-barge; when that is not the case his barge is a large double-banked 32-foot boat, with twelve or fourteen oars. The gig is a light, narrow, single-banked boat, about 30 feet long, built for speed. In addition to the foregoing is the *barge*, a large flat-bottom boat for carrying freight; the racing *shell*, built of veneering or paper; the gondola, dory, wherry, skiff, the *Sam-pan* of China, etc.

For an exhaustive treatise on boats, their uses, and management, see *Luce's Seamanship* (New York, 1891). S. B. L.

Boatbill: the *Cancroma cochlearia*, a bird of the order *Grallatores* and of the heron family. It differs from the heron chiefly in the form of its bill, which is very broad, and somewhat similar in shape to a boat. The mandibles have been compared to the bowls of two spoons placed one upon the other. It is found in the tropical parts of South America, and feeds on fish.

Boat-fly, or **Water-boatman**: an aquatic insect of the genus *Notonecta* and order *Hemiptera* and sub-order *Heteroptera*. It derives its name from the form of the body, which resembles a boat, and is well adapted to movement in the water. The boat-flies have the remarkable peculiarity of always swimming on their backs. The *Notonecta glauca*, called water-boatmen, is common in Great Britain, and is about half an inch long. It can fly well, but seldom uses its wings.

Boating: See Rowing and Sculling.

Boat-racing: See Rowing and Sculling.

Boatswain, commonly pronounced by sailors bō'sn [*swain* here means lad, servant, and is a Scandin. loan-word, Icel. *sveinn*]: an officer on a ship of war who has charge of the sails, rigging, cables, anchors, and cordage. He must frequently examine the masts, yards, sails, and ropes, and report their condition. It is also his duty to summon the crew to their work, and to assist in the necessary business of the ship and in relieving the watch. In the performance of his duties he is assisted by a boatswain's mate.

Boatswain: a name applied to the tropic-birds (*Phaëthon*) and to the jagers (*Stercorarius*), in both cases in allusion to the elongated tail-feathers, resembling marline-spikes, "the emblem of the boatswain." See Tropic-bird and Jaeger.

Bobadilla, bō-baă-deel'yaă, Francisco, de: a governor of Hispaniola and knight of Calatrava; sent in 1500 by Ferdinand and Isabella with plenary powers to investigate the affairs of that colony. He immediately put Columbus, who was then governor, in irons, and sent him to Spain. Columbus was, however, well received at court and by the nation, and was sent back on his fourth voyage, arriving there on the day when Bobadilla started to return to Spain, for he had been recalled. Bobadilla's government had been very disorderly and unfortunate, and hardly had he left the port when his ship was lost in a hurricane, and he was drowned, June 29, 1502.

Bobbin: a cylindrical piece of wood, or a wooden roller, flanged at each end, used to hold yarn, which is wound on it, preparatory to warping, in the weaving of cloth. In throstle-spinning bobbins are an essential part of the machinery, as they receive the thread from the rollers. The number of bobbins used in the various branches of business is enormous. In the thread manufacture alone in Great Britain it is stated that 2,000,000 gross are used annually. Thread-bobbins are turned by a self-acting lathe, which turns out 100 gross in ten hours, a saving of sixteenfold as compared with hand-turning; the attendant has to feed the machine by dropping blocks into a hopper, from which they pass into the lathe, where they are finished.

Bobbinet' (i. e. *bobbin-net*): a sort of lace or net-fabric woven by machinery, and usually made of cotton. It is a fine and elegant textile fabric of a peculiar texture, which consists in the interlacing of a set of long threads, representing the warp in common weaving with a set of cross ones, in such a manner as to form a mesh texture. Bobbinet is made at Nottingham, England, and in France.

Bobcaygeon, bob-kay'jŭn: a post-village of Verulam township, Victoria co., Ontario, Canada; on an island in Sturgeon and Pigeon Lakes, 18 miles from Lindsay (see map of Ontario, ref. 3–E). The town is divided by a canal which, with its locks, cost $150,000. It has a large trade in lumber, and has daily lines of steamboats, except in winter. Pop. 1,000.

Bobolink, bob'ō-lingk', **Reedbird**, or **Ricebird** (*Dolichonyx oryzivorus*): a beautiful American migratory bird of the order *Passeres* and family *Icteridæ*. It passes the winter in the West Indies or in Southern lowlands. It comes northward early in spring, and arrives in May in the latitude of New York State, in which latitude it breeds. It builds its nest in meadows among the grass, and renders service to farmers by the destruction of insects and worms. In May

The bobolink.

and June the male is very musical, singing in the air with great volubility and hilarity, and rising and falling as if by a series of jerks. "He chants out," says Wilson, "such a jingling medley of short variable notes, uttered with such seeming confusion and rapidity, that it appears as if half a dozen birds of different kinds were singing all together." The summer plumage of the male is mostly black, variegated with white on the scapularies and tail-coverts, and yellow, which it exchanges in July or August for a plumage like that of the female. This is marked with several shades of brown or dull yellow. Its length is 7½ inches. About the end of June the birds cease to sing, become gregarious, and move in large flocks to the Middle States. They are called reedbirds in Pennsylvania, where many of them are shot for the table in autumn. In the latter part of autumn immense flocks of them attack the rice-crops of South Carolina, where they receive the name of ricebird. Many of them are kept in cages for their song, but they do not sing in autumn or winter.

Bobruisk, bō-broo-ĕesk': a town of Russia; on the Berezina; in the government of Minsk, and 110 miles S. E. of

Minsk; was formerly fortified (see map of Russia, ref. 8–C). It is connected by steamboat with the towns on the river. Pop. (1897) 34,820.

Bob-white (*Colinus virginianus*): a very common small game-bird of the U. S., belonging to the family *Tetraonidæ*, and hence allied to the European partridge. The species is usually known as quail in the Northern States and as partridge in the South. The name bob-white is given for its peculiar call. See QUAIL.

Boca del Rio: See BAGDAD.

Bocage, bō-kaa'zhăy, MANOEL MARIA BARBOSA, du: Portuguese poet; b. in Setubal, Sept. 15, 1765; gave his early youth to military service; in 1790 settled in Lisbon and associated himself with the poets of the so-called Nova Arcadia, with the name Elmano Sadino. In 1791 his *Rimas* won applause, and from this time on he produced continually, much of his work being purely occasional, but all having the traces of that poetic talent which made him the true forerunner of Almeida-Garrett and Castilho. In opinion he was an adherent of the Revolution, and in 1797 he was imprisoned for so-called atheistical and seditious utterances. The best edition of Bocage's works is that edited by Th. Braga (7 vols., Porto, 1876). See Th. Braga, *Vida de Bocage e sua epoca litteraria* (1876, *seq.*). D. Dec. 21, 1805.
A. R. MARSH.

Boca Tigris, bok'a-tee'gris (in Chinese, *Hu-mên* or *Humŭn*, i. e. mouth of the tiger): the entrance of the Canton river into the Outer Waters, or Lintin Bay, called also the *Bogue*. On A-nung-hoy Point, on S. Wang-tong and Tiger islands, are the remains of a number of forts and batteries called "Bogue forts," which guard the entrance to the river, and were stormed by the British in 1841 and 1857.

Boccaccio, bok-kaat'chō, GIOVANNI, or **Boccaccio da Certaldo**: celebrated Italian poet, novelist, and scholar; b. in Paris, 1313; the illegitimate son of an Italian merchant and a French mother. His father wished to make a merchant of him, and about 1330 he went as such to Naples. He wasted six years thus, as he used to say; then was permitted to study canon law, on which he wasted other six years. His call was to poetry and to learning. In Naples he felt the full force of two impulses which were to make him famous—the one, that of admiration for the ancients and longing to know their works; the other, that of imaginative creation. His importance to the world is in these two directions; he was, with Petrarch, a founder of humanistic studies and of modern classical learning; as poet and novelist he was one of the great creative influences of early modern literature. Before he left Naples he had carried far his studies in classical mythology, and he had besides written several works of importance in the Italian tongue. The immediate occasion for the latter was his passion for Maria, natural daughter of King Robert of Naples (the *Fiammetta* of his works). In her honor he wrote *Il Filocolo* (wrongly called *Filocopo*), a prose romance upon the story of Floire and Blanchefleur; also *Il Teseide*, used by Chaucer for his *Knight's Tale*, and probably the first important poem in *ottave rime*; *Il Filostrato*, the tale of Troilus and Griseida; *Il Ninfale Fiesolano*. In 1341 he left Naples for a time and went to Florence. There, under the melancholy of absence from his mistress, he wrote the *Ameto*, or in full *Il Ninfale d'Ameto*, in prose alternating with lyrics; *L'Amorosa Visione*, a dream in which the poet, led by his lady, sees the lovers and heroes of the past; the *Fiammetta*, a romance in prose. In 1344 he returned to Naples, and began writing those tales in prose which were afterward put into the mouths of Florentine ladies and gentlemen, and called the *Decamerone*. Most of these were probably written between 1344 and 1350. In 1349 or 1350 Boccaccio was called back to Florence by the death of his father, and was received with great distinction by the Florentines. In Florence probably, in 1354 or 1355, he wrote his *Corbaccio*, or *Labirinto d'amore*. The rest of his life, however, was devoted for the most part to classical studies. He eagerly admired Petrarch, and wished to imitate him. He longed to study Greek, and did actually take lessons of a Greek, Leonzio Pilato, who at his request translated Homer into bad Latin, so that Boccaccio probably first of moderns read that poet. He himself toiled laboriously at works of encyclopædic scholarship: *De Genealogia Deorum Libri XV.*; *De Montium, Silvarum, Lacuum, et Marium nominibus liber*: *De Casibus Virorum et Feminarum Illustrium libri IX.*; and *De Claris Mulieribus*. These works are now unreadable, but the impulse given by them to European scholarship was very great, and they were much drawn upon (especially the *De Casibus*) by later writers for their imaginative material. In 1373 the Florentines appointed Boccaccio to the new chair established by them for the exposition of Dante. He had already written a *Life of Dante*, and now he prepared a commentary upon a little more than sixteen cantos of the *Inferno*. In 1374, however, he went to Certaldo, the home of his father's family, to live, and there he died Dec. 21, 1375. The literature about Boccaccio is very extensive. The following works, however, will suffice, the more so since they contain further bibliographical information: M. Landau, *G. Boccaccio, sein Leben u. seine Werke* (1877); G. Koerting, *Boccaccio's Leben und Werke* (Leipzig, 1880); A. Hortis, *Studj sulle Opere Latine del Boccaccio* (Trieste, 1879); M. Landau, *Die Quellen d. Decamerone* (2d ed. Stuttgart, 1884); A. Bartoli, *I Precursori del Boccaccio e alcune delle sue Fonti* (Florence, 1876); G. Voigt, *Die Wiederbelebung des classischen Alterthums* (2d ed. 1880); A. Gaspary, *Geschichte der Italienischen Literatur* (vol. ii. 1888).
A. R. MARSH.

Bochart, bō'shaar', SAMUEL: Protestant Orientalist and theologian; b. at Rouen, France, May 30, 1599; studied Arabic, Chaldee, and Syriac under Erpenius at Leyden, and excelled in philology. He became in 1625 pastor of the Protestant church at Caen, where he remained forty-two years, and gained a high reputation as a preacher and writer. His most important works are a *Sacred Geography*, in Latin (Caen, 1646), and *Hierozoicon*, or an account of the animals mentioned in the Bible (London, 1663). D. at Caen, May 16, 1667. His *Geographia Sacra* displays great learning and sagacity. His complete works appeared Leyden, 1675, 2 vols.; 3d ed. 1712, 3 vols. See Étienne Morin, *De Vita et Scriptis S. Bocharti*, prefixed to edition of his works (1692); Edward H. Smith, *S. Bochart: Recherches sur la Vie de cet Auteur illustre* (1833).

Bochnia, bo*kh*'nĕĕ-a: a town of Austria; in Galicia: 23 miles by rail E. S. E. of Cracow (see map of Austria-Hungary, ref. 3–I). It has several churches. Here are mines of salt which yield about 15,000 tons annually. Pop. 9,000.

Bochold, bo*kh*'ōlt, or **Bocholt**: a town of Prussia; in Westphalia, on the Aa; 42 miles W. S. W. of Münster (see map of German Empire, ref. 4–D). It has a castle, and manufactures of silk fabrics, hosiery, and cotton stuffs. Pop. (1890) 13,034.

Bochum, bo*kh*'oom: a Prussian town in Westphalia; 31 miles by rail N. E. of Düsseldorf (see map of German Empire, ref. 4–C); has manufactures of woolens, paper-hangings, hardware, iron, and tobacco, and important mines of coal. Pop. (1880) 33,440; (1890) 47,618; (1895) 53,842.

Bockenheim, bok'en-hīm: a town in Prussia: province of Hesse-Nassau; 3 miles N. W. of Frankfort-on-the-Main (see map of German Empire, ref. 5–D). It has manufactures of ironware, jewelry, and pianos, and a large cattle-market. Pop. (1890) 18,675.

Böckh, bök, or **Boeckh**, PHILIPP AUGUST: philologist and classical antiquary; b. at Carlsruhe, Nov. 24, 1785; educated at Halle; became in 1809 professor in the University of Heidelberg, and obtained in 1810 the chair of Eloquence and Ancient (or Greek) Literature in the University of Berlin, where he taught for forty years or more. His lectures comprised archæology and the history of ancient literature, philosophy, politics, etc. Among his greatest works, which have formed an era in archæology and philology, are *The Political Economy of the Athenians* (2 vols., 1817), which Sir George Cornewall Lewis translated into English; *Investigations Concerning the Weights, Coins, and Measures of Antiquity* (Berlin, 1830); and *Records of the Maritime Affairs of Attica* (1840). He commenced in 1824 the great work called *Corpus Inscriptionum Græcarum* (4th vol., 1867), which he destined to comprise all existing Greek inscriptions, whether printed or not. D. Aug. 3, 1867. Cf. Bursian, *Gesch. d. class. Philol. in Deutschland*, pp. 687–705.

Bodenstedt, bō'den-stet, FRIEDRICH MARTIN, von: German poet and translator; b. in Peine, Hanover, Aug. 22, 1819; through residence in Moscow as tutor (1840, *seq.*) became an enthusiastic lover of Slavic literature. In 1844 he went to Tiflis, where he remained two years, devoting himself to the study of the peoples of the Caucasus and of Oriental languages. In 1848 his work *Die Völker des Kaukasus* showed the outcome of this study. In 1845 his translations

of poetic tales in the Little Russian dialect, *Die poetische Ukraine*, made some stir in Germany. In 1849 appeared his *Tausend und ein Tag im Orient*; in 1851 his most famous book, *Die Lieder des Mirza Schaffy*, which in 1887 had reached its 126th edition, and was widely translated in other countries. At first these poems were taken to be translations, but eventually it appeared that Mirza Schaffy had been the poet's friend and teacher in Tiflis, to whom the poems were simply dedicated out of grateful remembrance. From the year 1851 Bodenstedt has published incessantly both original works and translations from the Oriental tongues. His *Gesammelte Schriften* appeared 1865–69 in twelve volumes. Since 1869 have been published *Einkehr und Umschau* (1873); *Verschollenes und Neues* (1877); *Aus Morgenland und Abendland* (1882); *Neues Leben* (1866); *Sakuntala* (1888). In 1881 he traveled in the U. S., and in 1882 described what he had seen in his *Vom Atlantischen zum Stillen Ocean*. In 1855 he published a translation of the poems of Puschkin; in 1877 one of the poems of Hafiz; in 1881 one of Omar Khayyam. He also busied himself much with the Elizabethan period of English literature: *Shakspeare's Zeitgenossen u. ihre Werke*, in his *Charakteristiken u. Uebersetzungen* (3 vols., 1858–60); *Shakspeare's Sonnette* (4th ed. 1873); *Shakspeare's Frauencharaktere* (1874). More recently his *Erinnerungen aus meinem Leben* (2d ed. 1888) have excited great interest. D. in Wiesbaden, Apr. 19, 1892.

A. R. Marsh.

Bode, bō'de, Johann Ehlert: astronomer; b. at Hamburg, Jan. 19, 1747; d. in Berlin, Nov. 23, 1826. At the age of twenty-five he became astronomer of the Berlin Academy, a position which he held for more than fifty years. He shortly afterward commenced the celebrated ephemeris afterward known as the *Berliner Astronomisches Jahrbuch*, the publication of which he conducted for more than fifty years. He was the author of several astronomical works of a more or less popular character, but his name is best known from his announcement of the law which, before the discovery of Neptune, was supposed to govern the distances of the planets from the sun. (See Bode's Law.) It is found, however, that this law should really be ascribed to Titius, another German astronomer, who published it in 1766.

Simon Newcomb.

Bode's Law: an empirical formula which marks quite closely the relative distances of the planets, Neptune excepted, from the sun. See Asteroids.

The law may be thus exhibited: Under the names of the several planets in the order of their distance set the number 4. Then below this row of fours write in order the numbers 0, 3, 6, 12, 24, 48, and so on, the 0 falling under Mercury, the 3 under Venus, and so on. Adding the several columns thus obtained, we have the following result:

Mercury.	Venus.	Earth.	Mars.	Asteroids.	Jupiter.	Saturn.	Uranus.	Neptune.
4	4	4	4	4	4	4	4	4
0	3	6	12	24	48	96	192	384
4	7	10	16	28	52	100	196	388

The numbers thus obtained correspond closely with the relative distances of the planets, except only in the case of Neptune. The real distances, calling the earth's distance 10, are as follows:

Mercury.	Venus.	Earth.	Mars.	Asteroids.	Jupiter.	Saturn.	Uranus.	Neptune.
3·9	7·2	10	15	27·5	52	95	192	300

It will be seen that the distance of Neptune falls far short of that which Bode's law would assign to a trans-Uranian planet. It does not therefore express any general law of nature, and fails entirely in the cases of the satellites.

Bo'die: Mono co., Cal. (for location of county, see map of California, ref. 7–F). Here are the noted "Bodie" and "Standard" gold mines. Pop. (1880) 2,712; (1890) 595.

Bodin, bō'dăn', Jean: French political writer; b. in Angers in 1530. He published in 1576 a treatise on government entitled *De la République*, and in 1586 a Latin version of the same. He advocated a limited monarchy as the best form of government. In the latter part of his life he was an adherent of Henry IV. D. in Laon in 1596. His *Heptaplomeres de abditis rerum sublimium arcanis* is considered one of the most interesting books of that age.

Bodle'ian Library: the principal library of Oxford University; was founded by Sir Thomas Bodley (see below), who in 1597–98 offered to restore to its former use the old room which once had held a collection of books. He expended some £10,000 of his own money in the purchase of books on the Continent, and secured the co-operation of his numerous friends; and so as the idea of making the library worthy of the university found favor, the collection was already quite large when the building was thrown open to the public by James I., Nov. 8, 1603, who gave the library Bodley's name. Since 1610 it has been entitled to receive a copy of every book published in the United Kingdom. Private donors have added to its stores. It contains now 550,000 printed volumes and over 30,000 manuscripts. The building contains also art treasures—e. g. the Pomfret and Arundel marbles, the Hope collection of portraits (200,000 engravings), and is connected with the "Camera Bodleiana" or "Radcliffe," a circular structure where the more modern books are kept. The first catalogue was published in 1605. Bodley left a large amount of money for the endowment of the library. See W. D. Macray, *Annals of the Bodleian Library* (Oxford and New York, 1868; 2d ed. 1890).

Bod'ley, Sir Thomas: an English diplomatist; b. in Exeter, Mar. 2, 1544; graduated at Oxford in 1566. He was sent by Queen Elizabeth on diplomatic missions to France, Denmark, and Holland. He expended much money in collecting rare and valuable books, and endowed the great Bodleian Library (*q. v.*). D. in Oxford, Jan. 28, 1612.

Bodmer, bōt'mer, Johann Jakob: Swiss critic and poet; b. near Zurich, July 19, 1688. He founded in 1721, after the model of the *Spectator*, a literary journal called *Discurse der Maler*, which promoted a reform in German literature, and waged a literary war against Gottsched. A great admirer of English poetry and especially of Milton, he revolutionized literary criticism in Germany by æsthetic doctrines derived from his English models. His writings had great influence upon the rising generation of German poets like Klopstock and Wieland. He was also among the first who appreciated the poetry of the German *Minnesong*. Even Goethe paid homage to the old patriarch on one of his early visits to Switzerland. Among his numerous works (which lack originality) is the *Noachide* (1752). He was Professor of History at Zurich for fifty years. He translated *Paradise Lost* into German. D. in Zurich, Jan. 2, 1783. See Mörikofer, *Die schweiz. Lit. des 18 Jahrh.* (Leipzig, 1861); Servaes, *Die Poetik Gottscheds* (Strassburg, 1887); Braitmaier, *Geschichte der poet. Theorie*, etc. (Frauenfeld, 1889).

Revised by Julius Goebel.

Bod'min: a town of England; capital of Cornwall; 26 miles W. N. W. of Plymouth (see map of England, ref. 14–C). It consists chiefly of one long street in a valley between two hills; it was once an important place. It now contains a court-house, a jail, an ancient priory, and a grammar school founded by Queen Elizabeth, and is one of the stannary towns of Cornwall. Pop. (1891) 5,151.

Bodrum: See Budrún.

Bødtcher, böt'cher, Ludvig Adolf: Danish lyric poet; b. in Copenhagen, Apr. 22, 1793; d. there Oct. 1, 1874. Bødtcher wrote little, but his poetry, much of which is erotic, is remarkable for beauty of form and exquisite finish. See Gosse's *Northern Studies* (1879).

Body, George, D. D.: canon missioner of Durham; b. at Cheriton, Fitzpaine, Devonshire, Jan. 7, 1840; graduated at St. John's College, Cambridge, 1862; ordained 1863. Author of *The Life of Justification* (1870; 6th ed. 1884); *Life of Temptation* (1870; 7th ed. 1891); *Mission Tracts*; *The School of Calvary* (1890; 2d ed. 1891).

Body Color: in *painting*, color which is so mixed for application as to be thick and to form a coating upon the surface to be painted. The term is especially used in water color to distinguish color made opaque by the mixture with it of white, from transparent or translucent color, which merely stains the surface. See Water-color Painting.

Body's Island: the long, low, sandy strip of land between Roanoke and Albemarle Sounds and the Atlantic Ocean N. of Oregon inlet. Body's island lighthouse, 2 miles N. of Oregon inlet (lat. 35° 48′ 47″ N., lon. 75° 33′ 20″ W.), is a brick tower with a granite foundation and an iron top, 150 feet high, showing a first-order dioptric white fixed light, 156 feet above the sea. The island is here 2 miles wide, and is in Dare co., N. C.

Boece, bois, or **Boyce**, or **Boethius**, Hector: historian; b. at Dundee about 1465. He studied and graduated at the University of Paris, where he became in 1492 Professor of Philosophy. In 1498 he went to Aberdeen, where he became later principal of King's College. He was a friend of Erasmus. His chief work is a *History of Scotland* (in Latin, Paris, 1526; Eng. trans. reprinted Edinburgh, 1821), which is highly esteemed. D. in Aberdeen, 1536.

Bœhme'ria [from G. R. Böhmer, a German savant]: a genus of plants of the family *Urticaceæ*; formerly included in the genus *Urtica* (nettle). The fibers of several species of this genus are used to make ropes, twine, nets, and cloth. The beautiful fabric called China grass-cloth is made of the fibers of *Bœhmeria nivea*, a perennial herbaceous plant, with broad ovate leaves, without stings, cultivated by the Chinese, who call it *choo-ma*. It can be propagated by seeds, and thrives best in shade and moisture. It grows naturally in China, Sumatra, and Burma, and other parts of the East Indies. The Malays call it *ramie*. The cultivation of ramie has been tried in some of the Southern U. S., with decided success. Nepaul produces an important species, *Bœhmeria frutescens*, which grows from 6 to 8 feet high, the fiber of which is said to be equal to flax. The natives call it pooee, yenki, or kienki. This fiber also makes excellent paper, and will probably become an important commercial product. There is one native species in the U. S. See Ramie.

Boeo, Cape: See Cape Boeo.

Bœo'tia (in Gr. Βοιωτία): a country or state of ancient Greece; bounded N. by Locris, N. E. and E. by the Enbœan Channel, S. by Attica and Megaris, S. W. by the Corinthian Gulf, and W. by Phocis. Area, estimated at 1,100 sq. miles. It may be described as a hollow basin, inclosed, on the N. by Mt. Parnassus and the Opuntian Mountains, on the E. by a continuation of the Opuntian range, on the S. by Mt. Cithæron and Mt. Parnes, and on the W. by Mt. Helicon. The surface is diversified by other mountains and several valleys and plains. It contained a large lake named Copais (now Topolias) which had no outlet except subterranean channels in the limestone mountains. These channels, now called *Katabothra*, were not sufficient to carry off the water of the lake, which sometimes inundated the surrounding plain. To obviate this evil the ancient Bœotians constructed two tunnels through the rock. One of these tunnels was nearly 4 miles long, with twenty vertical shafts let down into it. These two great works are perhaps the most remarkable monuments of what is called the heroic age. The largest rivers of Bœotia were the Asopus and the Cephissus, the latter of which rises in Phocis and enters Lake Copais. The Asopus flowed eastward through the southern part, and entered the Euripus. Instead of the pure and transparent air of Attica, the air of Bœotia is rendered damp and heavy by vapors rising from lakes and marshes. The winters were very severe, and the snow sometimes lay on the mountains for many days. The soil, which is mostly a rich mould, was very fertile and produced in ancient times, as well as in the present, abundant crops of grain. The plain of the Copais is especially remarkable for its fertility. Bœotia was famous for meadow and pasture land, on which were raised the excellent horses of the Bœotian cavalry. The grape and other fruits flourished in this region. Among the other productions was the auletic or flute reed, which grew in the marshes of Lake Copais, and had an important influence on the development of Greek music.

The most remarkable tribes that inhabited Bœotia in the heroic age were the Minyæ, who lived at Orchomenus, and the Cadmeans, or Cadmeones, who lived at Thebes. At the commencement of the historical period the Minyans and other tribes had nearly disappeared, and the country was occupied by the Bœotians, who are supposed to have come from Thessaly. The principal cities formed a confederacy under the presidency of Thebes. Orchomenus was the second city in importance. Among the other towns were Coroneia, Haliartus, Thespiæ, Tanagra, Platæa, and Anthedon. The Bœotians were regarded as a dull, unintellectual people, and less refined and polished than most of the Hellenic tribes. Their natural dullness was ascribed to the dampness and ungenial quality of their climate. According to Cornelius Nepos, they paid more attention to the development of their physical powers than the cultivation of their minds. Yet this state produced a few great men—Epaminondas, Hesiod, Pindar, and Plutarch. See Forchhammer, *Hellenika* (1837); Leake, *Travels in Northern Greece* (1835); Klutz. *De Fœdere Bœotico* (1821); Mure, *Travels in Greece*. See also Attica.

Boerhaave, boor'haă-ve, Herman: Ph. D., M. D., F. R. S.; a Dutch physician; b. at Voorhout, near Leyden, Dec. 31, 1668. He studied the ancient languages and history at Leyden, where he took the degree of doctor of philosophy in 1689. He began the study of medicine in 1690, and graduated as M. D. at Harderwick in 1693, after which he practiced at Leyden. In 1701 he was appointed Lecturer on the Theory of Medicine in the University of Leyden, and adopted the method of Hippocrates. He afterward deviated from that method, and substituted mechanical and chemical hypotheses to explain diseases. He published in 1708 an excellent systematic work called *Medical Institutes* (Institutiones Medicæ in Usus annuæ Exercitationis Domesticos). He became in 1709 Professor of Medicine and Botany at Leyden, where he acquired great popularity as a teacher. Among his important works are *Aphorisms on the Diagnosis and Cure of Diseases* (Aphorismi de Cognoscendis et Curandis Morbis, 1709), which is a model for style and other merits, and *Elements of Chemistry* (1724), which some persons consider his capital work. His reputation extended to every part of Christendom, and patients came to consult him from every country of Europe. He received, it is said, a letter from a Chinese mandarin, addressed "To Boerhaave, physician in Europe." D. Sept. 23, 1738.

Boers, boorz [recent loan-word from Dutch, but closely connected with *boor* and Germ. *Bauer*, peasant]: the farmers in South Africa of Dutch descent. After the annexation of Cape Colony by Great Britain, troubles arose between the Government and the Boers, and in 1836 many of them left the colony and founded the Orange Free State and also the Transvaal Republic. In 1858 they gave themselves a constitution, and after a time the commonwealth was recognized. But in 1877 the Cape Government, fearing an outbreak which might lead to a general rising of the natives, took possession of and annexed the territory. In Dec., 1880, the Boers took up arms, but a treaty of peace ensued in 1881 under which British suzerainty was recognized as to foreign affairs. In 1884 this treaty was modified, and the suzerainty was practically given up by the British Government. The Boers are sturdy, independent, and mostly farmers; they use an antiquated Dutch and are little given to refinements. For South African War see Africa.

Boe'thius, or **Boetius**, Anicius Manlius Torquatus Severinus: Roman philosopher and statesman; b. in Rome, after 475 A. D. He was liberally educated; became a good Greek scholar; was chosen consul in 510, and gained the confidence of Theodoric, King of the Goths, who reigned at Rome, and appointed Boethius *magister officiorum* in his court. His political influence was exerted for the benefit of the country, but his probity and virtues provoked the enmity of powerful courtiers whose corrupt or oppressive conduct he had opposed. He was accused of treasonable designs, was confined in prison, and finally executed by the sword by order of Theodoric in 525 A. D. Whether he was a Christian or not is a matter of uncertainty. He was considered such in the Middle Ages, and the Bollandists gave him the position of a saint, and his works are included in Migne's edition of the Latin ecclesiastical writers (vols. lxiii., lxiv.). Several theological tracts are attributed to him, and were included in the Leyden edition (1671) of his *Consolation of Philosophy*. But there is a predominance of argument in favor of the opinion that he was not, in any proper sense, a Christian, and that the tract on the Trinity was from another hand, probably from a monk of the same name, although Peiper maintains that it was a work of the early years of Boethius. Boethius holds a place in the history of scholastic philosophy from the fact that a passage from his commentary on the *Isagoge* of Porphyry gave rise to the long-continued discussions between the Realists and the Nominalists. While he was in prison he wrote, partly in verse, *De Consolatione Philosophiæ* (On the Consolation of Philosophy), which is his greatest work, and was very popular in the Middle Ages. It was translated into Anglo-Saxon by Alfred the Great and into English by Chaucer. It contains no allusions to Christianity—a fact which can hardly be reconciled with the hypothesis of his being a Christian, considering the circumstances under which it was written. See Barberini, *Exposizione della Vita de Boezio* (1783); Dom Gervaise, *Histoire de Boëce* (1715); Heyne, *Censura Ingenii Boethii* (1806); *Life of Boethius*, prefixed to Ridpath's translation of the *De Consolatione Philosophiæ*

(1785), English translation in Bohn's Library; Rudolphus Peiper's edition of the *Consolatio* (Leipzig, 1871). The mathematical and musical treatises of Boethius have been edited by J. Friedlein (Leipzig, 1867).

Revised by W. T. Harris.

Boethius, Hector: See Boece.

Bœuf, Bayou, bī'oo-bef: a river or creek of Arkansas and Louisiana; fed by water which it receives from the Mississippi river during inundations. It extends from Chicot co., Ark., southwestward into Louisiana, and unites with the Washita river at the south extremity of Franklin parish. Steamboats can ascend it 100 miles or more during high water.

Bofarull y Broca, bō-faa'roo-lee-brō'kaă, Antonio: Spanish and Catalan historian and philologist; b. Dec. 4, 1821; director of the archives of Barcelona. He has been an ardent participator in the new Catalan literary movement, and has published many poems in the revived tongue under the pseudonym of *El Coblejador de Moncada*. He is best known, however, for his *Historia crítica civil y eclesiástica de Cataluña* (9 vols., 1876–78), and his *Historia crítica de la Guerra de la Independencia en Cataluña* (1886–87). Worth mentioning also is his *Estudios, sistema gramatical y crestomatia de la lengua catalana* (1864). A. R. Marsh.

Bog [Gael. *bog*, soft; in compos., bog]: a swamp or tract of wet land, covered in many cases with Peat (*q. v.*). Bogs, called mosses in Scotland and swamps in America, often contain the well-preserved trunks of trees, especially of the oak in Ireland, and of the cypress in America. In many cases these tracts are higher than the surrounding country, and may thus be easily drained, when they often become very fertile land. See Drainage.

Bog: River of Russia. See Bug.

Bogar'dus, Everard: second minister of New York (then New Amsterdam); b. in Holland; came to America in 1633, and obtained by marriage in 1638 with Annetje Jansen (or, as she is commonly called, Anneke Jans) a farm (the "Dominie's Bouwerie") of 62 acres, now owned by the Trinity church corporation, an estate in much litigation, but with the title confirmed to Trinity church. Having much trouble with the magistrates and people, he resigned in 1647, in answer to charges against him before the classis of Amsterdam, and sailed for Holland, but was wrecked on the English coast, and with Gov. Kieft and many others was drowned, Sept. 27, 1647.

Bogar'dus, James: b. at Catskill, N. Y., Mar. 14, 1800. In 1814 he was apprenticed to a watchmaker. He made important improvements in cotton-spinning in 1828; invented a gas-meter (1832); a machine for engraving (1836); a pyrometer, and many other mechanical improvements. In 1847 he built in New York the first iron building in the U. S. D. in New York city, Apr. 13, 1874.

Bo'gart, John: civil engineer; b. in Albany, N. Y., Feb. 8, 1836; educated at Albany Academy and at Rutgers College, N. J. During the civil war he was attached to the engineer corps. Later he had charge of the Brooklyn park system, designed the Albany park, the State grounds at Nashville, Tenn., and the improvements in New Orleans park. From 1870 to 1877 he was chief engineer of the department of parks of New York. From 1877 to 1890 he was secretary and librarian of the American Society of Civil Engineers. In 1888 he was elected State engineer of the State of New York, and held the office for four years. He is now consulting engineer of the Cataract Construction Company, engaged in developing the water-power of the Niagara river.

Bogatzky, bō-gaat'skee, Karl Heinrich, von: a German devotional writer and pietist; b. at Jankowe, Silesia, Sept. 7, 1690; studied at Jena and Halle; lived in literary retirement, on Franke's invitation, in the famous orphanage in the latter city from 1746 until his death, June 15, 1774. He wrote *The Golden Treasury* (orig. Breslau, 1718; 58th ed. Halle, 1885; Eng. trans. n. e. 1888). See his *Life*, by J. Kelly (London, 1889).

Bog-butter: a substance which is found in peaty earth in some of the bogs of Ireland. In composition and qualities it exhibits the general properties of a fat, and melts at 124° F. It is probably fossil butter.

Bogenhausen, bō'gen-how-zen: a village of Bavaria; on the Iser, 2 miles N. E. of Munich. Pop. 1,000. Here is the royal observatory of Munich, which was erected in 1817, and is one of the best in Europe; lat. 48° 8′ 54″ N., lon. 11° 36′ 22″ E.

Boggs, Charles Stuart: U. S. admiral; b. in New Brunswick, N. J., Jan. 28, 1811; entered the navy as a midshipman Nov. 1, 1826, became a passed midshipman in 1832, a lieutenant in 1837, a commander in 1855, a captain in 1862, a commodore in 1866, a rear-admiral in 1870, and retired from active service in 1873. He commanded the Varuna at the passage of Forts St. Philip and Jackson and capture of New Orleans. D. at New Brunswick, N. J., Apr. 22, 1888.

Bøgh, böch, Erik: Danish man of letters; b. Jan. 17, 1822. He is a popular poet and play-writer, but is most remarkable for his short stories and humorous sketches. Besides several volumes of plays, *Dramatiske Arbejder* (7 vols., 1858–71); *Udvalgte Dramatiske Arbejder* (1885 ff.); and of poems, he has published, among other works, *Syv Forelæsninger* (Seven Lectures, 1858); *Jonas Tværmoses Ærgrelser* (J. T.'s Troubles, 1864–75); *Udvalgte Fortællinger* (Selected Tales, 1876); *Billeder paa Vers og Prosa* (Pictures in Verse and Prose, 1891); and a series of feuilletons (1860, etc.) called *Dit og Dat* (Odds and Ends). G. L. Kittredge.

Boghead Coal: a highly bituminous variety of the cannel coal of Scotland; from Boghead, in Linlithgowshire. The varieties of cannel pass into shale by insensible gradations, so that it is impossible to draw a line which shall properly limit the use of the term coal. The boghead is one of these substances, more valuable for gas-making, and for the oils and paraffine obtained from it by distillation, than for fuel. Dr. Fife found a picked specimen to yield on analysis 70 per cent. of volatile matter and 30 per cent. of ash.

Bog Iron Ore: a mineral of variable composition, in which the peroxide of iron often amounts to 60 per cent., the water to 20, phosphoric acid from 2 to 11 per cent., while silica, clay, and other substances make up the rest. Bog iron ore occurs in alluvial soils, in bogs, lakes, etc. It is of a yellowish or blackish-brown color. Some varieties are earthly and friable; some are in masses of an earthy character, and some compact, with conchoidal fracture. It is abundant in the northern countries of Europe generally; also in various parts of the U. S.

Revised by C. Kirchhoff.

Boglipoor: same as Bhagalpur.

Bogomiles [so named from their leader, the Bulgarian priest *Bogomil*, middle of tenth century]: a dualistic-manichæanistic sect of Thrace, Macedonia, and Bulgaria, originating in the early part of the tenth century. It spread over Servia, Bosnia, Dalmatia, and Croatia. In the latter countries it was called Patarenes, but by itself the Bosnia Church, and had many adherents among the aristocracy. It survived persecution, but when the Turks overran the country (1463) its members almost to a man became Mohammedans. Its principal doctrines were the origin of evil in the declension from God, the good principal; docetic views of the person of Christ in that they affirmed that Christ saved men by his teaching; the rejection of the sacraments; and the use of images in worship, and all the Old Testament except the Psalms, and to the New Testament they added certain apocrypha.

Bo'gos: a Negro tribe; inhabiting the highlands N. of Tigré, Abyssinia; have become known by the explorations of Werner, Munzinger, and Th. Heuglin. The flora and the fauna of the country of the Bogos are exceedingly rich. Mighty sycamores and tamarind trees, and lions, elephants, buffaloes, and antelopes, as well as the rhinoceros and many varieties of beasts of prey, are found here. The total population is estimated by Munzinger at 10,000 persons, of whom only one-third are true Bogos, who speak the Belen language. The rest are tribes subject to them, who speak the Tigré. The Bogos are well formed, and profess Christianity, but have very little religious knowledge. For several years they have paid a small annual tribute to Abyssinia. The Bogos have suffered much from the invasions of the inhabitants of Barla.

Bogoslof, bō-gō-slōf': a small volcanic island of the Aleutian Archipelago; lat. 53° 58′ N., lon. 168° W. Previous to 1795 its site was occupied by a group of reefs and low rocks. In that year began a period of eruption resulting in a craggy peak about 450 feet high. In 1883 a broader peak of the same height, Grewinck, was thrown up from the sea at a distance of a mile, and the two were connected by a spit.

G. K. G.

Bogotá, bō-gō-taa′ (formerly Santa Fé de Bogotá): a city of South America; capital of the republic of Colombia; pleasantly situated on the San Francisco river, which here joins the Rio de Bogotá, and at the foot of two mountains (see map of South America, ref. 2–B). It is on an extensive plateau, which is about 8,700 feet above the level of the sea, and enjoys a mild and genial climate like a perpetual autumn. Lat. 4° 35′ 48″ N., lon. 74° 13′ 45″ W. The adjacent table-land is very fertile, and is inclosed on several sides by high peaks of the Andes. Bogotá is well built, but, as it is subject to earthquakes, the houses are generally only two stories high. No vehicles are used in the streets, which are all narrow. It is the seat of an archbishop, and contains a cathedral and numerous churches, a palace of the president, a university, a national academy, a public library, and a theater. It has several public squares adorned with fountains, and some very good institutions for higher education. Mines of coal, salt, and precious stones occur in the vicinity. A few miles below the city is the great Cataract of Tequendama, where the Bogotá river has a perpendicular fall of 475 feet. Bogotá was founded in 1537. It has several times suffered considerably from earthquakes. Pop. (1886) 120,000.

Bogra, bōg-raa′: a district of Bengal, British India; between lat. 24° 20′ and 25° 20′ N., and meridians 88° 56′ and 89° 49′ E.; on the right bank of the Brahmaputra river. Area, 1,498 sq. miles. Pop. 750,000, 80 per cent. of whom are Mohammedans and 19 per cent. Hindus. It is a level plain intersected with streams and dotted with jungles. It is nearly all cultivated; the eastern portion is low, subject to inundations, and yielding heavy crops of rice. The western portion is higher, and is also devoted to rice, but of a finer quality. Fishing is also an important industry. The climate is oppressive, except in winter. The annual rainfall is about 80 inches.

Bogue, David, D. D.: a Scottish preacher; called the founder of the London Missionary Society; b. in Hallydown, in Berwickshire, Feb. 18, 1750; educated at Edinburgh; after teaching he became pastor in Gosport to an Independent church; was the first editor of the *Evangelical Magazine*, and wrote an *Essay on the Divine Authority of the New Testament* (London, 1801). He was author, in conjunction with James Bennett, of a *History of Dissenters from 1689 to 1808* (1808–12, 4 vols.; 2d ed. 1833). He and others founded the London Missionary Society in 1795. Yale College gave him a D. D. in 1815. D. in Brighton, Oct. 25, 1825.

Bohe′mia (in Lat. *Bohemia*; Germ. *Böhmen* and *Böheim*): a former kingdom of Europe, now a part of Austria-Hungary. It is bounded N. by Saxony and Prussian Silesia, E. by Moravia and Prussia, S. by Lower Austria, and W. by Bavaria. It is between lat. 48° 33′ and 51° 3′ N., and between lon. 12° and 16° 46′ E. Its area is 20,060 sq. miles. It is inclosed on all sides by four chains of mountains, which constitute its natural boundaries—namely, the Erzgebirge (Ore Mountains), which separate it from Saxony on the N. and N. W.; the Riesengebirge (Giant Mountains), which extend along the N. E. frontier; the Moravian Mountains, which separate it from Moravia on the S. E.; and the Böhmerwald (Bohemian Forest), which extends along the S. W. border. The Schneekoppe, which is the highest peak of the Riesengebirge, rises 5,275 feet above the level of the sea. The surface of Bohemia is mostly undulating, and belongs to the basin of the Elbe, which rises in the northeast part. The other principal rivers are the Moldau, which rises in the Böhmerwald, flows northward, and enters the Elbe; and the Eger, which flows through the northwest part into the Elbe. The Moldau and Elbe are navigable for steamboats. The climate is healthy, and mild in the valleys or lowlands. The mean annual temperature at Prague is 49° F. The soil is generally fertile. The staple productions are rye, oats, barley, flax, and wheat. The grapevine is also extensively cultivated. Nearly one-third of the country is covered with forests. Large numbers of cattle and sheep are raised in some parts of the country. Bohemia is rich in minerals, which are found chiefly in the mountains. Among its mineral resources are copper, tin, iron, lead, cobalt, silver, nickel, zinc, arsenic, sulphur, coal, cinnabar, alum, and precious stones. Here are also quarries of marble, granite, and sandstone. Famous mineral springs occur at Marienbad, Carlsbad, and Töplitz. The manufactures of Bohemia are very important and varied, the principal products being linens, cotton goods, woolens, glass, and paper. The manufacture of damask, cambric, lawn, and other linen goods employs about 400,000 flax-spinners and 50,000 weavers. Over 500,000 spindles are employed in the production of cotton yarn. Beet-sugar is extensively manufactured. The number of paper-mills is over 120. Bohemia has long been celebrated for its glass-works, which employ about 30,000 persons. A considerable quantity of iron is manufactured here. Railways extend from Prague in several directions, connecting it with Dresden, the cities of Bavaria, and those of Moravia. The chief towns are Prague, Pilsen, and Budweis. Bohemia has one university (Prague), twenty-three gymnasia, as well as numerous Realschulen, and other institutions of learning. A large majority of the inhabitants belong to the Roman Catholic Church, that being the established religion, but other churches are tolerated. The number of Protestants in Bohemia in 1880 was 120,120. Pop. (1890) 5,843,094, of whom about three-fifths are Czechs, and two-fifths Germans.

Bohemia derives its name from the *Boii*, a Celtic people who settled here before the Christian era, and were expelled by the Marcomanni in the time of the Roman Emperor Augustus. It was conquered by the Cechi (or Czechs), a Slavic race, who first established themselves in Bohemia in the second half of the sixth century, and in 630 A. D. made themselves independent. For several centuries the family of the Przemyslides ruled with varying success until in 1310 the kings of the House of Luxemburg ascended the throne, and ruled until 1437. John Huss effected a religious reformation in this country (1400–14), and was burned by the Catholics. The consequence was the sixteen years' war of the Hussites. In 1526 Bohemia was annexed to the dominions of Ferdinand I. of Austria. The majority of the Bohemians in the sixteenth century were Protestants, who, for the assertion of their religious liberty, revolted against the Emperor of Austria, and in 1619 elected as their king Frederick, the elector palatine. He was defeated near Prague in 1620 by the Austrians, who then commenced a cruel persecution of the Protestants, and almost exterminated them. The population was reduced in twenty years (1617–37) from 3,000,000 to 780,000. In recent times the country has been agitated by a strong political antagonism between the Czechs and the Germans, the former demanding the re-establishment of a kingdom embracing Bohemia and Moravia, and enjoying the same autonomy in point of administration which has been conceded to Hungary. See Austria-Hungary. Revised by C. K. Adams.

Bohemian Brethren, or **Moravian Brethren**: the name of a sect of Christians. The followers of Huss (*q. v.*) were divided into Calixtines and Taborites; the former approached the doctrines of the Roman Church, but the latter rejected all the distinctive ones, but at first united with the Calixtines in opposing the invasion by the Roman Church. But later the Calixtines, through the Compactata of Basel (1433), made peace with the Church; and so the Taborites were defeated. Ruined as a political power, they still lived as a sect. Under the name of "The Brethren and Sisters of the Law of Christ" they put themselves under the leadership of Gregory, the nephew of Rokyzana, the great Calixtine chief, and lived in apostolic simplicity at Lititz, in Bohemia. Later they changed their name to "The Unity of the Brethren" (*Unitas Fratrum*). Briefly, they held to these views: The three orders of the ministry; diocesan synods for local affairs; association of all the bishops in a general council for general affairs; permission of marriage to the clergy; rejection of purgatory, Mariolatry, and saint-worship; acceptance of only two sacraments and of infant baptism; church discipline of the most rigorous character. They found many sympathizers and converts, but were persecuted by the Roman Church and their former brethren, the Calixtines. When the Protestant movement began they numbered in Bohemia and Moravia about 200,000. They corresponded with the Reformers, learned much from them, but did not coalesce. In 1549 persecution drove them in large numbers to Poland, where they flourished. In 1620 the fate of the Brethren was sealed at the battle of the White Mountain, and they well-nigh vanished. Many were killed, many became members of the Roman Church, and many joined either the Lutheran or the Reformed bodies. In 1656 the Polish branch was similarly destroyed and absolved; but in 1722 the remnants of the sect, which had secretly and very obscurely existed all these years, came together on the domain of Count Zinzendorf at Berthelsdorf, near Zittau, about 60 miles S. E. of Dresden, on the border between Saxony and Bohemia, and then arose the renewed Moravian Brethren (*q. v.*). See C. A.

Pescheck, *Reform and Anti-reform in Bohemia* (London, 1845, 2 vols.); A. Gindely, *Geschichte der Böhmischen Brüder* (Prag, 1857); E. De Schweinitz, *History of the Unitas Fratrum* (Bethlehem, Pa., 1885). SAMUEL MACAULEY JACKSON.

Bohemian Forest, or **Böhmerwald**, bō'mer-vält: a chain of mountains in Germany, which forms the boundary between Bohemia and Bavaria, and separates the basin of the Danube from that of the Elbe. It extends in a S. E. and N. W. direction, and is about 130 miles long. The rocks of which it is formed are granite and gneiss. The highest summits of this chain are the Aber, 4,848 feet, and the Rachelberg, 4,743 feet, above the level of the sea. A large portion of these mountains is covered with dense forests. A railway extending from Bavaria to Prague crosses this range through the valley of the Cham.

Bohemian Language: See SLAVIC LANGUAGES.

Bohemian Literature: See CZECH LITERATURE.

Bo'hemond (Lat. *Bohemun'dus*) **I.**: a famous leader of the first crusade; b. about 1056; son of Robert Guiscard, Duke of Apulia and Calabria. He joined the crusade with a large army in 1095, and took part in the capture of Antioch in 1098. He remained at Antioch while the other crusaders marched to Jerusalem, and he reigned there as Prince of Antioch. He waged war with varying success against the Greek Emperor Alexis, and married a daughter of Philip I. of France. D. in Italy in 1111.

Bohemond II: a son of the preceding; was a minor at his father's death. He became Prince of Antioch in 1126, and fought against the Saracens as an ally of Baldwin, King of Jerusalem. He was killed in battle in 1130.

Böhl, böl, EDUARD, Ph. D., D. D.: Professor of Reformed Dogmatics and Symbolics, and of Pedagogics, Philosophy of Religion, and Apologetics, in the Protestant faculty of Theology at Vienna, Austria; b. at Hamburg, Nov. 18, 1836; educated at the universities of Berlin, Halle, and Erlangen, taking his present position in 1864. He is the author of a large number of exegetical, critical, and theological works in Latin and German, and has contributed in English to American reviews and periodicals. His position is extremely conservative, especially in the line of deprecating all revision of existing creeds. W. J. BEECHER.

Bohlen, bō'len, PETER, van: German Orientalist; b. in Oldenburg, Mar. 9, 1796. He became Professor of Oriental Languages at Königsberg in 1826; published, besides other works, an able treatise on Indian antiquities entitled *Das alte Indien* (2 vols., 1830). D. Feb. 6, 1840. See his *Autobiography* (1841).

Bohlen Lectures, THE: a series of lectures established by John Bohlen, a layman of the Protestant Episcopal Church in the U. S. (d. Apr. 26, 1874), who bequeathed to trustees $100,000 to be distributed to religious charities in accordance with the testator's wishes. On June 2, 1875, the trustees paid over to "the rector, churchwardens, and vestrymen of the Church of the Holy Trinity, Philadelphia," a sum of money for certain designated purposes, out of which fund $10,000 was set apart for the endowment of *The John Bohlen Lectureship*, for the delivery and publication of at least 100 copies of two or more lectures on subjects within the terms of the will of the founder of the Bampton Lectures, "or on any other subject distinctively connected with or relating to the Christian religion." These lectures have been delivered as follows: Rev. Alexander H. Vinton, D. D., *Inaugural Series*; Bishop Fred. D. Huntington, *The Fitness of Christianity to Man*; Rev. Phillips Brooks, *The Influence of Jesus*; Rev. John S. Howson, Dean of Chester, England, *The Evidential Value of the Acts of the Apostles*; Bishop Thomas U. Dudley, of Kentucky, *The Church's Need*; Bishop Samuel S. Harris, of Michigan, *The Relation of Christianity to Civil Society*; Rev. Alexander V. G. Allen, Cambridge, Mass., *The Continuity of Christian Thought*; Rev. Joseph F. Garrison, *The American Prayer-book*; Bishop William Stevens Perry, of Iowa, *Constitutional History of the American Church*; Rev. W. R. Huntington, *The Peace of the Church*.
W. S. PERRY.

Böhler, bö'ler, PETER: a theologian and Moravian bishop; b. in Frankfort-on-the-Main, Dec. 31, 1712. He is recognized in Methodist history as having given a decisive impulse to Wesley's opinions and career. He removed to America in 1738, and in 1740 founded the town of Nazareth, Pa. D. in London, Apr. 27, 1775.

Böhm, böm, THEOBALD: musician; b. in Munich, Apr. 9, 1794; d. there, Nov. 25, 1881; noted for an improvement in the construction of the flute. The Böhm flute is more accurate and even in tone, and more easily fingered, than those formerly in use. He also introduced improvements in other instruments, and composed musical pieces.

Böhme, bö'me, or **Böhm**, böm, or **Behmen**, bay'men, JAKOB: German mystic; b. near Görlitz, in Upper Lusatia, in 1575. He learned the trade of a shoemaker, worked at his trade at Görlitz, and became a member of the Lutheran Church. He had a very fertile imagination and a remarkable faculty of intuition, and professed to be divinely inspired and illuminated. His first work was entitled *Aurora, or the Morning Redness* (about 1612). This was condemned by the ecclesiastical authorities of Görlitz. He published several other works, which were admired by some eminent men, but they appear visionary and unintelligible to the generality of persons. D. at Görlitz, Nov. 24, 1624. His works (10 vols., 1682) were translated into English (2 vols. 4to, 1864) by William Law, who was an admirer of Böhme. He was a religious genius of great depth, and can be understood only by people of strong religious feeling and some religious experience: to them he is as sublime as he is obscure to others. See La Motte-Fouqué, *Notice sur J. Boehm* (1831); Fechner, *Jakob Böhme, sein Leben und seine Schriften* (Görlitz, 1857); Geiss, *Jakob Böhme, der Deutsche Philosoph* (Leipzig, 1860); also Rhys Evans's translation of Martensen's *Jacob Boehme*. Revised by W. T. HARRIS.

Böhmerwald: See BOHEMIAN FOREST.

Böh'misch-Lei'pa: town of Bohemia; on the Polzen; 56 miles N. of Prague (see map of Austria-Hungary, ref. 3–D). It has a gymnasium, and manufactures of woolen and cotton cloths, glass, and hardware. Pop. (1890) 10,406.

Bohn, HENRY GEORGE: bookseller, of German extraction; b. in London, Jan. 4, 1796; promoted the popularization of good literature by publishing translations from ancient and modern languages; made several useful compilations, and wrote a *Handbook of Pottery*. D. at Twickenham, London, Aug. 24, 1884.

Bohras: See ISMAEELIAH.

Böhtlingk, böt'lingk, OTTO: Russian Orientalist of German extraction; b. at St. Petersburg, May 30, 1815. After studying at Bonn he returned to St. Petersburg in 1842, and was made a member of the Imperial Academy in 1845. At the age of twenty-five he published an edition of one of the most difficult books of all literature, the Sanskrit grammar of PANINI (*q. v.*). There followed the *Çakuntala* of KALIDASA (*q. v.*), text and translation (1842); *Sanskrit Chrestomathy* (1845); Vopadeva's *Grammar* (1847); Hemachandra's *Dictionary* (1847); a volume *On the Language of the Yakuts* (1851); a collection of over 7,600 Sanskrit proverbs (*Indische Sprüche*, 3 vols., 2d ed. 1870–73), with critically edited text and German translation. In 1852 he began with RUDOLF ROTH (*q. v.*) the publication of the Sanskrit-German dictionary of the Imperial Academy, a great seven-volume folio, which they brought to a successful completion after twenty-three years in 1875. This dictionary gives the historical development of the meanings of the words, and illustrates them by citations excerpted often from works existing at the time in manuscript only. It is the greatest single contribution to Indology that has ever been made, and also the most fundamental. In 1879 Böhtlingk began to publish alone a *Sanskrit Wörterbuch in kürzerer Fassung*, which is an abridgment of the first, but is also a supplement thereto. This he completed in seven folio volumes in Jan., 1889. In 1886–87 he published a new edition of Panini, with translation, etc.; in 1889 the *Chandogya Upanishad* and the *Brihad Aranyaka Upanishad*; and in 1890 Dandin's *Poetics*, all three works in text and translation. Besides the above he has published some other books and many minor treatises. He is remarkable for having left none of his great undertakings unfinished. He is a text-critic of the first rank. Every one of his works marks a distinct advance of science. C. R. LANMAN.

Bo'hun U'pas [Malay, poison-tree]: the *Antiaris toxicaria*, a tree of the Malay and Philippine archipelagoes, of the family *Artocarpaceæ*. Many grossly exaggerated reports of its fatal qualities have been published. Its poison appears to be of an acrid, not a narcotic, character. The stories of the upas valley in Java, where nothing can grow but the upas-tree, probably arose from the now well-ascertained fact that certain close mountain-ravines in that

island so abound in poisonous volcanic gases that no plant, not even the upas, can live there. Besides the above, another bohun upas, the *Strychnos tieute*, is found in that region. It abounds in strychnine, and is even more deadly than the other.

Boiardo, bō-yaar'dō, Matteo Maria: Count of Scandiano; Italian poet; b. at Scandiano about 1434. He was patronized by Borso and Ercole d'Este, and became governor of Módena in 1481. His chief work is the romantic chivalrous poem *Orlando Innamorato*, which he left unfinished, and which was published in 1495. After his death, Niccolò degli Agostini, a poor poet, continued it, publishing three additional books (1506–14–24). Boiardo treated his material in a somewhat burlesque and satirical style; but in 1541 Francesco Berni (*q. v.*) published his *Rifacimento* of the poem, in which, by means of exquisite polish and point, the satiric effect is greatly heightened. The *Rifacimento* was so popular that it nearly supplanted the original, the subject of which was also continued by Ariosto (*q. v.*) in his *Orlando Furioso*. Curiously enough a second *Rifacimento*, by Lodovico Domenichi (1545), later superseded that of Berni.

Bibliography.—A. Panizzi, *Boiardo, Orlando Innamorato*; *Ariosto, Orlando Furioso*, with an essay on the *Romantic Narrative Poetry of the Italians, Memoirs, and Notes* (9 vols., London, Pickering, 1830); J. Boghen, *Matteo Maria Boiardo e l'Orlando Innamorato* (Ferrara, 1879). D. in Reggio, Dec. 20, 1494. Revised by A. R. Marsh.

Boies, Horace: politician; b. on a farm near Aurora, Erie co., N. Y., Dec. 7, 1827; educated in the common school and academy of the county; studied law; member of New York Assembly 1858; removed to Waterloo, Ia., 1867; having been a Republican in politics, he left that party in 1883 on account of objections to its attitude on the tariff and prohibition, and became a leader of the Democratic party in that State. Elected Governor of Iowa 1889; re-elected 1891. Candidate of the Iowa delegation for the presidency in the National Democratic Convention at Chicago 1892.

C. H. Thurber.

Boi'i: an ancient Celtic people; emigrated across the Po and occupied Umbria, where they waged war for several centuries against the Romans. They were defeated by the Romans in 283 B. C., and became allies of Hannibal when he invaded Italy in 218 B. C. Many years later the Romans expelled them from Umbria and drove them beyond the Alps. A portion of the Boii migrated to the country on the north side of the Danube and founded the kingdom of Boiohemum (Bohemia), from which they were expelled by the Marcomanni in the time of Augustus. From them also Bavaria takes its name.

Boil (in Lat. *furunculus*): a hard, painful, inflammatory swelling on the surface of the body, which begins as a point of a dusky red color, and is hot, aching, and throbbing. These symptoms increase in severity for several days, when the swelling is of a conical form, with a broad, firm base, and has on the apex a whitish point, which contains a little matter; this opens, and after a few days more there is discharged a slough of cellular tissue, and the cavity left heals, leaving a depressed scar. Boils often attack young and plethoric persons, and their appearance is not incompatible with robust health, although they may be so numerous as to greatly reduce the strength. Men in training for athletic exercises, or others who have suddenly changed their habits, are subject to them. Sometimes boils continue to succeed each other for a length of time. The treatment of boils is simple. The intestinal canal should be cleared by laxative medicines and the digestive powers improved by tonics and antacids. The tincture of perchloride of iron is often a useful remedy. The skin should be kept healthy by frequent washing, while the inflamed point should be poulticed. Wet lint is a sufficient application after the core has been thrown off. Free incision of the boil greatly hastens its course.

Boïldieu, bō'ĕĕl'dyö', or **Boïeldieu**, bō'yĕĕl'dyö', Adrien François: a French composer; b. at Rouen, Dec. 15, 1775. He went to Russia in 1803, and was there appointed chapel-master to the Emperor Alexander; but he returned to Paris in 1811. Among his works are the operas *La Dame Blanche*, *Jean de Paris*, and *My Aunt Aurora*. D. Oct. 8, 1834. See Réfuveille, *Boieldieu, sa Vie et ses Œuvres* (1851).

Boileau, or, more fully, **Boileau-Despréaux**, Nicolas: poet and satirist; b. near Paris, Nov. 1, 1636. He was liberally educated, and followed no profession but that of an author. He began his literary career in 1660 or 1661 by composing a satire for recitation to his friends, among whom were Racine, Molière, and La Fontaine. This satire (subsequently cut in two, *Adieux d'un poète à Paris* and *Les Embarras de Paris*) was so successful that the young author composed others, five in number, between 1661 and 1665. In 1666, moved by a surreptitious publication of them in Holland, he issued them himself in a volume. Among his best works are the *Lutrin* (Reading-desk, 1674) and the *Art of Poetry* (L'Art Poétique, 1674), which is an exquisite performance, and is considered by some French critics as equal to Horace's *Art of Poetry*. Hardly less successful were the *Réflexions sur Longin* (1693), the outcome of the famous quarrels as to the relative merits of the ancients and the moderns, in which Perrault was Boileau's chief antagonist. The *Epîtres*, written at long intervals between 1669 and 1701, show us the poet maturer, calmer, but also colder than in the *Satires*. His extensive *Correspondance* with his friends is full of interesting material for the literary history of his time. Boileau was admitted into the French Academy in 1684. He had an immense influence on French literature, being for many years the literary legislator of France. He made war on the survivors of the tedious and pedantic school of Ronsard, upon the one hand, on the followers of Malherbe, now declining into Marinism and other puerilities, on the other. He laid down the following as the basis of all sound poetic doctrine:

> Aimez donc la raison; que toujours vos écrits
> Empruntent d'elle seule et leur lustre et leur prix.
> Rien n'est beau que le vrai, le vrai seul est aimable.

This doctrine, however, confirmed the French in a tendency already visible in them—the tendency to prose in preference to poetry. D. in Paris, Mar. 13, 1711. See D'Alembert, *Éloge de Boileau*; Desmaizeaux, *Vie de Boileau* (1712); Daunou, *Éloge de Boileau* (1787); L. S. Auger, *Éloge de Boileau-Despréaux* (1805); É. Deschanel, *Boileau et Charles Perrault* (1888). A. Ch. Gidel, *Œuvres complètes de Boileau* (with *Life*), 4 vols., Paris, 1870–73.

Revised by A. R. Marsh.

Boiler: See Steam-boiler.

Boiling-point: the temperature at which the elastic force of the vapor of any liquid is equal to the pressure of the atmosphere. When a vessel containing water is heated, the temperature rises and vapor silently passes off from the surface; but at 212° F. or 100° C. (the barometric column standing at 30 inches at the sea-level) steam begins to be formed in bubbles at the bottom, and rising through the liquid throws it into commotion. If the steam is allowed freely to escape, the temperature of the water rises no higher. The water is then said to *boil*, and the temperature at which it remains is its *boiling-point*. Every liquid has a boiling-point of its own.

TABLE OF BOILING-POINTS AT 76 CENTIMETERS PRESSURE.

LIQUID.	Degrees (centigrade).	Authority.
Nitrogen	−194·4	Olszewski.
Carbon monoxide	−190·0	"
Oxygen	−181·4	"
Methane	−164·0	"
Nitrogen dioxide	−153·6	"
Ethylene	−102·5	"
Nitrogen monoxide	−87·9	Regnault.
Carbonic acid	−78·2	"
Ammonia	−38·5	"
Chlorine	−33·6	"
Sulphur dioxide	−10·0	"
Ether	+34·9	"
Carbon disulphide	+46·2	"
Chloroform	+60·2	"
Alcohol	+78·3	"
Water	+100	"
Oil of turpentine	+159·1	"
Phosphorus	+287·3	Pisati.
Mercury	+357·25	Regnault.
Sulphur	+448·5	"

The boiling-point of liquids depends upon the pressure to which they are subjected. When the barometer stands at 30 inches, showing an atmospheric pressure of 15 lb. on the sq. inch, the boiling-point of water is 212° F. (100° C.). When part of the pressure is removed it boils before coming to 212°, and when the pressure is increased the boiling-point rises. Thus in elevated positions, where there is less air above the liquid to press on it, the boiling-point is lower than at the level of the sea. An elevation of 510 feet makes a diminution of 1° F.; at higher levels the difference of

elevation corresponding to a degree of temperature in the boiling-point increases, and a method is thus furnished of measuring the heights of mountains. At the city of Mexico, 7,471 feet above the sea, water boils at 198·1° F. (92·2° C.); at Quito, 9,541 feet, at 194° F. (90° C.); in the Himalayas, at the height of 18,000 feet, at 180° F. (82·2° C.). Boiling water is thus not always equally hot, and in elevated places many substances can not be cooked by boiling. Under the receiver of an air-pump water boils at lower and lower temperatures as the pressure diminishes, until at last, if proper precautions be taken to dispose of the vapor as rapidly as it appears, the liquid may be converted into ice by the cold due to its own evaporation. It will freeze while still in a state of violent ebullition.

This effect of diminished pressure is largely turned to account in sugar-boiling, in preparing extracts, in distilling vegetable oils, and in other processes where the substances are apt to be injured by high temperature. By increasing the pressure, on the other hand, water may be heated to any degree without boiling. Papin's digester is formed on this principle. Under a pressure of two atmospheres the boiling-point rises to 120° C. (248° F.), at three atmospheres to 180° C. (356° F.). See the articles HEAT, STEAM, and LIQUIDS; also Balfour Stewart's *Elementary Treatise on Heat*; Tait, *On Heat*; and Maxwell's *Theory of Heat*.

Revised by E. L. NICHOLS.

Bois d'Arc, popularly pronounced *bō'dock*; Fr. pron. bwăă'daark' (Fr., bow-wood): the Osage orange-tree (*Maclura aurantiaca* or *Toxylon pomiferum*, family *Artocarpaceæ*). It is often used for a hedge-plant. As a tree its timber is tough, elastic, and extremely useful. It is a near relative of the fustic-tree, and its wood yields a yellow dye. It was used by the Indians for making bows and arrows. For its use in hedge-fences, see OSAGE ORANGE.

Bois de Boulogne, bwăă'de-boo'lōñ': a grove or public park in the environs of Paris; on the right bank of the Seine, about 3 miles W. of the city. It is nearly 3 miles long and 1 mile wide. It was the finest promenade in the vicinity of Paris, but many of the trees were cut down and burned when that city was besieged by the Germans in 1870. It is during the afternoon the rendezvous of the elegant society of Paris, and in the height of the season presents a sight of unequaled splendor.

Bois-Duval, bwăă'dü-văăl', JEAN ALPHONSE: b. at Ticheville, department of Orne, France, June 17, 1801; studied medicine and natural history at Rouen and Paris, and did excellent service as a physician during the first invasion of cholera in 1835. He wrote several valuable works on botany and entomology: *Flore française* (1828, 3 vols.), in which the plants are arranged according to natural families; *Histoire des lépidoptères et des chenilles de l'Amérique septentrionale* (1829–47); *Les chenilles d'Europe* (1832, *et seq.*, 2 vols.); *Histoire de lépidoptères de la Californie* (1852), written in conjunction with M. A. Guenée; *Essai sur l'entomologie horticale* (1866); *Histoire naturelle des insectes* (1874). D. in Ticheville, Dec. 30, 1879.

Boise, JAMES ROBINSON, Ph. D., LL. D.: b. in Blandford, Hampden co., Mass., Jan. 27, 1815; graduated at Brown University in 1840; tutor of Latin and Greek in that college from 1840 to 1843, and Professor of Greek till 1850. From 1852 till 1868 he was Professor of Greek in the University of Michigan. Thereafter he filled the same position in the University of Chicago. D. in Chicago, Feb. 9, 1895. Prof. Boise published several classical text-books, among which are editions, with English notes, of Xenophon's *Anabasis* and the first six books of Homer's *Iliad*.

Boise, OTIS B.: musician; b. in Cleveland, O., in 1844; and very early showed great inclination toward music. Sent abroad by his father, he entered the Conservatory at Leipzig, remaining there three years, studying under Wenzel, Richter, and Hauptmann, and then went to Berlin, where he studied the piano under Kullak. After his return to the U. S. he busied his leisure hours in composing, and he completed *In Memoriam*, a motet on the *Thirteenth Psalm*, a large work for organ and orchestra, played in Trinity church, New York; a *Concertstück*, for piano and orchestra, performed by Hamerik's orchestra in Baltimore; a piano concerto in G minor; a festival overture, and a trio for violin, piano, and violoncello, etc. He has given up the musical profession and gone into business.

D. E. HERVEY.

Boisé City: capital of Idaho and of Ada co. (for location of county, see map of Idaho, ref. 9–A); in the southern portion of the State; on Union Pac. R. R. and on Boisé river, 50 miles above its confluence with the Snake, in the Great Snake river valley; lat. 43° 34″ N., lon. about 116° W. It is surrounded by a fine agricultural and grazing country, and derives large support from the rich placer and quartz mines in the mountain districts within 50 miles N., S., and E. The principal business houses are fire-proof brick. The city has a U. S. assay-office, a penitentiary, high school, and various mechanical industries. Two large ditches, bringing the water from Boisé river, give an abundance of water-power, and side ditches for irrigating purposes carry the water to every lot in the city. Pop. (1880) 1,899; (1890) 2,311; (1900) 5,957.

EDITOR OF "STATESMAN."

Boise River: See BIG WOOD RIVER.

Boisgobey, bwăă'go-bay', FORTUNÉ, du: French novelist; b. in Normandy, 1824; army paymaster in Algeria; began to write in 1868. Author of *L'Homme sans Nom* (1872); *L'As de Cœur* (1875); *Le Crime de l'Opéra* (1880); *Le Secret de Berthe* (1884). D. in Paris, Mar. 4, 1891.

Bois-le-duc, bwăă'le-dük (in Dutch *'S Hertogenbosch*, i. e. duke's wood): town of Holland; capital of North Brabant; at the junction of the rivers Aa and Dommel; 30 miles S. S. E. of Utrecht (see map of Holland and Belgium, ref. 7–F). It is a clean and well-built town, intersected by several canals and defended by a citadel and two forts. It has a fine cathedral, a college, an academy of art, an arsenal, and a grammar school in which the celebrated Erasmus studied. Here are manufactures of cutlery, ribbons, woolen goods, linen thread, etc. It was founded in 1184 by the Duke of Brabant in a wood while hunting; hence its name. Pop. (1891) 27,302.

Boisserée, bwăă'se-ray', SULPIZ: architect and antiquary of French extraction; b. at Cologne, Aug. 2, 1783. He devoted himself to the collection of specimens of early German art, in which he was aided by his brother Melchior (1786–1851). They collected about 200 pictures, which were purchased by the King of Bavaria, and are called the "Boisserean Collection." He published *Monuments of Architecture on the Lower Rhine from the Seventh to the Thirteenth Century* (1830–33), and *Views, Plans, and Details of the Cathedral of Cologne, etc.* (1823). D. in Bonn, May 2, 1841.

Boissier, bwăă'si-ay', MARIE LOUIS GASTON: French scholar; b. in Nîmes, Aug. 15, 1823; Professor of Latin Oratory in Collège de France 1861; elected a member of the French Academy June 8, 1876. Author of *Une étude sur Terentius Varron: Ciceron et ses Amis*; *La Religion Romaine d'Auguste aux Antonins*; and many papers in the *Revue des Deux Mondes* and the *Revue de l'Instruction Publique*.

Boissonade, bwăă'sō-năăd', JEAN FRANÇOIS: classical scholar; b. in Paris, Aug. 12, 1774. He became Professor of Greek in the University of Paris in 1812; admitted into the Academy of Inscriptions in 1813; became Professor of Greek in the Collège de France in 1828, which position he held until a few days before his death. He edited several Greek prose authors, and published *Sylloge Poetarum Græcorum* (24 vols., 1823–26). He acquired a high reputation as a Hellenist, and gave a powerful impulse to the study of classical literature. D. Sept. 8, 1857.

Boissy d'Anglas, bwăă'see' dăăn'glaa', FRANÇOIS ANTOINE, Count de: a French statesman; b. in Saint-Jean Chambre, Ardèche, Dec. 8, 1756. He became a moderate member of the States-General in 1789; of the Convention in 1792. He was a member of the Committee of Public Safety in 1794; chosen president of the Tribunate in 1802; created a senator and count by Napoleon in 1805, and a peer of France by Louis XVIII. He wrote several political essays and a *Life of Malesherbes* (1819). D. in Paris, Oct. 20, 1826.

Boito, bō-ee'tō, ARRIGO: poet and composer; b. in Padua, Italy, Feb. 24, 1842; early acquired a taste for poetry, music, and art; studied at the Milan Conservatory, and during this time composed several numbers of his opera *Mefistofele*, of which he wrote his own libretto. During the years which followed up to 1867 he busied himself with literature, and wrote poems and novels. In the Garibaldian insurrection Boito took part, and after it was over went to Paris to become a French journalist. In the meantime, however, he continued to work leisurely on his *Mefistofele*. The manager of La Scala, Milan, hearing of this, induced him to complete it, and announced it for production in the season of 1867–68, and the first performance took place

on Mar. 5, 1868. Although the performance lasted nearly six hours, the work was a success, though it aroused such a furious opposition that it was withdrawn. He revised and largely rewrote it, and the new version was produced on Oct. 4, 1875. He wrote the librettos of *Ero e Leandro* and *Nerone*, and composed the music, but not being satisfied with them gave the former to Bottesini, who composed and produced it, and locked the latter up in his desk. He has also composed and written another opera, *Orestiade*, which likewise he retains unproduced. He has written numerous librettos for other composers, including *Amleto* (Faccio), *Gioconda* (Ponchielli), *Alessandro Farnese* (Palumbo), *Tram* (Dominiceto), *Otello* and *Falstaff* (Verdi), besides translating several of Wagner's opera-texts into Italian. His poems, found in *Il Libro dei Versi*, are very highly praised. Since 1867 he has lived in Milan, and is one of Verdi's most cherished friends. He is a great admirer of Bach, Beethoven and Wagner. He married Erminia Borghi-Mamo, who sang in the 1875 production of *Mefistofele*.

D. E. Hervey.

Boivin, bwăă'văń', Marie Anne Victoire Gillain, M. D.: French midwife; b. Apr. 9, 1773; educated in a nunnery, and afterward studied the elements of medicine. She married in 1797, but was soon left a widow with one child. To gain a living she worked in the Maternité Hospital, in Paris, of which she became superintendent in 1801. The King of Prussia gave her the civil order of merit, and the University of Marburg the degree of M. D. She wrote valuable professional works. D. May 16, 1841.

Bojador, Cape: See Cape Bojador.

Bo'ker, George Henry: poet; b. in Philadelphia, Oct. 6, 1823; graduated at Princeton, N. J., in 1842. He published *The Lesson of Life and other Poems* (1847); *Calaynos*, a tragedy (1848), which was performed with great success in England; *Plays and Poems* (1856); *Poems of the War* (1864); *Königsmark* (1869); *Book of the Dead* (1882); and *Sonnets* (1886). He was minister to Turkey 1871–75, and to Russia 1875–79. D. in Philadelphia, Jan. 2, 1890.

Bokha'ra (Lat. *Bucharia*; anc. *Sogdiana* and *Transoxiana*): also called *Uzebekistan*; a Russian vassal state of Central Asia; N. of the upper Oxus river; between Russian Turkestan and Afghanistan, between the meridians 62° and 72° E. and parallels 37° and 41° N. Area, estimated at 92,254 sq. miles. The high mountain-range of Hindu Kush extends along the southern border of Bokhara, the east part of which is occupied by offsets from the Bolor Tagh, but the greater part of the country is level. This level tract resembles the dry steppes and sandy wastes of the basin of the Caspian. The largest rivers of Bokhara are the Amu (Oxus), the Jihun, and the Samarcand river, or Kohik. Along the banks of these rivers there is arable and fertile land, which is about one-tenth of the whole country. The climate is moderate. Gold is found in the sands of the Oxus, but Bokhara is deficient in metals and timber. Among the products of the soil are cotton, rice, wheat, barley, silk, tobacco, and abundant fruits. The inhabitants raise great numbers of camels, sheep, goats, and horses. They manufacture silk stuffs, firearms, cutlery, shagreen, gold and silver ornaments, sabers, etc. This country derives commercial advantage and importance from its position between Russia and the south of Asia. The population is composed of a mixture of races, who mostly profess the Mohammedan religion. Bokhara partly corresponds to the ancient *Bactria*. It was conquered by Jengis Khan in 1219. The Uzbegs became masters of it in 1505. In 1864 the Russians moved up the Syr-Darya, captured several important cities, together with the northern half of Bokhara, and formed the government of Turkestan. Between 1866–68 the Russians conquered the cities of Samarcand and Katty Kurgan, with the territory belonging to them. Since then Bokhara has become more and more dependent upon Russia. In 1870 Russia conquered Badakshan and gave it to Bokhara, and in 1873, owing to the victory of the Russians over Khiva, the Amu was made the boundary between Khiva and Bokhara. The Transcaspian railway to Samarcand now runs through Bokhara. Trade is rapidly passing into Russian hands. The Amir Sayid Abdul Ahad, b. in 1860 and educated in Russia, succeeded his father in 1885. He gave 100,000 roubles for the relief of the distress by famine in S. E. Russia in 1892. The capital is the city of Bokhara. The other chief towns are Karshi (pop. 25,000), Hissar (10,000). Total pop. estimated at 2,500,000.

References.—Burnes, *Travels in Bokhara* (1839); Vambéry, *History of Bokhara* (1873); Curzon, *Russia in Central Asia* (1889). Revised by M. W. Harrington.

Bokhara (i. e. treasury of sciences): a city of Central Asia; capital of Bokhara; situated on a plain near the river Sogd or Zerafshan; 138 miles W. S. W of Samarcand (see map of Asia, ref. 4–D). The streets are very narrow and ill paved, the houses are small, have flat roofs, and are built of sun-dried bricks. Bokhara is probably the most important commercial town of Central Asia, and has numerous extensive bazaars, in which nearly all kinds of goods can be procured. Among the articles exported from it are silks, cotton, wool, coarse chintzes, lapis-lazuli, and dried fruits. This city is said to have 360 mosques, some of which are beautiful structures. It has long been famous as a seat of Mohammedan learning, and is said to contain over 100 colleges, with about 10,000 students. Among the principal edifices is the palace of the khan, which is inclosed by a wall about 65 feet high. Bokhara was ruined by Jengis Khan in 1220, and was rebuilt at the end of his reign. It was pillaged again by his successors in 1273 and 1276. The railway station for the Transcaspian road is at New Bokhara, about 10 miles from the old city. Pop. 70,000 to 100,000.

Bokhara Languages: See Iranian Languages.

Bo'lan (bō-laan') **Pass**: a pass in the mountains of Baluchistan; is 50 miles long, and is on the route from Sind to Kandahar and Kelat. The highest part of the pass is 5,793 feet above the level of the sea. The average ascent is 90 feet in a mile. The Bolan river rises here. In 1839 a small British army with heavy artillery marched through this pass from Sind to Afghanistan.

Bo'las [Span., plur. of *bola*, ball]: a Spanish-American name for a missile used by the Indians of the South American plains, and borrowed from them by the gauchos. It consists of a pair of balls (formerly made of clay by the Indians, but now often of iron) fastened together by a thong of hide. The bolas are hurled with great precision at the ox, horse, guanaco, or ostrich, and, entangling the legs of the animal, detain it till it can be captured or killed. Sixty feet or more is a moderate range for the bolas, which are thrown from the saddle.

Bolbec': a town of France; department of Seine-Inférieure; on a small river of its own name; 20 miles by rail E. N. E. of Havre; on the railway which connects Paris with the latter place (see map of France, ref. 2–D). It is well built, and is adorned with fountains. Here are manufactures of cotton, linen, and woolen fabrics, and chemicals, and three annual fairs doing considerable business. Pop. (1891) 12,028.

Boldini, bōl-dee'nĕĕ, Giovanni: contemporary painter of genre and of portraits, who, though born at Ferrara, Italy, has long resided in Paris, and is identified with the French school. He is an artist of the rarest talent, and one of the most wonderful technicians in modern art. His pictures are generally of small size and of minute finish, but possess a breadth of handling that gives them extraordinary value in the eyes of artists and connoisseurs. His portraits are treated much more synthetically than his small pictures, and some of them, notably those painted in pastel, are remarkable for their elegance of aspect and beauty of style. His pictures are well known in the U. S., and two exquisite examples of his work, *Ladies of the First Empire* and *The Parisians*, are in the collection of Mrs. W. H. Vanderbilt, New York. He was awarded a medal of honor at the Paris Exposition, 1889. Studio in Paris. William A. Coffin.

Bole [from Lat. *bolus*, from Gr. *βῶλος*, clod]: a hydrous silicate of aluminium, classified by Dana as one of the varieties of halloysite (so called in honor of the Belgian geologist J. B. J. d'Omalius d'Halloy, 1783–1875). Dana's classification was made with some reserve, however, for he states that more investigation is needed before it can be definitely determined that bole is not a mere mixture. It is a soft, colored, unctuous, compact, claylike substance, occurring in amorphous masses, has a conchoidal fracture and a greasy luster, is highly absorbent, and carries more or less oxide of iron and about 24 per cent. of water. The iron gives it a brownish, yellowish, or reddish color. It is found in Armenia, Italy, Java, France, Scotland, Ireland, and Germany. Savage tribes in South America eat bole when starving. It was at one time used in medicine, and the Armenian bole has been employed in veterinary practice. Under the names of English red and Berlin red it is used in Germany as a pigment. French bole and

Lemnian bole are of a pale red color; Bohemian bole is reddish yellow; Silesian bole, pale yellow; and Blois bole is yellow.

Bolero, bō-lay′rō: a Spanish national dance; generally in the time of a minuet, and with a peculiar rhythm. It is accompanied with the music of the guitar and castanet, and with songs. The dancer seeks to represent by pantomime the successive symptoms and emotions of amorous affection, with its various moods of jealousy, despair, triumph, etc. Adopted by the ballet-masters, it made its tour all over the world.

Bole′tus [Lat., from Gr. βωλίτης]: a genus of fungi of the order *Hymenomyceteæ* and family *Polyporaceæ*. It comprises several species, which resemble the mushroom (*Agaricus*) in form, but instead of having gills the under side of the cap (*pileus*) is occupied by a layer (*hymenium*) quite distinct from the body of the pileus in substance, and pierced by pores, so as to be composed of numerous small tubes united together. *Boletus edulis* is used as food in France and Germany, where it grows on the ground in woods and mossy places. In moist, warm summers it is very abundant, and sometimes very large (a foot in diameter). The part which is eaten is the flesh of the cap, which is firm, white, and delicate. Several other species are edible.

Boleyn, bŏŏl′en, or **Bul′len**, Anne: Queen of England: b. in 1507; daughter of Sir Thomas Bullen, afterward Earl of Wiltshire. Her mother was a daughter of the Duke of Norfolk. She was educated at the French court, and became about 1525 one of the maids of honor to the English queen, Catherine. Henry VIII., attracted by her beauty, applied to the pope to obtain a divorce from Catherine, and married Anne privately early in 1533. She became the mother of the Princess Elizabeth in September of that year. She showed favor to the cause of the Reformation. Having been supplanted in the favor of the king, she was accused of criminal intercourse with several men, was condemned by a jury of peers, and beheaded in the Tower of London May 19, 1536. Some writers think that her crime was not proven. See Froude, *History of England*, vol. ii.; Miss Benger, *Memoirs of Anne Boleyn*; Miss Strickland, *Queens of England*.

Bolgrad, bōl-graad′: a town of Russia; on Lake Yalpukh; 30 miles N. of Ismail, and near the frontier between Russia and Roumania (see map of Russia, ref. 10–B). In 1856 it was ceded by Russia to Turkey, but in 1878 it was ceded to Russia. It is a station on the railway from Galatz to Koshinef, and has excellent professional schools. Pop. 9,000.

Boli, bō′lĕĕ: a town in Asiatic Turkey: in Kastamuni; 85 miles N. W. of Angora (see map of Turkey, ref. 4–F); inhabited by Turks and Armenians. The manufactures are gold ornaments and leather. Pop. about 10,000.

Bolingbroke, bol′ing-brŏŏk, Henry St. John, Viscount: author and statesman; b. at Battersea, England, Oct. 1, 1678. He was educated at Eton and Oxford, and was extremely dissipated in his youth. Having entered Parliament in 1701, he soon became a prominent orator of the Tory party, and was appointed Secretary of War in 1704. He lost this office when the Whigs obtained power in 1708, but he continued to be a favorite counselor of Queen Anne, who dismissed the Whigs in 1710, and placed Harley at the head of a ministry in which St. John was Secretary for Foreign Affairs. He received in 1712 the title of Viscount Bolingbroke, and in 1713 concluded the treaty of Utrecht, which ended a long war between England and France. He quarreled with Harley (Earl of Oxford), and supplanted him as prime minister in July, 1714. His ambitious hopes were blasted by the death of Queen Anne (Aug., 1714), which also frustrated his designs and schemes to restore the Stuart dynasty. He was attainted in 1715, but he had escaped to France, and entered the service of the Pretender as his prime minister. In 1724 he was permitted to return to England, but not to enter Parliament. He wrote for the *Craftsman* many articles against Walpole, and published, besides other works, a *Dissertation on Parties* (1739) and *Remarks on the History of England* (1743). D. at Battersea, Dec. 12, 1751. He was brilliant and versatile, but not profound. His collected works, which have little merit except style, were published by David Mallet in five volumes (London, 1754). See Goldsmith, *Life of Lord Bolingbroke*; G. W. Cooke, *Memoirs of Lord Bolingbroke* (London, 1835); J. C. Collins, *Bolingbroke, an Historical Study* (1886).

Bolintineann, Dimitrie: poet and journalist; b. at Bolintina, Wallachia, in 1826; educated at Bucharest; studied in Paris; edited in 1848 a revolutionary paper, and was banished by Prince Stirbey; settled once more in Paris, but returned home under Prince Cuza; edited another journal, and received a high governmental position after the *coup d'état*, May 2, 1864. A French translation by himself of some of his poems was published under the title *Brises d'Orient* (Paris, 1866). D. in Bucharest, Sept. 1, 1872. An edition of a part of his works (*Poesii*) appeared in 1877 in two volumes at Bucharest, with a preface by G. Sion.

Revised by E. S. Sheldon.

Bolivar: city; capital of Polk co., Mo. (for location of county, see map of Missouri, ref. 6–F); 110 miles S. W. of Jefferson City. It has a fine high-school building, a woolen-mill, cotton-gin, flouring-mill, and other manufactories. Pop. (1880) 516; (1890) 1,485; (1900) 1,869.

Bolivar, bol-i-vaar′: capital of Hardeman co., Tenn. (for location of county, see map of Tennessee, ref. 7–B); 1 mile S. of Hatchie river; 28 miles S. of Jackson, and 68 miles E. of Memphis; in an excellent cotton region, with fine water-power and plenty of timber. It has a foundry, steam saw and grist mill, four academies, and the West Tennessee Hospital of the Insane. Pop. (1880) 1,043; (1890) 1,100; (1900) 1,035. Editors of "Bulletin."

Bolivar, bō-lee′var: a colony of Venezuela: near to and E. of Caracas; in the state of Guzman Blanco. In 1881 it obtained independent political rights. Area, 8 sq. miles. Pop. (1890) 855.

Bolivar: a state of Venezuela, the northern boundary of which is formed by the rivers Orinoco and Apure from the Caroni river (lon. about 63° W.) to lon. 70° W. The eastern boundary is the river Caroni; on the S. are Brazilian Guiana and Alto Orinoco; on the W. the latter, with Colombia and Armisticio. The name has been applied to several different territories in Venezuela, but the present outlines were established in 1884. Area, 88,701 sq. miles. Pop. (1890) 60,097. M. W. H.

Bolivar, or **Ciudad** (thĕĕ-oo-daad′) **Bolivar** (formerly *Angostu′ra*): a town of Venezuela; largest in the state of Bolivar; on the right bank of the Orinoco; 240 miles from its mouth (see map of South America, ref. 1–D). It is situated near a pass or narrows of the river, hence the last name. It can be reached by vessels of 300 tons, and considerable trade is carried on here, chiefly in cocoa, sugar, cotton, jerked meat, hides, and a medicinal bark called angostura. Pop. 11,686. M. W. H.

Bolivar: a central-plateau province of Ecuador; perhaps the smallest of the sixteen provinces of the republic. Pop. 43,000.

Bolivar: one of nine departments of the South American republic of Colombia; bounded N. by the Caribbean Sea, E. by Magdalena and Santander, S. by Antioquia, and on the W. by Cauca. Area, 21,345 sq. miles. Besides the Magdalena, which flows along its entire west boundary, the only river of importance is the Cauca. The principal towns are Cartagena, the capital, and Mompos. Pop. 280,000.

Bolivar (Sp. pron. bō-lee′var), Simon, or **Bolivar y Ponte**, bō-lee′var-ĕĕ-pōn′taĕ: surnamed The Liberator; a South American patriot; b. at Caracas, July 25, 1783; inherited an ample fortune. He studied law at Madrid, and afterward joined the patriots who revolted against Spain in 1810. He served as an officer under Miranda in several battles. Having obtained the command of a separate army, he defeated the Spaniards and entered Caracas in triumph in Aug., 1813, soon after which he was appointed dictator. He was defeated and driven out of Venezuela in 1814, but again rallied to the standard of liberty near the end of 1816, and gained several victories over the Spanish general Morillo in 1817. In Feb., 1819, a congress was opened at Angostura, and Bolivar was chosen president. In Dec., 1819, Venezuela and New Granada were united to form the republic of Colombia, of which Bolivar was elected the first president. He gained a victory at Carabobo in June, 1821, and in 1822 led an army into Peru, which he liberated from the Spaniards. He became dictator of Peru in 1823, and made a tour through that country, in which he was received with triumphal demonstrations. In honor of him the southern part of Peru was named Bolivia, and erected in 1825 into a separate state, of which he became president for life. He was also re-elected president of Colombia in 1826. In 1829 Venezuela seceded from the republic of Co-

lombia, which was much disturbed by faction. D. in San Pedro, near Santa Martha, Dec. 17, 1830. See Ducoudray-Holstein, *Mémoires de S. Bolivar* (1829).

Bolivar Point is at the north side of the entrance to Galveston Bay, Tex.: in Chambers co.; lat. 29° 22′ 02″ N., lon. 94° 45′ 34″ W. It has an iron lighthouse 110 feet high, with a white fixed light 117 feet above the sea.

Boliv'ia (Sp. pron. bō-lee'vĕe-a): a central country of South America, between Brazil and Argentina on the N., E., and S., and Chili and Peru on the W.; extending from about lat. 8° to 23° 15′ S., and from lon. 57° 20′ to about 73° W. Area about 567,240 sq. miles. The Atacama region of the Pacific coast was ceded to Chili after the war of 1879. Pop. 2,019,549, besides wild Indians.

Topography.—Primarily, Bolivia is divided into the high or Andean region, occupying the southwestern half, and the lowlands of the east and north, which lie in the great depressions of the Paraguay and Madeira. The Andean portion, taken as a whole, is the highest region of its size in America, averaging 13,000 feet or more. It may be described as a table-land capped by mountain-chains, of which the principal are the Andes and the Eastern Cordillera, each with an average elevation of about 15,000 feet, and with peaks rising above 20,000 feet. The Andes skirt the western frontier; the Eastern Cordillera (called *Cordillera Real* toward the north) is roughly parallel to the Andes, and about 125 miles farther inland. The space between these ranges is occupied by two great elevated basins, separated by a cross range of mountains about lat. 19° 50′ S. The northern basin is that of Lake Titicaca and the Desaguadero river, and extends a little way into Peru. (See Titicaca.) The southern basin, partly in Argentina, is a little-known region of arid lands, salt marshes, and isolated mountains, called the *Desertos de Lipes.* The average height of these basins is not less than 12,000 feet. The highest mountains of Bolivia are in the *Cordillera Real* (Eastern Cordillera). The Nevado de Sorata, or Illampu, in that range, is an imposing mass, formerly supposed to be the highest in America, but recent estimates make it under 22,000 feet. The twin peak of Illimani, near it, is almost as high. Eastward from the Eastern Cordillera a great number of branches or spurs spread over the highlands, inclosing valleys which are the finest parts of Bolivia. As the mountains subside eastward a kind of terrace is reached which drops abruptly to the lowlands. This terrace and the outlying Llanos de los Chiquitos in Eastern Bolivia resemble the Brazilian table-land, and probably were once a part of it. The eastern lowlands include a portion of the Gran Chaco (see Gran Chaco), passing northward into plains which are partly covered with forest; some isolated low mountains are found here, and the region is hardly separated from the great Madeira depression of the north (see Paraguay River and Madeira), a vast expanse of damp tropical forests and plains which are very imperfectly explored. The forests extend for some distance up the eastern mountain-slopes and valleys; but except on this border the highlands of Bolivia are without forest growth.

Climate.—The lowlands are hot, with heavy rains, especially from October to April; there is a marked dry season only in the Paraguayan basin. Above these there is every gradation to the snow-limit, which in Bolivia is at about 15,000 feet. Five zones of climate are commonly distinguished: *Yunga*, the plains and valleys to 5,000 feet; *Valle*, or *Medio Yunga*, 5,000 to 9,000 feet; *Cabezera de Valle*, high valleys from 9,000 to 11,000 feet; *Puna* and *Puna brava* above, the latter cold and sterile. Some parts of the great elevated basins southward are almost rainless.

Lakes and Rivers.—Titicaca, on the borders of Peru, is the largest lake in South America, and the highest large body of water in the world; it discharges southward by the deep and rapid Desaguadero river, 150 miles long; this flows into the Aullagas lake or swamp, where it is lost. (See Titicaca.) The great rivers are in the lowlands, the Pileomayo flowing S. E. to the Paraguay, and the Mamore, Beni, and Madre de Dios northward to the Madeira; the headwaters of the Purús are in the northern forests of Bolivia, but the river has been explored only from the Amazon. The branches of the Madeira offer the most promising outlet for the future commerce of Bolivia.

Geology.—Very imperfectly known. Portions of the Eastern Cordillera and the Titicaca basin contain palæozoic rocks, and there are tertiary beds bordering the Gran Chaco. The Andes range is largely volcanic and several of the peaks are active. Earthquakes are frequent in the mountain regions, but there have been few severe ones.

Minerals.—In minerals Bolivia is probably the richest country in South America, and heretofore they have formed the chief product. Silver is the most important metal, still constituting two-thirds of the value of exports. The former output of the Potosi and Porcos mines would seem fabulous were it not well attested (see Potosi), but there is little doubt that it may be equaled or exceeded with proper management. There are rich mines of gold and copper; tin, lead, and mercury are extracted from some of the silver ores, and beds of coal and iron are known.

Plants.—The richest rubber region of the world is probably about the river plains of Northern Bolivia. The cinchona trees of the mountain-slope forests are said to be nearly exhausted; but the other forest riches of Bolivia are untouched. Coca grows wild on the highlands, but is also cultivated and exported; wheat is exported, principally from Cochabamba, and coffee-raising is growing in importance in the *medio yunga* region. The soil of Bolivia is everywhere rich except in the *puna-brava* zone, and almost any temperate or tropical plant can be grown in some part. Among crops raised for home consumption are mandioca, plantains, tropical fruits, and maize in the lower lands, and potatoes, quinoa, and barley in the *puna* zone.

Animals.—The lowlands have the usual forest and prairie animals of the neotropical region (see America, South), including tapirs, jaguars, pumas, ant-eaters, armadillos, sloths, American monkeys, ostriches, and a great variety of birds, insects, etc. Among the animals peculiar to the highlands are bears, condors, and the wild llamas called *guanacus* and vicuñas. Tame llamas are raised as beasts of burden, and alpacas for their fleece. Sheep and cattle raising is growing in importance.

Inhabitants.—Nearly all the civilized population is in the highlands, and three-fourths are pure Aymará Indians, speaking their own language and retaining some of their customs; they are nominally Catholics and form the best portion of the laboring class, besides being excellent soldiers. Spanish is spoken in the towns. The largest city is La Paz (40,000 inhabitants). Other towns are Suere or Chuquisaca, the capital (20,000), Cochabamba (20,000), Potosi (12,000), Santa Cruz (10,288), Oruro (10,000). The principal settlements of the lowland are mission villages of Indians, formed by the Jesuits, and now (1894) in a state of decadence. Large portions of these plains are unexplored, and peopled only by small tribes of wild Indians. The total number of these Indians probably does not exceed 150,000.

Government, etc.—The executive power is invested in a president, who is now elected for four years; Congress consists of a Senate and House of Representatives, chosen, like the president, by universal suffrage. There is a small standing army, and the national guard includes all able-bodied men. Primary education is free and obligatory, but there are few good schools: four universities are well patronized. The recognized religion is Roman Catholic, but other sects are tolerated. The public debt is about $5,000,000, and is said to be diminishing.

Railways, etc.—The great want of Bolivia has been good means of external communication, by which her magnificent resources can be made available. Attempts to use the natural highways of the northern rivers have failed through bad management or lack of capital, and trade is mainly through Chili and Peru to the Pacific. A railway from the Chilian port of Antofagasta is now (1893) completed to Oruro, 500 miles of the line being in Bolivia; it will be continued to La Paz, thus opening up the great elevated basins. Another railway runs from La Paz to Lake Titicaca, and many more are projected. Great improvements have been made in the common roads. The telegraph system is very incomplete, generally following the railways.

History.—Probably the oldest civilized empire in America existed in the Titicaca basin, but we know of it only by vague tradition and by the ruins at Tiahuanacu and other places. (See Incan Antiquities.) It appears to have been broken up about the eighth century; the Collas or so-called Aymarás remained in the Bolivian highlands and retained some civilization. They were subdued in the fourteenth century by the Incas of Cuzco. (See Incas.) After the Inca empire had been overturned by Francisco Pizarro, he sent his brother Hernando to annex this southern region (1538), and in 1559 it was formed into the *audiencia* of Charcas, or Upper Peru. It was governed by judges who

resided at Chuquisaca (the modern Sucre), and at first were subject to the Viceroy of Peru; but in 1776 Charcas was made a province of the new viceroyalty of Buenos Ayres. The rich silver mines gave this region a special importance with Spain; but here as elsewhere the colonists, and especially the Indians, had much cause for discontent. A revolt in 1809 was speedily crushed, and patriot invading armies from Buenos Ayres (1811–1815) and from Peru (1821) were repulsed by the Spaniards. Thus Charcas was the last region in South America to be freed from Spanish troops. This was effected after the great victory of Ayacucho in Peru; early in 1825 Bolivar sent Sucre into Charcas, and the remaining Spaniards were speedily subdued; Bolivar himself followed a little later, formed or approved a constitution, and the same year the old province of Charcas was declared an independent country, taking the name of Bolivia in honor of its founder. Sucre, the first president, was obliged to resign in Sept., 1828. His successor, Marshal Andres Santa Cruz, interfered in the affairs of Peru (1835), and in 1836 a federal republic was formed, consisting of three states, North Peru, South Peru, and Bolivia, each governed by a president and Congress, with Santa Cruz as supreme protector. Malcontents from Peru, aided by an invading army from Chili, overthrew Santa Cruz in 1839, and the confederation was dissolved. In 1841 Gamana, president of Peru, made war on Bolivia, but was defeated and killed at the battle of Yngavi (Nov. 20, 1841), and peace was made next year. After 1845 most of the presidents were military adventurers who held their places by force of revolutions; but there were exceptions, as Dr. Linares, elected in 1858, and Col. Adolfo Ballivian, whose election in 1873 promised to put a stop to the disorders, but who died shortly after. Chili declared war on Bolivia in 1879 to uphold her seizure of the nitrate regions of Atacama; Bolivia and her ally, Peru, were beaten in the war, and Atacama was given up, leaving Bolivia without a seacoast. During this war the president of Bolivia, Gen. Hilarion Daza, was deposed by his own troops on account of cowardice, and was succeeded by Campero. Since the war Bolivia has been quiet, and the period of military revolutions seems to be past; but lack of external communications has retarded the natural development of the country.

Bibliography.—Dolence, *Bosquejo Estadistico de Bolivia* (1851); Cortes, *Ensayo sobre la Historia de Bolivia* (1861); Moreno, *Nociones de Geografia de Bolivia* (Sucre, 1889); Reck, *Geographie und Statistik der Republik Bolivia*, in Petermann's *Mittheilungen* (1866 and 1867); Bonelli, *Travels in Bolivia* (London, 1854); Weddell, *Voyage dans le Nord de la Bolivie* (Paris, 1853); Wiener, *Perou et Bolivie* (Paris, 1880); Castelnau, *Expédition dans les parties centrales de l'Amérique du Sud*, vols. iii., iv., and vi. (Paris, 1851); Mathews, *Up the Amazon and Madeira Rivers* (London, 1879); Wappaus, *Mittel und Sud Amerika* (1871); the works of Aramago, Cortes, and Von Tschudi; Markham, *The War between Peru and Chili* (London, 1883). There is a good map in Markham's *History of Peru* (Chicago, 1892), and reports by Minister Anderson on the Bolivian gold and silver mines may be found in *U. S. Consular Reports*, Feb. and Mar., 1892.

Herbert H. Smith.

Bolivian Literature: See Spanish-American Literature.

Bolkhoff, bol-*k*hoff′: a town of Russia: government of Orel; on the Nugra; 30 miles N. of Orel (see map of Russia, ref. 8–D). It is built mostly of wood, and has about twenty churches; also manufactures of gloves, hoisery, hats, and leather. Hemp, hides, oils, and tallow are exported. Pop. (1883) 26,395.

Bol'landists: certain Jesuits who compiled, and are compiling, a voluminous work called *Acta Sanctorum*, or *Lives of the Saints* (53 vols., 1643–1794). They derived their name from John Bollandus. (See Bollandus.) After his death the work was continued by a number of men, among whom were Daniel Papebroek, Conrad Janning, P. van den Bosche, Suyskens, and Hubens. In 1837 a new Bollandist association was formed by the Jesuits in Belgium, who have continued the work of publication. The sixty-first volume, published in 1887, comes down to the saints of Nov. 3. The earlier volumes were reprinted in Paris 1863–83. See L. P. Gachard, *Mémoire historique sur les Bollandistes* (Ghent, 1835).

Bollan'dus, or **Bol'land**, John: a Flemish Jesuit; b. in Julemont, near Liège, Belgium, Aug. 13, 1596. In conjunc- with Godfrey Henschen, he published in 1643–58 five volumes of the *Acta Sanctorum*. D. in Antwerp, Sept. 12, 1665. See Bollandists.

Bol'ler, Alfred Pancoast, A. M., C. E.: civil engineer; b. in Philadelphia, Pa., Feb. 23, 1840; graduated at University of Pennsylvania in 1858, and from Rensselaer Polytechnic Institute, Troy, N. Y., in 1861. He has been engaged in many railroad and bridge constructions as chief and consulting engineer, among which are the Hudson River R. R.; West Side and Yonkers R. R.; Manhattan Elevated R. R.; the Arthur Kill bridge, Staten Island; the Thames River bridge at New London, Conn.; and the department of public works, New York city. He is the author of *Iron Highway Bridges* (1876) and *Report on Thames River Bridge* (1890). See Bridges.

Bologna, bō-lōn′yaă: a province of Emilia, Italy; was previous to 1860 a legation, that is, was ruled by a cardinal. It is bounded N. by Ferrara, E. by Ravenna, S. by Florence, and W. by Módena; area, 1,392 sq. miles. The southern part is mountainous; the soil is mostly very fertile. Among the staple products are silk, wine, grain, olive oil, hemp, flax, and rice. Pop. (1890) 482,219. Capital, Bologna.

Bologna (anc. *Felsina* and *Bononia*): a famous city of Italy; capital of province of same name; situated in a fertile plain near the northern foot of the Apennines; 23 miles by rail S. E. of Modena and 83 miles by rail N. of Florence; lat. 44° 30′ N., lon. 11° 21′ E. (see map of Italy, ref. 4–D). Several railways extend from this point to Ferrara, Ancona, Modena, and Florence; that which connects it with Florence crosses the Apennines by numerous tunnels. Bologna is a handsome city with well-paved streets, lined with rich and varied colonnades, which afford shelter from the rain and sun, and it is adorned with many beautiful churches and fine palaces of the nobility, richly furnished with paintings of the old masters. Among the remarkable edifices are the Palazzo del Podestà; the Palazzo Maggiore del Publico; the leaning tower of Asinelli, built about 1110, and 256 feet high; the cathedral, rich in works of art; the Church of San Stefano, one of the oldest in Italy, and containing Greek frescoes of the twelfth century; the Church of San Petronio, a noble specimen of the Italian Gothic style, adorned with many masterpieces of painters and sculptors; and the Church of San Domenico, in which may be seen sculptures by Michael Angelo and paintings by Guido, L. Caracci, and Colonna. The number of churches in Bologna is about seventy-four.

Bologna is one of the great centers of learning in Italy. Its university, said to have been founded as early as 425, is the oldest in the peninsula. This school attained great celebrity, and was attended by thousands of students from all parts of Europe. The number of its students about the year 1260 is said to have amounted to 10,000. Several women have occupied chairs as professors in this institution. The library of the university has about 160,000 volumes and 1,000 valuable MSS. Bologna has an academy of fine arts and several theaters. Here are important manufactures of silk goods, velvet, crape, chemicals, paper, musical instruments, and sausages. This city was the native place of many eminent painters, including Albano, the three Caracci, and Guido; also of Pope Benedict XIV., Galvani, and Malpighi. A town called *Felsina*, founded here by the Etruscans, was perhaps as ancient as the city of Rome. The Romans, who obtained possession of it in 189 B. C., changed its name to *Bononia*. It was taken by Charlemagne in 800 A. D., and was the capital of the most powerful Italian republic from 1118 to 1274. It was annexed to the Papal States in 1514, and to the new kingdom of Italy in 1859. Pop. 120,000 (147,000 in the commune in 1891).

Bologna, Giovanni: sculptor; b. in Douai, 1524. His real name was Jean Boulogne, afterward Italianized. The equestrian statue of *Cosimo I.*; the well-known group the *Rape of the Sabines*, in the Loggia dei Lanzi; and the *Flying Mercury*, so called, in the Uffizi Museum, all in Florence, are among his more important works. D. in Florence in 1608.

Bologna Stone: a radiated, globular variety of barite or heavy spar, sulphate of baryta, found in a bed of clay in Mt. Paterno, near Bologna, Italy. In 1602 a shoemaker, V. Casciorolus, noticed that it possessed the property of becoming phosphorescent when heated with charcoal. It is also known as Bolognian or Bononian phosphorus.

Bolom'eter [from Gr. βολή, stroke, ray + μέτρον, measure]: an instrument for the measurement of radiant energy by means of the change in electrical resistance of a

metallic strip or wire. It is one of the most delicate instruments used in actinometry. The strip, which should be of very small mass, is exposed to the rays to be measured. It forms one arm of a Wheatstone's bridge, the balance of which is determined by a galvanometer of great sensitiveness. The metal employed is usually iron or platinum. By means of this instrument in the hands of its inventor, Prof. S. P. Langley, heat-measurements previously considered to be entirely below the range of direct experiment have been made. The most striking instances are the determination of the heat of the moon's direct and reflected rays and the exploration of the spectrum of the light of the Cuban firefly. Prof. Knut Angstrom, of Upsala, with a similar instrument has determined the radiant efficiency of such feeble sources of illumination as the electric glow in vacuum tubes, while Prof. B. W. Snow has explored the bright line spectra in various metals, and of the voltaic arc. See WHEATSTONE'S BRIDGE, ELECTRIC DISCHARGE, GALVANOMETER, and HEAT; also the *Proceedings American Academy of Arts and Sciences*, vol. xvi. (1881); *Professional Papers of the Signal Service, No. 15* (Washington, 1883); *Transactions of Academy of Sciences of Upsala* (Sweden, 1892), or *Physical Review* (vol. i., 1893). E. L. NICHOLS.

Bolsena, bol-say'năa (anc. *Volsinii* or *Volsinium*): a town of Italy: on the north shore of Lake Bolsena; about 20 miles N. N. W. of Viterbo (see map of Italy, ref. 5–D). It is now a small and mean village, but in ancient times it was an important Etruscan city and the capital of the Volsci. It was taken and destroyed in 280 B. C. by the Romans, who built here another city. This was the native place of Sejanus. Pop. 3,000. The lake was celebrated in the Middle Ages for its eels. Pope Leo X. was accustomed to visit the island in this lake, on which ruins of beautiful castles, built by the Farnese, are still visible.

Bolt: a dart or pointed shaft, a thunderbolt; also a cylindrical metal pin. Iron bolts are often used to fasten doors and protect houses against robbers. Metallic bolts, with a head at one end and a screw-thread and nut at the other, are used, in building ships and houses, to bind together timber or masonry. Bolts in ship-building are usually either iron or copper, and are of various forms and sizes, some being many feet long.

Bolton, HENRY CARRINGTON: See the Appendix.

Bol'ton-le-Moors': an important manufacturing town of Lancashire, England; on the Croal; 11 miles by rail N. W. of Manchester (see map of England, ref. 7–G). Several railways extend from this place to Liverpool, Manchester, and Blackburn. Bolton returns two members to Parliament. It is one of the principal seats of the cotton manufacture, and is the birthplace of the inventors Arkwright and Crompton. The chief products of its manufactories are muslins, fine calicoes, counterpanes, dimities, cotton shawls, and fustians. Here are also paper-mills, foundries, and machine-shops. Numerous coal mines are worked in the parish of Bolton. The manufacture of cotton and wool was introduced into this place by the Flemings about 1337. Pop. (1881) 105,422; (1891) 146,487; (1901) 168,025.

Bolus [Lat. *bolus*, from Gr. *βῶλος*, clod]: a dose of medicine given in a mass larger than a pill, yet small enough to be swallowed. The bolus is now seldom used.

Bolzano, bōl-zaa'nō, BERNHARD: b. in Prague, Oct. 5, 1781; d. there Dec. 18, 1848; studied theology and philosophy; took holy orders, and was in 1805 appointed professor in the university of his native city. Somewhat influenced by Hermes, he tried, like him, to represent the dogmas of the Roman Catholic Church as a complete and consistent system perfectly in harmony with human reason. He made a great impression on the students; but the curia suspected him, and, though protected by his archbishop, he was in 1820 deposed, and even suspended from his priestly functions. His principal work is *Wissenschaftslehre* (Sulzbach, 1837), besides a number of minor essays on mathematical subjects.

Bo'ma: capital of the CONGO FREE STATE (*q. v.*); on the right bank of the Congo river; has considerable trade (see map of Africa, ref. 6–D).

Bomarsund, bō'mar-soond: a fortress of Russia; on the southeast side of the island of Aland, which forms one of the principal links in that chain of fortifications which guard St. Petersburg from the sea side, and may be called an outwork of Cronstadt; lat. 60° 12′ 40″ N., lon. 20° 15′ E. This important fortress was taken by the allied English and French fleets in Aug., 1854, and was afterward blown up by the allies.

Bomb, bom or bŭm, or **Bomb'shell** [viâ Fr. and Span. from Lat. *bombus*, Gr. *βόμβος*, a humming, buzzing]: a kind of shell; a hollow ball of cast iron which, filled with powder or other explosive substance, is discharged from a mortar or heavy ordnance, and explodes when it strikes the ground or before it falls. The powder in it is usually exploded by a fuse or hollow tube filled with a slow-burning compound, which is ignited by the discharge of the mortar. The largest bomb in ordinary use is 13 inches in diameter, weighs about 195 lb., and is charged with 7 or 8 lb. of powder. Bombs are thrown at angles varying from twenty to forty-five degrees. See MORTAR.

Bom'ba: a surname or nickname given to Ferdinand II., King of the Two Sicilies, in consequence of his cruel bombardment of Messina, Sept. 2–7, 1848.

Bom'bard: a name applied during the Middle Ages to a war-engine resembling the ballista. After the invention of gunpowder the name was applied to all kinds of firearms; but at the beginning of the fifteenth century it was restricted to short pieces of large caliber, firing stone projectiles.

Bombard'ment: the firing from mortars of *bombs* (that is, shells or incendiary projectiles) into a fortress or place to compel, or aid in compelling, its surrender. "Bombardments," says Bardin (*Dict. de l'Armée*), "are an impolitic and barbarous means, since it attacks non-combatants, and is rather a warfare against the inhabitants than against the armed defenders, exasperating the people and *nationalizing* the strife." Among recorded bombardments may be mentioned that of Genoa in 1684; of Tripoli in 1685, 1728, and 1747; Barcelona, 1691. Brussels was bombarded in 1694 by Louis XIV. ("3,000 bombs and three times as many red-hot shot" were thrown in); Prague was bombarded in 1759; Breda, Lille, Lyons, Maestricht, Mayence, in 1793; and Menin, Valenciennes, Le Quesnoy, Ostende, Nieuwpoort, and Lécluse in 1794. Some resisted—as Lille and Mayence—others succumbed. That of Lille is most noted, this small place being subjected for 140 hours (six days and nights) to the fire of 12 mortars and 24 cannons. During the siege in 1832 of Antwerp 31,689 shells were thrown into the citadel without material effect in accelerating the surrender. Glogau, Breslau, and Schweidnitz were bombarded by the French in 1806 and 1807. During the long two years' blockade, 1809–10, of Cadiz, by the French under Marshal Victor it was found impossible to reach the city from the lines with shells from ordinary mortars: long bronze howitzers of 10 inches caliber were cast at Seville (one of which is now to be seen as a trophy (see Fig. 1) in St. James's Park near the Horse Guards, London), and called *à la Villantroys*, from the French colonel of artillery who had proposed them. These, elevated 45 degrees, threw their projectiles 5,000 meters (3 miles) into the heart of the city; but to attain this range it was found necessary to load the shells (already weighing 95 lb.) with lead, to the exclusion of most of the bursting-charge. In bursting they produced no effect, and it is stated that the inhabitants were "scarcely aware of the bombardment."

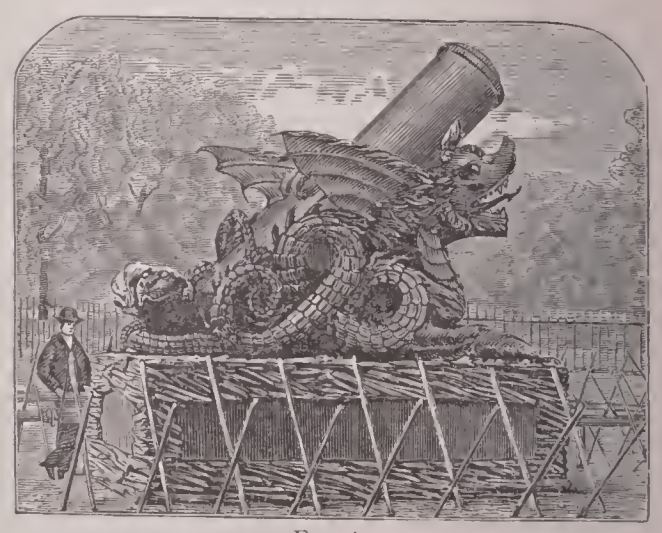


FIG. 1.

At the siege of Antwerp a mortar of 60 cm. (24 inches) caliber, weighing 7,000 kilog. and throwing a shell of 500 kilog. (1,100 lb.), designed by Col. Paixhans, was used. It threw fifteen shells in the last two days of the siege. It

was thought that if one fell on a magazine it would destroy it; but the shells actually thrown caused no serious damage. (*Spectateur Mil.*, 1833.) It was fired with 8 kilog. of powder, but its full charge was 13 kilog. Fired subsequently with this charge it burst.

At the siege of Vera Cruz by Gen. Scott in Mar., 1847, three mortar batteries, each containing four (10-inch) mortars, and a battery of eight large (8-inch) howitzers were established bearing upon the quarter called "La Merced." On the 23d Gen. Scott summoned the place and a conference was had; it proving fruitless, the twelve mortars opened on that day and the howitzer battery the day following. The fire continued throughout the 25th, 26th, and 27th. The La Merced quarter soon became ruinous—200 persons are said to have been injured. The fears of an assault caused Gen. Morales to surrender on the 27th. A shot from the Fort St. Juan entered one of the mortar batteries on the 22d, killing by its "wind" (for though knocking off his cap, the skin was not broken) Capt. John R. Vinton, Third Artillery.* During the bombardment our fleet kept up a cannonade on the fort, which, though intact, surrendered a few hours after the city.

De Blois (*Capitaine d'Artillerie*) published in 1848 a *Traité des Bombardements* to maintain that this means has not, as asserted, fallen into disuse; that bombardments reduce places with much less loss of time, munitions, and blood than regular sieges; and, finally, to defend the system "against the unjust reprobation cast upon it in characterizing its employment as an act of barbarity."

The cases cited by him, nearly all of which have been referred to in this article, scarcely sustain his thesis; still very recent examples go to prove that it is an agent which will continue, under certain circumstances, to be resorted to. Grivel (*La Marine dans l'Attaque des Fortifications et le Bombardment des Villes*, Paris, 1856) maintains that in the use of *curved* fires, combined with direct ones, naval armaments will in future find the most effective method of attacking fortified places. By the term *curved fires* he includes fire by which projectiles from rifled guns (or even smoothbores) can, by elevating the piece, be sent, at long ranges, into the interior of a place. The increase of caliber of modern artillery, and more especially the introduction of the rifled principle, has made such fires as effective as that from mortars, and the term "bombardment" is now extended to such.

At Odessa this species of bombardment was first effectively employed in 1854. The results attained there suggested to the allies the advantages to be derived from this application of floating artillery, and the subsequent bombardment of Sweaborg was provided for, in 1855, by adding to the fleet twenty-one mortar vessels which were towed to within about 2 miles (3,400 meters) of the center of the Russian arsenal, while the gunboats of the squadron, keeping in constant motion, approached to distances of 2,000 or 3,000 meters. The fire was maintained forty-five hours, during which 4,150 projectiles (2,828 of which were mortar shells) were thrown into the place, killing and wounding 2,000 men and destroying magazines, supplies, and shipping.

At an early period of the civil war in the U. S. the project of capturing New Orleans was mooted. The reduction of Forts Jackson and St. Philip seemed a necessary preliminary. For this object a fleet of twenty mortar vessels, each bearing one of the new model 13-inch mortars, weighing 11,500 lb., was prepared, and, under command of Commander (afterward Admiral) David D. Porter, added to Admiral Farragut's fleet. These vessels were moored to the right bank of the river at distances of 3,000 to 4,000 yards from the forts, their positions being screened from view by the woods. The bombardment began on Apr. 18, 1862, continued six days and six nights, during which time 7,500 bombs were fired, of which 1,080 exploded in the air and 1,113 were afterward counted as having fallen upon the fort and solid ground of glacis and levees, and 3,339 were computed to have fallen in the wet ditches and overflowed lands surrounding the fort (for the levees being broken by the shells the site was overflowed). At the end of this bombardment Admiral Farragut forced the passage with his fleet, and, destroying the Confederate flotilla of ironclads and gunboats, the forts surrendered.

Fort Jackson has a portion of its guns in casemates of the curtains; the arches were of brick of very moderate thickness, roofed with concrete, affording at the crown a thickness of 3 feet of masonry. These were covered by the earthen parapet and terreplein. In the flanks of the bastions were flanking casemates, the brick arches of which were not only destitute of earth covering but of the usual concrete covering. All the guns of Fort St. Philip were "en barbette." An engineer officer (Gen. Weitzel) examined the work immediately after its capture, and states:

"Fort St. Philip stands with one or two slight exceptions to-day without a scratch. Fort Jackson was subjected to a torrent of 13-inch and 11-inch shells during 144 hours. To an inexperienced eye it seems as if this work were badly cut up. It is as strong to-day as when the first shell was fired at it. The garrison did not bomb-proof the citadel" (i. e. had not placed earth over the heavy timber blindage spanning the walls for that purpose) "consequently the roof and furring caught fire. This fire, with subsequent shells, ruined the walls so much that I am tearing it down and removing the *débris* to the outside of the work. Three shot furnaces and three cisterns were destroyed. At several points the breast height walls were knocked down. One angle of the magazine on the north side of the postern was knocked off. Several shells went through the flank casemate arches (which were not covered with earth), and a few through the other casemate arches (where two or more struck in the same place). At several points in the casemates the 13-inch shell would penetrate through the earth over the arches, be stopped by the latter, then explode and loosen a patch of brickwork in the soffit of the arch about 3 feet in diameter and three-quarters of a brick deep, at its greatest depth. . . . To resist an assault, and even regular approaches, it is as strong to-day as it ever was." Gen. Abbott subsequently examined Fort Jackson, and reports that in one case a curtain casemate arch was broken through where there was 3 feet of masonry and 6½ feet of earth (the earth being a very pervious river formation). It does not appear that otherwise the forts were much injured or that the efficiency of their fire upon the fleet was seriously impaired. Doubtless, however, the loss of *morale* in the garrison which induced the surrender was due not merely to the successful passage and the destruction of the floating defenses, but to the physical exhaustion arising from the six days' bombardment and subsequent furious artillery contest with our fleet; and the bombardment is not therefore to be reckoned as without influence in the final result. This conclusion has an important bearing; for the writer, in calling for the use of mortars, in a memoir prepared for the Navy Department, did not maintain that the passage could not be forced, but contended that "to *pass* these works with a fleet and appear before New Orleans is merely a raid—no capture. New Orleans and the river can not be held until communications are perfectly established."

Mortar vessels as well as improvised ironclads were at an early date provided for our fleet in the upper Mississippi. After the fall of Forts Henry and Donelson and the evacuation of Columbus, the agency of bombardment (in conjunction with the fire of the cannon of the fleet) was first brought to bear upon the fortified position of Island No. 10 in the Mississippi, a short distance below New Madrid (Missouri). The bombardment was kept up from Mar. 16 to Apr. 8 (1862), the mortar vessels at one time numbering sixteen. The works and troops being disseminated over an extensive area (the island being over a mile long and 1½ miles

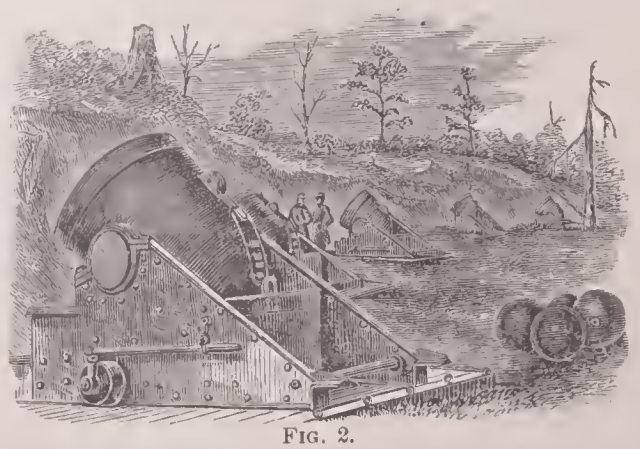


FIG. 2.

wide), neither the cannonade nor the bombs appear to have had much influence in causing the surrender. A similar remark is applicable to Fort Pillow, situated on the Mississippi, about 100 miles above Memphis.

*The facts are undoubtedly as stated. Whether death resulted from the "wind," from heart disease, or from other organic trouble, may be an open question. J. M.

When the course of events decided the establishment of a siege before Yorktown, in Apr., 1862, the Assistant Secretary of the Navy, Mr. Fox, notified Gen. McClellan that ten of the new 13-inch mortars which had been provided for naval purposes would be placed at his disposal. As easy water communication made their application practicable, they were accepted and put in battery on the margin of a navigable arm of Wormley creek, at about 2,500 yards distance from the ramparts of the town.

Besides the above there were established a battery of ten 10-inch siege mortars at 2,000 yards, another of five 10-inch seacoast mortars at 2,500 yards, and another of five 10 and five 8 inch siege mortars at 1,600 yards. The place was evacuated before our siege and mortar batteries opened.

Fort Pulaski, situated on Cockspur island, mouth of Savannah river, Ga., and defending the river approach to Savannah, was captured by bombardment and breaching Apr. 11, 1862, by the U. S. forces under command of Gen. Gillmore. The fort is pentagonal in form, with brick casemates on all sides and brick scarp-wall. It mounted one tier of guns in embrasure and one *en barbette*.

The artillery of the besiegers consisted of thirty-six pieces, distributed in eleven batteries along the shore of Tybee island, at various distances from the work, as follows (see Fig. 3):

1.	3 heavy 13-inch mortars	3,400	yards	distant.
2.	3 " " "	3,200	"	"
3.	3 10-inch columbiads	3,100	"	"
4.	3 8-inch "	3,045	"	"
5.	1 heavy 13-inch mortar	2,790	"	"
6.	3 heavy 13-inch mortars	2,600	"	"
7.	2 " " "	2,400	"	"
8.	3 10-inch columbiads, 1 8-inch "	1,740	"	"
9.	5 30-pdr. Parrott rifles, 1 48-pdr. James rifle (old 24-pdr.)	1,670	"	"
10.	2 84-pdr. " " (old 42-pdr.), 2 64-pdr. " " (old 32-pdr.)	1,650	"	"
11.	4 10-inch siege mortars	1,650	"	"

Batteries 8, 9, and 10 were designed to breach the scarp-wall of the work, and all the other batteries to keep down its fire and destroy its barbette armament. Some of the 13-inch mortars were served with the view of breaching the casemate arches.

The bombardment began about 8 o'clock on the morning of Apr. 10, 1862. By 9.30 A. M. all the batteries were in active operation, and were so maintained until the dusk of evening, a period of about ten hours. Throughout the night firing was kept up with two 13-inch mortars, one 10-inch mortar, and one 30-pounder Parrott rifle, the object being to prevent the garrison's making any arrangement for their protection by piling sandbags behind that portion of the wall selected for breaching or against the wall of the magazine, which would be exposed to direct fire as soon as the breach should be effected in the scarp-wall. During the first day's firing the breach was fairly begun in the pan-coupé connecting the south and southeast faces. On the morning of the 11th, a little after sunrise, all the batteries were again opened, the breach was rapidly enlarged, and by

FIG. 4.—Fort Pulaski: front view of breach, from opposite side of ditch.

2 o'clock in the afternoon the scarp-wall for a length of about 45 feet had fallen into the ditch. The fire from the breaching batteries passed freely through two of the casemates, endangering the safety of the powder-magazine on the opposite side of the work. At 2 o'clock the fort raised a white flag and surrendered.

The wall was found to be greatly shattered, much beyond the limits of actual breach, so that 100 feet of its length had to be replaced by new brickwork.

The number of shots fired is shown below:

From mortars: 1,144 13-inch shells and 588 10-inch shells.
10-inch columbiads: 203 shots and 321 shells.
8-inch " 298 " " 428 "
84-pdr. James rifles (old 42-pdr. rifled): 190 shots and 207 shells.
64-pdr. " " (" 32-pdr. "): 380 " " 16 "
48-pdr. " " (" 24-pdr. "): 133 " " 116 "
30-pdr. Parrott rifles: 150 shots and 1,101 shells.

It was estimated that 110,643 lb. of metal thrown from the breaching batteries struck the breached portion of the wall, equal to 2,458 lb. per lineal foot of wall, the average distance of the breaching gun from the work being 1,687 yards. With small smooth-bore guns at 500 yards distance, used during the Peninsular war in Spain, it was estimated by Sir W. Dennison that 2,544 lb. of metal was expended per lineal foot of wall, in breaching good rubble masonry backed by earth.

FIG. 3.—Map showing the position of the batteries used by the U. S. forces in the reduction of Fort Pulaski, Apr. 10 and 11, 1862.

The barbette armament of Fort Pulaski was so much injured during the first day as to render it unserviceable. No injury was inflicted upon the arches by mortar shells. Not more than one-tenth of the 13-inch shells fired fell inside the work.

Only twenty pieces of ordnance of the fort bore on the besiegers' batteries on Tybee island.

The recapture of Fort Sumter and the occupation of Charleston were from the first deemed by the Federal Government as of urgent importance.

Fort Sumter was a strong casemated brickwork of five faces, designed to mount a total armament of 135 guns, two tiers in embrasure and one *en barbette*, located on a shoal on the south side of the entrance to the inner harbor, at its narrowest point, and 3½ miles from the nearest part of Charleston city. The scarp-wall was 7½ feet thick and

40 feet high above the enrockment from which it rose. The embrasures of the second tier had never been finished, and before the siege began had been walled up with brick. The fort never received its full armament. The nearest land is the north end of Morris island, nearly due S. about 1,400 yards distant from the fort, and from this point the island —a narrow strip of sand—stretches across the coast in a southerly direction for a little more than 3½ miles. When siege operations began the Confederates had possession of the whole of Morris island, and had erected a strong and heavily armed earthwork—Fort Wagner—1,300 yards from the north end of it, and 2,700 yards from Fort Sumter, with the object of holding at least the northern half of the island, in order to prevent the establishment of batteries thereon, within effective breaching distance of Fort Sumter. They also had defenses on the south end of the island to prevent its capture. The plan of attack agreed upon comprised:

1. The capture of the south end of Morris island by assault.
2. The siege and capture of Fort Wagner.
3. The demolition of Fort Sumter by batteries established on the north end of Morris island; and
4. The entrance of the monitors into the inner harbor, and their passage up to the city of Charleston.

This programme was carried out with the following results:

On July 10, 1863, the south end of Morris island and the several batteries erected for its defense were captured by a brigade of infantry, which approached in small boats and landed under fire.

Two open assaults of Fort Wagner—on July 11 and 18 respectively—demonstrated the impracticability of carrying the position by that method of attack.

The plan of operations was then changed so as to give the demolition of Fort Sumter precedence, in point of time, over the capture of Fort Wagner, in order not to delay unnecessarily the entrance of the fleet and the capture of Charleston, for although Fort Wagner, in the hands of the besieged, was intended to prevent the erection of effective batteries against Fort Sumter, it did not protect the channel of approach by Fort Sumter to the inner harbor, or any of the channel obstructions erroneously supposed to exist there.

First Bombardment of Fort Sumter.—The demolition of Fort Sumter over the heads of the garrison of Fort Wagner was then the next step in the modified plan.

The armament placed in position for this purpose, and their several distances from Fort Sumter, are shown in the following table:

1.	2 8-inch Parrott rifles	3,516	yards distant.
2.	3 6·4-inch " "	3,447	" "
3.	2 6·4-inch " "	3,428	" "
4.	2 8-inch " " and 2 80-pdr. Whitworth rifles	3,938	" "
5.	1 8-inch Parrott rifle	4,172	" "
6.	1 8-inch " " and 2 6·4-inch " "	4,272	" "
7.	2 6·4-inch " "	4,278	" "
8.	1 10-inch " "	4,290	" "

Firing from these batteries commenced on Aug. 17, 1863. Its first stage ended Aug. 23. The firing from the most advanced of these batteries, which were less than 900 yards distant from Fort Wagner, was seriously interfered with and at times partially suspended, by the galling fire from that work to which the cannoniers were almost constantly exposed. The combined fire of mortars and light pieces, aided by the gunboats and ironclads, failed to subdue it, and it was necessary occasionally to turn the breaching batteries upon it. The result of this seven days' bombardment is thus given in the official report of the chief of artillery of the siege.

The fire from the breaching batteries upon Sumter was incessant, and kept up continuously from daylight till dark, until the evening of the 23d. For five days all the guns were directed upon the gorge wall, and had resulted in bringing it down to such an extent that on the evening of the 21st a practicable breach had been accomplished. On the morning of the 22d the fire from Batteries Nos. 1, 2, and 3 was directed upon the southeasterly face or right flank of the work, with the view of dismounting the guns on the barbette of this face, which commanded the entrance to the harbor, as well as to destroy the guns on the northeasterly face, which this fire would take in reverse. The fire upon the gorge had, by the morning of the 23d, succeeded in destroying every gun upon the parapet of it, and, as far as could be observed, had disabled or dismounted all the guns upon the parapet of the two faces looking toward the city, which it had taken in reverse. The parapet and ramparts of the gorge were, for nearly the entire length of the face, completely demolished, and in places everything was swept off down to the arches, the *débris* forming an accessible ramp to the top of the ruins.

There being nothing further to gain by a longer fire upon this face, all the guns were directed this day upon the southeasterly flank, and continued an incessant fire throughout the day. The demolition of the fort at the close of this day's firing was complete, so far as its offensive powers were considered. Every gun upon the parapet was either dismounted or seriously damaged; the terreplein for the entire circuit of the place must have been shattered and plowed up by our projectiles, hundreds of which had been seen to strike upon it. The parapet could be seen in many places, both on the sea and channel fronts, completely torn away down to the terreplein. The place, in fine, was a ruin, and effectually disabled for any immediate defense of the harbor of Charleston.

Having accomplished the end proposed, orders were accordingly issued on the evening of the 23d for the firing to cease, having been continuously sustained for seven days. There had been thrown 5,009 projectiles, of which about one-half had struck the fort. The weight of metal thrown during the seven days ending Aug. 23 was 289,986 lb., omitting that expended by the four rifles in the naval battery (No. 4), say 20,000 lb. The enemy remained in possession of the work, having constructed a system of subterranean galleries within the ruined casemates of the fort.

Second Bombardment of Fort Sumter.—Fort Wagner was captured on the morning of Sept. 7, thus giving the besiegers possession of the whole of Morris island. Heavy guns bearing upon Fort Sumter were at once established in Fort Wagner and on the north end of the island. Up to this time the gorge wall only had been breached. The southeast face, the only one seen from Morris island except the gorge, remained standing, although badly shattered in many places. Reports having been made by reconnoitering parties that the garrison were attempting to remount guns on this face, it was determined to cut down that face with the rifled guns established in Fort Wagner and on the north end of this island, so that the fire of the besiegers passing over the *débris* of the gorge and northeast face would take the casemates of the opposite or channel fronts in reverse, and prevent the mounting of guns there.

Fire was opened on the southeast face on Oct. 26. The armament used for this purpose comprised one 10-inch, two 8-inch, and nine $6\frac{4}{10}$-inch rifles, one 10-inch columbiad, and four 10-inch seacoast mortars. The distances of these several guns from Fort Sumter varied from 2,500 to 1,300 yards.

In a few days the southeast face was more completely a ruin than the gorge wall. The *débris* formed a continuous and practicable ramp, reaching from the water to the summit of the breach. The two faces of the work seen from Morris island were both in ruins, many of the casemate arches of the channel fronts had fallen in from the reverse fire, and the entire armament of the work had been destroyed or removed to prevent destruction.

FIG. 5.—Fort Sumter, Nov. 1, 1863, after the second bombardment.

The Franco-Prussian war of 1870 furnished numerous examples of a resort to bombardment as an auxiliary to siege or blockade, of which the most conspicuous are the sieges of Strassburg and Paris. The former city, fully invested on Aug. 8, was attacked by regular siege approaches and sur-

rendered (Sept. 27) only after, its walls breached, it became exposed (according to Gen. Ulrich) to the "doubtful chances of sustaining an assault." But a bombardment from Krupp guns, howitzers, and mortars commenced Aug. 18, and threw shells into the streets of the city, to the serious injury of the venerable and magnificent cathedral.

Paris was invested soon after the surrender at Sedan; and it was doubtless believed that its surrender would follow. No attempt at regular siege was ever made, and it was not until late in December (probably owing to the difficulty of collecting siege artillery, the Strassburg and numerous minor sieges employing all available) that from the heights of Chatillon a cannonade was opened upon the southern forts. Early in the following January shells commenced to be thrown from the same point into the southern quarters of Paris, and this was continued till the 27th. On Jan. 21 a violent cannonade and bombardment was opened upon the detached forts of St.-Denis and also upon the town, 120 shells falling there in one hour (22d), and many hitting the ancient cathedral. The population took refuge in Paris. At the time (1840–48) the defenses of Paris were constructed the extreme range of projectiles did not exceed 2½ miles; and it was in relation to the artillery service of the day that the forts were located. Hence they did not perfectly protect Paris from bombardment, which, however, had no important effect. The distance from the Prussian batteries on the heights of Chatillon to the nearest fort (Vanvres) was about a mile—to the nearest part of the *enceinte*, 2¼ miles; to the populous regions of the southern quarters, 3 miles; to the Palace of Luxembourg, Panthéon, Hôtel des Invalides, and the "monumental" portions of Southern Paris, 3½ miles. Hence the modern rifle (Krupp's guns of the Prussians) extended its range (with high elevation) to all these regions.

It is computed that in thirteen days, from Jan. 5 to 18, about 500 shells a day fell in Paris, hitting and wounding 308 persons, a fourth of them mortally, i. e. an average of 25 persons each day and 25 shells for each person hit. The number of private edifices hit averaged 50 a day, double the number of persons hit. The surface over which the bombardment extended was about 2,000 hectares (5,000 acres), or one-fourth the total area of Paris, chiefly on the left or south bank of the Seine. The population of this portion may be estimated at about 500,000. The Panthéon, the Museum, the Hôtel des Invalides (with its church and tomb of Napoleon) are among the monumental structures of this portion of the city. All were more or less injured.

It is asserted (L. Simonin, *Revue des Deux Mondes*, Feb., 1871) that from a military point of view the bombardment by itself was wholly inefficacious.

Nevertheless, though a city so extensive as Paris may endure a protracted bombardment, the destruction of life and property is something serious, and it must especially be so in *small* fortified towns; hence the increased range and accuracy of hollow projectiles have rendered the old system of closely surrounding a town with a continuous rampart or *enceinte* both useless and dangerous unless supplemented by a system of detached forts sufficiently in advance to keep an enemy's artillery beyond that distance, from which he might destroy the place by his shells. The fortifications of Paris are now supplemented by a second and much farther removed cordon of detached forts.

Small forts, by *themselves*, may, however, very safely defy bombardment, if reasonably provided with casemates or bomb-proofs. Fort Jackson, subjected to vertical fire only, was materially intact after a six-days bombardment, though doubtless the surrender was in *some* degree due to it. Fort Pulaski surrendered because its walls were thrown down and its magazines exposed, by the agency of *direct* fire. Fort Sumter was reduced to a ruin by breaching fire directed against its exposed vertical walls, but it never surrendered; while the little sand work, Fort Wagner, defied both direct and curved fire for two months, and was finally evacuated. An attempt to destroy by shells the bomb-proof or timber blindage covered with sand which sheltered its garrison—the exposed end of which could be seen over the parapet—signally failed, the sand running in quite as fast as it could be blown away by shells.

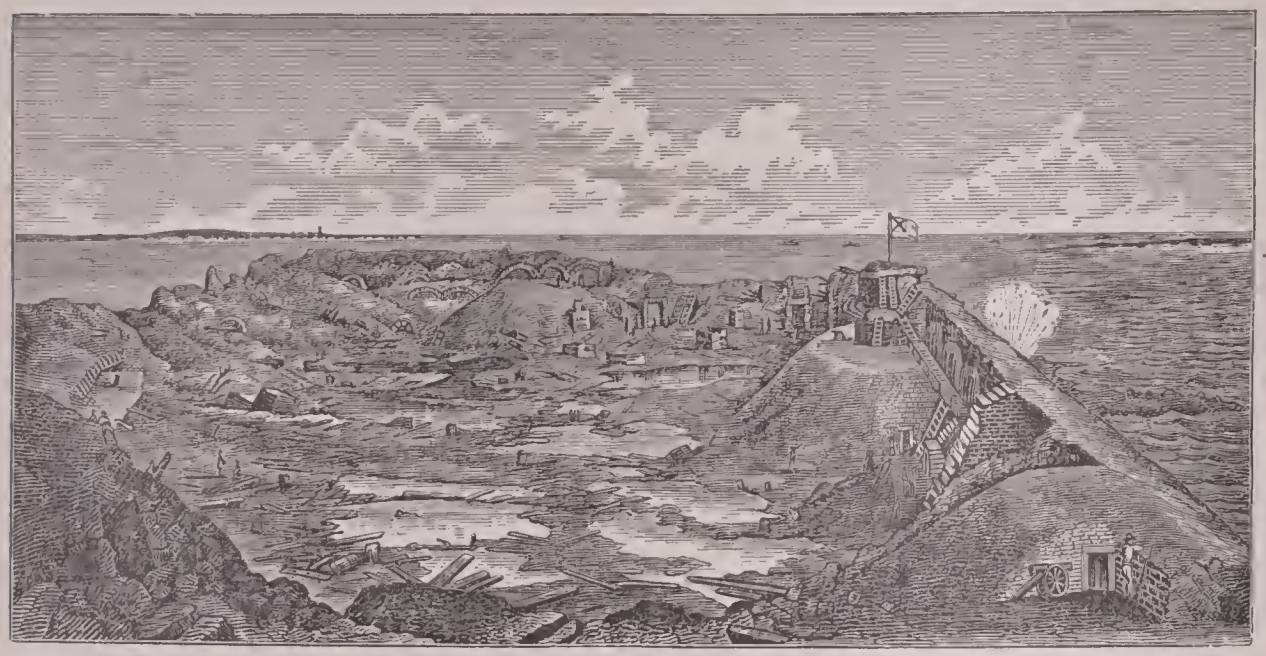


FIG. 6.—Fort Sumter, Dec. 9, 1863. Interior view from the southwest angle—from a drawing made by the Confederates. The original bears the autograph approval of the Confederate general commanding the Department of South Carolina, Georgia, and Florida, and may therefore be assumed to be correct. Morris island and the U. S. fleet are seen on the right, and Sullivan's island and Fort Moultrie on the left. The right of view shows the gorge face and the top of the adjoining face looking down the harbor. Both were breached by the Morris island batteries, although oblique to the line of fire. The *débris* formed an easy ascent from the water to the crest. The left and foreground show the other faces, in ruins from the reverse fire from Morris island. The interior slopes were subsequently made much steeper by the besieged than shown in the view, and were revetted with gabions. Bomb-proof quarters were also constructed under the ruins for the garrison. These quarters consisted of a continuous gallery all around in the ruins, protected on top and on the side next Morris island by thick embankments of earth. Throughout the autumn of 1863 the ruins contained no mounted guns. It was simply an infantry outpost. It repulsed a naval assault from small boats Sept. 8, 1863, and was held until Feb., 1865. On Apr. 14, 1865, the fourth anniversary of its capture by the Confederates, the U. S. flag was again raised over the ruins with imposing ceremonies.

Hence though the fortification of capitals, great naval or military dépôts, must, if attempted at all, be undertaken on an immense scale, yet the applicability of modern rifled guns (in place of *mortars*) to the purposes of bombardment, and the increased range of their curved fire, has not destroyed the utility of small forts as elements of the outer cordon of great fortified places; or, used isolatedly, for the special purposes of guarding great military routes, railroads, or water approaches.* See the article FORTIFICATION.

Revised by JAMES MERCUR.

Bom'bax [Late Lat., corruption of Lat. *bombyx*, silkworm, silk, cotton]: a genus of large soft-wooded trees of the family *Sterculiaceæ*; nearly related to the baobab-tree. They are natives of tropical climates, especially America. They yield great quantities of cotton, but the fiber is short, does not spin well, and is not durable. Nevertheless, in India cloth is made of it to a small extent. It would probably make good paper.

* The development of rifled mortars and howitzers, with an effective range for the larger calibers of nearly 8 miles and extreme accuracy of fire, with a capacity to throw torpedo-shells containing large charges of high explosives, has materially increased the strength of arch and thickness of cover required by bomb-proofs to withstand their effects.

This increased protection for men and materials is attainable at a reasonable expense by the use of concrete and sand. For the heavier guns it presents a more difficult problem, the only practicable solution seeming to be the use of iron and steel, at great cost.

The same problem is, however, presented to the attack, since the heavy artillery of the defense has advanced *pari passu* with that of the attack, and is correspondingly efficient against the siege-works, etc. The rapid fire and machine guns of the defense can be protected against the bombardment in the bomb-proofs, and will retain their full efficiency against a subsequent assault. J. M.

Bombay': a presidency of British India; bounded W. by the Indian Ocean and Baluchistan. Area, including Sind, 125,394 sq. miles. A large part of the surface is mountainous. The long range of the Western Ghats extends parallel to the seacoast in a direction nearly N. and S. Between this range and the sea is a narrow tract called the North and South Konkans, the climate of which is very hot and moist. The annual rainfall in the Konkans is more than 100 inches, in consequence of the vapors of the southwest monsoon being intercepted by the Ghats. This province is intersected by the Nerbudda and Tapti rivers, which flow westward into the Gulf of Cambay, and is also drained by the sources of the Godavari and the Krishna, which run in the opposite direction. The Indus crosses the western part. The soil of the valleys and plains is fertile. Cotton and rice are the staple productions of this region, which contains the richest cotton-fields of India. Sugar and indigo are also raised here. Among the indigenous plants are the cocoa-palm and the teak-tree. Bombay has important manufactures of silk stuffs and of woolen and cotton cloths. In 1880 it had over 1,800 miles of railway in operation. The administration of this country is vested in a governor and three councilors, subject to the superintendence, direction, and control of the Governor-General of India in council. It is divided into the northern division with 10 districts, the southern divisions with 9 districts, and Sind with 4 districts, and contains within its limits many feudatory states, the most of them very small. To this province belongs the naval force for all the presidencies. The annual revenue for the fiscal year 1890 amounted to 13,086,288 rupees, or $4,700,000; expenditures, 8,888,721 rupees, or $3,200,000. Pop. (1901) 18,584,496. Capital, Bombay.

Bombay [Eng. form of native name *Mambai* or *Bambai*]: a city and seaport of British India; capital of presidency of same name. It is situated on the south end of the island of Bombay and on the Indian Ocean; lat. 18° 56′ N., lon. 72° 54′ E. (see map of S. India, ref. 3–C). It has an excellent harbor, affording good anchorage for ships of the largest size, and is favorably situated for commerce, being in a direct line between Calcutta and Aden. It is the west terminus of railway systems connecting it with Delhi and Peshawar, Calcutta, and Madras. The mean temperature is 82° F. At the southern end of the island, which is 8 miles long and 3 miles wide, is the fortified European town, and a mile north of that is the Black Town, in which the Hindus and Mohammedans reside. The density of the population of this part of the city is more than three times that of the most populous districts of London—namely, 759 persons on an acre (according to the census of 1882), while the extreme ever reached in London is 222. Between these two towns is the esplanade and the barracks. Among the most remarkable buildings are the town-hall, mint, cathedral, the custom-house, the library of the Asiatic Society, the Elphinstone Institution, the missionary houses, the Grant Medical College, the great Hindu temple of *Momba Dêvî*, and the Jamsetjee Hospital. The Bombay water-works, among the largest in the world, were formally opened by the Viceroy of India in 1892. These are capable of supplying 31,000,000 gal. of water daily, and cost 15,000,000 rupees. The dam which forms the reservoir is 2 miles long, and there are 61 miles of tunneling, ducts, and pipes. The chief articles of export are raw cotton, shawls, opium, coffee, pepper, ivory, and gums. Bombay imports raw silk, sugar, and silk stuffs from China, and cotton yarn, cotton cloth, hardware, glass, copper, etc., from England. The sum of foreign imports for the fiscal year 1891 was 653,716,000 rupees, or about $235,000,000. Bombay, excepting Calcutta and Canton, is the greatest commercial emporium of Asia, and is the chief Indian port connected with the establishment of steam-navigation between India and the British islands. There is now a regular communication by steamers between Bombay and Europe through the Red Sea and the Mediterranean. Steamers also ply between this port and Point de Galle in Ceylon. Among the races that compose the population of Bombay the Parsis, descended from the Persian fire-worshipers, are distinguished for their respectability, wealth, and commercial enterprise. They are extensively engaged in ship-building, which is one of the most important interests of the city. The most flourishing and important industry in Bombay is the manufacture of yarn and cotton cloth, for which it has numerous large steam spinning and weaving mills. Area, 22 sq. miles. Pop. (1881) 753,000; (1891) 821,764.

Bombay Hook Island: Delaware; a part of Duck creek hundred, Kent County, separated from the mainland by Duck creek. Its north end (lat. 39° 21′ 46″ N., lon. 75° 30′ 19″ W.) has a brick lighthouse 36 feet high, with a fixed white light 46 feet above the water.

Bom'berger, John Henry Augustus, D. D., LL. D.: writer on theological and biblical subjects; b. in Lancaster, Pa., Jan. 13, 1817; graduated from Marshall College and from the Theological Seminary at Mercersburg, Pa. He served in the pastorate in several churches from 1838 to 1884. He was president of Ursinus College, Collegeville, Pa., from 1870 till his death there Aug. 19, 1890. He was editor of a condensation of the Herzog *Encyclopædia*, of which the first volume appeared in 1858 and the second in 1860. He edited the *Reformed Church Monthly* 1868–75. Other works are a translation of the *Handbook of Church History*, by Kurtz (2 vols., 1860–62); *Infant Salvation and Baptism* (1860); *Revised Liturgy* (1867); *Reformed not Ritualistic* (1867). W. J. Beecher.

Bomb-lance: an explosive missile used in the whale-fishery; consists of a cylindrical shell of iron armed with a sharp and heavy point of a triangular form. It is charged with powder, introduced through an opening at the rear end of the shell, and the opening is afterward stopped by melted lead. The lance is discharged from the barrel of a musket, and is exploded by a fuse after it has penetrated the body of the whale.

Bom'ford, George: soldier; b. in New York in 1780; graduated at West Point in 1805; chief of ordnance, U. S. A., May 30, 1832, with the rank of colonel. He was engaged as an engineer upon the construction of fortifications till 1812, when he was placed on ordnance duty. To the skill and inventive talent of this officer the country was largely indebted preceding and during the war of 1812–15 with Great Britain, he being almost the only one well informed as to the manufacture of ordnance and ordnance stores; he also introduced the bomb-cannon under the name of "columbiads." Breveted lieutenant-colonel Dec. 22, 1814, for meritorious services in the ordnance department. After 1842 he was on inspection duty, and made many ingenious and valuable experiments on the best forms for heavy artillery. D. in Boston, Mass., Mar. 25, 1848.

Bo'na [in Fr. *Bône*; anc. *Hippo Regius*; called by the Arabs *Beled-el-Arab*]: a fortified seaport-town of Algeria; province of Constantine; on a bay of the Mediterranean; 74 miles N. E. of Constantine; lat. 36° 54′ N., lon. 7° 48′ E. (see map of Africa, ref. 1–D). It is finely situated at the foot of a hill near the mouth of the river Seibous or Sebus; and is defended by Fort Cigogne, which is on the top of the hill. Bona was occupied by the French in 1832, since which it has been much improved. It has new markets, bazaars, and reading-rooms; also manufactures of tapestry, saddles, and native clothing. Wool, hides, grain, and coral are exported from it by steamboats. Near Bona are the ruins of the great city of *Hippo Regius*, once the see of St. Augustine. It was destroyed by the Arabs in 646 A. D. Pop. (1881) 19,687; (1891) 30,806.

Bona, Giovanni: a cardinal of the Roman Church; b. at Mondovi, Piedmont, Oct. 10, 1609; made cardinal in 1669; d. at Rome, Oct. 25, 1674. His principal works are *De Divina Psalmodia* (1663) and *Res Liturgicæ* (1671). He was equally distinguished for piety and learning.

Bo'na De'a (i. e. good goddess): a Roman divinity; the sister or wife of Faunus; was worshiped only by the Roman women, who concealed her name from the men. According to some authorities, she was identified with Ops. Her annual festival was celebrated on May 1, in the house of the consul, with mysterious rites, from which all males were strictly excluded. Her symbol was a serpent.

Bo'na Fi'de [Lat.; a legal term derived from the civil law, and meaning in good faith, without fraud or deceit, innocently]: A *bona fide* purchaser is one who purchases for a valuable consideration, without notice of opposing interests of third parties. This subject is of great importance in equity jurisprudence. It is a general rule that a court of equity will grant no relief against a purchaser in good faith. If, on the other hand, the purchaser has notice, actual or constructive, of the equitable rights of others, he will stand in no better position than the person from whom he acquired his title. Thus if a mortgage of land were canceled through mistake by a mortgagee, a purchaser in good faith from the mortgagor would hold free from the mort-

gage. On the other hand, if he had notice of the facts, a court would set up the mortgage against him as well as against the mortgagor. (See NOTICE.) The same question is presented in the case of bills of exchange, promissory notes, and other commercial paper. If the acceptor or maker has a defense to it as to the payee, it will in general be shut off as to a purchaser in good faith before maturity. But if the purchaser had notice of the defense before the purchase, he would stand in the same position as the payee. A contract not entered into in good faith is voidable at the option of the innocent party. The question of good faith is often of importance in actions for slander or libel, where it is frequently the case that certain acts if done *bona fide*, or in good faith, are not actionable, but are if done with malicious intent. Revised by F. STURGES ALLEN.

Bonaire, bō′nār′, or **Buen-Ayre**, bwen′ī′raĕ (i. e. good air): one of the Dutch West Indian islands; N. of Venezuela and E. of Curaçoa; lat. 12° 20′ N., lon. 68° 27′ W. (see map of West Indies, ref. 9–I). It is 20 miles long by 6 broad. Area, 129 sq. miles. Pop. 4,700; about 400 white. The climate is dry and the soil poor. Salt and chareoal are manufactured. Aloes, divi-divi, guaiaeum, Brazil-wood, and live stock (donkeys and cattle) are exported.
M. W. H.

Bonald, bō′naal′, LOUIS GABRIEL AMBROISE, Vicomte de: an eminent French publicist and ultra-royalist; b. near Milhau, Oct. 2, 1754. He emigrated in 1791, and published a *Theory of Political and Religious Power* (3 vols., 1796). Having returned to France about 1806, he was elected to the Chamber of Deputies in 1815, and acquired much influence under the Bonapartes and the Bourbons. He advocated absolutism and the infallibility of the pope. In 1823 he became a peer of France. Among his works is *La Législation Primitive*. D. in his castle near Milhau, Nov. 23, 1840. See Henri de Bonald, *Notice sur le Vicomte de Bonald* (1841).

Bonan′za [Span., fair weather, prosperity: Ital. *bonaccia*: Fr. *bonace*]: in the mining districts of California and Northern Mexico, an abundance of metal or an ore-body. The mines of Northern Mexico are principally what are called "pocket-mines," with thin veins of poor metal connecting the pockets. When a pocket of rich ore is struck the mine is said to be in *bonanza*. When the veins run out without leading to pockets, the mine is said to be in *borra* (i. e. useless words), from the verb *borrar*, to rub out or to blot out.

Bonaparte, CARLO: a Corsican lawyer; b. in Ajaccio, Mar. 29, 1746; the father of Napoleon I. He married in 1767 Maria Letitia (Letizia) Ramolino, and had five sons and three daughters. He became counselor and assessor of Ajaccio in 1773. D. in Montpellier, Feb. 24, 1785.

Bonaparte, CAROLINE MARIE ANNONCIADE: Queen of Naples; a daughter of the preceding; b. at Ajaccio, Mar. 26, 1782. She was married in 1800 to Joachim Murat, who became King of Naples in 1808. She was the mother of two sons and two daughters. After the death of her husband she took the title of Countess of Lipona. D. in Florence, May 18, 1839.

Bonaparte, CHARLES LUCIEN JULES LAURENT: Prince of Canino; a son of Lucien Bonaparte; b. in Paris, May 24, 1803. He was distinguished as an ornithologist, and took little part in political affairs. His wife was a daughter of Joseph Bonaparte. He resided in Philadelphia (1822–28) and Italy, and published *American Ornithology, or a History of the Birds of the United States*. D. in Paris, July 30, 1857.

Bonaparte, JERÔME: King of Westphalia; a brother of Napoleon I.; b. at Ajaccio, Nov. 15, 1784. He entered the French army in 1800, and during a visit to the U. S. married, in 1803, Miss Patterson, of Baltimore, without the consent of Napoleon. This marriage was annulled by order of Napoleon in 1805. (Madame Jerôme Bonaparte, *née* Elizabeth Patterson, b. in Baltimore, Md., Feb. 6, 1785: d. there Apr. 4, 1879.) Jerôme served as general of brigade against the Prussians in 1806, and was crowned King of Westphalia in 1807. In the same year he married a daughter of the King of Würtemberg. He lost his throne in Oct., 1813, and led a division at Waterloo in June, 1815. After many years in exile he became a marshal of France in 1850. D. in Villegenis, near Paris, June 24, 1860.

Bonaparte, JERÔME NAPOLÉON: a son of the preceding by his first wife; b. in Camberwell, England, July 7, 1805; graduated at Harvard in 1826. He greatly resembled Napoleon I. in appearance. He left two sons, Jerôme and Charles Joseph. D. in Baltimore, Md., June 17, 1870.

Bonaparte, JERÔME NAPOLÉON: soldier; grandson of Jerôme Bonaparte, King of Westphalia; grand-nephew of Napoleon I.; b. in Baltimore, Md., 1830; graduated at West Point in 1852; and till his resignation of his lieutenancy in the Mounted Riflemen, Aug. 16, 1854, served on frontier duty. He entered the French imperial army Sept. 5, 1854, as second lieutenant of the Seventh Dragoons, became chef d'escadron Third Cuirassiers Aug. 15, 1855, and was transferred Mar. 16, 1857, to the Dragons de l'Impératrice. He served in the Crimean war against Russia (1854–55); engineer at Balaklava, Inkerman, Tchernaia, and the siege of Sebastopol; for all of which active and distinguished services he was decorated by the Sultan of Turkey with the Medjidie Order, made knight of the Legion of Honor of France, and received the Crimean medal from the Queen of England. He was in the Algerian campaign in 1856–57; engaged in several actions with the Kabyles; in Italian campaign against Austria 1859; engaged at Montebello, Solferino, and various outpost affairs, receiving for his gallantry the French "médaille d'Italie" and the decoration of "Military Valor" from the King of Sardinia; in garrison at various posts 1859–67, and in the guard of the Empress of France 1867–72. On the fall of the empire he with difficulty escaped from the hands of the Commune in Paris. He was exiled in 1886. D. Sept. 3, 1893.

Bonaparte, JOSEPH: King of Spain; the eldest brother of Napoleon I.; was born in Corte, Corsica, Jan. 7, 1768. He studied law, married Julie Marie Clary, and was elected to the French Council of Five Hundred in 1797. He negotiated the treaty of Lunéville with Austria in 1801, and that of Amiens with England in Mar., 1802. On these and other occasions he showed considerable talents for diplomacy. Urged by the imperious will of Napoleon, he accepted the throne of Naples in 1806, though he does not appear to have been ambitious of such a position. He was transferred in May, 1808, to the throne of Spain, against the will of the majority of the Spanish people, who obstinately resisted the domination of the French. During his nominal reign many battles were fought between the French and the allied English and Spanish armies, who expelled him from Spain in June, 1813. In 1815 he emigrated to the U. S., and lived at Bordentown, N. J., under the name of the Count de Survilliers. D. in Florence, Italy, July 28, 1844. See A. du Casse, *Mémoires et Correspondance du Roi Joseph* (10 vols., 1854); Thiers, *History of the Consulate and the Empire*.

Bonaparte, LOUIS: a brother of Napoleon I.; b. at Ajaccio, Sept. 2, 1778. He entered the army in youth, and served at Areola and Rivoli (1797). In compliance with Napoleon's will, he married Hortense de Beauharnais in 1802, and became King of Holland in June, 1808. He and his wife separated about 1807, in consequence of their incompatibility. As nominal King of Holland he was not able to pursue the policy which he preferred, but was compelled by Napoleon to sacrifice the interests of the Dutch to the designs of the emperor, who was offended because Louis was not sufficiently subservient. Louis abdicated the throne in 1810, after which he resided in Italy. He was the putative father of Napoleon III. D. at Florence, June 29, 1846. See Thiers, *History of the Consulate and the Empire*; also his *Mémoires sur la Cour de Louis Napoléon et sur la Hollande* (Paris, 1828).

Bonaparte, LOUIS NAPOLEON: See NAPOLEON III.

Bonaparte, LOUIS LUCIEN: a son of Lucien and a nephew of Napoleon I.; b. in Mongrove, Worcestershire, England, Jan. 4, 1813. He was elected to the French National Assembly in 1849, became a senator in 1852, and grand officer of the Legion of Honor in 1855. He is distinguished for his labors in philology and chemistry. D. in Fano, Italy, Nov. 3, 1891.

Bonaparte, LUCIEN: Prince of Canino; a brother of Napoleon I.; b. at Ajaccio, May 21, 1775. He was an active and energetic republican in the French Revolution. In 1795 he married Christine Boyer, a woman of obscure birth. He was chosen in 1798 a member of the Council of Five Hundred, in which he opposed the Directory. On the 18th Brumaire (Nov., 1799) he displayed great resolution, and efficiently promoted the success of Napoleon. Lucien became Minister of the Interior in Dec., 1799, ambassador to Spain in 1800, and a tribune in 1802. Having lost his first wife, he married in 1803 a widow named Jouberthon with-

out the consent of Napoleon, who was angry at the match. Lucien went into exile, and refused the throne of Italy, which Napoleon offered him on condition that he should divorce his wife. He was in France during the Hundred Days, 1815, and actively supported Napoleon in that crisis. He passed the latter part of his life in Italy, and died at Viterbo, June 29, 1840, leaving five sons and six daughters. With the exception of his brother Napoleon, he was undoubtedly the most eminent and talented member of his family. See Lucien Bonaparte's *Autobiographic Memoirs* (1836).

Bonaparte, Lucien Louis Joseph Napoleon: second son of Charles Lucien; b. at Rome, Nov. 15, 1828. He entered the priesthood, and on Mar. 13, 1868, was made a cardinal priest. D. in Rome, Italy, Nov. 19, 1895.

Bonaparte, Marie Ann Élise: Princess de Piombino; a sister of Napoleon I.; b. in Corsica, Jan. 3, 1777. She was married in 1797 to Felix Baccioehi, a Corsican officer, and received in 1805 the title of Princess of Lucca and Piombino. She was for about six years (1809–14) Grand Duchess of Tuscany, which she ruled with ability. D. Aug. 7, 1820.

Bonaparte, Maria Letizia Ramolino: mother of Napoleon I.; b. in Ajaccio, Corsica, Aug. 24, 1750. She was considered a beauty, and had an uncommon intellect. According to her son Napoleon, "she had a great character, with much energy, elevation, and pride." She was married to Carlo Bonaparte in 1767. In 1804 she received the title of Madame Mère on the establishment of the empire. D. Feb. 2, 1836.

Bonaparte, Napoleon: See Napoleon I.

Bonaparte, Napoléon Joseph Charles Paul: prince; a son of Jerôme, King of Westphalia; b. at Trieste, Sept. 9, 1822. His mother was a daughter of the King of Würtemberg. As a professed democrat he was elected to the French Constituent Assembly in 1848. In 1852 he received the title of prince, and was recognized as the heir of his cousin, Napoleon III., in case the latter should die without issue. He married Clotilde, a daughter of King Victor Emmanuel. His features resembled those of his uncle, Napoleon I. He was called Plon-Plon. He was banished from France in 1873 and again in 1886. D. in Rome, Mar. 17, 1891.

Bonaparte, Pauline: Princess Borghese; b. at Ajaccio, Oct. 20, 1780; was the most beautiful of Napoleon's sisters. In 1801 she became the wife of Gen. Leelerc, who died in 1802. She was married in 1803 to Prince Camille Borghese, an Italian, from whom she soon separated. A statue of Pauline, executed by Canova, is said to resemble the Venus of Praxiteles. D. in Florence, June 9, 1825.

Bon'ar, Horatius, D. D.: hymnologist and religious writer; b. in Edinburgh, Scotland, Dec. 19, 1808. He graduated at Edinburgh University; was minister at Kelso from 1838 to 1866, and afterward of the Grange Free church, Edinburgh. He was a prolific author of tracts, sermons, and other religious literature, but is most generally known as a hymnologist. Among his publications in this kind are *Hymns of Faith and Hope* (3 vols., 1857–71); *Hymns of the Nativity* (1878); and *Selected Hymns* (1879). D. in Edinburgh, July 31, 1889. See his *Memorial* (New York, 1889).
Henry A. Beers.

Bona'sa: a genus of gallinaceous birds of the family *Tetraonidæ*, and one of the genera included in the popular term "grouse." It comprises the hazel-grouse, a European bird, the *Bonasa bonasa*. This bird, which is about as large as the common partridge, is prettily mottled with gray and reddish brown. It prefers the deep solitude of the forests. Its flesh is highly esteemed. Another species of this genus is the American ruffed grouse (*Bonasa umbellus*), which is about 18 inches long, and is called the pheasant in Pennsylvania and the partridge in New York and New England. The male has on each side a large shoulder tuft or ruff. In the breeding season it struts with erected ruff and tail like a turkey-cock. The loud thumping or "drumming" sound heard in the localities frequented by this bird is produced by the bird beating on its sides with its wings. It is heard most often in the morning and evening. This bird makes its nest on the ground in the forests. Its flesh is excellent as food.

Bonaventu'ra, Saint Giovanni Fidanza: scholastic theologian; called The Seraphic Doctor; b. in Bagnorea, States of the Church, 1221. He became a Franciscan monk, studied and afterward taught theology in Paris, became general of the order of Franciscans in 1256 and a cardinal in 1273. He had great influence in the Church, and was venerated for his ascetic piety and the miracles ascribed to him. Bonaventura was one of the most eminent of the Schoolmen. "His great mind," says Neander, "grasped the whole compass of learning as it existed in his time." Among his numerous works are *Breviloquium*; *Biblia Pauperum* (Poor Man's Bible); and *Itinerarium Mentis in Deum* (Progress of the Mind toward God; Eng. tr. in vol. xxi. *Jour. Spec. Philos.*). D. in Lyons, July 15, 1274; was canonized in 1482, and was made a doctor of the Church in 1587. His complete works have been often reprinted; best ed. Florence, 1844, *sqq.*, 15 vols.; Eng. trans. of his *Life of St. Francis of Assisi* (London, 1868); and *Life of Christ* (1881). See his life by A. M. da Vicenza; Germ. trans. from the Italian, Paderborn (1874); also Scholasticism. Revised by W. T. Harris.

Bonavis'ta: a port of entry and capital of Bonavista district, Newfoundland, and one of the oldest towns on the island. It has rather a poor harbor, a jail, and a fine Anglican church. Its people are mostly fishermen, but agriculture is also carried on. Pop. 3,500. The lighthouse on Cape Bonavista (lat. 48° 41′ 56″ N., lon. 53° 5′ 20″ W.) is a catoptric revolving white and red light, 150 feet above the sea.

Bonchamp, bōn′shaň′, Charles Melchior Artus, Marquis de: b. at Jouverdeil, France, May 10, 1760; was one of the most distinguished royalist generals in the Vendean war in France, in which he was mortally wounded at Chollet, Oct. 17, 1793. His soldiers were about to massacre 5,000 republican prisoners to avenge him, but at his dying request they were spared.

Bonchut, bōn′shü′, Ernest: French specialist in children's diseases; b. May 16, 1818; M. D. 1842; member of the Medical Faculty of Paris 1842; number of his published works exceeds 100, among them being *Traité des maladies des nouveaux-nés, des enfants à la mamelle et de la seconde enfance* (7th ed. Paris, 1879); *Hygiène de la première enfance; Nouveaux éléments de pathologie générale* (4th ed. 1882); *Traité de diagnostic et de séméiologie* (1883). D. in 1892.

Bond [same word as *band*, and from the root of the verb *bind*]: in law, an instrument in writing, sealed and delivered, whereby a person binds himself to pay a sum of money. It is also called a deed. It is either simple or with a condition. A bond is said to be simple when the engagement to pay is absolute. An instrument in the form of an ordinary promissory note becomes a simple bond if executed under seal. The most common form of bond is one executed under a condition. The instrument in this case consists of two parts —the engagement to pay, and the condition upon which the engagement to pay will become inoperative and void. The condition may be either for the payment of money or the performance of an act, such as the faithful execution of the duties of a public office or of agency or other authority. When for the payment of money, it is usually called a "money bond." In this case it is common to make the engagement to pay, called the penalty, double the amount expressed in the condition of the bond. The penalty will not, however, necessarily limit the amount of the recovery. In other words, in certain cases more may be recovered than the amount named in penalty of the bond; as, for example, the real debt and the interest accruing from delay in payment. At an early day, if the money named in the condition was not paid punctually, the whole penalty could be recovered. Courts of equity, however, regarded this result as in the nature of a forfeiture, and confined the recovery to the debt and the interest. When the bond is given for the performance of an act, the recovery is limited to the damages sustained by non-performance. The person who enters into the bond is called the *obligor*; the person to whom the engagement is made is termed the *obligee*. When it is executed by two or more persons, they may be either "joint" obligors or "joint and several"; that is, they may either bind themselves collectively, or both collectively and separately. An execution of the instrument by two persons simply would be joint. Express words should be used to create a "joint and several" obligation. This is an important distinction where some of the obligors are sureties, as is usual in bonds executed by incumbents of a public office. In the case of a *joint* bond, if one of the sureties should die, his estate would be discharged both in law and equity. This would not be the case had it been both *joint* and *several*, since the individual obligation would remain, though that which is joint would be at an end. A bond is otherwise termed a specialty. It is of a

higher grade than an ordinary contract, which is termed a simple contract. Accordingly, if A should owe money to B for goods sold or services rendered, and should give his bond for the amount, the original claim would be merged in the bond, and if the debt were not paid an action could be brought only on the bond. This would not be the case if A had given B his promissory note, or other engagement not under seal, for the amount of the claim. If the note were not paid at maturity, the original cause of action would remain. A bond, as a general rule, is not negotiable, but assignable. A purchaser would take it subject to the equities between the original parties. (See ASSIGNMENT.) The obligor of the bond commonly professes not only to bind himself, but his heirs, executors, administrators, etc. However, if these words were omitted, his obligation would be transferred to these successors in interest to the extent of the assets received from the obligor, it being a general rule in the U. S. that a debtor's property, both real and personal, is liable for his debts in the hands of heirs and other successors in interest.

T. W. DWIGHT.

Bond, EDWARD AUGUSTUS, C. B., LL. D., F. S. A.: English scholar; b. at Hanwell, Middlesex, England, Dec. 31, 1815; entered the British Museum as assistant in the department of manuscripts in 1838; librarian of the Edgerton MSS. in 1852; assistant keeper of the MSS. in 1854; keeper of the department in 1866; principal librarian of the British Museum in 1878; resigned in 1888; in 1870 founded the Palæographical Society, of which he was president. Edited many works for the library and the Government. D. Jan. 2, 1898.

Bond, GEORGE PHILLIPS: astronomer; b. at Dorchester, Mass., May 20, 1825; graduated at Harvard in 1845. He aided his father, W. C. Bond, in the observatory at Cambridge, and in 1859 succeeded him in the directorship of the observatory. He wrote several works, among which is an article *On the Construction of the Rings of Saturn*, and a work on Donati's comet. D. in Cambridge, Mass., Feb. 17, 1865.

Bond, THOMAS EMERSON, D. D., M. D.: physician and Methodist writer; b. at Baltimore, Md., in Feb., 1782. He became a professor in the Medical College of Maryland, and afterward a local Methodist preacher. He edited the *Christian Advocate and Journal* for twelve years, and wrote important pamphlets in defense of his Church. D. in New York city, Mar. 14, 1856.

Bond, WILLIAM CRANCH: astronomer; b. at Portland, Me., Sept. 9, 1789, and became a watchmaker. He was the first director of the observatory of Harvard University. He distinguished himself by his observations on Saturn, and discovered a satellite of that planet. D. Jan. 29, 1859.

Bondage: originally, the villeinage or basest form of tenure of the Old English feudal law. The term is now used for a species of tenure existing in Scotland and the north of England, by which the tenant of a cottage on a farm is bound to work at certain seasons for the farmer under whom he holds the cottage. Such a tenant is called a bondager.

Bonded Warehouse: See WAREHOUSING SYSTEM.

Bön'der: the yeomanry of Sweden and Norway. The bönder often claim an aristocratic origin. They have many virtues as a class, and constitute a large majority of the population.

Bonds: See SECURITIES, in the Appendix.

Bondu', or **Bondou**: a small district or kingdom of Western Africa; in Senegal; about lat. 14° to 15° N., and lon. 11° to 13° W. It is bounded on the E. by the river Falemé, which separates it from Bambuk. The surface is mostly level; the soil is fertile, well watered, and extensively covered with forests. The staple productions are cotton, indigo, maize, tobacco, and millet. Among the forest trees are the baobab and acacia. Iron is abundant here, and wild animals are numerous. The Fulahs are the most numerous of the tribes which inhabit Bondu. It is now under French protection. Capital, Bulibani, a mean town on the Falemé. Pop. estimated at 1,500,000.

Bône, a town of Algeria: See BONA.

Bone [O. Eng. *bān*: Germ. *Bein*: Swed. *ben*]: the substance of which the hard internal skeleton or framework of most vertebrate animals is formed. In the embryo the bones, with few exceptions, are preceded by masses of cartilage, or gristle, which in the course of development are replaced by true osseous tissue forming the skeleton; in some of the low fishes no such substitution takes place, the cartilage persisting as the adult skeleton. In addition to contributing the supporting framework, in many animals bone occurs in other localities; thus bony plates are found in the integument of armadillos, turtles, lizards, and certain fishes, in the heart of ruminants, in the diaphragm of camels, in the eye of many animals, in the tongue of certain birds and fishes, and in other organs. In animals below the vertebrates there is no true bone, osseous tissue here being substituted by amorphous incrustations and hardened excretions, composed principally of calcium carbonate.

Bone consists of two parts: (1) an *organic portion*, composed of a "matrix" of closely interwoven connective-tissue fibers, united by a homogeneous "ground-substance," containing cellular elements, the "bone-cells," within interfibrillar spaces, and yielding gelatin on boiling; and (2) *earthy matter*, which impregnates the ground-substance and produces the characteristic hardness of the tissue. If a bone be soaked in dilute hydrochloric acid for a sufficiently long time, the organic matter, called "ossein," or "bone-cartilage," alone remains, retaining the form of the original bone, and being flexible, tough, and translucent. If, on the other hand, a bone be burned in a hot fire with a strong blast of air, the animal matter is all burned away, leaving the earthy or inorganic matter a white, brittle mass, with just the form of the original bone. It consists of calcium phosphate (which constitutes more than half the weight of the whole bone), together with calcium carbonate and fluoride, magnesium phosphate and sodium chloride, with traces of other elements. The proportions vary in different parts of the skeleton, in the same bone at different ages, in various diseases, and in the corresponding bones of different species. Living bone is of a reddish-white tint externally, and is of a much deeper red within. Its physical properties include a specific gravity of 1·87–1·97, toughness and some elasticity, with a strength equal to twice that of oak; a cubic inch of bone will support 5,000 lb. Bones are usually covered at their ends or in some other part by cartilage; but the surface, with the exception of portions forming joints, is covered by a tough, fibrous membrane, the "periosteum"; hollow bones have a similar membrane within, the "endosteum." These membranes are of the utmost importance in the growth, nourishment, and repair of bones. The endosteum also nourishes the marrow, a substance filling the cavities of bones, and occurring in the adult in two forms—red and yellow marrow. (See HISTOLOGY.) In the young bones all marrow is red, but in after life the red marrow is confined to the vertebræ, ribs, certain small and flat bones, and the ends of the larger long bones. These forms of marrow differ principally in the lessened vascularity and increased quantity of fatty tissue contained in the yellow variety. The red marrow is of especial consequence as an important source of new red blood-cells throughout life.

From the periosteum, arteries and nerves enter the bone, traversing the longitudinal "Haversian canals," which are from $\frac{1}{200}$ to $\frac{1}{250}$ of an inch in diameter, and lined with a delicate membrane resembling periosteum. Each canal is surrounded by concentric layers of bone, constituting an "Haversian system," between the concentric lamella of which lie connective-tissue cells, the "bone-cells," each occupying a cavity called a "lacuna." The lacunæ send out lateral branching, freely communicating canals, the "canaliculi," $\frac{1}{1400}$ to $\frac{1}{2000}$ of an inch in diameter. Osseous tissue is arranged to form compact and cancelous bone, but the two differ only in relative density and the relative size of the contained cavities. For full account of structure of bone, see HISTOLOGY.

Osseous tissue is liable to several diseases, such as caries, necrosis, rachitis (rickets), osteomalacia, periostitis, osteomyelitis, caneer, exostosis, etc., each described under its own name. For descriptions of the several bones and of their relations to each other, see OSTEOLOGY and the names of particular bones, such as CLAVICLE, HUMERUS, etc.

Revised by GEORGE A. PIERSOL.

Bone-ash: the residue of burnt bones; it amounts to about 66 per cent. of the weight of the original bones. It consists of the earthy salts of the bone. Bone-ash is largely exported from South Ameriea. It is used as manure, for the manufacture of superphosphates, phosphorus, and cupels, and is an important constituent of English china. Also called BONE-EARTH.

Bone-black, or **Animal Charcoal**: the residue left on calcining bones in close vessels. The bones are placed either in retorts, like those used in making coal-gas, or in iron pots. On the application of heat destructive distillation

takes place. Combustible gases escape, accompanied by vapors which condense to ammoniacal water and offensive oils. Bone or Dippel's oil is thus produced. The residue in the vessels amounts to about 50 per cent. in weight of the original bones. It is passed between rollers, and separated by sieves into different sizes. Bone-black usually contains, after exposure to the air, from 1 to 6 or 7 per cent. of moisture. The average composition of dry bone-black, in 100, is carbon, containing nitrogen, 10; phosphate of lime, including a little phosphate of magnesia, 88; carbonate of lime, 8; sulphate of lime, 0·2; alkaline salts, 0·8; oxide of iron, 0·1; and silica, 0·3.

Animal charcoal possesses to a high degree the property of absorbing gases, and also of absorbing various substances from solutions. Its action is not limited to any one class of substances. It absorbs vegetable bases, bitter principles, astringent bodies, coloring-matters, iodine, metallic oxides, salts, etc. Its chief application in the arts is for the purification of sugar. The raw sugar is dissolved in water, more or less completely freed from suspended impurities by the aid of blood, and filtered through bags of cotton cloth, and then passed through high cylinders of iron containing the bone-black. It is thus almost completely decolorized, and at the same time freed from lime and other salts, and from certain organic substances which interfere with crystallization. On subsequently concentrating the solution in the vacuum-pan it readily yields perfectly white loaf sugar. (See SUGAR.) By washing with warm water, and subjecting to a red heat in suitable retorts, the black is *revivified*, when it may be used again. Sometimes it is also purified by fermentation and treatment with small quantities of dilute acids or alkalies. By repeated reheatings, however, the black becomes greatly condensed, owing to the semi-fusion of the phosphate of lime, and its decolorizing and purifying power is reduced to such a degree that it must be replaced by fresh black. This exhausted black, as well as the fine dust which is not suited for sugar-refining, finds a ready market for the manufacture of superphosphates to be used as fertilizers, for the manufacture of phosphorus, etc. In France, pulverized bone-black in fine powder is often boiled with the raw sugar before it goes to the bag filters.

When bone-black is to be used for decolorizing acid solutions, the phosphate of lime is first removed from it by dilute hydrochloric acid. Bone-black is sometimes employed to remove lime from highly calcareous waters. Many other forms of charcoal possess these properties, but none of them have been found so well adapted for the use of sugar-refiners as bone-black. Under the name of ivory-black animal charcoal is used as a pigment, especially for the preparation of shoe-blacking.

Bone-dust: a name applied to various bone fertilizers characterized by very fine division of the particles. The term is used for the finely ground product of dry and clean bones, or for the product of fresh or soft bone, meat, and other animal material, which are by-products in other industries or the refuse of slaughter-houses. If the bone has been heated before grinding, much of the nitrogen may be lost. In common with all bone fertilizers, the particular value of bone-dust lies in its phosphorus, although the nitrogen contents may run from 2 to 6 per cent.

Bonefish: a name applied to the ladyfish, *Albula vulpes*.

Bone-gelatin: See GELATIN.

Boner, JOHN HENRY: poet; b. in Salem, N. C., Jan. 31, 1845; educated privately. In 1867 edited *Salem Observer* and *Asheville Pioneer*. In the following year he was appointed assistant secretary to the North Carolina Constitutional Convention, and was made chief clerk of the House of Representatives for 1869–70; was for sixteen years in the civil service at Washington. In 1887 removed to New York, where he served on the editorial staff of the *Century Dictionary*. Subsequently became literary editor of the *New York World*, which position he resigned to join the editorial staff of the *Standard Dictionary*. In 1883 he published a volume of poems, entitled *Whispering Pines*. He is a contributor to the magazines and is a member of the Authors' Club.

Boneset: the *Eupatorium perfoliatum* (fam. *Compositæ*), an herbaceous plant, a native of the U. S., growing in low or moist places. It is a bitter weed, having hairy leaves, which are united at the base around the stem, and are serrate, very veiny, and wrinkled. An infusion of the leaves is used as a tonic, diaphoretic, etc.

Bon'gar: the native name for *Bungarus fasciatus*, a poisonous snake of the East Indies, related to the famous cobra, but having the neck less dilatable. It is of a light color, banded with black, and attains a length of 4 or 5 feet.
F. A. L.

Bonghi, bon'gee, RUGGIERO: Italian scholar and statesman; b. at Naples, Mar. 21, 1826; Professor of Philosophy, Academy of Milan, 1859; entered Italian Parliament 1860; Professor of Greek Literature at Turin 1864; of Latin at Florence 1865; and later of Ancient History at University of Rome; Minister of Public Instruction in Minghetti cabinet 1874–76; founded *La Cultura* (1881). Editor and translator of classics, and author of *Frati, Papi e Re* (1873); *Leone XIII. e l'Italia* (1878); *Francesco d'Assisi* (1884); *Vita di Gesù* (1890). D. near Naples, Oct. 22, 1895.

Bon'ham: town; capital of Fannin co., Tex. (for location of county, see map of Texas, ref. 2–I); on railroad; has numerous churches, Carlton College, Bonham Masonic Female Institute, and several handsome public school-buildings, etc.; also very fine flouring-mills, railroad machine-shops, manufactures of carriages, wagons, tobacco, brooms, mattresses, etc. In the cotton season 1890–91, 26,200 bales of cotton, and large quantities of flour, oats, corn, cotton-seed, etc., were shipped. Pop. (1880) 1,880; (1890) 3,361; (1900) 5,042.
EDITOR OF "NEWS."

Bonham, MILLEDGE L.: statesman and soldier; b. in South Carolina, May 6, 1815; graduated at South Carolina College in 1834; became a lawyer; and served in the Mexican war. He was solicitor for the southern circuit 1848–50, and a member of Congress from 1856 to 1860; was appointed major-general of South Carolina troops, and afterward brigadier-general in the Confederate army. Having been elected to the Confederate Senate he withdrew from the army, and became Governor of South Carolina 1862–64, after which he resumed his position in the army, and held it at the time of Lee's surrender. D. Aug. 27, 1890.

Bonheur, bo-nür', FRANÇOIS AUGUSTE: painter of animals and landscape; b. at Bordeaux, Nov. 4, 1824. D. in Bellevue, Feb. 22, 1884. Though less famous than his sister, Rosa Bonheur, he achieved a high reputation in the artistic world, and his work is marked by most serious and meritorious qualities. He was a pupil of his father, Raymond Bonheur, and received a first-class medal at the Paris Salon 1861; Legion of Honor 1867. One of his very best works, a fine landscape with cattle, *Environs of Fontainebleau*, is in the Metropolitan Museum, New York. WILLIAM A. COFFIN.

Bonheur, MARIE ROSA: eminent painter of animals, whose pictures are widely known in Europe and America; b. at Bordeaux, Mar. 22, 1822. She was a pupil of her father, Raymond Bonheur, and began her studies by copying pictures in the Louvre. She first attracted public notice by the exhibition of two pictures at Bordeaux in 1841, and since then produced a large number of works which placed her in the front rank of artists in the field to which she devoted herself. She received a first-class medal at the Paris Salon in 1848; was exempted by a special decree in 1853 from having her works passed upon by the Salon jury; received a first-class medal at the Paris Exposition 1855, and the Legion of Honor in 1865. *The Horse Fair*, painted in 1853, is perhaps the best, and is the most celebrated of her pictures. It was sold in the A. T. Stewart collection in New York in 1887, and presented by the purchaser, Cornelius Vanderbilt, to the Metropolitan Museum, New York, where it now is. A replica of this picture, of smaller size, is in the National Gallery, London, and a fine work, *Plowing in the Nivernais*, is in the Luxembourg Gallery, Paris. Her painting is exceedingly robust and vigorous in style; and, as may be seen in *The Horse Fair*, which was painted when the artist was in her best period, she possessed a fine talent for composition. D. in Fontainebleau, May 25, 1899.

Bo'ni: a state in the southwest peninsula of the island of Celebes; on the west side of the Gulf of Boni. It is about 80 miles long, and produces rice, sago, and cassia. The natives manufacture cotton cloth and articles of gold and iron. Area, 450 sq. miles. Pop. estimated at 200,000. Capital, Boni.

Boni, Gulf of, called also **Bughis** (boo'gĕes) **Bay**: separates the two southern peninsulas of Celebes. It is nearly 200 miles long, and from 40 to 80 miles wide. It is dangerous to navigation from its numerous reefs.

Bon'iface (Lat. *Bonifacius*): several popes have borne this name: (1) ST. BONIFACE I.; elected in 418 A.D. St.

Augustine dedicated several works to him. D. in 422. (2) Boniface II., a Goth; b. at Rome; succeeded Pope Felix IV. in 530. D. in 532 A. D. (3) Boniface III. was chosen pope in 607, and died the same year. He was the first to whom the title of "universal bishop" was given by the Greek emperor (Phocas). (4) Boniface IV., pope; b. at Valeria in Italy; succeeded Boniface III. in 608. He converted the pagan Pantheon of Rome into a church. D. in 615. (5) Boniface V., a native of Naples; became pope in 619. He died in 625, and was succeeded by Honorius I. (6) Boniface VI., a native of Rome; succeeded Formosus in 896, and died fifteen days after his election. He was an abandoned character. (7) Boniface VII., considered by some authors an anti-pope; was elected in 974 as a rival of Benedict VI. He was driven out of Rome in 975, and was starved to death in prison in 985. (8) Boniface VIII., Cardinal (Benedetto Gaetani); was born at Anagni about 1228. He became pope in 1294. He issued a bull forbidding all the clergy to pay any tax on ecclesiastical property, by which he was involved in a contest with Philip the Fair of France. He excommunicated Philip, who accused the pope of heresy and simony, and besieged him in his own palace. Boniface was skilled in both civil and canon law, and published the sixth book of *Papal Decretals*. He died Oct. 11, 1303. (See Dante, *Inferno*, canto xxvii.; W. Drumann, *Geschichte des Papstes Bonifacius VIII.*, 2 vols., 1852; Luigi Tosti, *Storia di Bonifazio VIII.*, 1847.) (9) Boniface IX. (Pietro Tomacelli) succeeded Urban VI. in 1389. He was a despotic ruler, and was accused of selling benefices and indulgences. He died Oct. 1, 1404, and was succeeded by Innocent VII.

Boniface, Saint Winfrid: called The Apostle of Germany; b. in Kirton, near Exeter, England, 680. He began in 716 to preach in Germany; converted a great number of people and founded schools and monasteries. He was made bishop by Pope Gregory II. in 723, and in 732 Gregory III. made him archbishop and primate of all Germany. In 718, in 723, and again in 738, he visited Rome. He became Archbishop of Mainz 745. June 5, 755, he was assassinated by a pagan mob at Dokkum in West Friesland, and his remains were finally taken to the famous abbey of Fulda, founded by him. See his works, edited by J. A. Giles, London, 1844, 2 vols., and in Migne, *Pat. Lat. LXXXIX.*; the original life is in Latin, by his pupil, Willibald, Germ. trans. Berlin, 1856; modern lives by G. W. Coxe, 1853; A. Werner, Leipzig, 1875; G. Pfahler, Regensburg, 1880; O. Fischer, Leipzig, 1881; A. Ebrard, Gütersloh, 1882.

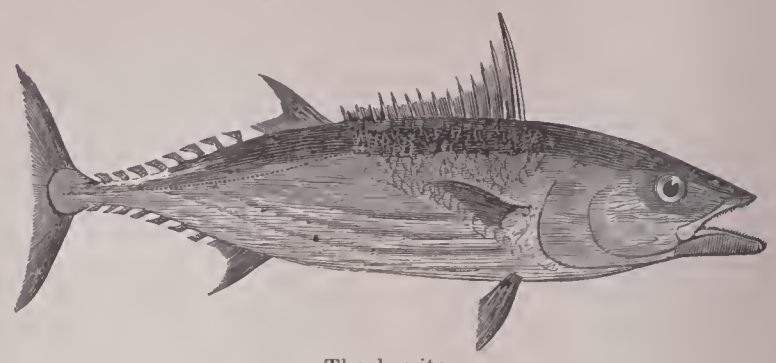
Bonifacio, José: See Andrada e Silva.

Bonifacio, bō-nĕĕ-faa'chō, **Strait of** (anc. *Fretum Gallicum*): the channel which separates Corsica and Sardinia. The narrowest part is only 7 miles wide. On the top of a white calcareous rock on the north stands the town of Bonifacio, which has a good harbor.

Bo'nin (or **Uninhabited**) **Islands** [from Chinese *Wuh nin*, without men]: islands in the Pacific Ocean; about 500 miles S. of Japan. They extend from lat. 26° 30′ to 27° 44′ N., and are about lon. 142° E. (see map of World, ref. 5–C). They are divisible into three groups, the most northern of which are called Parry islands, and the most southern Baily islands. Area, 38 sq. miles. Peel island, which is one of the middle group, is occupied by a small number of European and Polynesian colonists, the only inhabitants of the group. Japan now owns the group, and calls it Boninshima, i. e. Bonin islands.

Bon'ington, Richard Parkes: painter; b. at Arnold, near Nottingham, England, Oct. 25, 1801; d. in London, Sept. 23, 1828. Pupil of Baron Gros, though he began his studies by copying pictures in the Louvre, having been taken to Paris by his father, who was a portrait-painter, about 1816. Bonington painted landscapes chiefly, but also essayed figure subjects and marine views. He was in sympathy with the new movement in landscape painting originated by Constable, and his work was highly appreciated by French artists and critics. His influence on the new school forming in Paris, headed by the "men of 1830," was considerable. His work is notable for great truth of observation and refined quality of color. His *Column of St. Mark's, Venice*, is in the National Gallery, London, and *Francis I. and Duchess d'Étampes* and *The Park of Versailles* are in the Louvre. William A. Coffin.

Bonito, bō-nee'tō: one of several fishes of the family *Scombridæ*, allied to the mackerel. One of these, *Gymnosarda pelamys*, is a native of warm seas. It is a beautiful fish, about 2½ feet long, and resembles a mackerel in form. The color of its back and sides is a brilliant steel-blue.



The bonito.

Four dark lines extend along each side of the belly, from the throat to the tail. Its flesh, though rather dry, is eaten and relished by many. The term bonito is still more frequently applied to a related species (*Sarda sarda*) found on both shores of the North Atlantic, and distinguished from the preceding species by its strong teeth. On the Pacific coast is another bonito (*Sarda chilensis*).

Revised by D. S. Jordan.

Bo'nitz, Hermann: Platonic and Aristotelian scholar, and a high authority in educational matters; b. in Langensalza, July 29, 1814. Professor in the University of Vienna 1849–67; reorganizer of the Austrian school system; professor in Berlin till his death in that city, July 25, 1888. Wrote *Platonische Studien*; *Index Aristotelicus*; *Latin Commentary on Aristotle's Metaphysics* (Bonn, 1849), with a German translation published after his death by E. Wellmann; *Ueber den Ursprung der homerischen Gedichte* (1881, 5th ed.); and numerous critical contributions. See Th. Gomperz, *Biogr. Jahrb.*, vii. (1888), pp. 53–100.

Alfred Gudeman.

Bonn (anc. *Bonna*): a city of Rhenish Prussia; beautifully situated on the left bank of the Rhine; 19 miles by rail S. S. E. of Cologne (see map of German Empire, ref. 5–C). It is on the railway which connects Cologne with Coblentz. It has an ancient cathedral, which is a fine specimen of the Romanesque style. Here are manufactures of cotton goods, earthenware, and soap. Bonn is the seat of a celebrated university founded in 1818, which has a library of 250,000 volumes and is attended by over 1,200 students. Connected with it are an observatory, a botanic garden, and a museum of natural history. The buildings of this institution are excellent and very extensive. Niebuhr, A. W. Schlegel, Hermes, Simrock, and other eminent men have been professors in this university. Here are several large and elegant hotels for the accommodation of tourists, who are attracted by the picturesque scenery of the vicinity. Bonn is a very ancient town. *Bonna*, which was an important Roman station, is said to have been rebuilt by the Emperor Julian in the fourth century. It was conquered by the French in 1802, and annexed to Prussia in 1814. It is the native place of Beethoven, and a statue was erected to him in the Münsterplatz in 1845. Niebuhr is buried in the cemetery outside of the Sternthor, where there is a monument to him, erected by Frederick William IV. Pop. (1890) 39,805.

Bonnat, bon'naa', Léon Joseph Florentin: one of the most eminent painters of the contemporary French school; b. at Bayonne, June 20, 1833; pupil of Federico de Madrazo and Léon Cogniet. He is highly esteemed by his fellow-artists, and since the death of Meissonier is the recognized head of the art world of Paris. President of the Society of French Artists. He is most famous as a painter of portraits, but has also painted a number of historical and religious compositions, and numerous genre-pictures of Italian peasants. As a young man he spent several years in Spain and Italy, first gaining recognition at the Paris Salon in 1861, when he received a second-class medal. The list of his honors is a long one, including the medal of honor at the Salon of 1869. In the Legion of Honor he was made chevalier in 1867, officer in 1874, and commander in 1882. Member of the Institute and one of the three professors of painting at the Government École des Beaux-Arts. He has painted the portraits of many distinguished persons, including those of Thiers, Victor Hugo, Presidents Grévy and Carnot, Cardinal Lavigerie, Rénan, and Alexandre Dumas. He has also painted numerous Americans, and his portrait work is well known in the U. S. Some of his principal works are *St. Vincent de Paul taking the place of a Galley Slave* (1866);

Christ on the Cross (1874), in the Palais de Justice, Paris; *Jacob Wrestling with the Angel* (1876); *Job* (1880); *The Youth of Samson* (1891); and *Martyrdom of St. Denis* (1885), in the Panthéon, Paris. His *Job* and the portrait of his master, Léon Cogniet, are in the Luxembourg Gallery. At the Metropolitan Museum, New York, is a portrait by him of John Taylor Johnston, a founder and at the time of his death (Mar. 24, 1893) honorary president of that institution. *Italian Girl* is in the collection of Mrs. August Belmont, and *Arab Plucking a Thorn from his Foot* in that of Mrs. W. H. Vanderbilt, both in New York. Bonnat's portraits are characterized by great truthfulness to the sitter and fine drawing and modeling. He is not remarkable as a colorist.

WILLIAM A. COFFIN.

Bon'ner, EDMUND: an English prelate notorious as a persecutor; b. in Hanley about 1500. He was educated at Oxford; gained the favor of Henry VIII., who about 1532 sent him on a mission to the pope, and appointed him Bishop of Hereford in 1538 and Bishop of London in 1539. Having showed himself hostile to the Protestant cause, he was deprived of his bishopric in 1549 and imprisoned in the Marshalsea prison in London until the accession of Queen Mary in 1553, when he was restored to his office. He was the principal instigator of the bloody persecutions which disgraced the reign of Mary. Refusing to take the oath of supremacy on the accession of Elizabeth in 1558, he was imprisoned in the Marshalsea, London, where he died Sept. 5, 1569.

Bonnet: in fortification of the old school a small defense-work constructed at salient angles of the glacis or larger works. It has only two faces, with a parapet 3 feet high and 10 or 12 broad. A larger kind, with three salient angles, is called a priest's bonnet.

Bonnet, bon'nā', CHARLES, LL. D., F. R. S.: Swiss naturalist and philosopher; b. at Geneva, Mar. 13, 1720. He made discoveries in the reproductive and other functions of insects, etc., which he announced in his *Treatise on Insectology* (2 vols., 1745). He published in 1754 a valuable work *On the Use of the Leaves of Plants*. His sight having become impaired by the use of the microscope, he turned his attention to philosophy. Among his other works (all in French) are *Considerations on Organized Bodies* (1762) and *Philosophical Palingenesis* (3 vols., 1769), in which he argued that the Christian revelation is true. D. at Genthod, on Lake Geneva, May 20, 1793. The genus *Bonnetia* was named in his honor. See H. B. de Saussure, *Éloge historique de C. Bonnet* (1787); J. Trembley, *Mémoire de la Vie de C. Bonnet* (1794); A. Lemoine, *C. Bonnet de Genève, Philosophe et Naturaliste* (1850).

Bonne Terre: village; St. François co., Mo. (for location of county, see map of Missouri, ref. 5–J); on Miss. Riv. and Bonne Terre R. R.; 32 miles S. by W. of St. Louis. Its principal industries are lead-mining and smelting. Pop. (1890) 3,719; not returned separately in 1900.

Bonnet-head: a shark (*Sphyrna tiburo*), allied to the hammer-head, but with the head rather kidney-shaped than hammer-shaped. It reaches a length of 6 feet, and is found in tropical seas.

Bonneval, bon'vaăl', CLAUDE ALEXANDRE, Count de: a French adventurer; b. in Limousin, July 14, 1675. He deserted from the French army and entered the service of Austria, in which he distinguished himself by several daring exploits, and obtained the rank of general. Having quarreled with the governor of the Low Countries, he was condemned to death by a court martial about 1724, but the penalty was commuted to exile. He entered the Turkish army, took the name of Achmed, and became a pasha of three tails. D. in Constantinople, Mar. 27, 1745. See D. Fassmann, *Leben des Grafen von Bonneval* (1740); *Memoirs of the Bagshaw Count Bonneval* (London, 1750).

Bonneville, Lake: an extinct Pleistocene lake that twice occupied the now desert interior basin of Utah. Its shore-lines, contouring around the inclosing mountain-slopes, have been noticed by many explorers. Its history has been deciphered by Gilbert (Monograph I, U. S. Geol. Survey). The area and depth of the lake at its various levels are indicated by the shore-lines above mentioned. When at its greatest expansion its surface measured almost 20,000 sq. miles, and its depth was nearly 1,000 feet. The sediments corresponding to the shore-lines are found to lie on gravels, thus indicating that before the lake existed its basin was a dry interior depression as now. Moreover, the litoral and bottom deposits are separated by a series of gravel beds, indicating an arid period between two periods of high water. When at its highest level in the second period, forming what is called the Bonneville shore-line, the waters of the lake overflowed northward across Red Rock pass to a branch of the Shoshone river, and thus reached the Pacific. The pass was cut down about 370 feet, and at this level the waters lingered long enough to cut a second series of shore-lines, called the Provo shore. Then loss by evaporation overcame rainfall supply; overflow ceased, and the lake dwindled away, revealing its bottom as a desert plain. The variation in the area of the ancient lake indicates climatic changes from drier to moister conditions; and these alternations are apparently coincident with the alternations of glacial climates of Northeastern North America. Since the waters of the lake have dried away the shore-lines have been slightly warped out of level, as if owing to the relief of the weight of the water on the land. See GREAT SALT LAKE and LAHONTAN.

W. M. DAVIS.

Bon'ney, CHARLES CARROLL: president of the World's Congress Auxiliary of the World's Columbian Exposition; b. in 1831 in Hamilton, N. Y.; removed to Peoria, Ill., 1850; admitted to the bar 1852; removed to Chicago 1860; president of the Illinois State Bar Association 1882; has been president of the International Law and Order League, which he helped to found, since 1885; has been active in works of practical reform; author of the scheme for a series of world's congresses in connection with the World's Columbian Exposition of 1893 "to promote future progress by the fraternal co-operation of the enlightened minds of all countries."

C. H. THURBER.

Bonney, THOMAS GEORGE, LL. D.: author, scientist, and divine; b. in Rugeley, July 27, 1833; educated at St. John's College, Cambridge, where he took his B. A. degree in 1856; fellow St. John's College, Cambridge, 1859; elected Professor of Geology at University College, London, 1877; president Geological Society 1884–86. He has translated Pierotti's *Jerusalem Explored* (2 vols., 1864); Pierotti's *Customs and Traditions of Palestine*. Author *The Holy Places of Jerusalem* (1864); *Outline Sketches in the High Alps of Dauphiné* (1865); *Testimony of the Primitive Fathers to the Truth of the Gospel History* (1867); *Four Sermons* preached before the University of Cambridge (1868); *The Alpine Regions of Switzerland and the Neighboring Countries* (1868); *The Coast of Norway* (1870); *Vignettes, Alpine and Eastern* (1873); *The Bernese Oberland* (1874); *Lake and Mountain Scenery of the Swiss Alps* (1874); *Elementary Geology* (1874); *Welsh Scenery* (1875–76); *Sketch of the Geology of Cambridgeshire* (1875); *English Lake Scenery* (1876); *Elementary Physical Geography* (1877); *Sermons on some Questions of the Day* (1878); *The Influence of Science on Theology*, Hulsean Lectures (1885); contributor to the *Transactions of the Royal Society*, the *Journal of the Geological Society*, and other scientific publications.

W. S. PERRY.

Bonnivard, bon'nĕĕ'vaar', FRANÇOIS, de: writer and politician of Geneva; b. in France, 1496; educated at Turin; succeeded to the priory of St. Victor, near Geneva, 1510; sided with Geneva against the Duke of Savoy, by whose agents he was arrested and imprisoned in the castle of Chillon 1530; was liberated 1536, when his countrymen captured Chillon; wrote the chronicles of Geneva (1546–52); left several works in MSS. His books, given to the city, formed the nucleus of the public library of Geneva. His imprisonment is the foundation of Byron's poem, *The Prisoner of Chillon*. D. in Geneva, about 1571.

C. H. THURBER.

Bon'nycastle, CHARLES: b. at Woolwich, England, in 1792; son of John, noticed below. He was one of the professors brought over by Mr. Jefferson for the University of Virginia in 1825. He at first occupied the chair of Natural Philosophy, and afterward that of Mathematics. He published a treatise on *Algebra*, one on *Inductive Geometry*, and various scientific papers. D. at Charlottesville, Va., Oct., 1840.

Bonnycastle, JOHN: mathematician; b. in Whitchurch, Buckinghamshire, probably about 1750. He was Professor of Mathematics at the Royal Military Academy at Woolwich from 1782 to 1785, and published, besides other works, *Elements of Geometry* (1789) and *Elements of Algebra* (2 vols., 1813), which were highly esteemed. D. May 15, 1821.

Bonnycastle, Sir RICHARD HENRY: son of the foregoing; b. in 1791; served in Flanders and afterward in Cana-

da against the U. S. (1812–15); became in 1848 lieutenant-colonel of British engineers. Most of his life was passed in British North America. He was knighted for services in defense of Kingston, Canada, in 1837, and published *Canada as it Was, Is, and May Be*, and other works on Canada, and also one on *Spanish America* (1818). D. in 1848.

Bonpland, bōn'plăn', Aimé: French botanist; b. at La Rochelle, Aug. 22, 1773. He studied medicine and botany at Paris, and formed a friendship with Humboldt. In 1799 he accompanied Humboldt in a scientific expedition to South America, where they traveled about five years. After their return to France he published a splendid work entitled *Equinoctial Plants collected in Mexico* (2 vols., Paris, 1808–16, with 140 plates). He had collected 6,000 species of plants, of which 3,500 were entirely new. He became Professor of Natural History at Buenos Ayres in 1816, and departed in 1821 on an excursion to the Andes, but as he was passing through Paraguay he was arrested by order of Dr. Francia, who detained him as a prisoner nearly ten years. After his release in 1831 he resided for many years in Uruguay. D. in Santa Anna, May 11, 1858. Humboldt, Bonpland, and Kunth published a work called *Nova Genera et Species Plantarum* (7 vols., 1815–25, with 700 plates).

Bo'nus [orig. a jocularly inaccurate use of the Lat. adjec. good, as if meaning "a good thing"]: a sum or consideration given or paid beyond what is statedly or properly due. Specifically: (*a*) an extra dividend or allowance paid to the shareholders of a stock company, holders of insurance policies, etc., out of accumulated profits; (*b*) a premium for a loan distinct from the interest, and hence a premium paid for a charter or other privilege granted to a corporation or individual.

Bony Fishes: See Fish.

Bonvin, bōn'văn', François Saint-: French genre-painter, whose pictures are highly appreciated by artists and amateurs of art; b. at Vaugirard, near Paris, Sept. 22, 1817. He was self-taught, and began his art studies by copying the works of the Dutch masters in the Louvre. He exhibited frequently at the Paris Salon, and received a second-class medal in 1851 and the Legion of Honor in 1870; but his works did not gain for him a popular reputation. His pictures are now much sought for by collectors, and are justly valued for their sobriety but richness and depth of color, and their quiet, unobtrusive technique. His work has much in common with that of the great Dutch painters of the seventeenth century, but is distinguished by marked personal qualities. D. at Saint-Germain-en-Laye, Dec. 18, 1887.

William A. Coffin.

Bony-pike: a ganoid fish of the genus *Lepidosteus* (originally spelled *Lepisosteus*); found in America; especially remarkable as being examples of a type of fishes now almost extinct, but which in the old red sandstone period were extremely numerous. To the same genus belong the gar-pike and the alligator-gar of the U. S. The latter is sometimes 6 feet in length, and derives its name from its wide flattened head, which suggests that of an alligator. See Lepisosteidæ.

David S. Jordan.

Bonze, bonz: a name sometimes applied by foreigners to the Buddhist monks of China and Japan. The word may be a corruption of the Japanese *bozu*, a Buddhist monk, or of the Chinese *fan sŭng* (pronounced in Japan *hon* (or *bon*) *zo*), "an ordinary member of the assembly," i. e. of the monastic order founded by the Buddha. See Buddhism and Gautama.

Booby: one of several species of aquatic birds of the same genus as the gannet (*Sula*) and family *Sulidæ*. They are found on the coasts of tropical and sub-tropical countries. They seldom swim, but are birds of powerful wing, and feed on fish, which are caught near the surface of the water by a sudden plunge. They are remarkable for stupidity and slow movement on the land, and will remain motionless when approached. The boobies are persecuted by the frigate-bird, which sometimes compels them to give up the fishes they have caught, and even to disgorge those they have devoured. The name is more commonly applied to the darker species of the genus, the white ones being known as gannets. The commonest species in the U. S. is *Sula leucogastra*, which is very abundant along the South Atlantic and Gulf coasts.

D. S. Jordan.

Booddha: See Bûddha.

Boofarik, boo-faă-reek', or **Boufarik**: a town of Algeria. See Bufarik.

Book: a treatise written or printed on any material and put together in any convenient form. The materials and form have varied greatly among different nations and at different periods. The ordinary writing material of the ancients was papyrus. Parchment, thin leaves of lead and copper, ivory tablets, linen, etc., were also used. Leaves joined end to end and rolled up on a small roller made a "volume" (Lat. *volumen*, from *volvere*, to roll). Books in a square form came in later. Such a book was called a codex. Books were copied by hand down to the invention of printing, were frequently illuminated—i. e. adorned with sketches and miniatures in colors—and were rare and expensive. From the seventh to the eleventh centuries books were so scarce that often not one could be found in an entire city, and even rich monasteries possessed only a single mass-book. The introduction of paper into Europe about the thirteenth century, and the invention of printing in the fifteenth century, made possible the great accomplishments of modern bookmaking. Books printed before 1500 are known as incunabula (Lat. *incunabulum*, cradle). Scarcity of parchment led in the Middle Ages to the practice of washing or scraping off one writing to make room for another. A manuscript so treated was called a Palimpsest (*q. v.*). The terms folio (fol.), quarto (4to), octavo (8vo), duodecimo (12mo), etc., applied to books, indicate in a general way the size, folio being the largest. Books are printed on large sheets of paper; when these sheets are folded once, making each two leaves and four pages, the book is a folio; when folded twice, so as to make each four leaves and eight pages, the book is a quarto; folded so as to make eight leaves and sixteen pages, octavo, etc. See Bibliography, Bookbinding, Copyright, and Palæography.

Bookbinding: the art of fastening together and inclosing the leaves of a book for preservation and use; practiced for many centuries. Long before the invention of printing the written leaves of missals and other books were united together, and inclosed in covers of wood, parchment, and other materials. Much labor and expense was bestowed on a single volume, and the covers were frequently decorated with jewels and ornaments of gold and silver. Some of these volumes are still preserved in the monasteries and museums of the Old World, and are objects of interest and study.

Since the invention of printing, and especially from the beginning of this century, the rapid advancement of the mechanical arts, the extension of education, and the general diffusion of knowledge have made books as much a necessity of life as food and clothing, and their preservation is therefore an object of importance.

The modern operations of bookbinding may be grouped in two main divisions—"forwarding" and "finishing," the first comprehending what is necessary for the preservation of books, the latter pertaining to their embellishment. In each of these departments there are various subdivisions, which may be noted. The sheets are generally received from the printer in bundles containing a thousand, more or less, of one kind.

The first operation is to fold the sheet, by means of a thin piece of ivory or bone, about 9 inches long, called a "folder." The object of this is to bring the pages together in regular order, and on the care with which the folding is done much of the appearance of the book depends. The next process is "gathering" and "collating." Gathering consists in putting together one each of the various sheets of which the book is made, and collating is the examination of the numbers 1, 2, 3, etc., which are placed at the foot of the outside page of the folded sections, and which are called "signatures."

The next thing required is to make the book solid. This is done by placing it either in a hydraulic press or under some other form of pressure, such as the nature and size of the book may require. After being pressed the book is prepared for sewing by having indentations made in the back of the sheets by passing them over rapidly revolving circular saws. They are now sewed on a frame called a "sewing-bench," each sheet being sewed around twine bands, which are afterward fastened to the boards. Much of its durability depends on the sewing being well done, and all large work is improved by having the sections at the beginning and end of the book cross or "whip stitched."

The greater part of the labor has so far been done by women, who by practice acquire great dexterity in the performance of the various processes involved. Machinery is

used with considerable success in folding, and a machine has been introduced for sewing, but all the work in the early stages is still in great measure done by hand-labor. In the more advanced stages of binding machinery is used extensively, and our description will be in accordance with the methods pursued where large quantities are constantly being bound, and where machinery is used to facilitate production. The book, after being removed from the sewing-bench, and having about an inch of the twine left on either side to fasten to the pasteboard cover, has the end leaves applied. These are of colored, white, or marble paper, as the nature of the work may require. The book is now "cut" by being fastened tightly in a cutting-machine, and a vibrating knife is brought down on the edge, which is cut off smoothly at the point desired. The edges are either left white, are colored by being sprinkled with color thrown on finely with a brush, or are marbled, which is done by dipping the edge on colors which float on the surface of gum-water. The "comb edge" so much used is made by a comb being drawn through the colors on the surface of the gum-water before the book is dipped. If the book is to have gilt edges, it is placed in a press and a coating of red color applied. The edges are then sized with white of egg, and gold-leaf laid over the size. When the sizing is thoroughly dried the gold is burnished with agate or bloodstone.

A coating of glue is now applied to the back, and when partially dry a round is formed in the front and back by a slight hammering on the back. The book is then fastened firmly between iron clamps in a backing-machine, and a roller is then pressed heavily across the back, which turns part of the back over either side of the clamps, making a groove to hold the board of which the inside of the cover is made. The piece of silk braid or colored cloth which projects over the leaves of the back inside the cover, and is called the "head-band," is now fastened with glue, and the whole back has a lining of cloth or strong rope paper firmly applied to it with glue and paste. The open or spring back is now made by applying two thicknesses of paper, open in the center, but fastened at the edges—one thickness of the paper being attached to the back of the book, and the other thickness to the leather or other material of which the outside cover may be made. The book is now ready for the cover, the outside of which may be of muslin, sheepskin, calf, Turkey morocco, or such other materials as may be desired. The cover, or "case," is made by boards being cut larger than the leaves of the book, over which the outside material is fastened by glue or paste, a space being left between the two boards large enough to fit the back of the book in, the boards being required to fit nicely into the grooves made in backing. Much of the material used for boards of common books is straw, but all good work should have a hard, smooth board made of rope. The edge of the board is frequently ground off on a rapidly revolving emery wheel, which makes a beveled edge, now much used.

After the cover is dry the embellishment is done by stamping in gold, blank, and colors. If in gold, the leather or cloth is sized with albumin, and gold-leaf laid on with oil. The ornamental die or lettering being fastened in an "embossing-press" and heated, it is brought with sufficient pressure on the cover to make the gold-leaf adhere. The surplus gold being brushed off, leaves the impression of the die. The dies are cut in brass or steel, and very elaborate and beautiful designs, which formerly would have taken many weeks to execute by hand-labor, are now produced almost instantly by the embossing-press.

The cover having received all intended ornament, the back of the book is glued and fitted into it, the end-papers are pasted to the inside of the cover, and the book is placed in a press to remain till dry. When removed from the press it is ready for the publisher and the public.

"Half binding," much used for library and reference books, is that style of binding where the back and corners are covered with leather, and the sides with cloth or paper.

The old process of "forwarding" by hand, in which each book is backed by a hammer and cut singly by press and plow, and the book finished by the slow method of former years, is still followed to some extent in small binderies, but requires no minute description, as the system is almost obsolete for books in quantities.

Machinery is now much used in bookbinding, and large editions are produced in a style of great elegance and durability, and at prices so moderate as to be within reach of all classes of the community. JAMES SOMERVILLE.

Bookkeeping: the art of recording, in a regular and systematic manner, the transactions of merchants or other persons engaged in pursuits connected with money. There are two modes of keeping books of account—the one by what is termed *single*, and the other by *double entry*. Both are in general use. The system of single entry is the simpler mode of bookkeeping, and consists of only a day-book and a ledger. In the day-book the dealer enters his sales and purchases, and in his ledger he carries the former to the debit of his customers, and the latter to the credit of the merchants who supply him with goods. By making at any time a list of the sums due to him by his customers, and of those due by him to others, the dealer may, after adding to the debts due to him the value of his stock on hand, arrive at an approximation to the real state of his debts and assets. This, however, is but an imperfect method of bookkeeping, and in the case of wholesale mercantile business, where extensive and multifarious transactions have to be recorded, recourse is had to the system of *double entry*. This system possesses all the advantages of single entry, besides being so complete and comprehensive in its principles, and so certain in its results, as to admit of universal application.

No authentic accounts exist of the origin of bookkeeping. The double-entry system appears to have been first practiced in Italy in the latter part of the fifteenth century.

The objects of bookkeeping are to exhibit transactions in the most minute detail and in the most condensed form; advancing from the earliest stage to the latest by such clear and lucid steps as to admit of every fact being traced in its progress, so as to be secured at every step against error.

The three principal books required under the system of double entry are a cash-book, journal, and ledger. In the first of these every transaction is recorded where money is one of the elements. The journal forms a most important part of the system. It exhibits a narrative of every transaction of which an actual transfer of money does not form one of the elements, arranging the facts in as simple a form as correctness and intelligibility will admit of; and the results of those entries in the journal are afterward introduced into the ledger, which thereby becomes a key to the history of every transaction. In like manner cash transactions are often introduced into the journal, and are at stated periods classed and arranged in a condensed form and transferred to the ledger. The journal is advantageously ruled with four columns—two for entries debtor, and two for entries creditor; and all the transactions being connected either with personal and property accounts or with nominal accounts, such as charges, profit and loss, and so forth, they are classed accordingly in the columns on the debtor or creditor side of the journal respectively; and as the debit entries are at all times equal to the credit entries, the aggregate of the two columns on the debtor side must tally with the aggregate of the two on the creditor side of the journal. Experience and practice are occasionally suggesting minor improvements upon the forms of the cash-book, journal, and ledger to suit particular cases; and indeed an intelligent bookkeeper may accomplish much by a judicious classification of the facts in auxiliary books; but the fundamental principles of the double-entry system of bookkeeping remain perfect and unchanged, and may be regarded as the best hitherto discovered.

Book of the Dead: See RITUAL OF THE DEAD.

Book-plates: See the Appendix.

Boole, GEORGE: b. in Lincoln, England, Nov. 2, 1815; Professor of Mathematics, Queen's College, Cork, Ireland, and published, besides treatises on mathematics, *An Investigation into the Laws of Thought, on which are Founded the Mathematical Theories of Logic and Probabilities* (London, 1854). D. in Cork, Dec. 8, 1864.

Boolgarin: See BULGARIN.

Boom, bōm: a town of Belgium: province of Antwerp; on the river Rupel, at its junction with the Brussels Canal, 9 miles S. of Antwerp (see map of Holland and Belgium, ref. 9–E). It has a gymnasium and extensive brick and tile works, tanneries, ropewalks, and manufactures of sailcloth. Pop. (1890) 14,080.

Boondee: feudatory state and town of Rajputana, India. See BUNDI.

Boone: on railroad; a city; capital of Boone co., Ia. (for location of county, see map of Iowa, ref. 5–G). Immense

quantities of coal are shipped from here, and the adjacent timber lands are among the best in the State. The river affords a good water-power. The town of Boonsboro was annexed to Boone city before the census of 1890. Pop. (1880) 3,330; (1890) 6,520; (1900) 8,880.

Boone, DANIEL: a pioneer and hunter; b. in Berks co., Pa., Feb. 11, 1735. He emigrated to North Carolina, where he married. In 1769, with five companions, he penetrated into the forests of Kentucky, which were then uninhabited by white men. He was captured by Indians, but escaped, and continued to hunt in that region for more than a year. Having returned home early in 1771, he moved with his own and five other families to Kentucky in the autumn of 1773. To defend his colony against the savages, he built, in 1775, a fort at Boonesborough, on the Kentucky river. The Indians attacked this fort several times in 1777, but were repulsed. Boone was surprised and captured by them in Feb., 1778. They took him to Detroit, and treated him with lenity, but he soon escaped, and returned to his fort, which he defended with success against 450 Indians in Aug., 1778. He removed in 1795 to a place which is nearly 45 miles W. of St. Louis, Mo., and found there a new field for his favorite pursuits. He had received large land grants in Kentucky and Missouri which involved him in litigation, and most of his property was wrested from him. D. on his Missouri farm, Sept. 26, 1820, but his remains were removed in 1845 by the State of Kentucky and interred near Frankfort. See Sparks, *American Biography*, vol. xiii., second series; W. H. Bogart, *Life of Daniel Boone* (1857).

Boone, WILLIAM JONES, D. D.: first missionary bishop of the Protestant Episcopal Church to China; b. at Walterborough, S. C., July 1, 1811; graduated at College of South Carolina 1829; studied law and was admitted to the bar in 1833, but relinquished the practice of this profession to take holy orders. Having devoted himself to foreign missions, he took a course in medicine, receiving the degree of M. D. from the South Carolina Medical College. He was ordained Sept. 18, 1836, sailing for China July 8, 1837; consecrated bishop to China Oct. 26, 1844. D. at Shanghai, China, July 17, 1864. His published writings were mainly connected with the translation of the Bible into Chinese.—His son, WILLIAM JONES BOONE, D.D.; b. in Shanghai, China, May 17, 1846; graduated at Princeton, 1865, and ordained in 1868; became himself missionary bishop in China, after many years of service there, succeeding Bishop Scherechewsky, who had resigned on account of failing health. He was consecrated Bishop of Shanghai, having jurisdiction in China, Oct. 28, 1884. D. at his post Oct. 5, 1891. W. S. PERRY.

Boonesborough, Iowa: See BOONSBORO.

Booneville: See BOONVILLE.

Boon Island: 10 miles E. of the harbor of York, Me.: is in lat. 43° 07′ 16″ N., lon. 70°, 28′ 16″ W. It has a granite lighthouse 123 feet high, showing a fixed white dioptric light of the second order, 133 feet above the sea.

Boonsboro, or **Boonsborough,** Ia.: See BOONE.

Boon'ton: Morris co., N. J. (for location of county, see map of New Jersey, ref. 2–D); on railroad and the Rockaway river; about 30 miles from New York city. It has iron-works among the largest in the U. S.; the rolling-mills, nut-mills, plate-mills, nail-mills, and blast furnaces covering at least 50 acres of land. Pop. of township (1880) 2,682; (1890) 3,307; (1900) 4,710; town (1900) 3,901.

Boon'ville: town; capital of Warrick co., Ind. (for location of county, see map of Indiana, ref. 11–B); on L. E. and St. L. R. R.; 9 miles from Ohio river and 17 miles from Evansville. It has 8 churches (2 for colored people), 3 schools (1 for colored people); agriculture is the chief occupation, but coal is abundant and mined everywhere. Timber is abundant in the surrounding country. The town was founded about 1818. Pop. (1880) 1,182; (1890) 1,881; (1900) 2,849.

Boonville, or **Booneville**: a city and river port; capital of Cooper co., Mo. (for location, see map of Missouri, ref. 4–G); on J. C. B. and L. branch of Mo. Pac. R. R., and M. K. and T. R. R., and on the right (S.) bank of the Missouri river; 227 miles by water and 187 miles by railroad W. by N. of St. Louis. It stands on a bluff about 100 feet above the river, is very healthy, and has an advantageous position for trade. The railroad bridge which here crosses the river is one of the most costly that spans the Missouri. Boonville has excellent schools, public and private; its manufactures are few, the inhabitants being generally well to do. The town was founded in 1818. During the civil war a Confederate camp was established at this place. On June 16, 1861, Gen. Lyon reached Rockport, opposite Boonville, and on the following day attacked the forces in camp at Boonville under Col. Marmaduke. The Confederate force, amounting to only about 2,500 poorly armed raw troops, was routed, abandoning two guns and a large quantity of clothing, camp equipage, etc. Pop. (1880) 3,854; (1890) 4,141; (1900) 4,377.

Boonville: village; Oneida co., N. Y. (for location of county, see map of New York, ref. 4–H); 35 miles N. of Utica, on the Rome, Watertown and Ogdensburg R. R., and on Black River Canal. Here are 6 churches, an academy, Erwin Library and Institute, chair-factory, foundry, and 3 grist-mills. This neighborhood is a popular place of summer resort. Pop. (1880) 1,677; (1890) 1,613; (1900) 1,745.

Boorhanpoor: city of the Central Provinces, India. See BURHANPUR.

Booro: a large island in the East Indies. See BURU.

Booroogird: a city of Persia. See BURUGIRD.

Boossa: African town on the Central Niger. See BUSSANG.

Bootan: native state in the Himalaya Mountains. See BHUTAN.

Boö'tes [Gr. Βοώτης, i. e. plowman]: a name of PHILOMELUS; son of Ceres and a brother of Plutus. He is said to have invented the plow, and used it in cultivation of the soil. To reward him for this service he was translated into a constellation, under the name of Boötes.

Boötes: a northern constellation; represented on celestial globes as a man holding in one hand a club, and in the other a leash by which he leads two hunting-dogs. This constellation comprises Arcturus, a star of the first magnitude. Boötes is bounded N. by Draco, E. by Corona Borealis and Serpens, S. by Virgo, and W. by Canes Venatici and Coma Berenices.

Booth, ABRAHAM: b. at Blackwell, Derbyshire, England, May 20, 1734; from 1769 till his death pastor of the Baptist church in Goodman's Fields, London. He was author of *The Reign of Grace* (London, 1768) and *Pædobaptism Examined* (1784; 2d ed. 2 vols., 1787). The latter work was republished in 4 vols. 8vo in 1829. D. Jan. 27, 1806.

Booth, BARTON: actor and dramatist; b. in 1681. He first appeared in 1698 at Dublin, Ireland, in Thomas Southern's *Oroonoko*. In 1701 he first acted in London as Maximus in Lord Rochester's *Valentinian*. Thenceforward his career was prosperous and distinguished. He left the stage in 1728. D. in Hampstead, May 10, 1733. He acted well as Hotspur, Antony, Othello, and Henry VIII., and was noted for his personal beauty. He wrote a masque entitled the *Death of Dido* (1716).

Booth, EDWIN THOMAS: actor; son of Junius Brutus Booth; b. in Belair, Md., Nov. 13, 1833; d. in New York city, June 7, 1893. As a boy he traveled with his father, and first appeared on the stage, at the Boston Museum, Sept. 10, 1849, as Tressel in *Richard III.*, his father playing Richard. His first appearance before a New York audience, was as Wilford in *The Iron Chest*, at the National Theater, in Chatham street, Sept. 27, 1850. He afterward played with a Baltimore stock company, then went with his father to California, in July, 1852. He made an unprofitable trip to Hawaii and Australia in 1854, and in 1856 returned to the Eastern States, where he was everywhere welcomed and honored as a worthy successor of his famous father. His success extended in almost an unbroken line from that time till his death. From 1862 till 1867 he played chiefly at the Winter Garden Theater, New York. On March 23, 1867, the theater was burned with all its contents, Booth losing his entire wardrobe, together with many relics of his father. There was no insurance, and the entire loss fell upon Booth, who had recently bought out J. S. Clarke, his partner in the enterprise. He opened Booth's Theater Feb. 3, 1869, and in 1871 became its sole owner. The panic of 1873–1874 swept him into bankruptcy. He set out at once to free himself of this debt, and the profits of his work from Oct., 1875, to May, 1877, enabled him to pay off the entire obligation. He played in the Haymarket Theater, London, in 1861, but the civil war in the U. S. drew greatly from his popularity. He revisited England in 1880, and again in 1882, meeting with an enthusiastic reception in all the larger cities. He also played in Berlin, Hamburg, Hanover, Bremen, and Vienna. His notable parts were those of Hamlet, Macbeth, Lear, Othello, Iago, Wolsey, Richard III., Shylock, Richard II., Benedick, Petruchio, Richelieu, Payne's Brutus, Ruy Blas, and Don Cæsar de Bazan. In Jan., 1888, he procured the incorporation of The Players, and presented the club with a completely fitted club house,

No. 16 Gramercy Park, New York, on which he had expended $175,000. See his *Life*, by Winter (1886).

Booth, Henry Matthias, D.D.: Presbyterian minister and author; b. in New York city, Oct. 3, 1843; graduated at Williams College (1864) and at the Union Theological Seminary (1867); pastor in Englewood, N. J., 1867–91; president of Auburn Theological Seminary from Oct., 1893, until his death, Mar. 18, 1899. He published *The Heavenly Vision and other Sermons* (New York, 1885); *The Sunrise, Noonday, and Sunset of the Day of Grace* (1888). W. J. Beecher.

Booth, Junius Brutus: actor; b. near London, England, May 1, 1796; first appeared on the stage, Dec. 13, 1813, at Deptford, England, as Campillo, in Tobin's *Honeymoon*, and within four years became famous in London as Richard III. and Sir Giles Overreach. These and Pescara were his great parts. He first acted in the U. S., July 13, 1821, at Richmond, Va., as Richard III. His career on the U. S. stage was one long triumph—marred, however, by intemperance and incipient insanity. He died on a Mississippi river steamboat, Nov. 3, 1852, and was buried at Baltimore, Md. His wife was a Miss Holmes, of Reading, England. His children were Junius Brutus, Rosalie Anne, Edwin Thomas, Annie Sydney, Joseph Addison, Henry Byron, Mary, Frederick, Elizabeth, and John Wilkes. See *The Elder and the Younger Booth* (1882) in the American Actor Series.

Booth, Mary Louise: writer and journalist; b. at Yaphank, N. Y., Apr. 19, 1831; published a *History of the City of New York* (1859–67; 2d ed. New York, 1880), and over thirty volumes of French translations, among which are the works of De Gasparin, Cochin, and Laboulaye on the American civil war, and Henri Martin's abridged *History of France* (1880). From its beginning in 1867 until her death in New York, Mar. 5, 1889, she was editor of *Harper's Bazar*.

Booth, Newton: b. in Salem, Washington co., Ind., Dec. 25, 1825; graduated at Asbury University in 1846; studied law in Terre Haute, and was admitted to the bar in 1850; went to California soon afterward, and engaged in business in Sacramento; returned in 1857 to Terre Haute, and practiced law till 1860, when he went back to California. In 1863 he was elected to the California State Senate; in 1871 was elected Governor of California, but resigned in Mar., 1874, when elected U. S. Senator. He served from Mar. 9, 1875, till Mar. 3, 1881. D. in Sacramento, July 14, 1892.

Booth, Robert Russell, D. D.: Presbyterian minister; b. in New York city, May 16, 1830; graduated at Williams College (1849), and at Auburn Theological Seminary (1852). Previous to his present pastorate in Rutgers Riverside Presbyterian church in New York city, he was pastor successively in Troy, N. Y., Stamford, Conn., and of the Mercer Street and University Place churches, New York city. He has published many pamphlets and discourses, and is a trustee of Williams College, a director of Princeton Theological Seminary, a member of the Presbyterian Board of Foreign Missions, etc. W. J. Beecher.

Booth, William: general of the Salvation Army; b. in Nottingham, England, Apr. 10, 1829; educated at a private school in that town; became a minister of the Methodist New Connection in 1850; resigned from the Conference in 1861 to enter upon evangelistic work. In July, 1865, he started "The Christian Mission" in the East End of London. This mission grew rapidly, and was organized on military lines. In 1878 Mr. Booth gave to it the name of "The Salvation Army," of which he became general and absolute commander. His entire family have shared with him in this work. He has published several hymn-books; *Salvation Soldiery*; *Training of Children*; *Letters to Soldiers*; *In Darkest England*, the latter containing a scheme, subsequently put in operation at great expense, for the enlightenment and industrial support of the lowest classes. In 1880 Gen. Booth established the *War Cry* as the weekly gazette of the army. This is now (1897) published in some twenty-eight different languages, with a total circulation of about 600,000. See Salvation Army. C. H. Thurber.

Boothbay Harbor: town; Lincoln co., Me. (for location of county, see map of Maine, ref. 10–D); on Atlantic Ocean; 14 miles from Knox and Lincoln R. R., and 16 miles from Bath, from which it is reached by steamer. The town has two churches, a high school, bone-phosphate, canning, and cold-storage industries, two marine railways, steam lumber-mill, and a boat-manufactory. The fine bathing, sailing, and fishing to be had here, and the romantic scenery in the neighborhood, have made this place a popular summer-resort. This town was separated from Boothbay Feb. 16, 1889. Pop. of Boothbay township (1880) 3,575, including Boothbay Harbor; (1890) 1,718; (1900) 1,766. Of Boothbay Harbor (1890) 1,699; (1900) 1,926. Editor of "Register."

Boo'thia Fe'lix: a peninsula or island of North America; in the Arctic Ocean; extends from lat. 69° to 75° N. It is bounded on the E. by Boothia Gulf. It was discovered by Sir John Ross, and named in honor of Sir Felix Booth. It contains the north magnetic pole.

Boots: articles of dress worn on the feet, and reaching up the legs sometimes above the knees. They were developed from the sandal by slow stages, and appeared in England during the reign of Edward II. as part of a knight's costume. The Greek *cothurnus* or buskin was sometimes a boot reaching to near the knee, and made with thick soles to increase the stature of actors. The Roman patricians wore leather shoes, the color of which indicated rank. A senator's shoes were red. In the time of Charles I. a wide-topped boot of Spanish leather came into use, and this in turn was superseded by an elaborately adorned French boot. In the cavalry service this article of apparel became a matter of regulation by the government, and was known as the jack-boot, a high-topped heavy boot worn with spurs. In the eighteenth century a yellow-topped boot was fashionable in Great Britain, and copied thence in France. The Hessian boot followed; was worn over the trousers, and was decorated with a tassel. This gave way to modifications known as the Blücher and the Wellington boots. These forms are giving place to the modern Shoe (*q. v.* for the processes of manufacture).

In Scotland the name *boot* was applied to an instrument of torture in use until late in the seventeenth century. It consisted of a wooden or iron case, was placed on the lower part of the leg, and then tightened by driving in wedges with repeated blows of a mallet, and at times with such force as to crush the bones and muscles. It was employed by the privy council in putting a man to the question, and especially used upon the Covenanters. A milder form of the boot consisted of a wet leather or parchment envelope bound closely on the leg, and then shrunk by drying.

The *boot* of a carriage is a covered receptacle, placed either beside the driver or behind the body of the coach, in which baggage is carried; also a leather apron attached to the dash-board, and used as a protection against stormy weather.

Booty [deriv. of *boot*, profit < O. Eng. *bōt*: Germ. *Busse*]: in international law, personal property captured on land by a public enemy in time of war. It differs from prize, which is captured at sea. (See Prize.) In the case of prize the ownership of the property does not pass to the captor until condemnation by a prize court. Booty belongs to the captor after an undisturbed possession of twenty-four hours, and the right of *post liminium* is at an end. (See Postliminy.) In strictness of law, booty belongs to the sovereign, and not to the individual soldier who captures it. It is quite common for the sovereign power to bestow a portion or the whole of it upon its subjects. This matter, however, is not governed by international rules, but by the municipal law of the captor.

Bopp, Franz: German philologist; b. at Mentz, Sept. 14, 1791. He studied languages in Paris and Göttingen, and became in 1821 Professor of Philology at Berlin. He published a *Glossarium Sanscritum* and a *Critical Grammar of the Sanskrit Tongue*. He was an efficient promoter of the study of Sanskrit, and is regarded as the founder of the science of comparative philology. His most important work is a *Comparative Grammar of the Sanskrit, Zend, Greek, Latin, Lithuanian, Old Slavonian, Gothic, and German Languages* (1833; 2d edition, 3 vols., Berlin, 1857–61), which has been translated into English and published at Oxford (3 vols., 1845–50). D. in Berlin, Oct. 23, 1867. See Preface to the French translation of Bopp's *Comparative Grammar*, by Bréal (Paris, 1866–72, 4 vols.), and Lefman's *Franz Bopp, sein Leben und seine Wissenschaft* (Berlin, 1891).

Bo'ra, or **Boh'ren,** Kathrina, von: a German nun, who became the wife of Martin Luther; b. in Bitterfeld, Saxony, Jan. 29, 1499. She was converted to the Lutheran doctrines, and escaped from her convent in 1523. She was married to Luther, June 13, 1525, and bore him three sons and three daughters. After Luther's death (Feb. 18, 1546) she continued to live at Wittenberg, but in 1552 the plague drove her to Torgau, where she died Dec. 20, 1552. See her *Life*

by C. W. F. Walch (Halle, 1751–54, 2 vols.); F. G. Hofmann (Leipzig, 1845); A. Stein (Halle, 1878; 3d ed. 1886).

Boraç'ic (or **Bo'ric**) **Acid** occurs native in certain lagoons of Tuscany, and in a crater in the island of Vulcano (Volcano), N. of Sicily. It is of great commercial importance for the manufacture of borax. The acid has the composition $B(OH)_3$. When heated it loses the elements of water and forms the oxide B_2O_3, which is frequently called boracic acid. I. R.

Bo'rage: a short-lived annual or biennial herb (*Borago officinalis*), a foot or two high, native of Europe, long cultivated in gardens, and now escaped to waste ground and rubbish heaps. Its pretty blue flowers are quite ornamental, and yield nectar to bees, and are thus of value to bee-keepers. It was formerly used in medicine as a demulcent, refrigerant, and diaphoretic, but it is now regarded as of secondary value only, and has fallen into disuse. C. E. B.

Borage Family (*Boraginaceæ*): mostly rough, hairy herbaceous dicotyledons, with gamopetalous corollas and superior four-lobed ovaries. There are about 600 species, which are widely distributed in temperate climates.

Charles E. Bessey.

Bo'rax [from Arab. *bōraq*, *būraq*, borax] (also called *sodium tetraborate*): a compound ($Na_2B_4O_7 + 10H_2O$) of boracic acid and soda; found native as a saline incrustation on the shores of lakes in Persia, Thibet, and India. The impure borax collected on these shores is called *tincal* or crude borax, which is also found in Peru, Chili, California, Nevada, and other regions. Borax is also prepared from boracic acid by solution in boiling water, and the addition of a boiling solution of sodium carbonate (Na_2CO_3). It is also prepared from borate of lime, a salt largely procured from Chili, Peru, etc. Borax is a white salt of a sweetish taste, soluble in twice its weight of boiling water. It is useful as a flux in promoting the fusion of metallic mixtures and producing fusible silicates in assaying and in welding iron. As an agent in experimenting with the blowpipe it is valuable for the readiness with which it forms colored glasses with various metallic oxides. It is also used in medicine, and as a detergent in the laundry. More than 4,000,000 lb. are annually produced from native boracic acid in Italy, hot springs affording the heat necessary in the manufacture. The annual production on the Pacific coast has varied widely, declining from 5,180,810 lb. in 1876 to 1,584,966 lb. in 1879, but rising again to 11,000,000 lb. in 1887. In 1888 the product was 7,589,000 lb., valued at $455,340. See Boracic Acid. Revised by Ira Remsen.

Borax Lake: a small lake in Lake co., Cal., the water of which is a strong solution of borax. Crystals of borax are also found in large numbers in the muddy sediment at the bottom. Many hundreds of tons of these have been collected and sent to San Francisco.

Borda, bōr'daa', Jean Charles, de: French mathematician and astronomer; b. at Dax, department of Landes, May 4, 1733. He served as an engineer in the army, and became a captain in the navy. As a naval officer he fought for the U. S. in 1778–82. He wrote several scientific works, contributed much to the progress of nautical science, and invented or improved the reflecting circle. Aided by Delambre and Méchain, he measured an arc of the meridian from Dunkirk to the Balearic isles. D. in Paris, Feb. 20, 1799.

Borde, or **Boorde**, bōrd, Andrew: English physician and writer; b. at Boord's Hill, near Cuckfield, in Sussex, about 1490. Educated at Oxford, he became a Carthusian monk in London; became suffragan bishop of Chichester, 1521; but, finding the order too severe, he obtained a dispensation from his vow in 1528 and studied medicine on the Continent and at Glasgow; traveled much, and was for a time patronized by Henry VIII.; d. in 1549, after spending a little time in the Fleet prison. Author of a *Dyetary*; the *Fyrst Boke of the Introduction of Knowledge* (edited by Dr. Furnivall, 1870); and various books of travel, including an *Itinerary of England*.

Bordeaux, bōr'dō': a city and seaport of France; capital of the department of Gironde; finely situated on a plain on the left bank of the river Garonne; 58 miles from its mouth and 364 miles by rail S. S. W. of Paris; lat. 44° 50′ N., lon. 0° 34′ W. (see map of France, ref. 7–D). It has a capacious harbor, and is accessible by vessels of 600 tons at all stages of the tide. The river, which is here about 650 yards wide, is crossed by a noble bridge of seventeen arches. Bordeaux is an archbishop's see. It is connected by several railways with Paris, Toulouse, Marseilles, and other towns. It is probably the most commercial city of France, except Marseilles. The harbor is large enough to admit 1,200 vessels of the largest size. Its commerce extends to all parts of the world. The newer portions of the city have wide streets and pleasant promenades lined with trees. Among its remarkable edifices are the Gothic cathedral, consecrated in 1096; the church of St. Croix, which belongs to the tenth century; the town-hall; the Hôtel de la Marine; the bridge, which cost about $1,300,000; and the Great theater, which is one of the finest in Europe, and was built by Louis XVI. Bordeaux contains a mint, a college, a university or *Académie Universitaire*, a normal school, a school of navigation, and a public library of 190,000 volumes. Here are extensive manufactures of wine, brandy, chemicals, printed calicoes, woolen goods, carpets, hats, paper, etc. The chief articles of export are wine, brandy, vinegar, dried fruits, turpentine, and glass bottles. Wine of superior quality, called Médoc, claret, or Bordeaux wine, is produced in this vicinity. The principal merchants of Bordeaux are engaged in the wine-trade. The Canal du Midi affords a communication with the Mediterranean. Pop. (1886) 240,582; (1896) 256,906. Bordeaux, called in ancient times *Burdigala*, was founded before the Christian era, and was the capital of the Bituriges Vivisci. It became the capital of Aquitania Secunda in the reign of Hadrian. In 1152 it was transferred to the crown of the English kings by the marriage of Henry of Anjou (afterward Henry II. of England) with Eleanor of Guienne. It received important liberties and privileges from the English. The famous Black Prince held his court here. It has belonged to France since 1451. Among the remains of the ancient city is a palace of Gallienus. During the revolution of 1789 this city was the headquarters of the Girondists, and suffered terribly at the hands of the Terrorists. In consequence of the damage to its commerce by the continental system of Napoleon, Bordeaux was one of the first cities to declare for the Bourbons. On Dec. 10, 1870, the seat of government was transferred to Bordeaux, while Paris was besieged by the German armies and several members of the provisional government were shut up in the metropolis. The provinces were then subject to the authority of Gambetta and his colleagues, who, after they had been driven from Tours by the approach of the enemy, removed to Bordeaux. The National Assembly, elected in Feb., 1871, met first in this city, but removed to Versailles in March of that year.

Revised by M. W. Harrington.

Bordeaux Wines: a general name for several sorts of French wine produced in the department of Gironde. The red wines of Bordeaux are commonly called claret in the U. S., to which they are largely exported. The average quantity produced annually in the Gironde is about 31,500,000 gal., the ravages of the phylloxera having diminished the vintage. Among the best of these wines are the Médoc, which is red, and the Graves, which is white. No French wines except champagne are so largely exported.

Bordentown: borough; Burlington co., N. J. (for location of county, see map of New Jersey, ref. 5–D); on Amboy Division of Pa. R. R., and on Delaware river; 30 miles N. E. of Philadelphia and 6 miles S. E. of Trenton. Two passenger steamboats run daily to Philadelphia. Bordentown is the terminus of the Delaware and Raritan Canal, and is about 60 feet above the river. It has three female colleges, a military institute, a park, water and gas works, an opera-house, a very large steam-forge, and several foundries and manufactories. Bordentown was the home of Francis Hopkinson, signer of the Declaration of Independence, and is the seat of a mansion built by Joseph Bonaparte, ex-King of Spain. Pop. (1880) 4,258; (1890) 4,232; (1900) 4,110.

Publisher of "Register."

Bordes, bōrd, Ernest: contemporary painter of history and figure subjects; b. at Pau; pupil of Bonnat and of Cormon; second-class medal, Salon, 1886; second-class medal, Paris Exposition, 1889. Obtained a solid reputation as a painter of serious merit by the exhibition of a picture, *The Death of Bishop Proetextatus*, at the Salon of 1886, now in the museum at Reims. Studio in Paris. W. A. C.

Bore, called also **Ea'gre** [etymology unknown]: In estuaries into which large rivers flow, the struggle between the ascending tidal wave and the opposing current of the stream produces the imposing phenomenon of a huge wave, which, like a moving wall of water, advances with great rapidity

and a deep roaring noise up the river, often for hundreds of miles, to the limit of tide-water. This is called the *bore*. In the Hugli river, one of the main mouths of the Ganges, the bore rushes up the river with great impetuosity. In the Chinese river Tsientang it rises to 30 feet in height, and travels at the rate of 25 miles an hour, sweeping everything before it. In the Amazon river, at the time of the equinoxes, bores of 15 feet in height follow each other in quick succession, and within the space of 200 miles five such mighty waves may be seen traveling simultaneously up the river. The Indians call it *pororóca*.

Bo'reas: in Grecian mythology, the personification of the north wind, the brother of Hesperus, Zephyrus, and Notus; was imagined to dwell in the caves of Thrace, and represented with snow-covered wings, hair, and beard.

Borecole: See KALE.

Borel'li (in Lat. *Borellus*), GIOVANNI ALFONSO: physician and astronomer; b. at Naples, Italy, Jan. 28, 1608. He is called the founder of the iatro-mathematical school, which proposed to apply mathematics to medicine. He resided for many years in Rome, and was patronized by Queen Christina of Sweden. His most remarkable work is *De Motu Animalium* (1680). D. in Rome, Dec. 31, 1679.

Borers: a name applied to the larvæ of many insects which feed upon trees and vegetables, in which they eat holes. Their ravages are very great. The peach-tree borer is the larva of *Ægeria exitiosa*, a lepidopterous insect; and species kindred to the last named attack the pear-tree, the currant bush, and many other useful plants. The locust-tree borer is the larva of a coleopterous insect, the *Clytus pictus*, which, with other larvæ, has seriously diminished the supply of this valuable timber tree. The apple-tree is especially attacked by the grub of the *Saperda bivittata*. Borers are most easily destroyed by a wire or gouge while they are in their holes; and though many plans have been devised for preventing their ravages, none as yet are very successful.

Bor'gerhout: a flourishing town of Belgium; a suburb of Antwerp. It has bleachfields, dye-works, woolen factories, and corn-mills. Pop. (1891) 29,818.

Borghese, bōr-gā'zā, CAMILLO, Prince: b. in Rome, July 19, 1775. He served in the French army in his youth, and married in 1803 Pauline, a sister of Napoleon. He was in 1806 created Duke of Guastalla. He sold the Borghese collection of antiquities and artistic treasures to Napoleon for 13,000,000 francs, but some of them were restored to him after the fall of the emperor. These had been collected by his father, Marc Antonio. D. in Florence, Apr. 9, 1832.

Borghesi, bōr-gā'zĕe, BARTOLOMMEO, Count: an Italian antiquary and numismatist; b. at Savignano, June 11, 1781. He formed a rich collection of medals and coins, and distinguished himself by his successful efforts to illustrate the military, political, and municipal institutions of ancient Rome. His chief work is *Nuovi Frammenti dei Fasti Consolari Capitolini* (2 vols., 1818–20). D. in San Marino, Apr. 16, 1860.

Borgia, bōr'jăă, CESARE, Duc de Valentinois: Italian cardinal and soldier; a natural son of Pope Alexander VI.; b. in Apr., 1476. He was raised to the rank of cardinal in 1492, and received from Louis XII. of France the title of Duc de Valentinois in 1498. He married a daughter of the King of Navarre in 1499. With the connivance of the pope, his father, he waged with success an aggressive war against several princes of the Romagna who were feudatories of the Roman see. He was guilty of many acts of cruelty and treachery, and procured the death of several persons by poison. He made himself master of the duchy of Urbino, but his prosperity was ruined by the death of Pope Alexander VI. in 1503, and the accession of Julius II., who was an enemy of Cesare Borgia. The latter was arrested and imprisoned in 1504, but he escaped in 1506 and joined the army of the King of Navarre. He was killed in battle, at Mendavia, Spain, Mar. 12, 1507. See Tomasi, *Vita del Duca di Valentino* (1655); *Leben des C. Borgia* (Berlin, 1782).

Borgia, LUCREZIA: b. in Rome, 1480; renowned for beauty, talents, and vices; a sister of Cesare Borgia, noticed above. She was married in 1493 to Giovanni Sforza, Lord of Pesaro; was separated from him, and given in 1498 to the Duke of Bisceglia, a son of the Duke of Ferrara, who was assassinated two years later; and then she married in 1501 Alfonso, Duke of Ferrara, of the house of Este. She patronized Bembo and other literati, who complimented her in their works. She was accused by contemporaries of incest and poisoning, but several modern writers maintain that the charges against her character are greatly exaggerated. D. in Ferrara, June 24, 1519. See Gilbert, *Lucretia Borgia, Duchess of Ferrara* (2 vols., London, 1869); F. Gregorovius, *Life of L. Borgia* (Stuttgart, 1874, 2 vols.; 3d ed. 1875).

Borgne, bōrn: a lake or bay in the southeast part of Louisiana; 12 miles E. of New Orleans. It is 60 miles long, and 25 miles wide at the broadest part. It communicates with the Gulf of Mexico on the E., and is connected with Lake Pontchartrain by the Rigolets Pass, which is 10 miles long. The lake is surrounded to a great extent by marshes and cane-brakes, separated from it by a narrow ridge of shells. Steamers plying between New Orleans and Mobile traverse this lake.

Borgu': a kingdom in Central Africa; W. of the Niger; in about lat. 10° N., now in part in the British Niger protectorate (see map of Africa, ref. 4–C). The banks of the Niger are fertile and thickly populated, producing rice, indigo, grain, cotton, yams, lemons, bananas, honey, and game in abundance. The sorghum-fields yield five hundred-fold. The forests are full of elephants of immense size. The population consists of the original inhabitants and Fulahs, and a Mohammedan conquering tribe speaking a language cognate with the Yoruba tongues. The government is an hereditary monarchy.

Borissoff': a town of Russia; on the Berezina; government of Minsk; 46 miles N. E. of Minsk (see map of Russia, ref. 7–C). Near this place the army of Napoleon suffered a great disaster in its passage of the Berezina in Nov., 1812. Pop. 6,500.

Bor'land, SOLON: general in the Confederate army, and former U. S. Senator from Arkansas; b. in Virginia, studied medicine and settled in Arkansas. In the Mexican war he served as major of volunteers, and was taken prisoner. He was elected to the U. S. Senate 1849, appointed U. S. minister to Central America 1853; and it was on his return home that the inhabitants of Greytown attempted to arrest him for having given asylum to an accused person, and for which the town was destroyed by Com. Hollins, U. S. N., acting under instructions of his Government. In Apr., 1861, and previous to the secession of Arkansas, he organized a force and captured Fort Smith; was appointed brigadier-general in the Confederate army. D. in Texas, Jan. 31, 1864.

Borlase, bōr'las, WILLIAM, F. R. S.: English antiquary; b. in Cornwall, Feb. 2, 1695; educated at Oxford; became vicar of Ludgvan, near Penzance, 1722, to which he added the vicarage of St. Just 1732; was a friend and correspondent of Pope. Author of *Observations on the Antiquities of Cornwall* (1754); *Natural History of Cornwall* (1758); and several religious treatises. D. in Ludgvan, Aug. 31, 1772.

Born, bōrn, BERTRAN, de: Count of Hautefort; b. before 1140; one of the most renowned Provençal poets of the Middle Ages, called by Dante (*de Vulg. Eloq.* ii. 2) the poet of arms in the great triumvirate of troubadours, of which Arnaut Daniel and Guiraut de Borneil are the other members. He was, however, a poet of love as well, and his songs in honor, first, of Mathilde ("Maeuz" of the poems), wife of Talairand of Montignac, and later of a far more famous Mathilde, sister of Richard Lion-heart, wife of Henry the Lion and mother of the Emperor Otto, are not below the best level of such verse. In his war poetry, however, we undoubtedly get him at his best—an entirely mediæval character, passionate for war and arms and blood. Fortune enabled him to use his poetic art in affairs of great importance. He had a large and, on the whole, harmful influence in the struggles of the sons of Henry II. of England—Henry, Geoffrey, and Richard Lion-heart—against their father and then among themselves. Dante in a famous passage (*Inferno*, xxviii. 118, *seq.*) depicts the poet as compelled to carry in his hand his own head separated from his body, as he had himself separated a son (young Henry) from his father (Henry II.). Later, Bertran was for a time a violent adherent of Philippe Auguste in his struggles with Henry II. and Richard Lion-heart. Still later, however, he is found full of admiration for Richard and of scorn for Philippe Auguste. His sirventeses, or political poems, are therefore indispensable for the student of the social and political condition of the twelfth century. In his old age the poet en-

tered the monastery of Dalon. D. *circ.* 1215. See *B. de Born, sein Leben und seine Werke, herausgegeben v. A. Stimming* (1879); *B. de Born, poésies complètes* (publ. by A. Thomas, 1888); Diez, *Leben und Werke der Troubadours* (2d. ed. 1882); L. Clédat, *Du rôle historique de Bertrand de Born* (1878).

A. R. Marsh.

Bör'ne, Ludwig: satirical writer; b. of Jewish parents at Frankfort-on-the-Main, May 18, 1786; studied at Berlin and Heidelberg; adopted the Protestant faith in 1817; edited the liberal *Wage* and *Zeitschwingen*; published in 1826 his celebrated *Denkrede auf Jean Paul*. After 1830 he lived in Paris, was correspondent of the *Allgemeine Zeitung*, and edited *La Balance*. His *Briefe aus Paris* and other writings on political and æsthetical subjects are eloquent and witty, and display a singularly delicate critical sense, but are marked with bitterness of political feeling. *Sämmtliche Werke* (12 vols., 1862–63). D. in Paris, Feb. 13, 1837. See biographies by Beurmann (1841), and Gutzow (1840), and *Heine über Boerne*.

Borneil, bōr'nāl', Guiraut, de: Provençal poet; reckoned by Dante (*de Vulg. Eloq.* ii. 2) one of the three great troubadours, Arnaut Daniel and Bertran de Born being the other two. Dante also calls him the poet of uprightness, "rectitudinem." The precise dates of his career are not known, but it certainly fell between 1175 and *circ.* 1220. He was chiefly remarkable as a poet because of his profound belief in the art of poetry and in the chivalric ideals of his time. See F. Diez, *Leben und Werke der Troubadours* (Zwickau, 1829; 2d ed. Leipzig, 1882); also the Provençal life of the poet from the Cheltenham MS. 1910, printed in the *Revue des langues romanes* (3e série, v. 275).

A. R. Marsh.

Bor'neo (called by the natives *Pulo-Kalamantin*): an island in the Malay Archipelago; extends from lat. 7° 1′ N. to 4° 10′ S., and from lon. 108° 50′ to 119° 2′ E. (see map of East Indies, ref. 6–E). Its length is 807 miles, and it is about 600 miles wide. The area of the island proper is 283,400 sq. miles; with the small islands adjacent, 284,500 sq. miles. Next to New Guinea (303,000 sq. miles), it is the largest island on the globe. The interior is traversed by chains of mountains not yet fully explored by Europeans. Near the northern extremity of the island is a peak called Kinibalu, which rises 13,680 feet above the sea. The maritime parts of the island are mostly marshes or low plains covered with dense forests. It is probable that a large portion of the interior consists of fertile valleys and plains. The outline is nowhere deeply indented by inlets. It is thought by many that the form of Borneo was formerly similar to that of Celebes, but that the bays have been filled up in the course of time, and now form those marshy districts on the coasts so unhealthy to the inhabitants. Borneo is watered by numerous navigable rivers—viz., the Kapuas, Barito, Mahakkam, Redjang, and others. These mostly enter the sea through extensive deltas, and their mouths are so obstructed that large vessels can not enter them; but they afford facilities for inland navigation. The climate in the low grounds is hot. The rainy season begins about October, and continues till April, during which period heavy rains fall. In the higher lands of the interior the climate is moderate and healthy. The mountains are chiefly formed of granite, syenite, limestone, and quartz. Among the mineral resources are gold, tin, antimony, zinc, diamonds, iron of fine quality, and coal, which latter is very abundant and is excellent and easily mined. The principal commercial supply of antimony is at present from Borneo. Diamonds are widely disseminated in the soil, at a depth of several feet. One diamond found in Borneo weighed 367 carats. The vegetation of Borneo is exceedingly luxuriant. Among the forest trees are the teak, the ironwood, the gutta-percha-tree, the ebony, the cocoa-palm, and various sago-trees. The island produces also cinnamon, camphor, betel, pepper, ginger, cotton, rice, and yams. The forests and jungles are infested with tigers, bears, leopards, buffaloes, and orang-outangs. The elephant also is found here. The population (estimated at 1,734,000) is chiefly of four races—Malays, Dyaks, Bugis, and Chinese. The Malays, who mostly occupy the maritime parts, are partly Mohammedans and partly pagans. The Dyaks, who live farther inland, are the aboriginal inhabitants, and are the most numerous of all the races in the island. They are divided into many tribes, and subsist mostly by hunting, fishing, and piracy. "They are not all," says Craufurd, "in an equally abject condition; for while some are mere naked hunters, the majority have fixed abodes, and have made some progress in the useful arts. . . . With respect to religion, they have neither priests nor temples, nor do they pray or fast."

Borneo was in 1892 divided into the following governments: (1) *British North Borneo*, the northern end of the island from the Padas river on the west coast to the Sibuco river on the east coast. Area, 31,106 sq. miles, with a coastline of over 900 miles. Pop. 200,000, consisting of the aboriginal tribes inland and Mohammedan and Chinese settlers on the coast. The interior is mountainous; the most of the surface is covered by jungles. The territory is under the jurisdiction of the North Borneo Company. The laws are based on the Indian code and the Mohammedan law. The Government issues its own copper and paper money, which is in American dollars. Tobacco is planted on a large scale, and there is a flourishing timber-trade. Chief town, Kudat in the extreme north. (2) *Brunei*, a native sultanate, under British protection, on the west coast from British North Borneo to the Barram river. Area, 8,100 sq. miles. Pop. 50,000. It is similar to the territory to the north. Chief town, Brunei or Borneo. (3) *Sarawak*, a sultanate occupying the west coast from Brunei to Cape Datu and extending inland to the central mountain chain. It is under British protection. Area, 41,000 sq. miles. Pop. 320,000. It resembles North Borneo. Coal exists in large quantities, as well as gold, silver, and other metals. An Englishman, Sir James Brooke, obtained control of Sarawak as rajah in 1841. He was succeeded by his nephew, Sir Charles Johnson Brooke, in 1868. (4) *Dutch West Borneo* includes the southwestern part of the island S. of Sarawak and W. of about lon. 117° E., with all of the basin of the Kapuas river. Area, 59,700 sq. miles. Pop. 414,000. (5) *Dutch South and East Borneo*, including the parts of the island S. of North Borneo and E. of Brunei, Sarawak, and West Borneo. Area, 143,500 sq. miles, or more than all the rest put together. Pop. 750,000. The chief towns of Dutch Borneo are Pontianak (west coast, on the Kapuas river) and Banjermassin (South Borneo, on the Barito river).

History.—Borneo was discovered in 1518 by the Portuguese, who formed a settlement at Bandjermassin in 1690. The Dutch, who first visited the island in 1598, made a treaty of commerce with the Sultan of Sambas in 1609. They erected a fort and a factory at Tatis in 1643, and another at Pontianak in 1778. The first British settlement was at the northeast angle in 1756. Sir James Brooke first visited the island in 1838. The island has never, since known to geographers, had any political unity, and has, therefore, no proper history.

References.—*Handbook to British North Borneo* (1890); Temple, *Private Letters of Sir J. Brooke* (1853); Wallace, *Malay Archipelago* (1865); Posewitz, *Borneo, its Geology and Mineral Resources* (translated from the German, 1892).

M. W. Harrington.

Bornu', or **Bornou** (native *Kanowra*): a state of Central Africa; in the Sudan; bounded N. by the Sahara Desert, N. E. by Lake Chad, E. by Bagirmi, on the S. by Adamawa, and on the W. by Sokoto (see map of Africa, ref. 4–D). Area about 50,000 sq. miles. The surface is mostly level; the soil is fertile, producing maize, millet, rice, cotton, indigo, pulse, etc. Cattle, horses, and sheep form a large part of the riches of the Bornuese. The climate is excessively hot, the thermometer often rising to 105° F. in the shade. The rainy season lasts from October to April. The principal rivers of Bornu are the Shari and Yeon, which flow into Lake Chad. A large portion of the country is inundated in the rainy season. Lions, panthers, and other beasts infest the forests, which occur only in the vicinity of the rivers. Minerals are said to be rare in Bornu. The natives manufacture cotton cloth and coats-of-mail, which they use in warfare. The chief exports formerly were slaves and gold-dust. The dominant race, called Shonas, are of Arab descent and are bigoted Mohammedans. Chief town, Ngornu. Pop. about 5,000,000.

History.—Bornu was formerly a part of the kingdom of Kanem, which, founded in the ninth century, rose to its highest point of power in the twelfth. At the end of the fifteenth century, King Ali-Dunamâni founded Bornu. It attained its greatest power under Edrîss Alaoma (1571–1603), who conquered all the surrounding tribes, and even extended his territory to the shores of the Atlantic. Under his peaceful and extravagant successors the power of Bornu again declined, until in 1808 it could no longer resist the continued attacks of the Fellatah, who took and de-

stroyed the old capital, Birni. The king then established himself at Kuka. An Arab from Fezzan, however, soon defeated the Fellatah at Ngornu. His son Omar removed the old dynasty, and ascended the throne himself in 1835. Although not as strong and determined against his neighbors as his father, his rule has been extremely beneficial for the country, as he has encouraged trade and industry. He also assisted, as much as was in his power, the European travelers who visited his country, among them Denham, Clapperton, Beurmann, and Rohlfs, the last of whom says in his account, "No European prince could have assisted a traveler more than Omar, the Negro prince of Sudan, assisted me, the white Christian."

Revised by M. W. HARRINGTON.

Bo'ro Bud'ur, or **Bo'ro Bo'do**: an ancient Buddhistic temple of Java; on the river Probo; 25 miles N. W. of Yugyakarta; believed to be the most elaborate specimen of Bûddhist architecture now existing, and to have been built in 1350 A. D. It is a square pyramid, with nine terraces or stories (116 feet high, in all) and 400 feet square at the base, each terrace covered with cells or small houses for monastics, and the whole covered with profuse carvings.

Borodin, ALEXANDER P.: See the Appendix.

Borodino, bō-rō-dee'nō: a village of Russia; government of Moscow; on the Kolocza river; 70 miles W. S. W. of Moscow (see map of Russia, ref. 7–D). It is celebrated as the scene of a great battle between the army of Napoleon (125,000 strong) and the Russian army, of about 130,000 men, commanded by Gen. Kutusof, Sept. 7, 1812. The French remained masters of the field and claimed the victory, but they lost nearly 30,000 men. The loss of the Russians was still greater; some say 50,000 killed and wounded. The French took Moscow a few days after this battle, which they call the battle of the Moskwa, a river near the field.

Bo'ron [Mod. Lat., formed from *borax*]: an element which Sir Humphry Davy discovered about 1808 by exposing boracic acid to the action of a galvanic battery. Its chemical symbol is B; atomic weight 11; and specific gravity about 2. Combined with oxygen and hydrogen it forms boracic acid, and it occurs in nature only in combination with oxygen, generally in the form of that acid or of BORAX (*q. v.*). Boron is obtained in the form of an olive-brown powder, which is infusible, and has neither taste nor smell. It is not used in the arts in a separate state. It may also be obtained in a graphitoidal form in six-sided crystals. Crystallized boron is one of the most unalterable and indestructible of all simple substances. Wöhler and Deville have obtained boron by heating in a crucible a mixture of pure dry boracic acid with the metal aluminium, when the latter unites with the oxygen, leaving the boron as minute quadratic octahedral crystals, called boron diamonds. These rival the real diamond in luster and refractive power, and are scarcely inferior to it in hardness. They scratch glass and the corundum. No acids, pure or mixed, have any effect upon the boron diamond, nor can it be oxidized even when raised to a high temperature.

Revised by IRA REMSEN.

Borough: in England, formerly, a fortified town; an incorporated town; any populous place or a town in general. By a gradual restriction of sense the term borough has come to be used only to designate a town possessing a municipal corporation, and a town which returns one or more members to Parliament. There are often municipal and parliamentary boroughs of the same name, but differing in territorial extent. In Scotland the borough is called a burgh, which term is now used to designate a town having a charter of incorporation. There are royal burghs, with a charter from the king, burghs of regality, with a charter from a lord of regality, and burghs of barony, with a charter from a baron. Of these formerly only royal burghs sent members to Parliament. The citizens or freemen of a borough (called burgesses) formerly might become such by birth, marriage, apprenticeship, and various other ways, according to the custom of the borough. The privileges of the burgesses, which were of very considerable value, and varied with the locality, included such as the right of participation in the income of the corporation, the exclusive right of trading, etc. The possession of these privileges, the restrictions upon the right of citizenship, and the power acquired by the guilds gave rise to corruption and flagrant abuse in government, and they have been swept away by the Reform Act of 1832, the Municipal Corporations Act of 1835, and other subsequent acts. Burgesses are now simply the electors of municipal corporations, and the statutory qualifications necessary to entitle a person of age to become a burgess are, in general, the occupation of a house or other building and residence within the borough for a stated time, and the payment of poor and borough rates. The representatives of a borough in Parliament are often called burgesses, and by analogy in some of the American colonies the members of the lower house of the legislature were called burgesses. In the U. S. the term borough has no technical meaning except in Connecticut, Minnesota, New Jersey, and Pennsylvania, where it designates an incorporated town or village of a lower grade than a city, and in New York, as applied to the divisions of New York city. In New Jersey and Connecticut the borough is a part of the township, but in Pennsylvania and Minnesota the boroughs have independent municipal organizations.

F. STURGES ALLEN.

Borough English: a custom existing in some boroughs in England by force of which the youngest son of a person dying intestate inherits all the realty which belonged to his father within the borough. A special modification exists in some boroughs by which land descends to the younger son if he be not of the half-blood, and if he be, then to the eldest son. This custom obtains in the manor of Lambeth, Surrey, in Hackney, St. John of Jerusalem in Islington, Heston, and Edmonton, and in Middlesex, and in other counties.

Borromean Islands: a group of four small islands of Northern Italy; in Lago Maggiore. They derive their name from the family of Borromeo. In 1671 Count Borromeo covered them with soil, and converted them from barren rocks into gardens. Their beauty is such that they are sometimes called the "Enchanted Islands." The largest of them is named Isola Madre, and is covered with orange-trees and exotic plants. The most celebrated of the group is the Isola Bella, occupied by a beautiful palace of the Borromeo family, and a garden which rises in ten terraces, presenting the form of a truncated pyramid. Many tropical flowers are cultivated here.

Borromeo, bor-rō-may'ō (in Lat. *Borromæus*), CARLO, Saint: b. at Arona, on Lago Maggiore, Oct. 2, 1538; a nephew of Pope Pius IV.; appointed a cardinal and archbishop of Milan in 1560. His diocese was haunted by all the vices of the Church of Rome and vehemently stirred up by the invasion of the Reformation, whose ideas were poured into the country from Switzerland and found ready acceptance among the excited population, but, placing himself at the head of the Roman Catholic reaction and supported by the Jesuits, he succeeded in reforming his clergy and suppressing the Reformation. He also distinguished himself by the purity and devoutness of his personal life, and was in 1610 canonized by the pope. He wrote several religious works (5 vols. fol., Milan, 1747). D. in Milan, Nov. 3, 1584. See his biography by G. P. Giussano (Rome, 1610; Germ. trans. Regensburg, 3 vols., 1837); C. A. Jones (London, 1877); Charles Sylvain (Milan, 3 vols., 1884).

Bor'row, GEORGE HENRY: author; b. in East Dereham, near Norwich, England, July 17, 1803. He became master of several modern languages, for learning which he had remarkable talents. In his youth he associated with the gypsies. As an agent of the British and Foreign Bible Society he traveled through many countries of Europe. He published in London in 1841 *The Zincali, or an Account of the Gypsies in Spain*, and in 1843 *The Bible in Spain, or Journeys, Adventures, and Imprisonment of an Englishman in an Attempt to Circulate the Scriptures in the Peninsula*, which is a graphic and interesting work (n. e. 1892). His next work, *Lavengro, the Scholar, the Gypsy, and the Priest* (3 vols., 1851), is regarded as an autobiography, and to it as sequel he added *The Romany Rye* (1857); *Wild Wales* (1862), etc. D. at Oulton, July 30, 1881. See Theo. Watts, *Reminiscences of George Borrow* (*Athenæum*, Sept., 1881).

Bor'rowstounness', or **Bouess'**: a seaport-town of Scotland; in Linlithgowshire; on a low peninsula in the Frith of Forth; 17 miles W. N. W. of Edinburgh (see map of Scotland, ref. 11–H). It has a safe harbor, and manufactures of soap, salt, malt, vitriol, and earthenware. Here are coal mines which extend under the bed of the Forth. Limestone and ironstone are found in the parish, which is traversed by the Roman wall of Antoninus. Pop. (1891) 4,579.

Borsip'pa (in Gr. Βόρσιππα): an ancient city of Babylonia (according to Strabo), but there has been much doubt as to its exact situation. Stephanus calls it a city of the Chaldæans. It was probably situated near Babylon. Strabo states that it was sacred to Apollo and Diana. Some mod-

ern writers believe that Borsippa is represented by the remarkable mound called Birs-Nimrud, 5 miles S. W. of Hillah, the site of Babylon proper. See BABYLON and BABEL.

Borsod, bor'shod: a county of Hungary; bounded N. by the counties of Torna and Gömör, E. by Aba-Ujvar and Szabolcs, and S. and W. by Heves. Area, 1,370 sq. miles. The county consists chiefly of vineyards and wooded hills, except in the S. E., which is a plain traversed by several small rivers, while the Theiss forms the eastern boundary. The chief products are fruit, hemp, tobacco, and wine. Copper, iron, and coal are found in the mountains. Pop. (1890) 217,166. Chief town, Miskolcz.

Borthwick, JOHN DOUGLAS: See the Appendix.

Bory de Saint-Vincent, bō'ree'de-săn'văn'saăn', JEAN BAPTISTE GEORGE MARIE, Baron: French naturalist and traveler; b. at Agen in 1780. He explored the island of Mauritius about 1800, and published a *Voyage among the African Islands* (3 vols., 1804). He afterward served as a captain in the army at Austerlitz and in other battles, and became an exile in 1815. With the aid of Van Mons he edited at Brussels the *Annales des Sciences Physiques*, 8 vols. He had the chief command of a scientific expedition which the French Government sent to Algeria in 1839. D. in Paris, Dec. 22, 1846. See Héricart de Thury, *Notice sur le Baron Bory de Saint-Vincent* (1848).

Bos [Lat. ox, cow]: the systematic name for the genus of ruminant animals which comprises the ox, buffalo, etc. See BOVIDÆ and OX.

Bo'sa: a seaport-town of the island of Sardinia; on the west coast, at the mouth of the Termo; in the province of Cagliari; 30 miles S. of Sassari (see map of Italy, ref. 7–B). Its harbor is safe, but admits only small vessels. It is the seat of a bishop, and has a cathedral, an old castle, and several churches. Pop. 6,706.

Bosc, LOUIS AUGUSTINE GUILLAUME: naturalist; b. in Paris, Jan. 29, 1759; educated at Dijon; was an earnest student of botany; held office for a time, but shortly after the fall of Robespierre set out to explore the natural riches of America. He edited the *Dictionnaire raisonné et universel d'agriculture*, and was one of the editors of the *Annales de l'agriculture française*. D. in Paris, July 10, 1828.

Boscan, bōs-kaan', JUAN: poet; b. at Barcelona about the year 1493. Of his early life little is known, except that he first followed the military career and afterward traveled for several years, spending a considerable part of his time in Italy, devoted to the study of literature and the humanities. In his early poetical efforts he used the Castilian meter, but after 1526, through the influence of his friend Andrea Navagero, then Venetian ambassador to Spain, he began to use the measures of Petrarca, the sonnet and the canzone, and thus introduced the Italian measures in Spanish poetry. His poetical works were published by him in 1543, and embrace his verse in Castilian measure written before 1526, his sonnets and canciones dating from 1527–37, and his larger compositions, such as *Leandro y Hero*, in Italian blank verse, *La Allegoria*, in the octave stanza. Navagero also induced Boscan to translate into Spanish Castiglione's important didactic prose work *The Courtier* (Il Cortegiano). Boscan died in Apr., 1542. The best edition of his poetical works, with a good biographical account, is by W. T. Knapp, *Las Obras de Juan Boscan* (Madrid, 1875). HENRY R. LANG.

Bos'cawen, EDWARD: English admiral; son of Viscount Falmouth; b. Aug. 19, 1711. He served with distinction under Anson at Cape Finisterre, May, 1747, and commanded an expedition to the East Indies in 1748. He became a vice-admiral of the blue in 1756, was sent to North America, and gained several victories over the French in 1758. In Aug., 1759, he defeated the French fleet in the Bay of Lagos. He received for this service an annual pension of £3,000. D. in Hatchlands Park, Surrey, Jan. 10, 1761. See Campbell, *Lives of the British Admirals*.

Bosch-bok [Dutch, bush-buck; *bosch*, wood, bush]: the *Tragelaphus sylvaticus*, a South African antelope; almost always found in thick underbrush which is not easily penetrated by man. When surprised in the open country it is easily caught, and is prized for its fine venison. It is about 4 or 5 feet long, and has a voice like the barking of a dog. Several other African antelopes have this name.

Bosch-vark [Dutch, bush-pig; *vark*: O. H. G. *farh*: Eng. *farrow*; cf. Lat. *porcus*]: a wild hog of Southern and Western Africa; in size and habits much resembling the common hog. It has long, pointed ears, a long tail, and is of a dull red color, with white marks. It goes in herds, and the stroke

Bosch-vark, or Guinea hog.

of the boar's tusks is much dreaded. It is the *Potamochœrus africanus*.

Bos'cobel: city: Grant co., Wis. (for location of county, see map of Wisconsin, ref. 7–C); on railroad and Wisconsin river; 70 miles W. of Madison. Pop. (1880) 1,428; (1890) 1,570; (1900) 1,637.

Bos'covich, RUGGIERO GIUSEPPE, F. R. S.: astronomer and natural philosopher; b. at Ragusa, in Dalmatia, May 18, 1701. He entered the order of Jesuits in 1725; became Professor of Mathematics and Philosophy in the Roman College in 1740. He was one of the first on the Continent who adopted the Newtonian philosophy. His Latin poem *On the Eclipses of the Sun and Moon* (1764) was much admired. He wrote various scientific works, among which may be mentioned *Philosophiæ Naturalis Theoria* (1758) and *Opera Pertinentia ad Opticam et Astronomiam* (5 vols., 1785). The latter is a collection of treatises on optics and astronomy. D. in Milan, Feb. 12, 1787. See Fabroni, *Vitæ Italorum doctrina excellentium*; Ricca, *Elogio storico dell' Abate R. G. Boscovich* (1789).

Bosio, bō'zĕe-ō, FRANÇOIS JOSEPH, Baron: sculptor; b. at Monaco, Mar. 19, 1767. He worked in Paris, and was patronized by Napoleon I., for whom he executed busts of Josephine and her daughter Hortense; also the bas-reliefs of the column of the Place Vendôme. Among his masterpieces are the *Hyacinth*, in the Luxembourg, *Cupid Darting Arrows*, and the *Nymph Salmacis*. His works are remarkable for grace and harmony. He was a member of the French Institute and director of the Academy of Fine Arts. D. in Paris, July 29, 1845.

Bosjesmans: See BUSHMEN.

Bosna-Serai: See SERAJEVO.

Bos'nia: a province of Turkey in Europe; inhabited by a Slavonic tribe akin to the Servians; formerly an independent kingdom; from 1522 to 1878 a province of Turkey, and since that time under the administration of Austria-Hungary; bounded N. by the river Save, E. by the Drin, S. by Albania, and W. by Dalmatia. Area of Bosnia and Herzegovina, 23,262 sq. miles. The surface is for the most part mountainous, and the Dinaric Alps extend along the western border. Some peaks of this range rise about 7,000 feet above the level of the sea. The largest rivers, besides the Save, are the Bosna, the Verbas, the Narenta, and the Drin (or Drina). The mountain-slopes are covered with forests of oak, beech, chestnut, and other trees. The soil of the plains and valleys is fertile, and produces good crops of maize, wheat, hemp, and various fruits. Cattle-grazing is an important industry. Bosnia is rich in coal, iron, lead, and other metals, but the mines are not worked to a great extent. This province has few manufactures except fire-arms, sabers, and knives. There are 342 miles of railway and 1,743 miles of telegraph lines. The population is a mixture of Bosnians, Croats, Morlaks, Turks, Illyrians, Jews, gypsies, etc., the majority being of the Slavic race. Capital,

Sarajevo; other important towns, Mostar and Baniäluka. Pop. in 1885, 1,148,517, and of Herzegovina, which is generally associated with it, 187,574, making a total of 1,336,091, of whom 492,710 were Mohammedans (not Turks, but Bosniacs, or of Slavonic race), 571,250 Bosniacs of the Greek Orthodox Church, 265,788 Roman Catholics, and 5,805 Jews. Jan. 1, 1888, the population was estimated at 1,404,000.

History.—Settled by Slavs in the fifth or sixth century, it was under the sway of the Byzantine empire for several centuries; at one time a powerful kingdom, it was, both before and after, in turn the prey of Hungary, Servia, the German empire, and the popes; its inhabitants, largely Protestants, repelled the attempts of all to convert them, and maintained their own faith amid terrible persecutions, till at last, in sheer despair, they surrendered to the Turks in 1463 to 1483, and their children were made Mohammedans by force. In the Russo-Turkish war of 1877–78 they opposed Turkey, and were finally annexed to Austria. See *Through Bosnia and the Herzegovina*, by A. J. Evans.

Revised by C. K. Adams.

Bos'phorus, or **Bos'porus** [Gr. Βόσπορος; popularly, if not properly, interpreted as ox-ford]: the strait which connects the Black Sea (Pontus Euxinus) with the Sea of Mármora (Propontis); forms part of the boundary between Europe and Asia. It is about 16 miles long, and varies in width from ½ a mile to 2 miles. The Bosphorus is deep, and flows between high shores and cliffs which present much picturesque scenery, the beauty of which is enhanced by many ancient ruins. Constantinople stands at the southwest end of the Bosphorus, which is sometimes called the Strait of Constantinople. It was also called the Thracian Bosphorus, to distinguish it from the Cimmerian Bosphorus, the modern name of which is the Strait of Yenikale.

Bos'phorus, Cimme'rian (Gr. Βόσπορος Κιμμέριος): the ancient name of the Strait of Yenikale (or Strait of Kaffa); connects the Black Sea with the Sea of Azov (Palus Mæotis). The width of the narrowest part is about 3½ miles. On the west side of it was a Milesian colony and the city of Panticapæum, which was the capital of a kingdom founded by the Archæanactidæ in 480 B. C. This kingdom endured several centuries under various dynasties, whose dominions were on both sides of the strait. A bridge across the Bosphorus from Scutari to Stamboul was projected in 1892.

Bosquet, bos'kā', Pierre François Joseph: French general; b. at Mont de Marsan, Nov. 8, 1810. He served in many campaigns in Algeria, became a general of brigade in 1848 and a general of division in 1853. In the Crimean war he commanded a division at Alma, and rendered important services at Inkermann 1854, for which he received the thanks of the British Parliament. He was disabled by a wound at the siege of Sebastopol, Sept., 1855, but was, on account of his great merits, made a senator and marshal of France in 1856. He took, however, no part in politics. D. Feb. 5, 1861.

Boss, Lewis: astronomer; b. at Providence, R. I., Oct. 26, 1846; graduated at Dartmouth College in 1870; in 1872 became astronomer of the U. S. northern boundary commission, a position which he held during four years. His duty was to prepare the data for a very accurate determination of the latitudes of the various points of observation on the boundary line, and in order to do this he prepared a catalogue of the declinations of 500 of the principal fixed stars. This work was done with such thoroughness and ability that it at once gave the author, who was previously unknown, a European reputation, and has since been adopted as the standard by the office of the American Ephemeris. In 1876 he was appointed director of the Dudley Observatory, Albany, N. Y., where he undertook the preparation of one of the catalogues of stars which were being prepared by co-operation among several of the leading observatories of Europe. He pushed this work with such energy that, although he was the last to enter the field, his completed work was the first to be published. In 1882 he went to Santiago, Chili, as chief of the U. S. party to observe the transit of Venus. In 1889 he was elected a member of the National Academy of Sciences, and in 1890 an honorary foreign associate of the Royal Astronomical Society.

S. Newcomb.

Bossi, bos'sĕe, Luigi: Italian antiquary and historian; b. in Milan, Feb. 28, 1785. He was appointed prefect of the archives of the kingdom of Italy by Napoleon. Among his numerous works are a *History of Italy* (19 vols., 1819–23) and an *Introduction to the Study of the Arts of Design.* D. in Milan, Apr. 10, 1835. See G. B. Carta, *Cenni biografici intorno al Cavaliere L. Bossi* (1835).

Bossuet, bos'sü'ay', Jacques Bénigne, D. D.: French pulpit orator and theologian; b. at Dijon, Sept. 27, 1627. He entered in 1642 the College of Navarre in Paris, where he studied Greek, Latin, philosophy, and theology. In 1652 he was ordained a priest, received the degree of doctor of divinity, and became Canon of Metz. Having become renowned as a pulpit orator, he was appointed to preach the Advent sermons before the king and court in 1661. In the ensuing years he preached in many churches of Paris, and converted Marshal Turenne to the Catholic communion. He was appointed Bishop of Condom in 1669; preceptor to the dauphin in 1670; and Bishop of Meaux in 1681. For the dauphin he wrote a *Discourse on Universal History* (Paris, 1681; latest Eng. trans. London, 1810), which marks a new stage in the study of the philosophy of history. He was also the author of four articles which were adopted by an assembly of French clergy in 1682, and which secured the liberties of the Gallican Church against papal aggression. Against the Protestants he wrote his eloquent *Exposition of the Doctrines of the Catholic Church on Subjects of Controversy* (1671; latest Eng. trans. London, 1841), but his principal polemical work against the Protestants is his *History of the Variations of the Protestant Churches* (2 vols., 1688; latest Eng. trans. Dublin, 1836, 2 vols.). It is an attempt to argue from the alleged contradictory teachings of Protestantism, as shown in the various confessions of the sixteenth and seventeenth centuries, in favor of the Church of Rome, which has doctrinal stability. But the polemic is often partisan. He was involved in a controversy with Fénelon, whom he censured for his defense of Madame Guyon and her quietism, and whom he treated in an arrogant and supercilious way without understanding him. He applauded the Revocation of the Edict of Nantes (1685). He was very learned, and particularly well read in the Bible. D. in Paris, Apr. 12, 1704. Among his most admired compositions are his *Funeral Orations* on the Prince of Condé, on the two Henriettas of England, and other eminent persons (Eng. trans.). His complete works were published at Bar-le-Duc in 10 vols., 4to, 1877; and some recently discovered at Paris, 1883, 2 vols. See L. F. de Bausset, *Histoire de Bossuet* (4 vols., Versailles, 1814; 2d ed. Besançon, 1846, 3 vols.); l'Abbé François le Dieu, *Mémoires et Journal sur la Vie et les Ouvrages de Bossuet* (4 vols., Paris, 1856–57); A. Floquet, *Études sur la Vie de Bossuet, jusqu'à son entrée en fonctions en qualité de précepteur du dauphin 1627–1670* (3 vols., 1855); same author, *Bossuet précepteur du Dauphin et Évêque à la Cour 1670–1682* (1864); H. L. Farrer [Lear], *Bossuet and his Contemporaries* (London, 1874; 2d ed. 1877); G. Lanson, *Bossuet* (1891).

Revised by S. M. Jackson.

Bossut, bos'sü', Charles: French geometer; b. near Lyons, Aug. 11, 1730; was a friend of Fontenelle. He was admitted into the Academy of Sciences in 1768. Among his works are a *Treatise on Mechanics and Dynamics* (1763); a *Complete Course of Mathematics* (7 vols., 1795–1801); and an *Essay on the General History of Mathematics* (2 vols., 1802). He published an edition of Pascal's works. D. Jan. 14, 1814. See J. B. J. Delambre, *Éloge de Bossut.*

Bostan, Al: See Albistan.

Boston: a complex but exceedingly interesting game of cards, played with two packs, which count as in whist. The players bid in turn for the privilege of undertaking to do any one of fifteen different things, which rank in the order of difficulty, and vary from taking all the tricks to playing with hand open on the table and taking no tricks. There are, consequently, no poor hands, as in whist. For the somewhat complicated details of the game, see *Hoyle's Games.*

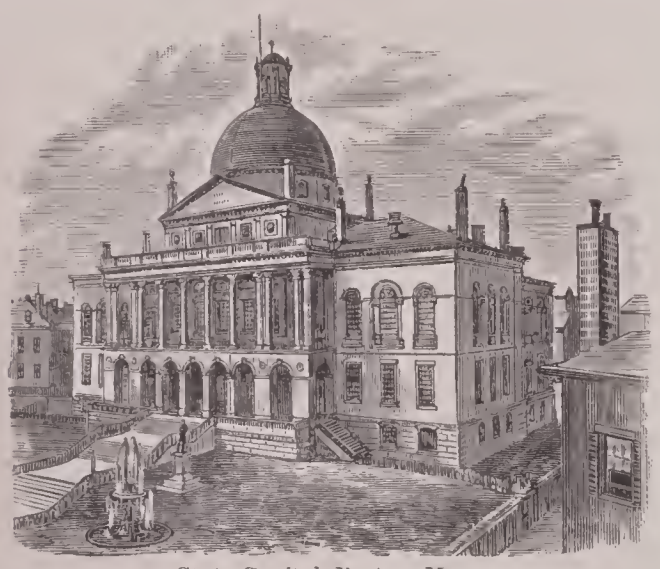
Boston [perhaps degenerated from Botolph's Town]: an ancient borough and seaport of Lincolnshire, England; is on both sides of the river Witham (see map of England, ref. 8–J). It is on the Great Northern Railway; 107 miles by rail N. of London. Vessels of 300 tons can ascend the river to this place, which is supposed to be identical with Icanhoe, where St. Botolph founded an abbey in 654 A. D. About 1200 Boston was one of the chief seaports of England. Here is the parish church of St. Botolph, built in 1309, 245 feet long, with a tower 290 feet high, surmounted by a lantern which is visible nearly 40 miles at sea. Boston has

manufactures of canvas, iron, brass, ropes, hats, leather, etc. Pop. (1891) 14,593.

Boston: the capital of Massachusetts, in Suffolk co. (for location, see map of Massachusetts, ref. 3–I), and the metropolis of New England; situated at the west extremity of Massachusetts Bay, about 450 miles by railroad N. E. of Washington, and 232 miles N. E. of New York; the State-house is in lat. 42° 21′ 27·6″ N., lon. 71° 3′ 30″ W. Founded in 1630 by Puritan colonists from England under the lead of John Winthrop and Thomas Dudley.

Original Site.—The site was originally a pear-shaped peninsula, in its extreme length less than 2 miles, and its greatest breadth a little more than 1, bounded N. and W. by the Charles river, expanded into a broad estuary in its northwest sweep into the deep water of the harbor. The peninsula was attached to the mainland at Roxbury by a narrow stem or neck a mile in length, between tide-washed flats often submerged. The water on the N. of this isthmus was an inlet of the Charles river nearly a mile wide, called the Back Bay, and that on the S. was an inlet of the harbor, called the South Bay. The peninsula was indented by coves and bordered by salt-marshes, and its surface was abrupt, irregular, and diversified by three hills. Such essentially were the natural features of Boston till after the Revolution, with narrow, crooked streets, lanes, alleys, and detached buildings, only four being of stone, of which King's chapel yet remains, and comparatively few of brick, the latter including Faneuil Hall, the Town (now Old State) house, Christ church, and the Old South meeting-house, still treasured landmarks. At the Revolution it was the richest and most populous city in the U. S., yet it contained only 2,000 buildings and less than 20,000 inhabitants.

Modern Changes.—Excepting three ancient burying-grounds and a few old buildings, not a vestige of the town as it appeared a century ago remains. The original site has been completely transformed. Every part has been graded, the steep hills having been reduced or wholly removed. The highest remaining eminence, Beacon Hill, crowned by the State-house (the old part, or "Bulfinch Front," so called from its architect, Charles Bulfinch, built in 1795; the extension, or "State-house Annex," 1889–97), rises now but 110 feet, its original height having been 138 feet. The coves, inlets, creeks, and marshes of the northerly borders



State Capitol, Boston, Mass.

have been converted into solid land covered with thoroughfares and business blocks, and fringed with wharves and docks; the broad bays on the opposite side have been filled; and thousands of acres and flats on the E., W., and S. have been reclaimed and covered by streets, squares, warehouses, and dwellings; so that where the area was the narrowest it has become the widest, and the original 783 acres of solid land comprised in the old peninsula have become 1,829. By the annexation of neighboring cities and towns, and the reclamation of the flats of what are now South Boston and East Boston, districts earlier absorbed, additional territory has been acquired, increasing the aggregate area within the city limits to 23,707 acres (37·04 sq. miles)—more than 30 times the extent of the original area. The extreme length of Boston from N. to S. is now 11 miles, and the breadth E. to W. 9 miles. South Boston was formerly Dorchester Neck, a part of Dorchester, annexed to Boston in 1804, and East Boston was Noddle's island. The other territorial acquisitions were the city of Roxbury, annexed in 1868; the town of Dorchester in 1870; and the city and towns of Charlestown, West Roxbury, and Brighton, in 1874.

Streets and Buildings.—The watercourses around Boston proper are spanned by numerous bridges, East Boston only being reached by ferry, that the harbor may be open to the navy-yard in the Charlestown district. Washington Street (originally a series of streets bearing different names), now extending from Haymarket Square to and through the Roxbury district, has always been the main thoroughfare. Tremont Street, from Scollay Square also to Roxbury, is an-

The City Hall.

other important artery. State Street is the financial center. Atlantic Avenue, 100 feet wide, extends along a portion of the water-front at the head of the principal wharves. Many of the old streets have been straightened, widened, and extended at enormous expense; and in place of the waters of the Back Bay has grown up the "Back Bay quarter," a region of broad streets and stately avenues, costly and often elegant dwellings, noble churches, fine public and private buildings, famous institutions, great hotels and apartment-houses: remarkable especially for the taste displayed in its embellishment and the richness and variety of its architecture. Beacon Street, sweeping over Beacon Hill, for years the finest residential quarter, is now continued across the Back Bay into the Brighton district as a broad boulevard. Commonwealth Avenue, 250 feet wide, with a mall in the center, also extending through the Back Bay section to and through the Brighton district, is one of the finest boulevards in the world. Near the heart of Boston proper is the Common, set apart for public use by the first settlers, a rare old park (48⅝ acres), with broad malls and pleasant by-paths shaded by elms, lindens, and other graceful trees; and beyond, separated from it by a single street, is the Public Garden (24¼ acres), the gateway to the Back Bay quarter. In these parks and other public places are numerous statues and monuments, of which the most noted are the Robert G. Shaw monument, by Augustus St. Gaudens, on the Common; the statues of Benjamin Franklin and Josiah Quincy in front of the City Hall; the equestrian statue of Washington, by Thomas Ball, in the Public Garden; and the statues of Alexander Hamilton, General John Glover of Revolutionary war fame, William Lloyd Garrison, and Leif Ericson, in Commonwealth-avenue parkway. The greater public-park system consists of a chain of parks beginning with the Back Bay Fens, and extending through parkways to the Arboretum (223 acres) and Franklin Park (527 acres) in the West Roxbury district, and along the shores of Dorchester Bay to the Marine Park at South Boston. The system also includes an embankment along a part of the city shore of the Charles river, and various independent parks. It embraces in all an area of 2354·67 acres. The amount expended by the city for land and construction, from the institution of the system to 1901, is upward of $16,600,000. The street electric railway system is one of the largest in the world under a single man-

BOSTON

INDEX.

Railroad Stations.

Boston & Maine R. R. Eastern Div. } Union or
Western " } North
Southern " } Sta., D 3
Fitchburg " }
N. Y., N. H. & Hartford R. R. } Terminal or So. Sta., D 4
Providence Div.
Plymouth "
New England "
N. Y. Central R. R. }
Bost. & Alb. Div. }
Boston, Revere Beach & Lynn R. R., F 3

Hotels.

1. Adams, C 4
2. American, D 3
3. Bellevue, D 3
4. Boston Tavern, D 4
5. Brunswick, C 4
6. Castle Square, C 5
7. Clark's, D 4
8. Crawford, D 3
9. Copley Square, B 5
10. Essex, D 4
11. Langham, B 6
12. Lenox, B 4
13. Nottingham, B 5
14. Parker, D 4
15. Quincy, D 3
16. Revere, D 3
17. Reynolds, D 4
18. Savoy, C 4
19. Somerset, A 4
20. Thorndike, C 4
21. Touraine, C 4
22. United States, D 4
23. Vendome, B 4
24. Victoria, B 4
25. Westminster, B 4
26. Young's, D 3

Public Buildings, etc.

27. Boston Atheneum, D 4
28. Boston University, D 3
29. Bunker Hill Mon't, D 2
30. Chamber of Com., D 4
31. City Hall, D 4
32. City Hospital, C 6
33. County C.H. (new), D 3
34. County C. H. (old), D 3
35. County Jail, C 3
36. Custom House, D 3
37. Emancipat'n Mon't, C 4
38. Faneuil Hall, D 3
39. Mass. Charitable Mechanic Assoc., B 5
40. Mass. Gen. Hosp., C 3
41. Mass. Hist. Soc., A 5
43. Mass. Inst. Tech., C 4
44. Mass. Normal Art School, B 4
45. Masonic Temple, C 4
46. Museum of Fine Arts, B 5
47. Museum of Nat. History, C 4
48. Navy Yard, D 2
49. N. E. Conservatory of Music, C 6
50. N. E. Historical Genealogical Soc., D 3
51. Odd Fellows' Hall, C 5
52. Old South Meeting-house, D 4
53. Old State House, D 3
54. Paine Memorial Hall, C 5
55. Perkins' Institution for the Blind, E 6
56. Post Office and Federal Courts, D 4
57. Public Library, B 4
58. Quincy Market, D 3
59. Soldiers' Monum't, C 4
60. State House, C 3
61. State Prison, C 2
62. Stock Exchange, D 3
63. Y. M. C. Assoc., C 4
64. Y. M. C. Union, C 4

Theatres, etc.

65. Castle Square Theatre, C 5
66. Colonial Theatre, C 4
67. Columbia Theatre, C 5
68. Grand Museum, C 5
69. Boston Museum, D 3
70. Boston Theatre, D 4
71. Bowdoin Square Theatre, D 3
72. Grand Opera House, C 5
73. Hollis St. Theatre, C 4
74. Horticultural Hall, B 5
75. Howard Atheneum, D 3
76. Keith's Theatre, D 4
77. Mechanics' Hall (see 39), B 5
78. Palace Theatre, D 3
79. Park Theatre, C 4
80. Symphony Hall, B 5
81. Tremont Temple (for lectures, etc.; also Baptist Churc..), D 4
82. Tremont Theatre, C 4

Churches.

83. Advent P. E., C 4
84. Arlington St. Unit., C 4
85. Cathedral, R. C., C 5
86. Central Cong., C 4
87. Christ P. E., D 3
88. Columbus Ave. Univ., C 5
89. Disciples, Unit., B 5
90. Emanuel P. E., C 4
91. Every Day Institutional, B 6
92. First Baptist, B 4
93. First Unit., B 4
94. Im. Conception, R. C., C 6
95. King's Chapel, Unit., D 4
96. Mt. Vernon Cong., A 4
97. New Old South Cong., B 4
98. Park St. Cong., D 4
99. People's Temple, M. E., C 4
100. St. John Evangelist, P. E., C 3
101. St. Mary's R. C., D 3
102. St. Paul's P. E., D 4
103. Second Unitarian, B 4
104. South Cong., Unit., C 5
105. Spiritual Temple, B 4
106. Tremont St. M.E., B 5
107. Tremont Temple, Baptist (see 81), D 4
108. Trinity, P. E., B 4
109. Warren Ave Baptist, B 5

SOUTH BOSTON
SOUTH BAY
ROXBURY
THE CALF PASTURE
SCALE OF MILES
0 1/8 1/4 1/2
Street Car Lines
Railroads
City Pt.
Marine Park
Pleasure Bay
INDEPENDENCE SQUARE
House of Correction
Insane Hospital
Boston Yacht Club House
School for Idiots
Pumping Sta.
Thomas Park
Telegraph Hill
Reservoir
Commonwealth Park
City Hospital
Washington Park
Orchard Park
FRANKLIN PARK
SAVIN HILL
UPHAM'S CORNER
FENS
BACK BAY
Mass. Charitable Mechanic Ass'n
Chickering Sta.
Notre Dame Academy
N. E. Hospital for Women
NEW YORK NEW HAVEN & HARTFORD R. R.
OLD COLONY SYSTEM
NEW ENGLAND
FORT POINT CHANNEL
Roxbury Canal
A
B
C
D
E
F
5
6
7
8

agement. The Subway, an underground roadway, in part four-track and in part two-track, carries the street-car traffic through portions of the heart of the city. It was built by the municipality, under the direction of a Transit Commission, in 1897–99, at a cost of $4,400,000, and leased to the local street railway company for a period of twenty years at a rental of 4½ per cent. of its cost. An elevated system between the Roxbury and Charlestown districts, completed in 1901, is connected with the Subway. The steam railways radiating from the city, formerly 5, subsequently consolidated into 3 great systems, connect Boston with all parts of New England, and the far West, South, and East. They enter two great stations, the Union Station at the north, and the South, or Terminal, Station, at the south. The latter is claimed to be the largest railway station in the country.

Public Free Schools and Libraries.—The system of public schools comprises kindergarten, primary, grammar, high, Latin, normal, and special schools, in which in 1901 86,719 pupils were taught by 1,970 teachers. There are 226 school-houses. The total school expenses, exclusive of school building, repairs, etc., for 1900–01 were $2,977,282. The system is wholly supported by money drawn from the general tax levy of the city. The school board is composed of 24 members, 8 elected annually by the citizens for three years. Women, qualifying for the purpose, are eligible to election to the board. The supervision of the schools is exercised by a superintendent and 6 supervisors, salaried officials. In the number and extent of its libraries Boston stands at the head of American cities. The Boston Public Library, opened in 1854, is wholly free, and is supported by the city at an annual expense of about $255,000. It is the largest library in the world for free circulation. With its 10 branches it contains 746,383 volumes, and the annual circulation is over 1,250,000 volumes. Its executive force consists of 140 persons. A new public library building on Copley Square, Back Bay, costing upward of $2,225,000, was built in 1888–95. It is a monumental structure, of elegant proportions, the interior especially enriched by some of the best of modern decorative work. Among other notable libraries are those of the Boston Athenæum (founded in 1807), the Massachusetts Historical Society (1791), the N. E. Historic-Genealogical Society (1845), and the State Library. Conspicuous among the higher institutions for instruction are the Massachusetts Institute of Technology, the Boston University, the Boston College (Roman Catholic), the medical and dental schools connected with Harvard University, the Massachusetts Normal Art School, and the New England Conservatory of Music. The Boston Museum of Fine Arts (organized 1870) ranks among the most important in the world.

Commerce and Finance.—Boston has been from the first a leading commercial city. Its advantageous situation upon a harbor, deep, secure, unobstructed by sand-bars, and containing nearly 60 sq. miles of anchorage, was early appreciated by the people, and the shipping interests were steadily extended. It is the principal mart of the country for the sale of wool, shoes, and leather, and the business and financial center of most of the manufacturing establishments of New England. The first bank in America was established in Boston, in 1686, and the first savings institution, in 1816. In 1901 there were 43 national banks with a total capital of $38,500,000; 13 trust companies, $8,500,000; and 17 savings-banks. The valuation of taxable property in Boston, May 1, 1900, was $1,129,175,832; the tax levy, $16,928,136; the tax rate, $14.70. The net debt in 1900 was $51,385,764. The current expenses for the same year were $30,000,000.

History.—Boston was named (Sept. 17—7 o. s.—1630) for old Boston in England, in honor of leaders of the Winthrop company who came from that place. The newcomers first called it Trimountain, from the three peaks which Beacon Hill originally showed. Its Indian name was Shawmut. It remained for nearly two centuries under the simple form of a town government by all the citizens assembled in "town-meeting." The city charter was granted in 1822. The present government is composed of a mayor, a board of 13 aldermen, and a common council of 72, the mayor elected biennially, and the aldermen and councilmen annually, the 13 aldermen chosen in 11 aldermanic districts. There are commissioners for fire, water, health, streets, parks, public institutions, and police, and boards for various other departments of the public service. In and near Boston were enacted the first scenes of the drama of the Revolution. From the old town the British troops went out to meet the "embattled farmers" at Lexington and Concord, and to fight the battle of Bunker Hill, the site of which is now within the city limits; then followed the "siege of Boston" and the evacuation by the British, forced by Washington, Mar. 17, 1776. On the evening of Nov. 9, 1872, the great Boston fire broke out and destroyed the most substantial business portion of the city, sweeping over 65 acres, and involving a loss of upward of $75,000,000. In a little more than two years the whole "burnt district," with widened and improved thoroughfares, was again covered with solid business edifices. Pop. (1800) 24,937; (1880) 362,839; (1890) 448,477; (1900) 560,892. Revised by Edwin M. Bacon.

Boston University: chartered by the Legislature of Massachusetts in 1869, is in organization and in its affiliations unique. There are two departments, admission to which does not presuppose a preliminary collegiate education, and these are called the Colleges of Liberal Arts and Agriculture respectively. There are three for students who have completed a course in the liberal arts—viz., the Schools of Theology, Law, and Medicine. All these colleges and schools have separate faculties and separate administrations. There is also a department of general post-graduate study in language, philosophy, and science, known as the School of All Sciences. The university council consists of the president of the university and the deans of all the colleges and schools. The university senate consists of all members of the university council, together with all regular professors in the different faculties. The corporation consists of not less than ten nor more than thirty trustees, each elected for a term of five years. Property to the amount of $1,492,000 is held by this body. The three original corporators were Isaac Rich, Esq., the Hon. Lee Claflin, and the Hon. Jacob Sleeper, all of whom had held responsible positions in the government of one or more of the older New England colleges, and the last of whom had served as a State-appointed overseer of Harvard University for twelve years. Sixty-four free scholarships in the College of Liberal Arts have been established in honor of Isaac Rich, first founder and the chief benefactor of the university. Two fellowships and more than 200 other scholarships have been founded in the university. The place of the College of Agriculture is supplied by the Massachusetts Agricultural College, at Amherst, Mass. By virtue of a special arrangement, the faculties of the National University, at Athens, and of the Royal University, at Rome, are so associated with the School of All Sciences that students in the latter can receive instruction in those universities without charge, and on returning and passing the requisite examination be promoted to advanced degrees in Boston University. W. F. Warren.

Bos'tra, or **Bots'rah**, sometimes spelled **Boz'rah**: formerly a great city of Arabia, now in ruins; in an oasis of the Syrian desert, about 75 miles S. of Damascus, and about 40 miles E. of the Jordan. It was in the southern part of the district of Auranitis, the modern Hauran, of which it was the capital in the Middle Ages. It was beautified by Trajan, who made it the capital of the Roman province of Arabia about 105 A. D. The Roman Emperor Philip gave it the title of *Metropolis*, probably because it was his native place. It was described as a great and populous city about 300 A. D. The important ruins of Bostra are described by Burckhardt in his *Travels* and Robinson in his *Biblical Researches* (vol. iii.). *Bostra*, though sometimes called *Bozrah*, must not be confounded with the Idumean city of that name. See Bozrah.

Bos'well, James, of Auchinleck: biographer of Dr. Johnson; b. at Edinburgh, Oct. 29, 1740. He studied law, and in 1763 became acquainted with Dr. Johnson; in 1773 was chosen a member of the literary club established by the latter in London. He diligently noted and recorded the sayings, opinions, and actions of Dr. Johnson, of whom he was an intimate associate. His *Life of Samuel Johnson* (2 vols., London, 1791) is a remarkable, and in many respects an admirable, biography; best ed. by George Birkbeck Hill, 1887, 6 vols. D. in London, May 19, 1795. See Macaulay's review of Boswell's *Life of Johnson* in the *Edinburgh Review* for 1831, and *Life* by Percy Fitzgerald, 1891, 2 vols.

Boswel'lia (named in honor of John Boswell, a physician): a genus of trees of the family *Burseraceæ*, natives of India, Persia, and Arabia. The flowers have five petals and a crenulated granular disk. The fruit is a triangular capsule with three valves, three cells, and one seed in each cell. The number of known species is small. The *Boswellia serrata* is a large tree with pinnate leaves, each of which has

about ten pairs of hairy, serrate leaflets and one odd leaflet. It has small pink flowers in axillary racemes. This tree yields the fragrant resin called *olibanum*, which is believed to be identical with the frankincense of the ancients. See OLIBANUM.

Bos'worth: a market-town of Leicestershire, England; on an eminence 10 miles W. of Leicester (see map of England, ref. 9–H). On a moor near this town was fought in Aug., 1485, the battle of Bosworth, or Bosworth Field, in which Richard III. was defeated and killed. This battle terminated the civil war of the Roses, and raised Henry VII. to the throne.

Bosworth, JOSEPH, D. D., F. R. S.: philologist; b. in Derbyshire, England, 1789; took degree of M. A., and later LL. D., at Aberdeen; studied at Trinity College, Cambridge; was ordained priest 1815; became vicar of Horwood Parva, in Buckinghamshire, 1817; resided in Holland as British chaplain 1829–40; became vicar of Waith, Lincolnshire, 1840; rector of Water Shelford, Buckinghamshire, 1857; Rawlinson Professor of Anglo-Saxon, Oxford, 1858. D. at Water Shelford, May 27, 1876. He devoted much time to the study of Anglo-Saxon, and published a *Dictionary of the Anglo-Saxon Language* (1838), an enlarged edition of which, by T. N. Toller, is now being published at Oxford (1882–1892).

Botanic Garden: a garden in which collections of growing plants are reared for the purpose of instruction or scientific study. Such collections have been made and temporarily maintained from time to time in the past. It is said that Mithridates and Attalus established botanic gardens in Pontus and Pargamus more than 2,000 years ago, in which poisonous plants were reared and experiments made with others as antidotes to poisons. Modern botanic gardens are usually connected with universities, or are under government control for economic purposes. The most noted are the Royal Gardens, at Kew, near London, which originated about 200 years ago on a private estate, afterward becoming a royal property, which was transferred to the Government in 1841 with the present title. Other botanic gardens are now maintained in Cambridge, Oxford, Edinburgh, and Dublin, the whole number in Great Britain being 11. In France there are 19 botanic gardens, of which the Jardin des Plantes in Paris is the most noteworthy. Germany has 25, nearly every important city or university town maintaining one. Austria-Hungary has 14; Switzerland, Belgium, Holland, and Scandinavia, 4 each; Italy, 21; Russia, 2; Roumania and Portugal, 2 each; Greece, Servia, Spain, and Denmark, 1 each. The total number in Europe is about 125. In many of the British colonies botanic gardens are maintained by the Government, there being in the West Indian region 3; in the Cape region, 8; Australian, 6; East Indian, 8; Canada, 1. The Dutch Gardens at Buitenzorg, in Java, are noted. There are 5 botanic gardens in South America—viz., in Rio de Janeiro, Quito, Lima, Santiago, and Buenos Ayres.

In the U. S. there are many considerable collections of plants grown for instruction and study, but few bear the name of botanic gardens. Many of the larger universities, and usually all of the agricultural colleges, have such collections, which are, in fact, botanic gardens in everything but the name. Some of the public parks, e. g. in Boston, New York, and Chicago, contain excellent botanic gardens, although they do not bear that name in published reports. The botanic garden and the Arnold Arboretum of Harvard University, the botanic gardens of the U. S. Department of Agriculture at Washington, and the Missouri Botanic Garden in St. Louis are the most extensive plant collections in this country. CHARLES E. BESSEY.

Botany [formed from Gr. *βοτάνη*, plant]: the science of the vegetable kingdom. It includes all inquiries as to the structure, physiology, development, classification, and distribution of all those living (or once living) things which we call plants.

Plant Defined.—It is no easy task to trace the line which separates plants from animals. They are unlike enough in their higher forms, but many of the lower plants and animals are so much alike that naturalists are by no means agreed as to whether they are to be placed in this or that kingdom. We can not at present frame a definition which will certainly include all plants and exclude all animals. The most we can do is to bring together those characters which separate the greater number of plants from animals, and then to associate with the plants so set off such of the remaining organisms as appear to be more plant-like than animal-like. Accordingly, we may say that, for the most part, plants are cells inclosed in walls of cellulose, or aggregates of such cells, all or part of which contain chlorophyll, by means of which they are able to appropriate carbon from inorganic matter (carbon dioxide). The organisms so set off constitute the bulk and mark the principal divisions of the vegetable kingdom.

There are, however, many plants which have suffered more or less degeneration through having become parasitic or saprophytic; these are colorless, and are incapable of appropriating carbon from carbon dioxide; they are often greatly reduced as to their vegetative organs, and in many cases even their reproductive organs have suffered great degeneration. These degraded plants must be assigned to such positions in the vegetable kingdom as will best show their relationships. It may be remarked in passing that in many attempts to define plants the true relation of these degenerated ones has been overlooked, and they have been treated as though they represented separate types instead of degradations from chlorophyll-bearing types, thus leading to no little confusion of ideas, and to a serious misunderstanding of the true nature of plants.

Anatomy and Physiology.—If we examine under a microscope some of the green slimy coating growing on the north side of a tree or wall, we find it to be composed of minute balls of soft matter (here colored green), each surrounded by a harder coat. The soft matter is known as protoplasm and its cover as the cell-wall; the protoplasm and wall are called a cell. Similar examination of a bit of compressed yeast will show similar roundish balls of soft matter, each surrounded by a cell-wall. Here, however, the protoplasm is not green, and we find on further investigation that plant protoplasm is itself not green, and that the green color is imparted by a stain to which the name chlorophyll has been given. These cells, whether green or not, freely absorb watery solutions, which are transformed into cell-matter by the protoplasm. Green cells supplied with water and carbon dioxide make the carbon compound, starch, ($C_6H_{10}O_5$) when in the sunlight, and this is afterward transformed into cell-matter. Colorless plants can not make starch, and are dependent upon other organisms for their supply of carbon. Thus while the green cell supplies itself with carbon in the starch which it makes, the yeast cell is dependent upon the starch in flour (made by some cereal). See CELL and PROTOPLASM.

Now, all plants are made up of cells having essentially the structure of those here described. In many plants all the cells are green, and able to make starch; in many others some of the cells are green, while the remainder are colorless, in which case the latter are dependent upon the former for their carbon; in still others all the cells of the plant are colorless, resulting in the complete dependence of the plant upon some other organism (parasitically or saprophytically).

In few-celled plants the cells may be alike in form and function, but as the number of cells is increased there is always a differentiation both in form and function. In the higher plants we have masses of similar cells occupying particular portions of the plant body, and having similar functions. Such cell-masses are known as tissues, and may be briefly designated as follows:

I. Soft tissue (*parenchyma*), of short, thin-walled cells.

II. Thick-angled tissue (*collenchyma*), of elongated cells whose angles are thickened.

III. Stony tissue (*sclerenchyma*), of short, thick-walled cells.

IV. Fibrous tissue, of elongated, usually pointed, thick-walled cells.

V. Milk tissue (*laticiferous tissue*), of elongated cells, or rows of cells, containing a milky fluid.

VI. Sieve tissue, of rows of enlarged and elongated cells, connected by perforated walls.

VII. Tracheary tissue, of enlarged and elongated cells with their walls thickened in rings, spirals or reticulations.

Soft tissue may be regarded as typical plant-tissue, inasmuch as it constitutes the essential part of every plant. All assimilating, growing, and reproductive organs are composed of parenchymatous cells. The other tissues are accessory, and serve to protect, strengthen, or connect the masses of soft tissue.

The simplest plants are composed entirely of soft tissue, although even here the cells may show some differentiation. In large plants there must be some means for supporting and strengthening the plant-body. This is accomplished by

the development of fibrous or stony cells, that is, by thick-walled cells, which may be long or short. These may develop in the boundary region, or in the axial. In the simplest cases these strengthening cells form poorly defined bundles of elongated cells with thickened walls, as in many brown seaweeds, red seaweeds, liverworts, and mosses; but in most ferns and flowering plants the well-developed fibers are associated with tracheary and sieve vessels, where they constitute the *fibro-vascular bundles*. A still higher structure is exhibited in those plants in which the bundles join one another at regular intervals, thus constituting a *fibro-vascular system*; and this union of the bundles may become so perfect as to form a solid woody-vascular cylinder, as in large, strong herbs, and in shrubs and trees. See HISTOLOGY, VEGETABLE.

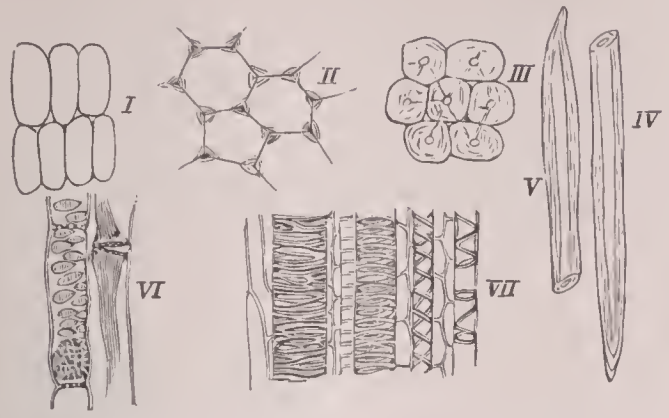


FIG. 1.—Illustrations of tissues, highly magnified: I. Soft tissue from a leaf; II. Thick-angled tissue; III. Stony tissue from hickory nut; IV. and V. Fibrous tissue in longitudinal section; VI. Sieve tissue from squash stem; VII. Tracheary tissue of various forms.

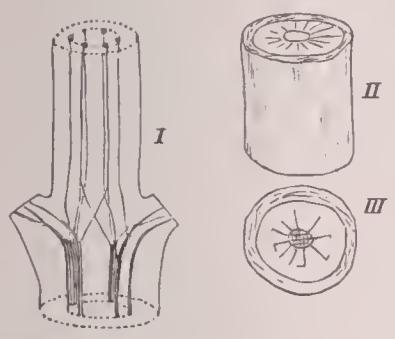


FIG. 2.—Illustrations of fibro-vascular systems: I. Diagrammatic figure showing the courses of the bundles in an herbaceous stem; II. and III. Fibro-vascular system in a woody plant, consisting of a woody cylinder with pith in the center, and surrounded by bark.

The *plant-body* in the simplest plants is the cell itself. Where the plant consists of a row of cells, there is very commonly a distinct base which is prolonged into root-like "hold-fasts," while the opposite end of the cell-row is as distinctly apical in structure. The cell-layers or masses (*thallomes*), branched or not, so common in the lower water-plants, and in some terrestrial plants, e. g. liverworts, have a marked axial polarity, and usually are distinctly bilateral. The plant-body in higher plants (*shoot* and *root*) exhibits axial polarity, and is usually polysymmetrical.

The plant-body is thus either (1) a *cell*, (2) a *filament*, (3) a *thallome*, or (4) a *shoot* (with *root*).

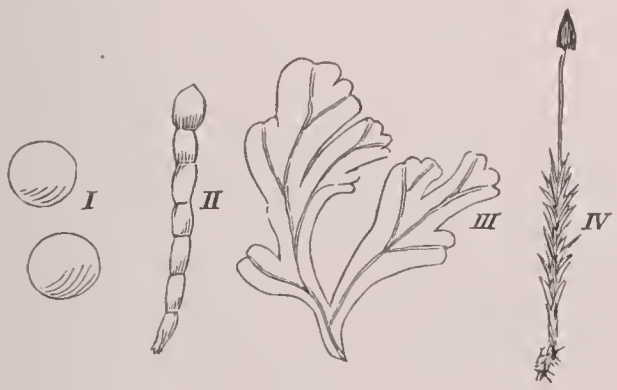


FIG. 3.—Illustrations of the plant-body: I. Simple cell of Protococcus, magnified; II. A filament, or chain of cells of Œdogonium, magnified; III. A thallome of Marchantia, natural size; IV. A shoot of a moss, slightly reduced.

All these types of plant-body may remain simple, or they may become more or less branched. Moreover, the line of demarkation between one and the other is very poorly defined. Thus a few cells may be feebly connected, forming a weak filament which very easily breaks up into separate cells. In like manner a number of filaments may cohere into a kind of weak thallome, and the thallome by lateral lobing (forming *leaves*) may approach and gradually merge into the shoot.

Terminology.—In the accurate description of plants it is necessary that many terms should be used with fixed and exact meanings. This has given rise to a myriad of technical terms which constitute the glossology or terminology of the science. It is unfortunate that these terms have been needlessly multiplied, each branch of the vegetable kingdom having, to a great extent, its special terminology. It would be out of place in this article to attempt to give a complete account of the terms used in all departments of botany. Nor is it desirable to take up those only which relate to the flowering plants, as is so frequently done, inasmuch as it would tend to confirm the too common impression that botany is essentially the study of flowering plants.

Branching.—In the branching of the plant-body there are two types, viz., terminal and lateral. In the first the

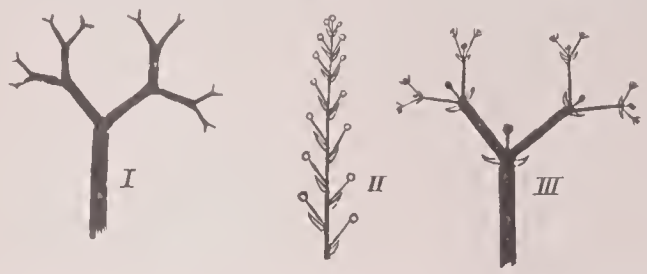


FIG. 4.—Illustrations of branching: I. Terminal (dichotomous) branching; II. and III. Lateral (monopodial) branching; II. Indefinite (or racemose); III. Definite (or cymose).

branches arise at the growing apex of the body, usually in twos (dichotomous branching), or occasionally in threes (trichotomous), or even in fours (tetrachotomous). In the second (monopodial) the branches always arise on the sides of the body, but even here they usually originate near to the growing apex. In a series of branches on the side of the plant-body those toward the base are usually the oldest, while those nearest the apex are the youngest. Occasionally a branch originates, and after a short growth ceases to develop further for a considerable period, even after the neighboring branches have become well grown. When such "latent" branches renew their growth they are apparent, but not real, exceptions to the rule that branches arise acropetally.

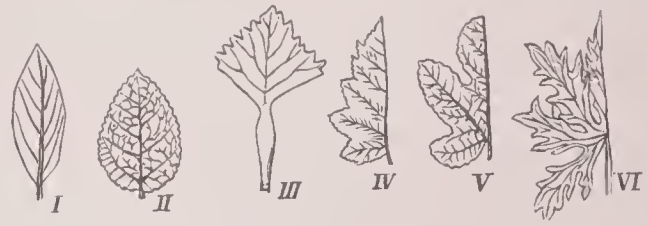


FIG. 5.—Illustrations of the branching of flat structures: I. Entire margin; II. Serrate; III. Dentate; IV. Incised; V. Lobed; VI. Parted.

In many plants where lateral branches arise, the apex of the original plant-body, or axis, continues to grow, thus producing an *indefinite* branching system (a *racemose* system); in other cases the apex soon ceases to grow, producing a *definite* branching system (a *cymose* system). All forms of both terminal and lateral branching are subject to unsymmetrical development, thus partially obscuring the plan of growth.

FIG. 6.—Illustrations of compound leaves: I. Palmately compound (three leaflets); II. Palmately compound (seven leaflets); III. Pinnately compound, with terminal leaflet; IV. Pinnately compound, with tendril at the end.

The branching of flat structures, as thallomes and leaves,

has given rise to a multitude of terms. When such structures have made no beginning in branching, the margins have an *entire* outline. When branching has barely begun, the margin may be *sinuate*, or *serrate*; when the branches have grown further, the margins may be *dentate*; or still further, *incised*; or more still, *lobed*, then *parted*, and *divided*.

In leaves where the branching has gone so far that the leaf-branches are distinct and separable, we use the term *compound*. Where the leaf-branches arise very near together, the leaf is said to be *palmately compound*; where they arise at considerable intervals, it is *pinnately compound*.

Surfaces.—In plants consisting of cell-masses the external cells are always more or less modified by contact with the surrounding medium. They usually contain less protoplasm, and quite commonly have thicker walls; this is especially true of terrestrial plants, although it may be seen in aquatics to a less degree. This outer layer is known as the epidermis. It is frequently *smooth* externally, the outer walls of the contiguous cells forming an even surface. In other cases the cells may project more or less, or they may develop short points which project above the surface and make it *rough*. These projections may be so extended as to form a *hairy* surface.

It frequently happens that a mass of cells in or beneath the epidermis grows out into a sharp, broad-based point, a prickle, as in the roses and raspberries, whose stems are

Fig. 7.—I. Prickles on a rose-stem, superficial, not connected with the woody part of the stem; II. A thorn on a plum-stem, evidently a reduced branch.

prickly. Prickles are to be distinguished from spines and thorns, the former of which are allied to hairs, being essentially superficial in structure, while the latter are stunted stem-branches, pointed and usually leafless.

Shoots.—The stem with its leaves is the shoot. It is clearly derived from, and in its simplest cases merges into, the thallome. In higher plants the stem (*axis* or *caulome*) and the leaves (*phyllomes*) are distinct, but among mosses and scale-mosses, as well as in still lower plants, this is not always the case. Where the leaves are distinct from the stem they arise as lateral outgrowths upon its growing apex, observing the law of acropetal development. As the axis elongates, leaves grow upon its newest portions. The youngest leaves are at the summit of the stem, simply because that part of the stem is the youngest.

When the stem grows rapidly in length at the same time that the leaves are growing, the latter are soon separated by considerable distances, but when the stem-growth is slow the leaves are more or less crowded. Most stems elongate rapidly during a part of the growing season, in which case the leaves are farther apart, but when the stem-growth is retarded, as it is later in the season, the leaves meanwhile continuing to grow, the result is the formation of a more or less compact cluster of leaves, termed a *bud*. A bud is thus a condition of a shoot, brought about by a retardation of stem-growth. When the stem-growth is resumed, the bud gradually disappears. See Bud.

It remains to speak briefly of the anatomy of leaves which grow in the air. The greater part of the leaf is composed of cells of soft tissue (parenchyma) containing chlorophyll. These are loosely arranged, so that there are many intercellular spaces between them. The outer cells constitute a close sheet (the epidermis) in which occur many pores (stomata). These pores may close entirely, when the interior cells of the leaf are completely cut off from the external air, or they may open, allowing free communication between the interior and exterior. The framework, which gives stiffness to the leaf, is composed of fibro-vascular bundles, which are continuous with the bundles in the stem. In the leaf the bundles are variously disposed, dependent mainly upon its shape and mode of growth. The details of the bundle-arrangement (called *venation*, from vein (Lat. *vena*), which name the bundles usually have) need not be taken up here. See Leaf and Venation.

Roots.—True roots exist only in the flowering plants and the fernworts. In the mosses, the lower part of the stem produces hairs which have the function, but not the structure, of roots. Some of the algæ have hold-fasts which approach roots in structure, and possibly are to be regarded as the foreshadowings of them.

A root is an axial structure closely allied to the stem, of which it is often the downward extension. It is always of a simpler structure than the stem, and its tissues are usually

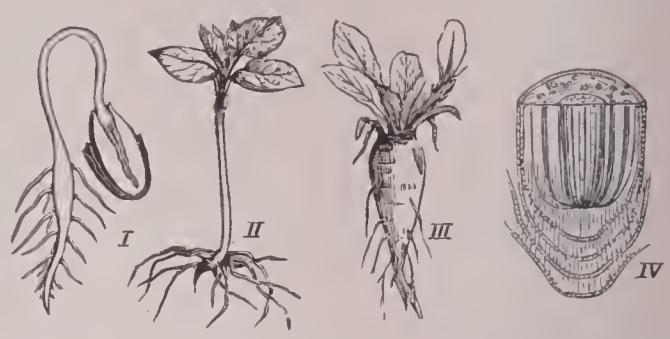


Fig. 8.—Illustrations of roots: I. Root and rootlets of young castor-oil plant; II. Roots of melon; III. Root of turnip; IV. Diagrammatic section of the tip of the root of the screw-pine (*Pandanus*), showing the root-caps in several layers.

less well marked. The boundary layer of cells (epidermis) is not as well marked as is usually the case in the stem. The absence of leaves and the rarity of shoot-buds are also noteworthy. The development of a mass of cells, the root-cap, in advance of the growing tip, is perhaps the most characteristic structure of the root.

Physiology of Larger Plants.—Enough has been said of the mode of life of single-celled or few-celled plants. In larger plants, where there are masses of cells, the physiological processes are somewhat more complicated. Food is absorbed by the cells in contact with it. In aquatics, all (or nearly all) external cells absorb watery solutions. In terrestrial plants the external root-cells absorb the watery solutions in the soil. Cells in contact with the air may absorb gases. In all cases the active agent in absorption is the living protoplasm. Some food-matter is converted into cell-matter in the cell which absorbs it from without, but much more is absorbed by neighboring cells. Thus cell No. 1 may absorb food matter from the surrounding medium (water or air); cell No. 2 may absorb nearly all of it from No. 1; so cell No. 3 may take from No. 2, and so on. In this way food-matter may be transferred rapidly from the cells in contact with the food-supply to those a long distance from it, and in this way cells obtain much of the material which they need for their sustenance and growth. It is pretty certain that the nitrogenous constituents of cells are obtained by the protoplasm directly from various nitrates and the salts of ammonia dissolved in the water. In like manner, the lime, potash, sulphur, etc., are appropriated directly by the protoplasm of the cells.

There is one process, however, viz., the assimilation of carbon (starch-making), which can be performed only in those cells of the plant which contain chlorophyll. To such cells water and carbon dioxide must be transferred from the points where they are absorbed. In a common land plant, as a tree, for example, the chlorophyll-bearing cells are confined to the leaves and young branches; the water is absorbed by the roots, while the carbon dioxide is absorbed directly by the green cells of the leaves. When a molecule of starch is made, the water is taken from the supply at hand in the cell, and this loss is made up by absorption from the neighboring cells; these again absorb from others, until finally the root-supply is reached. This hydrocarbon (starch) is now a food-matter for the cells of the plant. It is transformed into a soluble substance (often sugar), and is absorbed from cell to cell until all parts of the plant are supplied. See Assimilation.

The total food-supply for the cells of a plant is thus: (1) water, (2) solutions which are used directly by the cells, (3) the hydrocarbon made by the green cells, to which may be added (4) oxygen, which is freely absorbed by the active cells. On this food-matter the cells live and grow as so many little organisms, each with its own wants and needs. When a cell has made a sufficient growth it may divide (see Cell), and when this takes place in a considerable number of the cells of a plant we say that it grows. The growth of

the plant is but the aggregate of the growth and division of its cells.

It is a common occurrence that cells do not themselves use the food-matter which they absorb, but store it for future use. Thus they often store starch, as in many seeds and tubers, but in all cases it is eventually used by growing cells (of the young plant, in the seed; of the new shoots, in the tuber).

It may be noted in passing that "sap" as commonly understood (i. e. as a kind of vegetable blood) has no existence except in imagination. Likewise the "circulation of sap" in plants, especially in trees, has no existence. It follows that the terms "crude sap" and "elaborated sap" are founded upon error. There is water in every living cell; when active it may contain from 75 to 95 per cent. of water, or even more in some cases. So a living plant is a watery thing, and this water contains food-matters in solution. These are absorbed from cell to cell as there may be demand. So there are movements of food-matters in plants, but they are not of the nature of currents streaming through particular tracts.

The evaporation of water from the exposed surfaces of plants gives rise to a movement (usually upward) of the water in the roots and stems. While the leaves and young stems are covered with an epidermis for checking evaporation, much water escapes through the stomata when they are open to allow an interchange of gases. This water-loss from the exposed cells is followed by absorption of water from deeper-lying cells, and these again draw from others, and so on. This movement of the water, which is purely a physical phenomenon, has doubtless been taken for a "sap circulation."

Reproduction.—The lowest plants merely divide themselves into two or more parts, each of which becomes a new individual. This is the non-sexual (asexual) method, and there are few (if any) plants which do not at some time give rise to new individuals in essentially this way. In many of the simpler plants single cells are spontaneously separated from the plant-body, which on germination produce new plants. These are the asexually formed spores, commonly called conidia, summer spores, tetraspores, etc. In higher plants single cells do not separate in this way, but masses of cells, buds, leaves, and shoots sometimes spontaneously fall away and give rise to new plants.

Sexual reproduction, in which the new individual is produced as a result of the union of two cells (male and female), is pretty general throughout the vegetable kingdom. The lowest plants, the water slimes, reproduce asexually only. In those a little higher, confervas, water flannels, etc., two similar cells (similar in size, shape, and activity at least) unite their protoplasms, the resulting mass forming a spore. From this sexually produced spore a new plant arises upon germination. In the green felts the two uniting cells are manifestly different, the larger being the female and the smaller the male. In red seaweeds the union of the male and female protoplasms no longer results in the production of one spore; here the female cell after fertilization sends out branches, each of which produces one or more spores. In the mosses the female cell is inclosed within a flask-shaped organ, the archegone; after fertilization it produces a many-celled growth, which eventually develops spores from some of its internal cells, thus constituting the spore capsules. Ferns have archegones similar to those in mosses; after fertilization these give rise to leafy shoots, which eventually produce spores. The germination of the spores gives rise again to the sexual plant, the so-called prothallium. The archegones of flowering plants are feebly developed, in most cases consisting of little more than the female cell. In pines and their allies, where they are best developed, they are produced in minute dependent plants (prothallia) in the interior of the ovule. Fertilization is followed by the growth (as in ferns) of a leafy shoot (the new plant) for a time inside of the ovule (seed state), and afterward in the earth and air. In the higher flowering plants the reduction of the archegones and prothallia is carried still further. See Reproduction (in plants).

The Classification of Plants.—There are so many kinds of plants in the world that it becomes necessary for us to classify them in order that we may be able to study them intelligently, and communicate our results to others. For this purpose alone any system will suffice which enumerates all plants and designates each kind with ease and certainty. Such a system was that devised by Linnæus a little more than one hundred and fifty years ago, and used for a century or more in Europe and America, although it brought together plants of very unlike characters. That it served the general purpose of classification referred to above is proved by the fact of its long use during a period in which the study of plants made great progress.

But it is not enough to arrange plants for our convenience; we wish to make our classification show also the natural relationships which exist between plants and groups of plants In such a classification the kinds of plants "are arranged according to the totality of their morphological resemblances" (Huxley), and not upon resemblances in single and relatively unimportant structures. Moreover, these resemblances are not confined to the adult plant, but include also those observed in its early (embryonic) life. To these we must bring such aid (all too little as yet) as we may obtain from a study of the ancestral vegetation of the globe. Such a natural system, when perfected, will not only show present resemblances, but it will indicate genetic relationships. It is perhaps needless to say that no system yet proposed approaches this ideal. It will be long before vegetable embryology will have supplied us with all the embryonic characters, and it will be still longer before phytopalæontology (fossil botany) will have traced for us the lines of descent for the vegetation of to-day. See Plants (Fossil).

Species.—In the examination of living things in any particular locality it is readily seen that there are different kinds, whose individuals resemble one another more than they do the individuals of other kinds. It is observed, moreover, that in reproduction the individuals of a particular kind always give rise to new ones of the same kind. Thus seeds of purslane always produce purslane plants, and while they may not be (and generally are not) exactly alike, they are unquestionably purslanes. By the observation of many such cases we arrive at the ordinary conception of kinds of plants, that is, of species. This appears to have been the conception of species held by Linnæus and many of his followers down to about the middle of the present century.

With the advent of the idea of evolution came a change in our conception of species. We no longer conceive species as a fixed group of essentially similar organisms running back in time unchanged to a definite beginning, and forward as unchanged to a definite end only in extinction. The history of the past shows us that species have come into existence and after a time have disappeared, but it suggests that they have arisen by modifications (variations) of pre-existing species, and that often they have disappeared, not by extinction, but by undergoing considerable modifications. There may have been, and probably was, much of actual extinction of species, but it is equally certain that in many a case the species disappeared in name only, and that the succession of organisms continued in unbroken lines. The modern conception of species is that it is composed of similar but not identical organisms, forming many adjacent or contiguous genetic lines, in which the individuals are the successive points. This living stream does not necessarily maintain a fixed position in the vegetable kingdom, but may drift more or less in this or that direction.

Genera.—There are few species which do not resemble other species. Observation has shown us that this resemblance is often so close as to make a natural group of species. Thus all the kinds of violets are readily recognized as violets, while they are also as readily recognized as different species. Such groupings of species are *genera*.

Families and Orders.—Related genera are grouped into *families*, and related families into *orders*. In most English and American works on systematic botany "family" and "order" have been made synonymous, or perhaps it may be better to say that families have been called orders, while the orders have been called *cohorts*. In zoölogy families and orders stand as separate groups, and no good reason has been assigned for a different practice in botany.

Classes.—Related orders are grouped into *classes*, which thus usually include great numbers of species. It is possible now to group all known plants into about fifteen classes, viz.: (1) *Schizophyceæ*, (2) *Chlorophyceæ*, (3) *Phæophyceæ*, (4) *Coleochæteæ*, (5) *Ascomycetes*, (6) *Basidiomycetes*, (7) *Florideæ* (or *Rhodophyceæ*), (8) *Charophyceæ*, (9) *Hepaticæ*, (10) *Musci*, (11) *Filicinæ*, (12) *Equisetinæ*, (13) *Lycopodinæ*, (14) *Gymnospermæ*, and (15) *Angiospermæ*. Two of these, viz., *Ascomycetes* and *Basidiomycetes*, are composed of degraded plants only, and are doubtfully entitled to class rank.

Branches or Divisions.—The foregoing classes may be grouped into branches or divisions in various ways, according to the views of the student. There is little question

nowadays as to the disposition of the higher classes (ninth to fifteenth inclusive), nor is there any doubt that the first class constitutes the lowest branch of the vegetable kingdom. There is, however, much doubt as to the proper disposal of the second to the eighth classes. See VEGETABLE KINGDOM.

The Distribution of Plants.—Ordinary observation shows us that the spores and seeds of plants are readily distributed over the earth's surface. They are blown by the winds and carried by the water, and often by animals of various kinds. Seeds are especially provided in many cases with structural devices for wind carriage, as in the milkweed and cottonwood, where a spreading tuft of long hairs enables the seed to be floated in the air for many miles. Many fruits are winged or provided with hair tufts, so that as they are carried away by winds their contained seeds are carried also. Again, many seeds serve as food for various animals, as squirrels, rats, mice, and some birds, which often make great stores of edible seeds for their winter food-supply. Still again many fleshy fruits are eaten by animals, the seeds often being rejected or passed through the alimentary canal uninjured. Some seeds and fruits attach themselves to passing animals by means of hooks or other devices, and are carried to considerable distances. On the Western plains the whole plant, in some cases, separates from the root, and is rolled and tumbled over the prairies for many miles, dropping here and there its burden of seeds. Similar "tumbleweeds" are to be found upon the plains of South America and Southeastern Europe.

These, in brief, are the ways in which the spores and seeds of plants become distributed over the face of the earth. They may spring up into plants which may become permanent residents in the new localities, or they may fail to find the proper conditions for growth and so disappear. The discussion of these conditions belongs to GEOGRAPHICAL BOTANY (*q. v.*).

HISTORY OF BOTANY.—The following summary by Mr. Roscoe Pound gives in one view the main facts in the history of botany. Theophrastus (B. C. 300), Dioscorides (*cir.* A. D. 64), and Pliny (a little later) were the principal writers on botany in ancient times. They enumerated and described medicinal and useful plants, and explained their supposed properties. Little or nothing more was done for over a thousand years. The first after the ancients is Otto Brunfels, a German monk (d. 1534). Fuchsius (1501–66) and Clusius (de l'Écluse—1526–1609) are some of the greater names in mediæval botany. These men and their contemporaries collected extensively, and published drawings and descriptions of plants, with notes of their properties. They did not classify, but some sort of conscious arrangement is to be seen in their works.

The first classification was made by Andrea Cesalpino (Cæsalpinus), an Italian physician (d. 1602). His system contains fifteen classes based on the fruit. Cesalpino was strongly imbued with scholasticism, and founded his system on predetermined marks obtained by reasoning from the supposed nature of plants. Classification down to Jussieu was based on single characters after Cesalpino. Of later botanists, Caspar Bauhin (1560–1624) and John Ray (1628–1705) deserve especial mention. Many terms in common use were first used by them or their contemporaries; e. g. monocotyledons, umbelliferæ, polypetalæ.

Marcello Malpighi, an Italian (1628–94), and Nehemiah Grew, an Englishman (1628–1711), founded vegetable anatomy. Marriotte, a Frenchman (d. 1684), and Stephen Hales, an Englishman (1677–1761), founded vegetable physiology. R. J. Camerarius, a German (1665–1721), demonstrated by experiment the sexuality of plants. Camerarius approached the subject in true scientific manner, as would be done today. His contemporaries and botanists long after him attempted to prove sexuality by abstract reasoning without experiment.

Joseph Pitton de Tournefort is the founder of genera. He was the last to classify plants as herbs, trees, and shrubs. Johann Jacob Dillenius, a German, afterward professor at Oxford (1684–1747), and Pietro Antonio Micheli, an Italian gardener (1679–1736), are the pioneers of cryptogamic botany.

Carl von Linne (Linnæus, 1707–78) invented the binomial nomenclature, reorganized nomenclature, revised the genera of flowering plants, and fixed species about in their present form. He was no experimenter, relied on abstract reasoning more than on observation, and fastened scholasticism on systematic botany. He was an admirer of Cesalpino, and founded a system based on the stamens. At the same time he made a provisional natural system. At the beginning of this century A. L. de Jussieu took it up and greatly developed it. He is called the founder of the natural system. A. P. De Candolle (1778–1841) put Jussieu's system on a permanent basis.

Robert Brown, between 1800 and 1830, discovered the nature of the gymnospermous flower, and called attention to the cell contents. C. H. Persoon (*Synopsis Fungorum*, 1801) put mycology on a lasting basis. Von Mohl and Naegeli, between 1820 and 1860, made vegetable anatomy what it now is. Hofmeister about the same time worked out the development and embryology of pteridophytes and gymnosperms. Tulasne and De Bary, before 1860, studied the development of fungi, and caused their classification to be remodeled. Schwendener discovered the true nature of the lichens about 1868.

About 1860 the Darwinian theory put the natural system on a sure foundation by explaining the relationships on which it was based. Systematic botany is, however, very conservative, and the full effect of this has not yet been felt.

In 1874 Sachs discarded fungi and algæ as definite groups, and co-ordinated the subdivisions of the cryptogams with the phanerogams. Henceforth cryptogam, like invertebrate, is a word of convenience only.

The Study of Botany.—Some knowledge of plants should be possessed by every one. Aside from its purely utilitarian importance in agriculture, horticulture, and medicine, botany when properly studied may become an important part of the general culture of the educated man. It should therefore occupy a proper place in the course of study pursued by pupils in the schools, and the teacher should be prepared to give instruction in accordance with the present state of the science. It is unfortunately true, however, that much of the study (and teaching) of botany is a full century behind the modern science, and the culture which it should give is wanting.

In beginning the study of botany it must be clearly understood that it is only by the study of *plants* that we can know plants. It is not a "book study," but rather a laboratory study, in which much of the laboratory is to be found in the fields and forests. The beginner should first of all make the acquaintance of a good number of representative plants. This he should accomplish by actual examination himself, with not too much in the way of suggestion from teacher or books. It is a good plan for the beginner to early set about the making of a collection of the plants in his neighborhood. In so doing he will learn much about their structure, habits, and reproduction. When he has acquired some familiarity with the general structure and physiology of plants in the principal groups of the vegetable kingdom, he may profitably spend a little time in learning the details of descriptive and systematic botany in some group, commonly the flowering plants. Should he have access to descriptive manuals of other groups, it will be well for him to use these enough to give him some familiarity with them.

This accomplished, he should take up the deeper study of structure, using a compound microscope capable of magnifying fully 600 diameters. He should become acquainted with protoplasm, and the various cells and tissues it builds in simple and complex plants. He is then prepared to take up the study of the particular structure of representative plants in the principal classes and orders of the vegetable kingdom. Should he desire to pursue the subject further, there open to him now many lines of work. Thus he may take up the structure and physiology of a single plant, or he may undertake some physiological investigation, or he may turn to some department of systematic botany, etc.

See ALTERNATION OF GENERATIONS, ANCESTRY OF PLANTS, ASSIMILATION, EMBRYOLOGY (in plants), GEOGRAPHICAL BOTANY, FERTILIZATION (in plants), HERBARIUM, HISTOLOGY, VEGETABLE; LEAF, MORPHOLOGY, VEGETABLE; REPRODUCTION (in plants), PHYSIOLOGY, VEGETABLE; VEGETABLE KINGDOM; and VENATION.

BIBLIOGRAPHY.—Only general works on botany will be noted here. See the bibliographies under the special topics. Baillon, *Dictionnaire de Botanique* (3 vols., 1876–92); Balfour, *Manual of Botany* (5th ed. 1875); Bentley, *Manual of Botany* (4th ed. 1882); Bessey, *Botany for High School sand Colleges* (7th ed. 1892); Duchartre, *Éléments de Botanique* (3d ed. 1885); Goebel, *Outlines of Classification and Special Morphology of Plants* (1887); Goodale, *Physiological Botany* (1885); Gray, *Structural Botany* (1879); Jackson, *Guide to the Literature of Botany* (1881); Le Maout and Decaisne, *General System of Botany* (1876); Luerssen, *Handbuch der Systematischen Botanik* (2 vols., 1879–82); Mohl, *The Vege-*

table Cell (1852); Pritzel, *Thesaurus Literaturæ Botanicæ* (1872); Sachs, *Text-book of Botany* (1882); Sachs, *Lectures on the Physiology of Plants* (1887); Vines, *Lectures on the Physiology of Plants* (1886). CHARLES E. BESSEY.

Botany Bay: a bay of Australia; in New South Wales. It was discovered by Capt. Cook in 1770, and received its name from Joseph Banks, the botanist of the expedition, in allusion to the great number of new plants found there. It is 5 miles S. of Sydney, in lat. 34° 2′ S. and lon. 151° 13′ E. A colony of British convicts was planted here in 1787, and was removed to Port Jackson in 1788, but the penal colony long continued to retain the name of Botany Bay. The transportation of criminals to New South Wales was discontinued in 1840, on account of the often-repeated protests of the colonists.

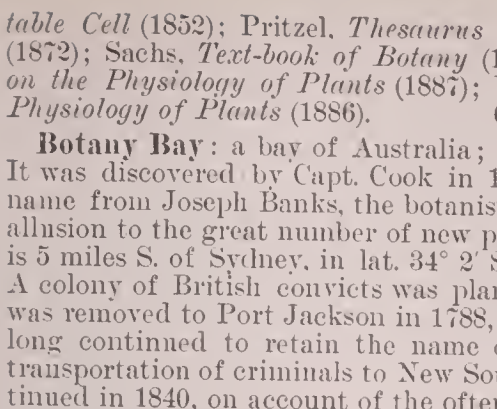
Botelho de Oliveira, bō-tāl′yō-dā-ō-lĕĕ′vā-ee′răă, MANOEL: Brazilian poet; b. at Bahia in 1636; d. Jan. 5, 1711. He was educated in Portugal, in the University of Coïmbra, and there became an enthusiastic admirer of the Spanish poet Góngora, whose works were the rage in both Spain and Portugal. He returned to Bahia and there followed the career of advocate. In 1705 his poems were published in Lisbon by the printer of the Inquisition, Manescal, under the title: *Musica do Parnasso, dividida em quatro côros de rimas portuguezas, castelhanas, italianas e latinas, com seu descante comico reduzido em duas comedias.*

A. R. MARSH.

Botero, bō-tā′rō, GIOVANNI, surnamed BENISIUS: Italian ecclesiastic and writer; b. at Bene, Piedmont, in 1540. He was secretary to St. Carlo Borromeo, and became in 1599 tutor to Charles Emmanuel's children. He wrote a noted political treatise, *Della Ragione di Stato*. D. in 1617.

Bot'etourt, NORBONNE BERKELEY, Lord: b. in England about 1734. He was appointed royal Governor of Virginia in 1768, and dissolved the Assembly of Burgesses in 1769 because they passed a remonstrance against some acts of the British Parliament. D. in Williamsburg, Va., Oct. 15, 1770.

Bot-fly: any dipterous insect of the family *Œstridæ*, but in the U. S. generally restricted to the horse bot-fly, *Gastrophilus equi*. The fly lays her eggs upon the hairs of the horse, and after laying her eggs almost immediately dies. The eggs, conveyed to the horse's stomach, are hatched, and the larvæ are provided with mouth-hooks, by which they hang on to the coats of the stomach. In about a year's time they are discharged with the excrement, and in one month they are changed into perfect flies. When very numerous there is reason to believe that bots are very injurious to the horse; but there is some dispute among horse-breeders as to the extent of the injury done by them.



Bot-fly.

Both'nia (in Swed. *Botten*): formerly a country of Northern Europe, which belonged to Sweden, and was situated on both sides of the Gulf of Bothnia. The eastern portion is now comprised in Finland, and the western forms the Swedish provinces of Piteå and Umeå.

Bothnia, Gulf of: the northern portion of the Baltic Sea; extends from Torneå southward to the island of Åland; is about 400 miles long and from 60 to 130 miles wide. It is bounded on the E. by Finland and on the W. by Sweden. Its greatest depth is about 50 fathoms. The navigation of it is rendered difficult by many small islands and sand-banks near the shores. The gulf is usually frozen in winter so that sledges can cross it.

Bothrioceph'alus [from Gr. *βοθρίον*, little trench + *κεφαλή*, head; in allusion to the depressions on each side of its head]: a genus of cestoid intestinal worms, formerly confounded with the *Tænia*, or common tapeworm. Two species occur in man, *Bothriocephalus latus* and *Bothriocephalus cordatus*. The former is common only in Switzerland, Russia, Sweden, Norway, Lapland, Finland, and Poland. It is from 6 to 20 feet in length; composed of numerous flat and wide segments, and an elongated, compressed, obtuse head, having an elongated slit-like sucker on each side. The eggs are oval, with a hood-shaped lid at one end, and are found numerously in the stools of infected persons. They develop in fresh water into an embryo having six hooklets and a ciliated covering. These enter certain fishes, especially the pike and eel-pout, where they become encysted in the tissue as cysticerci. Man is infected by eating the diseased fish. The symptoms produced are those of tapeworm in general, but occasionally a severe form of anæmia, "progressive pernicious anæmia," results. *Bothriocephalus cordatus* has been found to inhabit the human intestines only in North Greenland. In that country it is quite common in dogs. It is about a foot in length, and receives its name from the cordate or heart-shaped head. (Cobbold, *Proceedings of the Zoölogical Society*, London, 1862.) The means of destroying or expelling the "broad tapeworm," as this parasite is sometimes called, are the same as in the case of *Tænia*. See TAPEWORM.

Revised by WILLIAM PEPPER.

Both'well: a small village of Bothwell parish, Lanarkshire, Scotland; situated near the river Clyde; about 8½ miles S. E. of Glasgow (see map of Scotland, ref. 12–G). In the vicinity are the ruins of Bothwell Castle. The Covenanters were utterly routed by the troops of the Duke of Monmouth, June 22, 1679, at Bothwell Bridge. Pop. 2,600.

Bothwell: a post-town of Zone township, Bothwell electoral district, Ontario, Canada; on the Great Western Railway; 23 miles N. E. of Chatham (see map of Ontario, ref. 6–B). It has numerous petroleum-wells, and a trade in cattle, grain, and lumber, the latter being extensively manufactured here. Pop. 1,000.

Bothwell, JAMES HEPBURN, Earl of: b. about 1536; inherited the title and large estate of his father in 1556. In 1562 he was imprisoned for a conspiracy to seize the queen's person, but he escaped to France, after which he was outlawed. He returned in 1565, and became an enemy of Regent Murray and a favorite adviser of Queen Mary. The murder of Lord Darnley (1567) is generally imputed to him. He was indicted for this crime, but as he came to court with 4,000 followers he was acquitted. In Apr., 1567, many nobles signed a bond or document in which they commended Bothwell as a fit husband to the queen, whom he carried to Dunbar Castle. He married her in May of the same year. A strong party soon took arms against Bothwell, who fled to Denmark, where he was imprisoned. D. in the prison at Drangholm, Zeeland, Apr. 14, 1578. See Burton, *History of Scotland* (vol. iv.); Robertson, *History of Scotland*; and the dramas of Swinburne and Björnstjerne Björnson.

Botocu'dos, or **Aymo'res**: a native tribe of Brazil. They live in the forests on the Rio Doce, along the boundary of the provinces of Espirito Santo and Minas Geraes, and are said to resemble the Chinese. They are brave, but treacherous, and have caused the Government considerable trouble. They number about 4,000, and are rapidly dying out. They pierce the lower lip and insert a block of wood in the hole, from which comes their Portuguese name (*botoque*, a block of wood).

Botoshani, bō-tō-shaa′nĕĕ: a town in Roumania; on the Schiska; 60 miles N. W. of Jassy (see map of Austria-Hungary, ref. 6–M); carries on a considerable trade with Germany in cattle, wine, wool, tobacco, etc. Pop. 40,000.

Bo-tree, or **Pee'pul**: the *Ficus religiosa*, or sacred fig-tree of Hindustan and Ceylon; greatly venerated by the followers of Vishnu (who was born under this tree), and especially by the Bûddhists. It is a large tree, whose sap abounds in caoutchouc, and which yields a small edible fig, not much valued. Great amounts of lac are gathered from its branches, for it is one of the favorite abodes of the lac insect. The famous bo-tree of Anarajapura in Ceylon is believed, on apparently good grounds, to have been planted in 288 B. C.

Botrychium, bo-trik′i-um [Gr. *βότρυχος*, vine-stalk; *βότρυς*, cluster of grapes, in allusion to the appearance of the spore-bearing leaves]: a genus of adder-tongue ferns (*Ophioglossaceæ*) represented in the U. S. by seven species and several additional varieties. The most common species is *B. virginianum*, which occurs also in Europe and Asia. Other species—e. g. *B. lunaria* and *B. ternatum*—are widely distributed, occurring in North and South America, Europe, Asia, and Australia. See FERNWORTS and VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Botry'tis: See Mildew.

Bots'ford, Amos Edwin: Canadian Senator; b. at St. John, N. B., Sept. 25, 1804, and educated at Sackville, N. B. He has been a member of the Executive Council of New Brunswick: a member of the Legislative Council of that province 1833–67; and in 1867 was called to the Canadian Senate and has been its speaker. He has been for fifty-nine consecutive years a member of the legislature of his country; has been prominent in military and judicial affairs; and, in addition to various other important missions assigned to him, was a delegate to Washington respecting a reciprocity treaty in 1852. He was appointed a privy councilor of Canada May 30, 1891. Neil Macdonald.

Botsrah: See Bostra.

Bot'ta, Anne Charlotte Lynch: poet; b. at Bennington, Vt., in 1820. She was married to Vincenzo Botta in 1855. She published a volume of poems (1848–84) and a *Handbook of Universal Literature* (1860–87). D. in New York city, Mar. 28, 1891.

Botta, Carlo Giuseppe Guglielmo, M. D.: an eminent Italian historian; b. at San Giorgio, in Piedmont, Nov. 6, 1766. He studied medicine, and served as surgeon in the French army in 1795–96. In 1803 he was elected to the French legislative body. He published in 1809 a *History of the American War of Independence*, and in 1825 a *History of the Nations of Italy from Constantine to Napoleon* (3 vols.). His most important works are a *History of Italy from 1789 to 1814* (Storia d'Italia dal 1789 al 1814, 4 vols., 1824) and his *Continuation of Guicciardini's History of Italy to 1789* (10 vols., 1832). He died in Paris, Aug. 10, 1837. See F. Becchi, *Elogia storico di C. Botta* (1839).

Botta, Paul Émile: archæologist and traveler; a son of the preceding; b. in Turin, Dec. 2, 1802; d. in Achères, near Poissy, Mar. 29, 1870. He entered the service of Mehemet Ali of Egypt as a physician about 1830, and became French consul at Alexandria. Having visited Arabia in 1837, he published in French a *Narrative of a Journey to Yemen, etc.* (1844). He was next sent as consul to Mosul, and in 1843 began to excavate the mound at Khorsabad near the Tigris for monuments of ancient Assyria, and there discovered the palace of Sargon (King of Assyria, 722–705 B. C.) with statues and cuneiform inscriptions. With the aid of the artist Flandin, he published in French a magnificent work entitled *Monuments of Nineveh, Discovered and Described by M. Botta, with Designs by Flandin* (5 vols. folio, 1847–50). Revised by D. G. Lyon.

Botta, Vincenzo, Ph. D.: b. near Turin, Italy, Nov. 11, 1818; became Professor of Philosophy at Cuneo, and afterward at Turin; a member of the parliament in 1849; in 1850 inspected the educational system of Germany, and in 1853 that of the U. S., and became Professor of Italian Literature in the University of the City of New York. Among his works are a *Life of Cavour* (New York, 1862); *Dante as Philosopher, Patriot, and Poet* (1865); and a history of modern philosophy in Italy. D. in New York, Oct. 5, 1894.

Bottesini, bot-tā-see'nĕe, Giovanni: musician; celebrated not only as a composer but also as the most remarkable performer on the double-bass ever known; b. at Crema, in Lombardy, Dec. 24, 1822; admitted to the Milan Conservatory when eleven years old, and took up the double-bass as a solo instrument; visited the U. S. with Arditi, and made a successful tour. His first opera, *Christophe Colombe*, was produced in Havana in 1846. Visited England in 1849, and conducted the Italian opera in Paris 1855–57, and afterward conductor at the Italian opera, Cairo, Egypt. His opera *L'Assedio di Firenze* was produced in Paris in 1856; *Ali Baba*, London, 1871; *Ero e Leandro*, Turin, 1879; and at the Norwich festival of 1887 his oratorio *The Garden of Olivet*, libretto by Joseph Bennett, was successfully sung. He died in 1889. D. E. Hervey.

Bött'ger, written also **Bött'cher**, or **Böt'tiger**, Johann Friedrich: a German alchemist; noted as the inventor of Meissen porcelain; b. at Schleiz, Feb. 4, 1682. He spent much time and money in the search for the philosopher's stone. D. in Dresden, Mar. 13, 1719.

Botticelli, Sandro: See Filipepi.

Böttticher, Paul: See Lagarde, Paul de.

Bottle Gourd, or **Cal'abash**: a plant of the genus *Lagenaria* and order *Cucurbitaceæ*: nearly allied to plants of the genus *Cucurbita*, in which it was formerly included. The *Lagenaria vulgaris*, or common bottle gourd, is a native of India, but is cultivated in many warm climates. It is a climbing annual, having white flowers, and a large bottle-shaped fruit with a hard rind, which is called a *calabash*, and is used for holding or dipping water. This fruit is sometimes several feet long. Some varieties of *Lagenaria* have an edible pulp, which is an important article of food.

Bottle-nose Whale, sometimes called **Bottlehead** (*Hyperoödon rostratus*): a cetaceous mammal of the family *Ziphiidæ*. It inhabits the North Atlantic and sometimes ascends rivers. It reaches a length of about 25 feet, and is remarkable for its bottle-shaped head. The name of Bottle-nose Dolphin is applied to another mammal, the *Tursiops tursio*, abundant in the North Atlantic.

Bottome, Margaret: See the Appendix.

Bottom Heat: a term applied in horticulture to the temperature communicated to certain soils, either by fermenting and decomposing substances placed underneath them, for which purpose leaves, fresh dung, and the refuse bark of the tanyard are often used, or by means of flues or hot-water apparatus. The system is applied to the cultivation of pineapples, grapes, melons, cucumbers, and other plants grown in hothouses, pits, or frames. It is one of the most important agents in the artificial cultivation of tender plants, whether flower or fruit bearing.

Bottomry [deriv. of *bottom*, lower part of hull, hull; imitation of Dutch *bodmerij*, so Germ. *Bodmerei*, Fr. *bomerie*]: the act of lending money on the pledge of a ship or on the bottom of a ship. It may be considered under the following divisions: 1, the nature of the contract; 2, its form; 3, by whom made; 4, the mode of its enforcement.

1. *The Nature of the Contract.*—It is a maritime contract, and in the nature of a wager. The substance of the contract is that if the ship returns, the loan is to be repaid with interest. If it is lost in the course of navigation, the debt is discharged, though the borrower may have abundant means for repayment. The principal of the loan being thus put at risk, the case does not come within the operation of the usury laws. Large interest is sometimes exacted—15 or 20 per cent., or even a larger rate. The proper court, however, has power, in extreme cases of excessive interest, to grant relief. Should the ship deviate from her voyage and be lost, the lender would not take that risk upon himself, but the borrower would still be liable. So if the ship be lost by the wrongful act of the borrower or the master, instead of the perils of the sea. It has been decided that the doctrine of constructive loss which applies in insurance law does not extend to a bottomry loan. This loan is not within the act of Congress, which requires mortgages and conveyances of vessels to be registered for the purpose of giving notice to subsequent grantors or to creditors. Should the ship return, the loan becomes due, and the principal and maritime interest together form a new principal, on which ordinary interest will be calculated until payment. A bottomry loan is strictly on the ship. A corresponding loan on the cargo is termed *respondentia*. It is governed by rules closely resembling those applicable to bottomry. A bottomry loan has this marked peculiarity, applicable, however, to other maritime liens: that where there are two or more in succession, the latest may have the preference, as it may be the price of the safety of the ship. In liens created regularly upon property on land it is a well-known general rule that the earliest has the preference.

2. *The Form of the Transaction.*—There is usually executed a bottomry bond. This is not, however, absolutely essential. The courts do not look so much at the technical forms as at the intent of the parties. Even if there were a sale intended as a security for a loan, evidence to show the true nature of the transaction could be adduced, and it would be enforced accordingly.

3. *By Whom Given.*—A bottomry bond may be executed either by the owner or the master of the ship in the owner's absence. The owner can execute it, in general, whenever he sees fit, so long as the transaction is in its nature maritime. A master of a ship, on the other hand, is governed by special rules. His leading duty is to navigate the ship, not to pledge nor to sell it. These latter powers are conferred upon him in extraordinary emergencies, where the exigencies require it. The lender must be prepared to show that the case is one which justifies the loan, such as stress of weather, necessity of repairs, and the like. Due measures must be taken to communicate with the owner where such communication is feasible. At the present time the

telegraph must be resorted to where it is accessible. The power of the master may in like manner in extraordinary cases extend to a pledge, or even a sale, of the cargo. The general test of his authority in all these cases is that he must exercise the diligence of a prudent owner, and that there must be an apparent necessity for the pledge or sale.

4. *Enforcement.*—A bottomry bond is enforceable in a court of admiralty—in this country in the district courts of the U. S. A proceeding is instituted against the ship, or, in technical language, *in rem*. If necessary, the ship may be sold, and the claim paid out of its proceeds. The borrower is also personally responsible. The lien of seamen for subsequent wages is superior to that of the bottomry lender. Should the latter, in order to preserve his own claim, discharge that of the seamen, he could have a lien upon the proceeds of the ship for his reimbursement, as well as a personal claim against the owners; or, in other words, he would be allowed to stand in the place of the seamen.

It may be added that if a ship, having incurred a bottomry loan, does not set out on her intended voyage, the property will not have incurred any maritime risk, and consequently the maritime interest can not be exacted, but only ordinary interest.

T. W. Dwight.

Botts, John Minor: statesman; b. at Dumfries, Prince William co., Va., Sept. 16, 1802; lost both parents by a theater fire in Richmond 1811. He was elected to Congress as a Whig in 1839, and re-elected several times, and denounced Mr. Tyler's breach with the party which had elected him Vice-President. In 1844 he supported Mr. Clay for the presidency. He opposed the repeal of the Missouri Compromise in 1854, was a firm adherent of the Union during the civil war, and afterward favored the Republican party, having suffered much inconvenience and a short imprisonment for his opinions at the hands of the Confederates. He wrote *The Great Rebellion* (1866). D. in Culpeper, Va., Jan. 8, 1869.

Bot'zen, or **Bozen** (It. *Bolsano*): a trading town of the Austrian Tyrol; at the junction of the river Talf with the Eisach; 33 miles by rail N. N. E. of Trent (see map of Austria-Hungary, ref. 7–B). It is situated in a hilly or mountainous district, is well built, and contains a gymnasium, a Gothic cathedral, and a castle; also manufactures of silk, linen, hosiery, etc. It has four annual fairs, and is an entrepôt of the trade between Italy, Germany, and Switzerland. Pop. (1890) 11,655.

Bouchard, boo'shaar', Henri Désire Abel: French physician; b. Dec. 18, 1833; M. D., University of Strassburg, 1856; appointed Professor of Anatomy in the Medical Faculty of Bordeaux 1878; author of *Essai sur les gaînes synoviales tendineuses du pied*; *Du tissu connectif*; *Nouveaux éléments d'anatomie descriptive et d'embryologie*; *Précis d'anatomie descriptive et d'embryologie.*

Boucher, bow'cher, Jonathan: philologist; b. in Blencow, Cumberland, England, Mar. 12, 1738. He removed to Virginia in 1756, when but sixteen years old. Nominated to the rectorship of Hanover parish before he was in orders, he was ordained in England March 26, 1762. In 1768 he was appointed by Gov. Eden to St. Anne's, Annapolis, and afterward to Queen Anne's, Prince George County. Sympathizing with the motherland at the breaking out of the Revolution, he returned to England in 1775, and compiled a *Glossary of Archaic and Provincial Words*. In 1797 he published *A View of the Causes and Consequences of the American Revolution*. This work was dedicated to Washington, with whom he had been personally acquainted. D. in Epsom, England, Apr. 27, 1804.

Revised by W. S. Perry.

Boucher de Crèvecœur de Perthes, boo'shay'de-krev'-kör'de-pert', Jacques: a French archæologist and naturalist; b. at Rethel, Sept. 10, 1788. His principal works are *The Creation* (5 vols., 1839–41), his principal publication; *Celtic and Antediluvian Antiquities* (1847); and *Antediluvian Man and his Works* (1860). He is regarded as the founder of the science of archæo-anthropology. D. in Abbeville, Aug. 9, 1868.

Bouches-du-Rhône, boosh'dü-rōn': a department in the southeast part of France; formerly included in Provence. Its area is 1,971 sq. miles. It is bounded N. by the Durance, which separates it from Vaucluse, E. by Var, S. by the Mediterranean, and W. by Gard. It is intersected by the Rhône, which enters the sea by several mouths, and forms a delta called the "Île de la Camargue." The surface in the east part is hilly, and is elsewhere diversified by plains, heaths, forests, and saline lakes. The grapevine and olive flourish here, and large numbers of silkworms and sheep are raised in this department. Among the public works are several canals, a railway connecting Marseilles with Lyons, and an aqueduct, 50 miles long, from the Durance to Marseilles, which is the capital. It has manufactures of cloth, hats, perfumes, wine, brandy, sugar, salt, soap, olive oil, and chemical products. It is divided into three arrondissements. Pop. (1896) 673,820.

Bouchette, Joseph: b. in Canada in 1774. In 1790 he entered the surveyor-general's office for British America, and afterward served in the volunteers and in the navy of the lakes. In 1804 he became surveyor-general. He served against the U. S. in the war of 1812. As surveyor-general he was afterward employed in establishing the southern boundary of Canada. He published (1816) a topographical and geographical description of Canada: *The British Dominions of North America* (1831); and a *Topographical Dictionary of Lower Canada* (1832). D. at Montreal, Apr. 9, 1841.

Boucicault, boo'sĕe-kō', Dion: playwright; b. in Dublin, Ireland, Dec. 26, 1822; educated by his guardian, Dr. Dionysius Lardner, and at the London University, as University College was then called. His first successful play was *London Assurance*, which he wrote in conjunction with John Brougham, and which was acted in 1841 at Covent Garden, London. He was married to Miss Agnes Robertson; removed to the U. S. in 1853, and remained till 1860, when he returned to London and brought out, at the Adelphi theater, his first, and still famous, Irish play, *The Colleen Bawn*. This is founded on Gerald Griffin's novel of *The Collegians*. In 1861 was produced at the same theater his play of *The Octoroon*, which vigorously illustrated, and by implication denounced, the evils of slavery in the Southern U. S. He remained in Great Britain till 1872, and furnished to the London stage a number of plays, among which were *The Relief of Lucknow* (1863); *The Streets of London* (1865); *Arrah-na-Pogue*; *Rip Van Winkle*; *The Flying Scud*; *The Long Strike* (1867); *How She Loves Him!*; *Foul Play* (written in collaboration with the novelist Charles Reade, 1868); *After Dark* (1869); *Formosa*; and *Kerry*. In the autumn of 1872 he appeared at Booth's theater, New York, as Shaun in *Arrah-na-Pogue*. In 1873 he produced, at Booth's theater, his beautiful Irish play of *Daddy O'Dowd*; at Wallack's theater, his *Mora* and his *Mimi*. On Dec. 25, 1873, he opened, in conjunction with Mr. William Stuart, the New Park theater, on Broadway, near Twenty-second Street, New York. *The Shaughraun*, produced at Wallack's theater in 1876, was one of his most successful dramas. He went on a professional tour to Australia, and married in 1889 Louisa Thorndyke, a young American actress. The question of the validity of the divorce proceedings with Agnes Robertson Boucicault was undetermined at the time of his death. Among his earlier works, prior to his first visit to America, were *Old Heads and Young Hearts*; *The Irish Heiress*; *The Willow Copse*; and *The Vampire*. The dramas of Boucicault are seldom, if ever, original in plot, but they are often original in action, treatment of incidents, and are bright in dialogue. He has been the means of great improvement and elevation to the Irish drama, having replaced the "ranting, roaring Irishman," with stuffed stick and black bottle, by genuine men of the Emerald Isle, such as Myles-na-Coppaleen, Shaun the Post, Kerry, and Daddy O'Dowd. As an actor, Mr. Boucicault's best successes were won in personating eccentric characters, such as Mantilini, and rustic old Irishmen, such as Daddy O'Dowd. He will also be remembered for having made dramatic authorship a remunerative profession to authors in Great Britain. This he did by asserting, maintaining, and finally establishing the principle that among theatrical attractions the play should be made predominant, and should be suitably recompensed. The change in practice that ensued may be inferred from the fact that whereas, in the earlier part of his career, Mr. Boucicault received but $300 for his *Corsican Brothers*, he obtained, in 1866, for his *Flying Scud*, $32,500. Boucicault was educated as an architect and civil engineer. As a manager he established a theater in Washington, D. C., in 1858; reconstructed the Metropolitan theater, New York, and converted it into the Winter Garden in 1859; remodeled Astley's circus and built the Westminster theater—both in London—in 1862.

He was the author of numerous newspaper essays and letters on dramatic subjects. D. in New York, Sept. 18, 1890.

Revised by B. B. Vallentine.

Boudinot, boo'di-not, Elias, LL. D.: philanthropist; b. in Philadelphia, May 2, 1740. He practiced law in New Jersey, and supported the popular cause in the Revolution. He was a member of the Continental (later U. S.) Congress in 1778–79, 1781–84; its president in 1782, in which capacity he signed the treaty of peace with Great Britain, and was director of the mint at Philadelphia from 1795 to 1805. In 1813 he was a founder of the American Board of Commissioners of Foreign Missions. In 1816 he became the first president of the American Bible Society, and so remained till his death. He wrote several works, and gave large sums of money for charitable purposes. His wife was a sister of Richard Stockton. D. in Burlington, N. J., Oct. 24, 1821.

Bouflers, boo'flār', Louis François, Duke de: French general; b. Jan. 10, 1644. He served under Turenne and Catinat; distinguished himself at Steenkerke in 1692, and became a marshal of France in 1693. He commanded at Namur when it was besieged by William III. of England in 1695, and defended Lille with success in 1708 against Prince Eugène. He commanded a wing at Malplaquet (1709), from which he made a masterly retreat. D. in Fontainebleau, Aug. 20, 1711. See *Vie du Maréchal de Bouflers* (Lille, 1852).

Bougainville, boo'găñ'veel', Louis Antoine, de: navigator; b. in Paris, Nov. 11, 1729. He was aide-de-camp to Montcalm in America in 1756; served with distinction in Germany in 1761; founded a colony in the Falkland islands, which was sold in 1766 to Spain; performed a voyage round the world in 1767–69, and discovered several islands in the South Sea, being the first Frenchman who had circumnavigated the globe. In 1771 he published a narrative of that voyage. During the American Revolution he had a high command in several naval battles between the French and British. D. Aug. 31, 1811.

Bough, bō, Samuel, R. S. A.: landscape-painter; b. at Carlisle, England, Jan. 8, 1822; at first a scene-painter; learned to work in oil and water-colors chiefly by self-instruction. Among his oil paintings are *Royal Volunteer Review* (1860); *Edinburgh from the Canal* (1862); *The Vale of Leith* (1866). Glasgow Institute possesses over 200 of his works. D. at Edinburgh, Nov. 19, 1878.

Bought Note: a memorandum given by a broker who effects a sale to the purchaser, in which the latter is notified that the property therein described has been bought for him of the seller, the price and terms being stated. A similar memorandum given to the seller is called the *sold note*. Both these memoranda and the broker's book entry should be signed, in order that they may not be excluded as evidence under the Statute of Frauds. In case of a discrepancy among them it becomes a question of fact what the real contract was. If the notes agree they will be taken to represent the contract; if they disagree, but one agrees with the entry, the contract will be presumed to be represented by the entry and the agreeing note.

Revised by F. Sturges Allen.

Boughton, baw'ton, George Henry: genre-painter; b. near Norwich, England, in 1834. When he was three years of age his parents went to Albany, N. Y.: he early took up the study of art without a master. In 1853 he made a sketching trip in Great Britain; returned to the U. S., and removed from Albany to New York in 1858. In 1860 he went to Paris, and thence to London in 1861, where he has since resided. National Academician 1871; associate Royal Academy, London, 1879; Royal Academy, 1896. His subjects are taken from the Puritan days in New England, "Knickerbocker" life in the early history of New York, and modern English scenes. His work is extremely popular both in the U. S. and in Great Britain. The *Edict of William the Testy* (1877) is in the Corcoran Art Gallery, Washington. Studio in London.

William A. Coffin.

Bougie, boo'zhee' [Fr., wax-candle: cf. Ital. *bugia*, Span. *bujia*, so named from *Bugia*, Arab. *Bijiyah*, an Algerian port from which wax was formerly exported in large quantities]: a slender surgical instrument designed to be introduced into the male urethra. It is usually made of gum-elastic or gutta-percha, but may be made of other flexible substances. Bougies are often medicated, but more commonly they are designed to act mechanically upon a contracted passage. They are sometimes made of a larger size for the rectum or for the œsophagus.

Bouguereau, boo'gă̆y-rō', Adolphe William: one of the most famous contemporary French painters; b. in La Rochelle, Nov. 30, 1825; pupil of Picot and winner of the Grand Prix de Rome in 1850. Member of the Institute; commander of the Legion of Honor 1885; medal of honor, Paris Exposition, 1878; medal of honor, Paris Salon, 1885. With the exception of Meissonier and Gérôme, his work is probably more widely known than that of any painter of the modern French school. Many of his pictures are owned in the U. S., and a number of them have become popular through engravings and other reproductive processes. He is chiefly celebrated as a painter of the nude figure, is a most skillful draughtsman, a delicate, but not forceful colorist. His *Youth of Bacchus* (1884) is one of the best of his compositions, and his *Madonna of Consolation* (1874) and his *Birth of Venus* (1879) are in the Luxembourg gallery. A picture called *Nymphs and Satyr*, painted in 1873, a fine example, is in the Hoffman House, New York. Most of the pictures by him in the U. S., however, are weakly sentimental figures of women and children, which detract from the reputation he achieved by his serious work. His abilities have been the subject of considerable difference of opinion among artists, the majority conceding him only powers of the second order. Studio in Paris.

William A. Coffin.

Bouillé, boo'lay', François Claude Amour, Marquis de: general; b. in Auvergne, France, Nov. 19, 1739; served in the Seven Years war; governor of Guadeloupe 1768; during American Revolution captured several British islands in the West Indies; member of Assembly of Notables 1787–88; commander-in-chief of the army of the Meuse, Saar, and Moselle 1790; aided Louis XVI. in his attempt to escape from Paris; served under Gustavus III. of Sweden 1791; later under Prince of Condé; d. in London, Nov. 14, 1800. Author of *Mémoires sur la Révolution Française*.

Bouillon, Godefroi de: See Godfrey of Bouillon.

Boulac: See Bulak.

Boulanger, -lăñ'zhay', Georges Ernest Jean Marie: French soldier and politician; b. at Rennes, April 29, 1837; appointed sub-lieutenant in First Regiment of Algerian Tirailleurs in 1856; received the decoration of the Legion of Honor in 1859; chief of battalion in the army of Paris during the Franco-Prussian war; appointed brigadier-general in 1880; sent to the U. S. as head of the mission to the Centennial Celebration in 1876; appointed French Minister of War Jan. 7, 1886. An energetic and capable organizer, he became the idol of the populace and the rising hope of the radicals, but eventually he brought forward measures for the reorganization of France which were accepted by Bonapartists, monarchists, clericals, and socialists. The movement known as Boulangism attracted all the malcontents, who elected him deputy for Nord by 100,000 majority, and for a time seriously disturbed political affairs in France. He fought a duel with Prime Minister Floquet, and was severely wounded, in 1888. Accused of violating his parole and conspiring to overturn the republic, he fled to Great Britain in order to avoid arrest. His trial proceeded in his absence, and he was sentenced to transportation for life. It was shown that the Duchess d'Uzès had supplied him with 3,000,000 francs for his political purposes. On Sept. 30, 1891, he shot himself on the grave of his mistress, Mme. de Bonnemain, who had followed him in exile and had supported him on her bounty during two years.

C. K. Adams.

Boulder: same as Bowlder (*q. v.*).

Boulder: a city and railroad center; capital of Boulder co., Col. (for location of county, see map of Colorado, ref. 2–E); situated at the east base of the Rocky Mountains, on both sides of Boulder creek, which flows through the famous Boulder Cañon. The State University is located here. Boulder has flouring-mills, smelting and sampling works, excellent public schools, and a complete system of water-works (the reservoir of which is fed by pure mountain-streams), and electric lights; is the center of both the agricultural and mining interests of the county, the great telluride belt of mines being only 6 to 8 miles distant, the free gold mines only 8 to 14 miles, and the famous silver mines of Caribou only 22 miles away. Coal and iron mines abound in the valley within 4 to 6 miles. This is a a favorite resort for tourists and invalids. Pop. (1880) 3,069; (1890) 3,330; (1900) 6,150.

Editor of "Herald."

Boulder-clay: same as BOWLDER-CLAY (*q. v.*).

Bou'le [Gr. βουλή, council]: the name of the ancient Athenian senate; instituted by Solon as a check on the *ecclesia* (ἐκκλησία), which was an assembly of the whole people. The boule was at first composed of 400 members, but Cleisthenes increased the number to 500 when he divided the Athenians into ten tribes. The number was subsequently raised to 600. All free-born Athenian citizens above thirty years of age were eligible to this council.

Boule, or **Boule-work**: See BUHL, or BUHL-WORK.

Boulevard' [Fr., loan-word from Germ. *Bollwerk*; Eng. *bulwark*, So. Russ. *bolverk*]: originally a kind of fortification introduced in France by the Normans after their conquest of Normandy. In France and Germany these defensive works have been generally leveled and turned into public promenades or avennes lined with trees. The Inner Boulevards of Paris form a magnificent central thoroughfare, lined on each side by a double row of trees, under which is a wide and elevated pathway, and bordered by elegant shops and mansions, the whole presenting a scene of gayety and splendor which no other capital can equal.

Boulogne, boo'lōñ', or **Boulogne-sur-Seine**, boo'lōñ'sür-sayn': a town of France; department of the Seine; on the right bank of the river Seine; 5 miles W. of Paris, from which it is separated by the BOIS DE BOULOGNE (*q. v.*). A fine stone bridge connects it with the ruined palace of St.-Cloud. It is surrounded by beautiful scenery. Pop. (1886) 30,084; (1896) 37,418.

Boulogne, or **Boulogne-sur-Mer**, -sür-mār': a seaport of France: department of Pas-de-Calais; on the English Channel; at the mouth of the Lianne; 158 miles by rail N. N. W. of Paris and 27 miles by rail S. W. of Calais; lat. 50° 44′ N., lon. 1° 37′ E. (see map of France, ref. 1–E). The railway which connects Calais with Amiens passes through it. It is divided into two parts—the upper and lower town, from the former of which the English coast is visible. The upper town has beautiful promenades, an old Gothic cathedral, an hôtel de ville, and an episcopal palace. The lower town is newer, more regular, and more populous. It contains a hospital, a theater, a museum, a public library, and an exchange. Boulogne derives much of its prosperity from English residents and visitors, who are very numerous. Steamers ply twice a day between this port and Folkestone. The harbor will admit large vessels during high water, and has been improved by the construction of vast moles at a cost of $5,000,000. Here are manufactures of linen and woolen goods, sailcloth, cordage, bottles, etc. It occupies the site of the ancient *Gesoriacum*, which after the time of Constantine the Great was called *Bononia Oceanensis*. Several centuries later the name was changed to *Bolonia*. At this place Napoleon assembled in 1804 an army of 180,000 men and a flotilla of 2,400 transports for the invasion of England. To commemorate this design, which, however, was never executed, a column 164 feet high was erected. Pop. (1891) 45,205; (1896) 46,807.

Boulogne, ÉTIENNE ANTOINE: French prelate: b. in Avignon, Dec. 26, 1747; edited during the Revolution the *Annales religieuses*, which was several times suppressed and revived with altered title. Under the empire he, as Bishop of Troyes, was imprisoned with two other bishops for declaring that the emperor had no authority to confine a bishop without the approval of the pope. He was made an archbishop in 1822. His works appeared in 1826–28, 8 vols. D. in Paris, May 13, 1825.

Boul'ton, MATTHEW: inventor; b. in Birmingham, England, Sept. 3, 1728. He was noted for his energy and enterprise as a manufacturer, and he became a friend and partner of James Watt. He established at Soho, near Birmingham, a manufactory of steam-engines in 1765. Boulton invented an improved apparatus for coining money and a new mode of inlaying steel. He was a man of generous disposition. D. in Soho, Aug. 18, 1809. See *Life of M. Boulton* (Birmingham, 1809), and S. Smiles, *Lives of Boulton and Watt* (1865).

Bou-Maza, surnamed SI MOHAMMED BEN ABDALLAH: an Arab chief; b. about 1820; followed for three years the austere life of a dervish; then, proclaiming that he was an emissary of heaven, he stirred up the Kabyles, the warlike inhabitants of Dahra in Algiers; preached the extermination of Christians, and waged war upon the allies of France, Hadj-Achmed and Sidi-Darribi. He surrendered after a protracted conflict with Gen. Herbillon, Jan. 13, 1847, and was conveyed to Paris. He afterward entered the service of the Porte, and attained the rank of colonel.

Bound, or **Bownde**, NICHOLAS, D. D.: a clergyman of the Church of England; educated at Cambridge; fellow of Peterhouse 1570; became rector of Norton, Suffolk, 1585; minister of Church of St. Andrew the Apostle, Norwich, and there he was buried Dec. 26, 1613. He published his famous work *The Doctrine of the Sabbath* (London, 1595); enlarged edition with partial Latin title, *Sabbathum Veteris et Novi Testamenti; or the True Doctrine of the Sabbath* (1606), in which the Puritan doctrine of the Lord's Day was for the first time broadly and prominently asserted. He also was an advocate of *The Holy Exercise of Fasting* (Cambridge, 1606).

Bound-bailiff: See BAILIFF.

Bound Brook: borough; in Bridgewater township, Somerset co., N. J. (for location of county, see map of New Jersey, ref. 3–C); 31 miles W. S. W. of New York. It is pleasantly situated on the Raritan river and the Delaware and Raritan Canal. It has seven churches and important woolen, engine, brass, and paint manufactures, and its trade in lumber is very extensive. Washington's army was encamped here for two winters. Pop. (1880) 934; (1890) 1,462; (1900) 2,622. EDITOR OF "CHRONICLE."

Bounty [from Fr. *bonté*, goodness, kindness; < Lat. *bo'nitas*]: a premium given by a government to foster some branch of industry, or to encourage enterprises which are believed to be of national importance and conducive to the public interests. The British Government formerly gave bounties to encourage the herring fisheries and the exportation of grain and Irish linen, and for other purposes. The modern political economists reject this factitious method of fostering commerce, agriculture, etc., and argue that it promotes a misdirection of capital, talent, and industry. The impolicy of giving bounties for such purposes appears to be now generally admitted, but they are still continued in France to promote ship-building and the production of sugar. They are often given, particularly in new countries, for the destruction of ferocious animals, as wolves, bears, etc. The general Government and some of the U. S. give bounties for tree-planting. Subsidies to sugar-planters, steamship companies, and land grants to railways are common in the U. S.

A bounty in money is also often given to induce men to enlist in the army and navy. The amount of this money varies according to the exigency and the difficulty of obtaining recruits. In 1812 the British Government offered a nominal bounty of £23 17*s.* 6*d.*, but this was subject to large deductions and drawbacks. The bounty given in Great Britain at present is about one pound sterling. In the American civil war the recruits of the Union army received in some cases a bounty of $500 or more. Many of these recruits deserted soon after they had received the bounty; these were called "bounty-jumpers."

Queen Anne's Bounty is a fund applied in England by a corporation of *ex-officio* governors to the augmentation of the incomes of the poorer clergy of the Church of England. Henry VIII. annexed to the crown the first fruits or the first year's income to a new incumbent of a benefice, and the tenths, which had previously gone to the pope. In 1703 Parliament, with the consent of Queen Anne, set aside the revenues from these sources for the increase of poor livings. In 1890 these amounted to $884,480, and the board of governors appropriate the revenue under a long series of statutes to promote private benefactions or endowments, or building of parsonages, by giving an equal sum not exceeding $1,000 to benefices having a yearly income of this amount or less.

Bounty, MUTINY OF THE: See BLIGH, WILLIAM, and PITCAIRN ISLAND.

Bouquet de la Grye, boo'kay' de-la-gree', JEAN JACQUES ANATOLE: hydrographical engineer; member of the Institute; commander of the Legion of Honor; b. in Thiers, Puy-de-Dôme, May 20, 1827; studied at the Polytechnic School, graduating in 1847 in the hydrographical engineers, of which he became engineer-in-chief in 1886. He is member of the bureau of longitudes; vice-president of the committee on hydrography; elected member of the Academy in 1884 in place of Yvon Villarceau. He is the ardent promoter of the project to make Paris a seaport by means of a ship-canal and the improvement of the Seine. Author of *Pilote des Côtes Ouest de la France*; *Notes sur la Sondage*

à la mer; *Étude hydrographique sur la baie de la Rochelle*; *Régime de la Loire maritime*; *Paris, Port de mer.*

W. R. H.

Bouquetin, boo'ke-tăñ', or **Ibex of the Alps** (in Germ. *Steinbock*): a species of wild goat (*Capra ibex*) formerly found on the Alps, and which ascends to the limit of perpetual snow. It is larger than the common goat, and has large horns which curve backward. The horns of the male are sometimes 20 inches long or more. It has no beard except a few hairs in winter. The color of the hair is mostly brown. This animal feeds on shrubs, lichens, and the scanty herbage which is found on the confines of vegetation. It has an extraordinary power of bounding from crag to crag, and of climbing precipices which are almost perpendicular. The bouquetin can be tamed if it is taken young, and it will breed with the common goat. The bouquetin is now extinct in the Alps, except possibly near Courmayeur. There are still probably forty or fifty on the mountains S. of the Dora Baltea. The bouquetin is preserved by law.

Bourbaki, boor'bă'kee', Charles Denis Sauter: French general; b. in Pau, Apr. 22, 1816: took part in the wars in the Crimea and in Italy: and in the German-French war of 1870 he commanded the imperial guards before Metz. After the deposition of Napoleon he organized the Army of the North under Gambetta; then tried with disastrous results to break the German line at Belfort. He attempted suicide, and gave up the command to Clinchant, who crossed the Swiss frontier with 84,000 men, Feb. 1, 1871. In 1873 he commanded an army-corps at Lyons; was retired from active duty in 1881. D. in Bayonne, Sept. 22, 1897.

Bourbon: a French island. See Réunion.

Bourbon: town; on railroad, Marshall co., Ind. (for location of county, see map of Indiana, ref. 2–E); 53 miles from Fort Wayne and 95 from Chicago. It has three churches, a graded school, including high-school department, wagon manufactories, a large roller flouring-mill, several boot and shoe manufactories, and various other mechanical enterprises. The surrounding country is very fertile, and some valuable timber, such as walnut, poplar, oak, maple, beech, etc., is yet standing. Large quantities of butter, eggs, poultry, wool, horses, cattle, hogs, sheep, wheat, oats, clover-seed, lumber, etc., are annually exported. Pop. (1880) 1,056; (1890) 1,064; (1900) 1,187. Editor of "Mirror."

Bourbon (Fr. pron. boor'bŏñ'): the name of a family which reigned over France from 1589 to 1792, and from 1815 to 1848. A prince of the Bourbon dynasty also obtained the throne of Spain in 1700, and another that of Naples and Sicily in 1735. The Bourbons derive their name from the castle of Bourbon, which was built in the thirteenth century, and was situated in the old province of Bourbonnais, 16 miles W. of Moulins. The heiress of the seigniory was married in 1272 to Robert, a younger son of King Louis IX. The seigniory was erected into a duchy, and Louis, a son of Robert, became about 1327 the first Duke of Bourbon. He died in 1341, and was succeeded by his son Pierre, who was killed at Poitiers in 1356. Louis, a son of Pierre, became the third Duke of Bourbon. He was one of the most powerful vassals of the crown of France, and made large additions to the duchy by his marriages. D. in 1410. His son Jean, b. in 1381, was the fourth duke. He was taken prisoner by the English at Agincourt, and detained until his death (1434). He was succeeded by his son Charles, b. in 1401. He died in 1456, leaving a son Jean, who became the sixth Duke of Bourbon and constable of France. See Bourbon, Charles de.

Among the collateral branches of the Bourbon family were those of Vendôme, Condé, Montpensier, Orléans, Conti, and Soissons. Antoine de Bourbon, Duke of Vendôme, became by marriage King of Navarre. His son, Henry of Navarre, was the first French king of the house of Bourbon, and began to reign as Henry IV. in 1589. He had two sons, Louis XIII. and Gaston, Duke of Orléans; a daughter, Elizabeth, who was married to Philip IV. of Spain, and Henrietta, who became the queen of Charles I. of England. Louis XIII., who died in 1643, left two sons, Louis XIV. and Philip, Duke of Orléans, who was the ancestor of King Louis Philippe. The dauphin, the eldest son of Louis XIV., d. in 1711, leaving three sons—1, Louis, Duke of Burgundy; 2, Philip, Duke of Anjou, who became King of Spain as Philip V.; 3, Charles, Duke of Berry. Louis of Burgundy, who died in 1712, was the father of Louis XV., who succeeded his great-grandfather, Louis XIV., in 1715. Louis XV. had one son, Louis, who died before his father, leaving three sons, who all reigned successively—namely, Louis XVI., Louis XVIII., and Charles X. Louis XVI. left one son, who by the royalists was recognized as Louis XVII., but perished as a child during the French Revolution. As the circumstances of his death remained unknown, many adventurers claimed to be Louis XVII. Louis XVIII. had no issue. Charles X. had two sons—Louis Antoine, who died without issue in 1844, and Charles Ferdinand, Duke of Berry. His only son, Henri, Duke of Bordeaux, styled Count de Chambord, was the heir to the throne, according to the Legitimists, who gave him the title of Henry V. See Chambord.

The House of Orléans is called the younger branch of the royal family of Bourbon, and is descended from Philip of Orléans, a younger brother of Louis XIV. His son Philip was regent of France during the minority of Louis XV., and left a son, Louis Philippe, Duke of Orléans. This last was the grandfather of the Duke of Orléans who figured in the Revolution as Citizen Egalité, and was father of Louis Philippe, who became King of the French in 1830. This king had five sons—the Duke of Orléans, the Duke of Nemours, the Prince de Joinville, the Duke of Aumale, and the Duke of Montpensier. The Count of Paris, the son of the eldest of these five, is regarded as the heir to the throne by the Orleanist party.

Philip, Duke of Anjou, who was placed on the throne of Spain in 1700, was the founder of a Spanish dynasty, which reigned in Spain until the dethronement of Queen Isabella in 1868, and regained the crown in 1875 through Alfonso XII. Philip of Anjou was also the ancestor of the Bourbon dynasties of Naples and Parma. Francis II., who was dethroned in Sept., 1860, was the last Bourbon monarch of Naples (or the Two Sicilies). The Bourbons have also ceased to reign in Parma, which was annexed to the kingdom of Italy in 1859. Louise of Bourbon, a daughter of the Duke of Berry and sister to the Count of Chambord, b. in 1819, d. in 1864, was married in 1845 at Frohsdorf to Charles III. of Parma, who descended from the Spanish line of the Bourbons. Charles III. was violently reactionary in his policy, and was assassinated Mar. 26, 1854. Louise immediately assumed the regency in the name of her minor son, Robert I., and she developed extraordinary energy and made great personal sacrifices in order to gain the confidence of the Italians and bring back order and peace. She was not altogether unsuccessful in her endeavors, but the tendency of the time pointed another way. See Achaintre, *Histoire Chronologique et Généalogique de la Maison Royale de Bourbon* (2 vols., 1825); Coxe, *Memoirs of the Kings of Spain of the House of Bourbon* (3 vols., 1813).

Bourbon, Charles, Duc de, usually styled Constable Bourbon (Connétable de Bourbon): French general; b. Feb. 17, 1489; son of Gilbert Bourbon, Count of Montpensier. He married the heiress of the Duke of Bourbon—Suzanne, a daughter of Pierre de Bourbon, who died in 1503—and became the owner of the vast estates of both branches of the Bourbons. But his brilliant military successes aroused the jealousy of Louis XII., who refused to make him commander-in-chief. Francis I., however, followed another policy. Charles was appointed constable of France in 1515, and was one of the generals who gained a victory at Marignano in that year. He was very popular with the soldiers and with the court, but his popularity caused his fall. The mother of Francis I. was enamored of him, but her overtures having been rejected, she became his enemy. At her instigation, the estates which he had acquired by marriage were seized by the king after the death of Suzanne. Other insults were heaped upon him. In the campaign against Charles V. the command of the vanguard was given to the Duc de Alençon. His official salaries and the sums he had borrowed for his war expenses were not paid, and he, the richest man in France, was actually reduced to beggary. Bourbon deeply resented this injury, renounced his allegiance to the King of France in 1523, and became the ally of the Emperor Charles V., for whose services he raised about 6,000 Germans. He contributed largely to the victory which the imperial army gained over the French at Pavia in 1525. It appears that he was distrusted by Charles V., who neglected to pay Bourbon's German mercenaries, and these consequently became mutinous. However, the emperor made him Duke of Milan and commander of his mercenaries in Northern Italy in 1526, and with them he conducted a daring enterprise against Rome, in which he displayed great military talent. His army

took Rome by assault May 5, 1527, but he was killed as he mounted the wall by a pistol-shot, fired, it is said, by Benvenuto Cellini. In German there is a biography by Schwartzenau (Berlin, 1852). The Constable Bourbon is a prominent character in Byron's drama *The Deformed Transformed*.

Bourdaloue, boor'dăă'loo', Louis: French pulpit orator; b. in Bourges, Aug. 20, 1632. He entered the order of Jesuits in 1648, and became professor of rhetoric and the humanities. In 1669 he removed to Paris, where he preached for many years before Louis XIV. and the court. His style of eloquence was less inflated and more direct than that which then prevailed in France. He was a general favorite with the common people, as well as the learned and higher classes. D. in Paris, May 13, 1704. His sermons were published in 16 vols., 1707–34. Perhaps the most famous among them are the sermon of the Passion; that on the Conception; and that on the Last Judgment. Eng. trans. of select sermons (n. e. London, 1884). See A. Feugère, *Bourdaloue, sa prédication et son temps* (Paris, 1874; 5th ed. 1889); M. Lauras, *Bourdaloue, sa vie et ses œuvres* (Paris, 1881).

Revised by A. R. Marsh.

Bourdon [Fr. pilgrim's staff]: in music, the humming sound produced by blowing through a long hollow staff. Hence the name given to the stop of low pitch found in all pipe-organs.

Bourg: a place of refuge or fortified place; the name of about forty villages and towns in France. The most important is **Bourg**, or **Bourg-en-Bresse**, boorg'ăăn-bres': a town of France; capital of the department of Ain; pleasantly situated on the Reyssouse; 57 miles by rail N. N. E. of Lyons (see map of France, ref. 6–H). Several railways connect it with Lyons, Mâcon, and Besançon. It is well built, has a college, a museum, a large hospital, and a public library of about 20,000 volumes. Here are manufactures of linen, cotton stuffs, hosiery, etc. Pop. (1896) 18,501.

Bourgeois, bŭr-jois': the name of a type used in printing. It is one size larger than brevier, and one size smaller than long primer. See Printing.

Bourgeois, boor'zhwăă': a French word signifying a citizen or resident of a city; a commoner, as distinguished from a nobleman; a civilian, as distinguished from a soldier. A citizen of the state or republic is called *citoyen*.

Bourgeoisie, boor'zhwăă'zee': a French term; is also much used in English, defined in dictionaries as "citizens," "citizenship," "commonalty." It is applied to the great middle class of French society, composed mostly of merchants, manufacturers, master mechanics, lawyers, etc., who live in towns and cities. They are inferior in rank to the aristocracy, and superior to the peasantry and to the *prolétaires* of the towns.

Bourges, boorzh' (anc. *Avaricum*, afterward *Bituriges*): a city of France; near its center; capital of the department of Cher; is situated in a fertile plain at the confluence of the Auron and the Eure, 146 miles by rail S. of Paris (see map of France, ref. 5–F). It is connected by railway with Paris, Orléans, Moulins, and other cities. It was inclosed by ramparts now converted into promenades or boulevards bordered with chestnut and walnut trees. The streets are crooked and the houses mostly antique. Bourges has a college, a normal school, a public library of about 25,000 volumes, a fine hôtel de ville, and a magnificent Gothic cathedral, which is considered one of the finest in Europe. It is the see of an archbishop. This town was formerly the seat of a celebrated university founded in 1463 and suppressed in 1789. It has manufactures of cutlery, woolen stuffs, etc. *Avaricum*, which occupied this site, was a very ancient town, and was the capital of Celtic Gaul about 500 B. C. It was the chief town of the Bituriges in the time of Julius Cæsar, who besieged and took it in 52 B. C., after which it became the capital of the Roman province of Aquitania. During the Middle Ages seven councils of the Church were held here, and in 1438 the Pragmatic Sanction of the Gallican Church was established here. Pop. (1886) 42,829; (1891) 45,432; (1896) 43,587.

Bourget, boor'zhay', Paul: French novelist and critic; b. at Amiens, Sept. 2, 1852; devoted himself early to journalism and literature. He has attracted much attention, on the one hand, by his work in criticism, *Études de Psychologie contemporaine* (2 series, 1883–85); *Études et Portraits* (1889); and, on the other hand, by his novels, in which the sad conclusions of so-called realist or naturalist psychology and the pessimism of the *fin du siècle* are embodied in delicate and subtle art. Among these novels the following have perhaps had most repute: *Cruelle Énigme* (1885); *Un Crime d'amour* (1886); *André Cornélis* (1887); *Mensonges* (1887); *Le Disciple* (1889); *Un cœur de femme* (1890); *La Terre Promise* (1892); *Cosmopolis* (1892); *La Duchesse Bleue* (1898); *Drames de Famille* (1900). He has published also several volumes of verse: *La vie inquiète* (1875); *Edel* (1878); *Les aveux* (1882); *Au bord de la mer*, etc. (1885).

Bourgoing, boor'gwăñ', Jean François, Baron de: French diplomatist: b. in Nevers, Nov. 20, 1748; was ambassador at different courts. During a nine years' residence in Spain he wrote, among others, a thorough book upon it, *Nouveau voyage en Espagne, etc.* D. in Carlsbad, July 20, 1811.

Bourignon, boo'rēēn'yōñ, Antoinette: a Flemish visionary; b. at Lille, Jan. 13, 1616; professed that she received special revelations; found asylum in a convent. Having left the convent and renounced Catholicism, she traveled in foreign countries; wrote several religious works; gained many converts to her sect; it especially prospered in Scotland. She was an eloquent speaker and writer. D. in Franeker, Friesland, Oct. 30, 1680. See a *Life of Antoinette Bourignon*, prefixed to her works (Amsterdam, 25 vols., 1676–84). Peter Poiret was the chief expounder of her mysticism. Some of her writings appeared in English within thirty years of her death. See Labadie, Jean, de.

Bou'rinot, John George, C. M. G., LL.D.: Canadian publicist; b. at Sydney, Nova Scotia, Oct. 24, 1838; educated at Trinity College, Toronto; engaged in journalism; established the *Halifax Reporter*, and was its editor for many years. After holding various appointments in the senate, he became clerk of the Dominion Parliament in 1880; created by the Queen a companion of the Order of St. Michael and St. George in 1890; and in 1892 was elected president of the Royal Society, Canada. He has contributed extensively to the magazines on both sides of the ocean. Among his works are: *Intellectual Development of Canadian People* (Toronto, 1880); *Parliamentary Practice and Procedure* (Montreal, 1884); *Constitutional History of Canada* (1887); and *Parliamentary Government in Canada* (1892).

Bourke, John Gregory: See the Appendix.

Bourmont, boor'mōñ', Louis Auguste Victor, de: Comte de Ghaisne; a French general; b. in Anjou, Sept. 2, 1773; was a royalist in the Revolution; fought against the republic in 1794–96; entered the service of Napoleon about 1809. Having served with distinction in Russia, he was raised to the rank of lieutenant-general in 1814. During the Hundred Days, 1815, he deserted Louis XVIII. and Napoleon by turns. He became Minister of War in 1829, and commander-in-chief of the army sent against Algiers in 1830. He conquered Algiers, and was rewarded in July, 1830, with the bâton of a marshal of France. Being devoted to Charles X., he was deprived of his command by the revolution of 1830, and went into exile, and fought for Dom Miguel in Portugal. Died in Anjou, Oct. 27, 1846. See De Lansac, *Notice sur le Comte de Bourmont* (1847).

Bourne: town (incorporated Apr. 2, 1884); Barnstable co., Mass. (for location of county, see map of Massachusetts, ref. 5–K); on Old Col. R. R. (Cape Cod Div.); 56 miles from Boston. The town has 6 churches and 11 schools, including a high school; its principal industries are freight-car manufactory, iron foundry, art-works, oystering, and line-fishing. Bourne was set off from Sandwich, and a large part of its territory borders on Buzzard's Bay. It is a popular summer-resort, and has many elegant summer residences. Pop. of township, including 8 villages (1890) 1,442; (1900) 1,657.

David D. Nye.

Bourne, Hugh: preacher; b. at Fordhays Farm, in the parish of Stoke-on-Trent, Staffordshire, England, Apr. 3, 1772; was one of the founders of the sect of Primitive Methodists. He was by trade a wheelwright; joined the Wesleyans 1799; started camp-meetings in imitation of the American practice 1807; was in consequence "cut off" from the Wesleyan connection in 1808. His new sect was organized in 1810. He visited the U. S. 1844–46. D. in Bemersley, Staffordshire, Oct. 11, 1852. He wrote a history of the Primitive Methodists (Bemersley, 1825). See his *Life*, by J. Walford (London, 1855), and Methodism.

Bourne, Vincent: English scholar and Latin poet; b. about 1695. He was an usher of Westminster School; graduated at Trinity College, Cambridge, and became a fellow in 1720; passed the rest of his life as a master in

Westminster School. He wrote several short original Latin poems, which are remarkably graceful, and produced Latin versions of English ballads, which are felicitous. These were published under the title *Poemata* (1734; another edition, with a memoir by Mitford, 1840). Cowper translated some of his original Latin poems. D. Dec. 2, 1747.
Revised by HENRY A. BEERS.

Bournemouth: a health-resort of Hampshire, England; on Poole Bay, English Channel. It is in the borough of Christchurch; 37 miles S. W. from Southampton (see map of England, ref. 14–G). The suburbs in Bourne Brook valley are laid out in pine groves and parks; there are here a national sanitarium, homes for consumptives and incurables, and other health establishments, a town-hall, and St. Peter's church, with a memorial to Keble. It was a coast-guard station until about 1840, when it began to grow rapidly on account of its benign climate. Pop. (1891) 37,650; (1901) 47,003.

Bour'nonite, or **Endel'lionite**: a triple sulphide of copper, antimony, and lead; composed of 41·8 per cent. of lead, 26 of antimony, 19·4 of sulphur, and 12·8 of copper. It occurs in crystals, and massive.

Bouro: See BURU.

Bourrienne, boor'ri-en', LOUIS ANTOINE FAUVELET, de: a French diplomatist; b. at Sens, July 9, 1769. He was a fellow-student and friend of Bonaparte at the school of Brienne. They met at Paris in 1792, and renewed their intimacy. In 1796 Bourrienne became private secretary to General Bonaparte, whom he followed to Egypt. In 1804 he was sent as minister to Hamburg, but he was accused of peculation, and was recalled in 1811 and forced to refund 1,000,000 francs. Having deserted Napoleon in 1814, he was appointed Minister of State by Louis XVIII. in 1815. He published an interesting work entitled *Memoirs upon Napoleon* (10 vols., 1829–31), which is an important contribution to the history of the times. Died in an asylum in Caen, Feb. 7, 1834. See Boulay de la Meurthe, *Bourrienne et ses Erreurs* (2 vols., 1830).

Bourse: See EXCHANGE.

Bousbecq, AUGIER GHISLEN: See BUSBECQ, AUGIER GHISLEN.

Boussingault, boos'săn'gō', JEAN BAPTISTE JOSEPH DIEUDONNÉ: chemist; b. in Paris, Feb. 2, 1802; educated at the mining school of St. Étienne; was an officer under Bolivar in South America in his youth. Returning to France, he was made Professor of Chemistry at Lyons, and in 1839 was elected a member of the Academy of Sciences and given the chair of Agriculture in the Paris Conservatory of Arts and Trades. He was made commander of the Legion of Honor in 1857, and promoted to the rank of grand officer of that order in 1876. In 1844 he published a valuable work, *Treatise on Rural Economy* (2 vols.). Among other works, he wrote *Annals of Physics and Chemistry*. He was a moderate republican member of the National Assembly in 1848. D. in Paris, May 12, 1887.

Bonstrophe'don [Gr. *βουστροφηδόν*, turning like oxen in plowing; *βοῦς*, ox + *στρέφειν*, turn]: a mode of writing practiced by the ancient Greeks until about 450 B. C.—namely, in alternate lines from right to left and from left to right, as fields are plowed in furrows, having an alternate direction.

Boutelle, CHARLES ADDISON: Congressman; b. at Damariscotta, Me., Feb. 9, 1839; educated at Yarmouth Academy; entered the shipping business; volunteered in the navy in 1862, and served with distinction to the close of the war; assumed the management of the Bangor *Whig and Courier* in 1870; unanimously nominated for Congress in 1880, and from that time served continuously till his death; represented Maine on the Republican national committee in 1884; chairman of the committee on naval affairs in the 51st, 54th, and 55th Congresses, and in this capacity drafted the bill providing for the first heavy battle-ships for the new navy. D. in Waverly, Mass., May 21, 1901. C. H. THURBER.

Bouterwek, boo'ter-vek, FRIEDRICH: philosopher and critic; b. near Goslar, in Hanover, Apr. 15, 1766. He wrote several poems and a romance called *Count Donamar* (3 vols., 1791). He became Extraordinary Professor of Philosophy at Göttingen in 1797 and ordinary professor in 1802. He published several works on philosophy and a *Treatise on Æsthetics* (1806). His reputation is founded on his excellent *History of Modern Poetry and Eloquence* (12 vols., 1801–19). D. in Göttingen, Aug. 9, 1828.

Boutmy, boot'mee', ÉMILE: publicist; b. at Paris, April 13, 1835; director of the École libre des Sciences politiques, and since 1880 member of the Academy of Moral and Political Sciences. M. Boutmy's chief works are: *Quelques observations sur la réforme de l'enseignement supérieur* (1877); *Études de droit constitutionel*; *France, Angleterre, États-Unis* (1885), an original and highly suggestive book, of which an English translation by E. M. Dicey was published at New York in 1891; and *Le développement de la constitution en Angleterre* (1886; English translation by J. M. Eaden, New York, 1891).
C. H. T.

Bou'ton, NATHANIEL, D. D.: b. in Norwalk, Conn., June 29, 1799; graduated from Yale College 1821, and from Andover Theological Seminary 1824; settled as pastor of the Congregational church in Concord, N. H., Mar. 23, 1825, and so remained till 1867; received the honorary appointment of State historian of New Hampshire; was corresponding secretary of New Hampshire Historical Society and one of its most prominent members. Among his principal works are *History of Concord, New Hampshire* (Concord, 1856), and 10 volumes of *Provincial Records* (of New Hampshire). D. in Concord, N. H., June 6, 1878.

Bont'well, GEORGE SEWALL, LL. D.: lawyer and cabinet officer; b. in Brookline, Mass., Jan. 28, 1818. His education was partly obtained in the public schools and by a course of prolonged private study. He taught school in his youth; was admitted to the bar at the age of twenty-eight; entered political life in 1840 as a disciple of Van Buren; was thrice defeated for Congress and twice for Governor of his native State; but in 1851 and 1852 was chosen chief executive of Massachusetts. He was long a member of the Massachusetts Board of Education, of which he was secretary for five years. He organized the internal revenue department of the U. S. Government, and in 1862 became its first commissioner. He was a member of Congress from Massachusetts 1863–69, and Secretary of the Treasury 1869–73 under President Grant. In 1873 he was chosen U. S. Senator from Massachusetts for the term ending 1877 in place of Hon. Henry Wilson, Vice-President of the U. S. Wrote treatises on education and taxation in a conservative spirit.

Bouvar'dia [named in honor of Bouvard, physician of Louis XIII.]: a genus of plants of the family *Rubiaceæ*; allied to the trees from which Peruvian bark is obtained. The corolla is tubular, four-lobed, and has four stamens included in it. The fruit is a capsule, two-celled. The species of this genus are natives of Mexico. Many species are cultivated in gardens for their beautiful flowers.

Bouvier, JOHN: jurist; b. in Codogno, province of Milan, Italy, in 1787; emigrated to the U. S. in 1802, and practiced law in Philadelphia. In 1838 he became a judge of the criminal court of that city. He published a *Law Dictionary* (1839), and *Institutes of American Law* (4 vols., 1851), which were long standard reference-books. D. in Philadelphia, Nov. 18, 1851.—His daughter HANNAH, b. in 1811, published *Familiar Astronomy* (1857).

Bovey, HENRY TAYLOR: See the Appendix.

Bovia'num: an ancient city of Italy; founded by the Samnites on or near the site of the modern Bojano; surrounded by high mountains. According to Livy it was a wealthy and powerful city. It was besieged and taken by the Romans in 311 B. C. In the second Punic war it was several times headquarters of the Roman army. During the Social war it was capital of the confederates.

Bo'vidæ [from Lat. *bos, bovis*, ox]: the ox family; an important family of ruminant mammals; rich in species, and including a large number of those most useful to man. They vary greatly in form, the average type, or that represented by the greatest number of species, being exemplified in the antelopes, while extremes are represented by the oxen, the sheep, and the goats. The head is narrowed forward, the nose generally naked, and the nostrils large and open. The teeth are of the typical ruminant type, no incisors being present in the upper jaw; and the upper canines also are usually lacking, though sometimes well developed. In the lower jaw are three incisors on each side, and in contact with them a canine shaped like an incisor and often mistaken for one. The horns are always developed in the males, and frequently in females. They are of the "hollow" type, each horn consisting of a solid process of the frontal bone, the "core," enveloped in a fibrous sheath of true horn; and they are not periodically shed as in the related deer family. The latter grows slowly, but continuously, from the base

and wears away at the tip. The family includes all the hollow-horned ruminants except the prong-horn of America and *Saïga* of the plains of Western Asia, each of which represents apparently a distinct family. The genera still embraced are quite numerous, and are susceptible of being grouped into several sections or sub-families. See CATTLE, and ADDAX, ANOA, ARNEE, BISON, BLAUW-BOC, BLES-BOC, BUFFALO, CHAMOIS, ELAND, GAYAL, GAZELLE, GNU, GOAT, IBEX, KOODOO, MUSK-OX, SHEEP, SPRING-BOK, STEIN-BOK, URUS, YAK, and ZEBU. Revised by DAVID S. JORDAN.

Bovino, bō-vee'nō (anc. *Vibinum*): a fortified town of Italy: province of Foggia; 14 miles S. S. W. of Foggia (see map of Italy, ref. 6-G). It has a cathedral and several churches. The imperialists defeated the Spaniards here in 1734. Pop. 8,000.

Bow and arrow: one of the oldest of missile weapons. Bows have been made of various materials and different sizes and powers from prehistoric times, and were the favorite and generally used projectile weapon until the introduction of small arms.

The English long-bow, which accomplished such remarkable results in the fourteenth and fifteenth centuries, was usually about 5½ feet long and was made of yew, although elm and wych-hazel were also used. The arrow was 3 feet long, feathered, and furnished with a steel head. In the hands of a good archer it was accurate, and had sufficient penetration to inflict fatal wounds up to 240 or 250 yards, with an extreme range of 300 to 400 yards, and a capacity of from eight to twelve shots per minute.

The cross-bow, which was a bow attached to a stock resembling a musket, was shorter and stiffer, and was sometimes drawn by a small windlass attached to the stock. It discharged a shorter and stouter arrow, called a "quarrel," and was of slower fire than the long-bow.

The shorter bows in different ages have been made of steel, horn, and other elastic materials, and the arrows have sometimes been poisoned, particularly by savages. See ARCHERS and ARCHERY. JAMES MERCUR.

Bow'dich, THOMAS EDWARD: an English linguist and traveler; b. in Bristol, June 20, 1791. Having visited Ashanti in 1816, he published a *Mission from Cape Coast Castle to Ashanti* (1819). He undertook an exploring expedition into the interior of Africa in 1822, but he died of fever on the river Gambia, near its mouth, Jan. 16, 1824. Of this exploration his wife edited his account (1825).

Bowditch, HENRY INGERSOLL: physician; son of Nathaniel, named below; b. in Salem, Mass., Aug. 9, 1808; d. in Boston, Jan. 14, 1892; graduated at Harvard 1838; studied medicine in Cambridge; Professor of Clinical Medicine in Harvard 1859-67; announced a law of soil-moisture as a cause of pulmonary disease; first practiced puncturing the chest cavity to remove pleural effusions; was an active abolitionist; translated from the French the treatises of Louis on *Typhoid* (Boston, 1836) and on *Phthisis* (1836), and of Maunoir on *Cataract* (1837); wrote papers for medical societies and journals.

Bowditch, HENRY PICKERING, M. D.: b. in Boston, Mass., Apr. 4, 1840; grandson of Nathaniel; graduated from Harvard College 1861; entered the army as second lieutenant in November of the same year; rose to the rank of captain; was discharged Feb., 1864; in March commissioned major, and served at the front through the rest of the war, entering Richmond at its evacuation; attended the Harvard Medical School 1865–66; M. D., Harvard, 1868; studied several years in Germany, and during the winter of 1868–69 in France; devoted himself especially to physiology under Prof. Ludwig at Leipzig; assistant Professor of Physiology, Harvard Medical School, 1871; full professor 1876; dean of the faculty, Harvard Medical School, 1883; author of numerous papers and reports on physiological subjects. See *Fifth Report, Harvard Class of 1861*. C. H. THURBER.

Bowditch, NATHANIEL, LL. D., F. R. S.: mathematician; b. in Salem, Mass., Mar. 26, 1773. He made several long voyages as an officer or supercargo of a merchant vessel, and learned Greek and Latin without a teacher. He published a valuable work called *The Practical Navigator*, which remained the standard among American seamen for eighty years. His greatest work was a translation of the celebrated *Mécanique Céleste* of Laplace, which he enriched with a commentary explaining the complicated mathematical operations of the work. He also published many papers on mathematical astronomy in the *Memoirs* of the American Academy and elsewhere. He was a fellow of the Royal Society of London, and a member of a large number of the learned societies of Europe and America. D. in Boston, Mar. 16, 1838. See a *Memoir of N. Bowditch*, by his son, N. I. Bowditch (1839).

Bowditch, NATHANIEL INGERSOLL: b. in Salem, Mass., Jan. 17, 1805; graduated at Harvard in 1822. He was called to the bar in Boston in 1825, but became a conveyancer, acquiring great reputation for accuracy and industry. He wrote much for periodicals, and published a *Memoir of N. Bowditch* (1840); a *History of the Massachusetts General Hospital* (1851); and *Suffolk Surnames*. Gave $70,000 to Harvard College for the endowment of scholarships. D. in Brookline, Apr. 16, 1861.

Bowd'ler, THOMAS: English expurgator; b. near Bath, July 11, 1754; educated at St. Andrews and at Edinburgh (M. D. 1776). He is chiefly noted for *The Family Shakespeare* (10 vols., 1818), in which he omitted from the original text "those words and expressions . . . . which can not with propriety be read aloud in a family." He also prepared an edition of Gibbon's *History* "with the careful omissions of all passages of an irreligious or immoral tendency," published by his nephew (6 vols., 1826). D. in Rhyddings, Feb. 24, 1825.

Bowdoin, bōd'n, JAMES, LL.D.: a Governor of Massachusetts; b. in Boston, Aug. 8, 1727; graduated at Harvard in 1745. He was president of the convention which in 1778 formed the constitution of Massachusetts; was chosen Governor of that State in 1785, and again in 1786. He suppressed Shay's rebellion in 1786. D. in Boston, Nov. 6, 1790.

Bowdoin, JAMES: son of the preceding; b. in Boston, Sept. 22, 1752. He graduated at Harvard in 1771; was sent in 1805 on a mission to Spain, to procure the cession of Florida to the U. S., and to obtain indemnity for injuries to commerce of the U. S. He was a benefactor of Bowdoin College, to which he gave 6,000 acres of land and £1,100, besides bequeathing to it his collections of books, minerals, and paintings, and the island of Naushon, in Buzzard's Bay, his summer residence, where he died Oct. 11, 1811.

Bowdoin College: the oldest college in Maine; chartered in 1794; opened in 1802 at Brunswick, Cumberland County. It was named in honor of Gov. James Bowdoin, of Massachusetts, whose son gave to the college, with gifts of land and money, his valuable library and collection of paintings. Connected with the college is the Medical School of Maine, founded in 1820. The college buildings, eleven in number, include a finely equipped gymnasium, and offer accommodation for various scientific collections and a library of 98,160 volumes. The faculty consists of 43 persons—35 professors, including the president, 6 instructors, a librarian, and a director of the gymnasium. The number of students in 1900 was 372. Rev. William De Witt Hyde, D. D., has been president since 1885. Its graduates, among whom may be mentioned Longfellow and Hawthorne, Chief Justice Fuller, and ex-Speaker Reed, number 4,763, of whom 2,756 are living.

Bow'ell, MACKENZIE: Canadian statesman; b. at Rickinghall, Suffolk, England, Dec. 27, 1823. He removed to Canada with his parents in 1833; engaged in journalism, and was editor and proprietor of the Belleville *Daily* and *Weekly Intelligencer* for a long period. He was elected to Parliament in 1867, and re-elected to every succeeding Parliament up to and including that following the general election of 1891. He became a member of the privy council and Minister of Customs Oct. 19, 1878, a portfolio which he held continuously till Jan. 25, 1892, when he was appointed Minister of Militia and Defense. He became Prime Minister in Dec., 1894, upon the death of Sir John Thompson, and retired Apr. 27, 1896.

Bowen, bō'en, Rt. Hon. Sir CHARLES SYNGE CHRISTOPHER, D. C. L., LL. D., F. R. S.: judge; b. in Wollaston, Gloucestershire, England, 1835; educated at Rugby and at Balliol College, Oxford, taking three of the great university prizes; called to the bar 1861; judge of the Queen's Bench Division of the High Court of Justice 1879; Lord Justice in the Court of Appeal and privy councilor 1882. D. Apr. 9, 1894.

Bowen, FRANCIS, LL. D.: writer; b. at Charlestown, Mass., Sept. 8, 1811; graduated at Harvard in 1833. He edited the *North American Review* about eleven years (1843–54); opposed Kossuth's mission in the U. S., which delayed his confirmation as professor for four years, and became in 1853 Professor of Natural Religion, Moral Phi-

losophy, etc., at Harvard University. Among his works are *Lives of Baron Steuben*, *James Otis*, and *Benjamin Lincoln*, which were published in Sparks's *American Biography*, and a treatise on *Political Economy*; assailed the speculative systems of Kant, Fichte, Comte, J. S. Mill; also published a *Treatise on Logic* (1864); *Modern Philosophy from Descartes to Schopenhauer and Hartmann* (1877); and *Gleanings from a Literary Life* (1880). D. in Cambridge, Jan. 21, 1890.

Bowen, Rt. Hon. Sir George Ferguson, D. C. L., LL. D.: English colonial statesman; b. 1821; educated at the Charterhouse and at Trinity College, Oxford; chief secretary to the Government of Ionian islands 1854–59; appointed governor of Queensland 1850; of New Zealand 1868; of Victoria 1873; of Mauritius 1875; of Hongkong 1883; royal commissioner to establish a new constitution for Malta 1888. Author of *Murray's Handbook for Travelers in Greece*; *Mount Athos, Thessaly, and Epirus* (1852); *Ithaca in 1850*; *Imperial Federation* (1886). In S. Lane-Poole's *Thirty Years of Colonial Government* (London, 1890) a biography of him may be found.

Bowen, Nathaniel, D. D.: b. in Boston, Mass., June 29, 1779; graduated at Charleston College, South Carolina, in 1794; held pastorates in Protestant Episcopal churches at Providence, R. I., Charleston, S.C., and New York city; Oct. 18, 1818, was consecrated Bishop of South Carolina. D. in Charleston, S. C., Aug. 25, 1839. He wrote *Christian Consolation* (Charleston, S. C., 1831); *Private Prayers* (1837); and two volumes of his sermons were published after his death.

Bow'er, Archibald: writer; of Roman Catholic parentage; b. at Dundee, Scotland, Jan. 17, 1685–86; educated at Douay; joined the Jesuits 1706; became counselor in the court of the Inquisition at Macerata; in alleged horror renounced in England the Roman Church 1726; rejoined the Jesuits 1745; and again became a Protestant 1747. His *History of the Popes*, in seven quarto volumes (1748–66; ed. S.H. Coxe, Philadelphia, 1844–45, 3 vols.), is characterized by great partisan bitterness. D. in London, Sept. 3, 1766.

Bower-bird: a name given by Gould to certain birds which construct bowers wherein the males disport themselves to attract the females. These structures have nothing to do with the nests, and are built by the males alone. The bowers or "runs" are made of small twigs or pieces of stiff grass, so arranged as to form a walk from 1 to 3 feet long and 7 or 8 inches wide. The spotted bower-bird (*Chlamydera maculata*) decorates both interior and exterior with pebbles, bits of bone, shell, etc.; the satin bower-bird (*Ptilorhynchus violaceus*) uses parrot feathers, and the regent bird (*Sericulus melinus*) confines itself almost entirely to snail shells. With two exceptions, the fourteen species of bower-birds are confined to Eastern Australia, and are partial to the thick woods. They are birds of moderate size, 8 to 10 inches long, and the males are usually much gayer in plumage than the females. F. A. Lucas.

Bow'ers, Theodore S.: soldier; b. in Pennsylvania, Oct. 10, 1832. A printer by trade, he subsequently edited a paper in Illinois; entered the service in Oct., 1861. He served continuously in the field and afterward at Washington, on the staff of Gen. Grant, from Apr., 1862, to Mar. 6, 1866, when he was accidentally killed by being thrown under a train at Garrison's station, New York. Brevet lieutenant-colonel, colonel, and brigadier-general U. S. army for gallant and meritorious services during the war.

Bowie: town (incorporated in 1884); Montague co., Tex. (for location of county, see map of Texas, ref. 2–H); on Fort Worth and Den. City, and Chi., R. I., and Tex. railways; 68 miles from Fort Worth; has 5 churches and 4 schools. Bowie is situated in the midst of the fruit-belt of Texas, and is the trading center for Montague and adjacent counties. Pop. of judicial district, including Bowie (1890) 1,486: (1900) 2,600. Editor of "Cross Timbers."

Bowie, James: soldier; b. in Burke co., Ga., about 1790; settled in Chatahoula parish, La., in 1802; in 1827 was involved in a *mêlée* which grew out of a duel opposite Natchez, and resulted in the death of six persons and the wounding of fifteen. Bowie, who had been shot early in the engagement, drew his knife, a rude one made from a blacksmith's rasp, and killed Major Norris Wright with it. This knife was remodeled by a Philadelphia cutler, and became the murderous bowie knife of frontier fame—"more trustworthy in the hands of a strong man than a pistol, for it will not snap." Bowie removed to Texas, and engaged in the revolt of that State from Mexico in 1835, attaining the rank of colonel. In Jan., 1836, he was ordered to Bexar, and three months later was at Alamo with Crockett and Travis, and perished Mar. 6, 1836, in the massacre which Santa Anna inflicted on the garrison.

Bowlder, bōl'der, or **Boulder**: a large, rounded mass or fragment of rock. Bowlders are usually rounded by attrition. In many cases they have been transported hundreds of miles by the action of icebergs or glaciers. Large masses of Scandinavian rocks are scattered over the plains of Denmark and Northern Germany. The pedestal of the statue of Peter the Great at St. Petersburg was hewn out of an erratic granite bowlder 42 feet long, 27 feet broad, and 21 feet high. In the Western States occur many granite bowlders which probably came from Canada. They abound along the coast of New England, where they often are so large as to form a prominent feature in the landscape. The famous Plymouth Rock is a bowlder of syenite. See Drift.

Bowlder-clay: See Drift and Geology.

Bowles, bōlz, Francis Tiffany: naval architect; b. in Springfield, Mass., Oct. 7, 1858; entered the navy as a cadet engineer in 1875; graduated at the Naval Academy of Annapolis with distinction; entered the school of naval architecture at the Royal Naval College at Greenwich, England; on his return from England, Nov. 1, 1881, was appointed assistant naval constructor in the U. S. navy, and assigned to duty as secretary to the naval advisory board at Washington 1882–86; in charge of construction and repair department of Navy-yard, Norfolk, Va., 1886–95; constructor 1888; naval constructor, Navy-yard, New York city, 1895–1901; chief constructor of the navy, with rank of rear-admiral, March 7, 1901.

Bowles, Samuel: journalist; b. in Springfield, Mass., Feb. 9, 1826. From 1844 to 1878 he was principal conductor of the *Springfield Republican*, one of the most successful newspapers in the U. S., and which he made a type of independent journalism. He published *Across the Continent* (1865); *The Switzerland of America* (1869); and other works. D. in Springfield, Mass., Jan. 16, 1878. See his *Life and Times*, by George S. Merriam (1885).

Bowles, William Lisle: English clergyman and poet; b. at King's Sutton, Northamptonshire, Sept. 24, 1762. He was educated at Winchester School and Trinity College, Oxford; was rector of several parishes and canon residentiary of Salisbury Cathedral (1828). D. in Salisbury, Apr. 7, 1850. He wrote much on antiquarian and ecclesiastical themes, but his most memorable publications were a volume of *Sonnets* (1789), which had great influence on Coleridge, and his edition of *Pope* (1806), that led to a controversy in which Byron, Campbell, and others took part. His sister, Caroline Bowles, was married to Robert Southey.
Henry A. Beers.

Bowling Green: capital of Warren co., Ky. (for location of county, see map of Kentucky, ref. 5–F); on L. and N. R. R., and on Barren river; 113 miles S. by W. of Louisville and 72 miles from Nashville. It is at the head of navigation, and has an active trade in pork, tobacco, lumber, etc. Here are Ogden College, Potter Female College, and several mills and factories. Steamboats navigate the river. Pop. (1880) 5,114; (1890) 7,803; (1900) 8,226.
Editor of "Park City Times."

Bowling Green: town; capital of Pike co., Mo. (for location of county, see map of Missouri, ref. 3–I); on C. and A. and St. L. and H. R. Rs.; 12 miles W. of Louisiana: has mining and agricultural industries. Pop. (1880) 1,067; (1890) 1,564; (1900) 1,902. Editor of "Times."

Bowling Green: town; capital of Wood co., O. (for location of county, see map of Ohio, ref. 2–D); on Western Division of the T. and O. C. R. R., and a branch of the C., H. and D. R. R.; 20 miles from Toledo; has 3 schools and 6 churches; principal industry of the county is agriculture and the production of oil and natural gas, the Wood County oil-field being one of the largest in the world. First settlement, at Perrysburg, about 1812. Pop. (1880) 1,539; (1890) 3,467; (1900) 5,067. Publishers of "Sentinel."

Bowls and **Bowling**: Two games are known as bowls, one an indoor game played on a long wooden alley, and the other an outdoor game played on a level grass-plat or bowling-green. The indoor game (called also *tenpins* and *skittles*) is played with lignum-vitæ balls rolled on a long alley floored with ash or maple boards 1 inch in thickness laid on

their edges. The regulation alley of the present time is required to measure not less than 75 feet in length (permitting a run of 15 feet for the bowler before he reaches the delivery-line) and not less than 41 nor more than 42 inches in width. In the best alleys the boards are bolted through and through at each 3 feet of their length, and are laid on crossties set in a bed of concrete, and the surface made by their exposed edges is smoothed with a plane. The object of the game is to knock down a number of wooden pins arranged at one end of the alley in a triangular form, the apex of which is toward the player, who stands at the other end of the alley. The game of bowling at pins was formerly played with nine pins, set in the shape of a diamond, and was called ninepins, but to evade a law prohibiting the playing at ninepins a tenth pin was added, and they were set in a triangular frame, and the game became known as tenpins.

At the sides of the alley are gutters, which at the corner pin must be 4 inches deep, into which unskillfully bowled balls drop when they leave the alley before reaching the pins. The balls are returned to the players' end from the pit into which they and the pins drop by an elevated run or trough directly above the gutter, sloping slightly downward. The score is recorded on a blackboard ruled off into squares. The pins now used in the regulation game as played in the U. S. are ten in number, are made of maplewood, are 15 inches in height, 15 inches in circumference at a point 4½ inches from their base, and 2¼ inches across at the base, and are placed 12 inches apart. Regulation balls do not exceed a circumference of 27 inches. This size weighs about 15¾ lb. The game as played in the U. S. consists of 10 frames of 10 pins each; 3 balls of any size within the regulation limits are allotted for each frame. Should the player bowl down all the pins with a single ball, the play is called a "ten strike," or double spare, meaning that the player is entitled to roll two spare balls at a new frame in order to complete the frame and his aggregate score for the inning when he secured the strike. Should the player continue to make "ten strikes" to the end of the game, he will secure the maximum score of 300 pins. Should the player bowl down all the pins with two balls, such play is called a "spare," which means that the player is entitled to roll one additional ball to complete the frame in which he secured the spare. Each pin bowled down counts one for the player. Each "strike" and "spare" counts ten, with the addition that to the "strike" is added all the pins which the player bowls down with *two* spare balls, and to the "spare" is added all the pins which he bowls down with *one* spare ball.

The games which gave origin to the modern bowling at pins have been traced back to the Middle Ages. The open-air game is the more ancient, and was early known under various names, such as "casting the stone," "bowles," French *boules*, *carreau*, etc. Stone bowls were used, and as these were not perfect spheres they described a curved line as they speeded down the "green" toward the mark bowled at, which was a cone. Two cones were used, one at each end of the rink, and bowled at alternately. The object of the player was to roll his bowl so that when it came to rest it would lie as near as possible to the cone. The object of the opposite side was to strike their opponents' bowls away from the cone and interpose their own bowls, or roll them nearer to the cone than the adversary. He whose bowl rested nearest the cone scored one point. Later stone bowls were supplanted by lignum-vitæ balls, the wood being cut from the outside of the tree; the heart, heavier than the outside, gave the desired bias to the bowl. Later the ball was loaded with lead to give it the required bias; or one side was cut a perfect half sphere, and the opposite side oval. The skill requisite in playing at bowls was that of the art of mastering the bias of each particular bowl. The cones were superseded by a stone or earthen ball about 3½ inches in diameter, called the "jack," this ball being rolled down the "green" at least a distance of 21 feet by the player who had won the toss, as a mark to bowl at. The bowling-green on which this game is played must be dead-level. It usually measures from 90 to 150 feet on a side, according to the limits of the ground, and is kept smooth by frequent rolling and the use of a scythe or lawn-mower.

Bowling on a "green" seems to have been in considerable vogue in New York and elsewhere in colonial days. In an old map of the city of New York, prepared about 1728, a "bowling-green" is shown on the north side of the public garden situated on "the King's Farm" (near the foot of Murray and Warren Streets). We also find that in 1732 the locality called "Bowling Green," at the foot of Broadway, was leased at a yearly rental of a pepper-corn, by John Chambers, Peter Bayard, and Peter Jay, and by them inclosed and laid out as a bowling-green.

Bowls as an indoor game had its origin in several games, variously styled club-kayles, cayles, kayle, keiles (French *quilles*), skittles, loggats, and skayles. In the kayle games and at loggats conical pins made of bone were used. These were set up in rows of six and eight, and were struck down by hurling clubs or "sheepes-joyntes" at them. Bowling down pins with a bowl or ball was the invention of a later period. In the French games of *carreau* the bowls were rolled at a fixed mark, while in the games called kayle, kayles, cayles, keiles (French *quilles*), closh, cloish, clossynge, kettles, kittles, skittles, Dutch-pins, four corners, half-bowl, rolly-polly, and ninepins, the bowls were rolled at pins. The earliest mention of bowls being played on an alley and under cover occurs in William Fitz-Stephen's *Survey of London*, about the twelfth century. The game was introduced into America by the English colonists. It is on record that a match was played on the "Knickerbocker Alley" in New York city, Jan. 1, 1840. Down to 1875, while clubs were numerous, there was great diversity as regards the length of the alley; the pins were of great size, and were set so close together that the falling of a single pin often caused the entire frame to collapse, and it was easy to run up a score of 300 in a very short time. In that year delegates representing nine clubs in New York and its vicinity formed a national bowling association, and framed laws for the regulation of the game. These related (1) to the size of the bowls, which were restricted in circumference to 27 inches; (2) to the distance from the pins at which the player was to halt and deliver his bowl (60 feet); and (3) to "dead-wood" or fallen pins, which were directed to be removed from the alley and gutters. Fifteen years later the American Amateur Bowling League was organized, afterward called "Union" instead of league. See *The American League Bowling Guide* (Brunswick-Balke-Collender Company, New York).

MORTIMER T. HUMPHREY.

Bowman, bō'man, ALEXANDER HAMILTON: soldier; b. in Wilkesbarre, Pa., May 15, 1803, graduated at West Point in 1825; lieutenant-colonel of engineers Mar. 3, 1863. He served as assistant professor at the Military Academy 1825–26; in building defenses and improving rivers and harbors on the Gulf of Mexico 1826–34; in constructing Memphis and St. Francis military road 1834–39; in the improvement of Cumberland and Tennessee rivers 1834–38; on the defenses of Charleston Harbor, S. C., 1838–53; as instructor of practical military engineering at the Military Academy 1851–52; in charge of improvement of Charleston harbor 1852–53; chief engineer U. S. treasury department and treasury building extension 1853–61; member of lighthouse board 1857–59; superintendent of Military Academy 1861–64; member of engineer boards 1847–65. D. at Wilkesbarre, Pa., Nov. 11, 1865.

Bowman, EDWARD MORRIS: musician; b. in Barnard, Vt., July 18, 1848, receiving his first musical instruction in the village where he went to school. In 1863 he went to Minneapolis, Minn., as a teacher and organist. In 1866 he studied under William Mason and the late John P. Morgan in New York; in 1872 went to Europe and studied in Berlin and Paris; on his return settled in St. Louis and began his career as a professional musician; again visited Europe in 1881, and while in London was made an associate of the College of Organists. In 1882 he was elected to the presidency of the Music Teachers' National Association, and again in 1892. He was the founder in 1884, and from the beginning has been the president, of the American College of Musicians; has been organist of churches in St. Louis, Mo., and in Newark, N. J., where he organized the Cacilian Choir of 100 voices; Professor of Music in Vassar College, succeeding the late Dr. F. L. Ritter, and from 1892 in Evelyn College, Princeton, N. J.

D. E. HERVEY.

Bowman, SAMUEL, D. D.: Protestant Episcopal bishop; b. in Wilkesbarre, Pa., May 21, 1800; studied law, but was ordained a deacon of the Protestant Episcopal Church in 1823, and a priest in 1824. He was long settled in Lancaster, Pa., 1827–58. In 1847 he was chosen Bishop of Indiana, but declined. In 1858 he was consecrated assistant Bishop of Pennsylvania. Died suddenly when on a visitation, near Butler, Pa., Aug 3, 1861.

Bowman, THOMAS, D. D., LL. D.: bishop in the M. E. Church; b. at Berwick, Pa., July, 15, 1817; graduated at

Dickinson College 1837; organized and was president of Dickinson Seminary, Williamsport, Pa., 1848–58; president of Indiana Asbury (now De Pauw) University 1858–72; chaplain U. S. Senate 1864–65; elected bishop of the M. E. Church 1872; retired 1896.

Bowman, Sir WILLIAM PAGET, M. D., LL. D., F. R. S.: ophthalmologist; b. at Nantwich, England, July 20, 1816; studied in Leyden, Amsterdam, Bonn, Heidelberg, Munich, Vienna, and Berlin; became Demonstrator of Anatomy and Curator of the Anatomical Museum in London 1838; honorary M. D., Dublin, 1867; LL. D., Cambridge, 1880, and Edinburgh, 1881; member of a large number of learned societies in various parts of Europe; author of *Lectures on the Parts Concerned in the Operations of the Eyes*; *Observations on Artificial Pupil*; *The Physiological Anatomy and Physiology of Man* (with Dr. Todd), etc. He was made a baronet in 1884. D. in London, Mar. 29, 1892.

Bowmanville: a port of entry; Darlington township, Durham co., Ontario, Canada; on the Grand Trunk Railway, 43 miles N. E. of Toronto (see map of Ontario, ref. 4–E). It has good water-power, and manufactures of furniture, pianos, organs, agricultural machinery, and flour. It has a good harbor, and is daily visited by steamers during the season of navigation. Pop. (1881) 3,504; (1891) 3,377.

Bowne, BORDEN PARKER, LL. D.: professor of philosophy; b. in Leonardville, N. J., Jan. 14, 1847; A. B., University of City of New York, 1871; studied at universities of Halle, Göttingen, and Paris 1873–75; religious editor New York *Independent* 1875–76; Professor of Philosophy, Boston University, since 1876; author of *The Philosophy of Herbert Spencer* (N. Y., 1874); *Studies in Theism* (1879); *Metaphysics* (1882); *Introduction to Psychological Theory* (1886); *Philosophy of Theism* (1887); *Principles of Ethics* (1892). C. H. THURBER.

Bow'ring, Sir JOHN: author and linguist; b. in Exeter, England, Oct. 17, 1792. He was an intimate friend of Jeremy Bentham, and was well versed in modern languages, especially the Slavonic. In 1825 he became editor of the *Westminster Review*. He collected and translated into verse the ancient and popular poems of almost all the countries of Europe. In 1835 he was elected to Parliament; in 1854 became governor of Hongkong, China; received the honor of knighthood in 1854; in 1856 ordered the bombardment of Canton in consequence of the Arrow affair. In 1859 he retired on a pension. Among his works is *The Kingdom and People of Siam* (2 vols., 1857). He wrote a description of his visit to the Philippine islands (1859). He also wrote some excellent hymns, including *In the cross of Christ I glory*. D. in Exeter, Nov. 23, 1872. See his *Autobiographical Reminiscences* (1877).

Bowsprit, bō'sprit, or bow'sprit: a large spar which projects over the stem or bow of a ship. It serves to support the foremast, which is fastened to it by large stays or ropes; also to carry sail forward, as a means of counteracting the effect of the after sails and keeping the sail power well balanced. In many cases the bowsprit rises at an angle of about 45 degrees. It supports the jib and flying-jibbooms.

Bowstring-hemp: the fiber of the *Sanseviera zeylanica*, a plant of the family *Hæmodoraceæ*; native of the East Indies. The Hindu name is *moorva*. This fiber, which is white, silky, and elastic, is used to make bowstrings. A similar fiber is obtained from the leaves of *Sanseviera roxburghiana*, a perennial Indian plant which has leaves about 3 feet long, and from other Asiatic and African species.

Box: an evergreen shrub or small tree of the genus *Buxus* and family *Euphorbiaceæ*, with opposite leaves entire at the margins. It has staminate and pistillate flowers growing on the same plant. The staminate flower is a perianth with four stamens, and the pistillate flower is a perianth with an ovary surmounted by three styles. The most important species is the *Buxus sempervirens* (common box), which is a native of Europe and Asia, has oval, shining, and deep-green leaves, and is remarkable for its compact habit of growth. In Southern Europe it grows 20 feet high or more. A variety called dwarf box, which is only 2 or 3 feet high, is extensively cultivated in gardens, and is used to form edgings of flower-beds and gravel-walks, being reduced by clipping to the height of a few inches. The wood of the box, which is very hard, heavy, compact, and fine-grained, is the best of all materials for wood-engraving, and is highly prized by turners. It is also commonly used to make flutes and other wind instruments. It is of a pale-yellow color, admits of a beautiful polish, and is not liable to be worm-eaten. Large quantities of boxwood are exported from Spain and Turkey. See SPURGEWORTS.

Revised by CHARLES E. BESSEY.

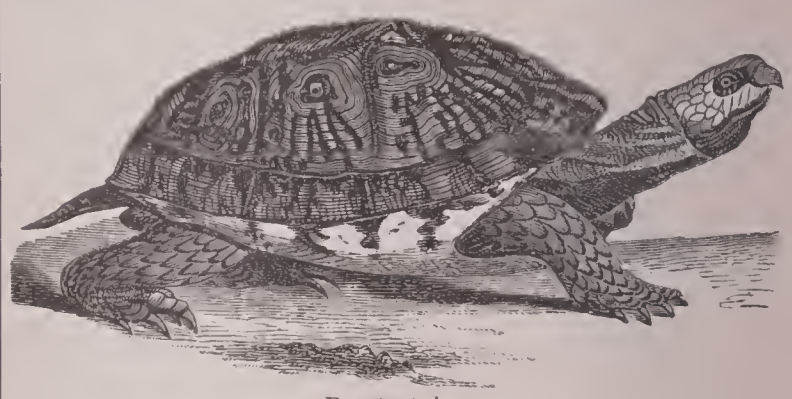
Box-elder, or **Ash-leaved Maple**: a small tree of the family *Sapindaceæ*, the *Acer negundo* or *Negundo aceroides*, which grows from Florida to Pennsylvania and westward, especially along the banks of streams. It is very beautiful, and is one of the characteristic trees of the far West. In Minnesota, Nebraska, etc., it is tapped like the sugar-maple, for its sap, which affords sugar of good quality.

Box-hauling: a method of working a ship from one tack to the other, characterized by the bracing of the head yards *abox*, or aback, either after luffing into the wind as in tacking, or at once without deadening the headway. The latter is sometimes called *wearing short round*. See TACKING AND WEARING.

Boxing the Compass: a nautical phrase, meaning an enumeration of the thirty-two points of the mariner's compass in their proper order, as *north*, *north by east*, *northnortheast*, and so on around till north is reached by way of the south and west quadrants. This enumeration may be considerably varied by beginning at any other point and going around both ways in turn. S. B. LUCE.

Box'tel: a village of Holland; in North Brabant; on the river Dommel; 6 miles S. of Bois-le-Duc (see map of Holland and Belgium, ref. 7–G). The river flows through the streets and affords passage for boats. Fine diaper is manufactured here. Pop. 5,700.

Box-tortoise, or **Box-turtle**: popular names of the *Cistudo carolina*; an American tortoise, characterized by the division of the plastron into two parts by a crosswise division, united, however, by a ligament which serves as a hinge on which the parts of the plastron turn, thus enabling the animal to shut himself entirely up in his shell. These tortoises are very timid and of gentle disposition. Their legs are longer and their speed greater than is usual among tortoises. Revised by D. S. JORDAN.



Box-tortoise.

Boyaca, bō-yăă-kaa': one of the states of Colombia; bounded N. E. and E. by Venezuela, S. and S. W. by Cundinamarca, and N. W. by Santander. Area, 33,351 sq. miles. While in the west the state is exceedingly mountainous, the east consists of a hot, dry plain. Copper and precious stones are found in the mountains. Capital, Tunja. Pop. 702,000.

Boyaca: a small village in the state of Boyaca, Colombia; about 20 miles S. of Tunja. It was the scene of a battle (Aug. 7, 1819) in which Bolivar, with about 2,000 patriots, defeated the superior Spanish force of Barreiro, took him prisoner, with most of his army, and forced the Spaniards to leave the country, then called New Grenada. H. H. S.

Boyar, boi'ăar, or bō-yaar' [from Russ. *boyarin*, lord]: a title given in ancient Russia to those who distinguished themselves in war. This afterward came to be the title of the nobility, who under the Grand Duke of Moscow formed an aristocracy with powers differing according to the character of the monarch, but which were so considerable that even Ivan the Terrible in his ukases added to the words "The czar has commanded," also "The boyars have approved." The last boyar died in 1750.

Boy-bishop: During the Middle Ages the custom grew up of allowing the choristers of cathedrals to choose yearly one of their number to act the part of the bishop. The election generally took place on Dec. 6, St. Nicholas's Day, after which the boy-bishop was vested in the episcopal attire, with

miter, ring, and pastoral staff. He held office till Dec. 28 (Holy Innocents' Day). The practice was permitted probably from the same motives which suffered the mummeries of the Abbot of Unreason (a graphic account of which may be found in Sir W. Scott's romance of *The Monastery*). If the boy-bishop died within his short period of office, he was buried in his episcopal robes. A tomb with the effigy of a boy so clothed may be seen in Salisbury Cathedral, England.

W. S. Perry.

Boyce, Hector: See Boece, Hector.

Boyce, James Petigru, D. D., LL. D.: b. in Charleston, S. C., Jan. 11, 1827: graduated at Brown University 1847, and at the Theological Seminary in Princeton, N. J., 1849–51: became pastor of a Baptist Church at Greenville, S. C., 1851; Professor of Theology in Furman University, Greenville, S. C., 1855; Professor of Theology in the Southern Baptist Theological Seminary (formerly Greenville, S. C., now Louisville, Ky.) 1859. He published several sermons, addresses, and articles, which have largely contributed to mold the opinions of the Southern Baptists, and held, as president of the Southern Baptist Convention, a position of commanding influence. D. in Pau, France, Dec. 28, 1888.

Boyce, William: English composer; b. in London, 1710; in 1736 appointed composer and in 1758 organist to the Chapel Royal; composed a number of anthems; the serenata *Solomon* (1743); and published *The Cathedral Music of the English Masters of the Last Two Centuries* (3 vols., 1760). D. in Kensington, London, Feb. 7, 1779.

Boy'cotting: a combining of persons or a concerted action to restrain from or prevent social or business intercourse with another. The term was coined from the name of a Capt. Boycott, an agent in Ireland of Lord Erne's Lough Mask estate, who in 1880 evicted a large number of tenants. These and their neighbors refused all intercourse with him and his family, and would not work for him or trade with him, or allow others to do so. He was aided in the harvesting of his crops by the Orangemen, and was obliged to work under military protection. When the combination amounts to a conspiracy to wrongfully prevent or restrain another from carrying on a legitimate business, or to accomplish any unlawful purpose, it is a criminal offense. See Conspiracy.

Revised by F. Sturges Allen.

Boyd, Andrew Kennedy Hutchison, D. D., LL. D. (whose pen-name was for some time *A. K. H. B.*): minister of the Church of Scotland; b. at Auchinlech, Ayrshire, Scotland, Nov. 3, 1825, where his father was parish minister. He was educated at King's College, London, and at Glasgow University; B. A. 1846. He was ordained in 1851; after having charge of several parishes, became minister of St. Andrews 1865. He published more than twenty volumes of contemplative essays and sermons, of which the *Recreations of a Country Parson* (1859–78, 3 series) has been especially popular. He published his reminiscences, *Twenty-five Years of St. Andrews, Sept., 1865, to Sept., 1890* (London, 1892, 2 vols.). D. in Bournemouth, England, Mar. 2, 1899.

Boyd, John Parker: general; b. in Newburyport, Mass., Dec. 21, 1764; entered the U. S. army as ensign in 1786. A spirit of adventure led him to India in 1789, where he commanded mercenaries, raised by himself and others, in the Mahratta service of native princes, and rose to the rank of commander. He returned to the U. S. in 1808, and was commissioned colonel of the Fourth U. S. Infantry. In the war with Great Britain he was a brigadier-general; distinguished himself at Tippecanoe, at the capture of Fort George, Canada, and Chrysler's Field. In 1830 President Jackson appointed him naval officer of the port of Boston, Mass. D. in Boston, Oct. 4, 1830.

Boyd, Linn: statesman; b. in Nashville, Tenn., Nov. 22, 1800; member of Congress from Kentucky for twenty years, being first elected in 1835. During his last term he served as Speaker of the House of Representatives. D. in Paducah, Ky., Dec. 18, 1859.

Boy'dell, John: engraver and patron of art; b. in Dorrington, Shropshire, England, Jan. 19, 1719; became a print-seller in London, and amassed a large fortune. He promoted the improvement of British art by his liberal patronage of native engravers and painters. He employed Opie, Reynolds, Northcote, West, and other painters to illustrate Shakspeare's works. The result was the *Shakspeare Gallery*, from which was engraved a volume of admirable plates (1803). He was lord mayor of London in 1790. D. there Dec. 11, 1804.

Boyer, bwäă'yā', Alexis, Baron de: surgeon; b. in Limousin, France, Mar. 1, 1757; son of a tailor; acquired his profession under great drawbacks. He was surgeon to Napoleon I. and Chirurgical Professor of the University of Paris. His main works are *Traité complet d'anatomie* (4 vols., 1797–99) and *Traité des maladies chirurgicales et des operations qui leur conviennent* (8 vols., 1814–22). D. Nov. 25, 1833.

Boyer, Jean Pierre: president of Hayti; b. at Port-au-Prince, Feb. 28, 1776; was a mulatto. He entered the French army in his youth, and as an officer in the army of Pétion fought against Dessalines and Christophe when he declared himself emperor. On the death of Pétion he was elected president of the republic in 1818. By partiality to the mulattoes and arbitrary measures he offended the Negroes, who revolted and expelled him from the island in 1843. D. in Paris, July 9, 1850.

Boy'ertown: borough (founded in 1800, incorporated as a borough in 1866): Berks co., Pa. (for location of county, see map of Pennsylvania, ref. 5–I): on branch of Phil. and Reading R. R.; 17 miles from Reading, 48 miles from Philadelphia. Cigar-making and iron-mining are the chief industries of Boyertown, over 500 persons being employed in the former industry. There are 6 graded schools and 6 churches. The population is largely American-born Germans. Pop. (1880) 1,099; (1890) 1,436; (1900) 1,709.

Editor of "Demokrat."

Boy'esen, Hjalmar Hjorth: Norse-American author and scholar; b. at Fredericksvaern, Norway, Sept. 23, 1848. He was educated at Leipzig and the university in Christiania; removed to the U. S. in 1868; edited *The Fremad*, a Norwegian paper, in Chicago; was Professor of German in Cornell University (1874–80) and in Columbia College, New York, from 1880 till his death, Oct. 4, 1895. He published, among other things, *Gunnar, a Norse Romance* (1874); *A Norseman's Pilgrimage* (1875); *Falconberg* (1878); *Goethe and Schiller, their Lives and Works* (1878); *Ilka on the Hill-top* (1881), which has been dramatized; *Queen Titania* (1882); *A Daughter of the Philistines* (Boston, 1883), which had great vogue in Europe and the U. S.; *Essays on German Literature* (1892); and *Boyhood in Norway* (1892). Several of his books have been translated into German and Norwegian. His fictions have usually a social or political bearing.

Henry A. Beers.

Boyl, Boil, or **Buell**, Antonio: Spanish Benedictine monk; b. in Catalonia about 1450. He was an inmate of the Convent of Montserrat when, in 1493, the pope appointed him apostolical vicar of the New World. With eleven other monks he accompanied Columbus to Hispaniola, where he acted as official councilor as well as religious leader. He showed a bigoted and unrelenting spirit toward the Indians, advising Columbus to put the chief Guacanagari to death; later he joined the malcontents against the admiral and his brothers, and in 1494 went to Spain to prefer charges against them: he was long one of the bitterest and most dangerous enemies of Columbus. He did not return to Hispaniola, but was made abbot of the Cuxa convent, where he died in 1520.

Herbert H. Smith.

Boyle, David: See the Appendix.

Boyle, Robert: celebrated experimental philosopher; b. in Lismore Castle, Ireland, Jan. 25, 1627; seventh son of Richard, the first Earl of Cork. He was educated at Eton and Geneva; took no part in political contests, but devoted himself to the cultivation of science, especially chemistry and natural philosophy. He became a resident of Oxford in 1654, and was one of the founders of the Royal Society. To qualify himself to defend the Christian religion, he learned the Hebrew and Greek languages. He improved the air-pump, and made important discoveries in pneumatics. Among his works are a *Disquisition on Final Causes*; a *Discourse of Things above Reason*; *Excellency of Theology*; and *Hydrostatical Paradoxes*. He declined a peerage which was repeatedly offered to him. He was remarkable for his benevolence and charity. It was through his Christian liberality that Eliot's Indian Bible was published; and it was by his exertions that the funds of the Society for the Propagation of the Gospel in New England, originally a Puritan organization, were preserved at the Restoration for their sacred uses. By his last will he endowed the Boyle Lectures (*q. v.*). D. in London, Dec. 30, 1691. His complete works, with a *Life*, in 5 vols. fol., were published by Thomas Birch (London, 1744).

Boyle Lectures: called from Robert Boyle, who bequeathed an annual salary to be paid to some clergyman for preaching eight sermons in a year in order "to prove the truth of the Christian religion against Atheists, Deists, Pagans, Jews, and Mohammedans, not descending to any controversies among Christians themselves." The first person selected to deliver the "Boyle Lectures" was the celebrated Richard Bentley (1691), who directed his arguments against atheism. In 1739 three volumes of the lectures were published, and nearly sixty volumes since then. The "Boyle Lectures" are still maintained.

Boyle's Law: a statement of the fact that "the volume of a gas is inversely as the pressure"; that is to say, if we double the pressure upon a gas we reduce its volume to one-half; if we make the pressure three times what it was at first, the bulk of the gas is reduced to one-third. More commonly called MARIOTTE'S LAW (*q. v.*).

Boyne: the most important river in the E. of Ireland; rises in the Bog of Allen; flows northeastward through Kildare, King's County, Meath, and Louth; enters the Irish Sea after a course of 65 miles. Many ruins of monasteries and castles are found on its banks. An obelisk 150 feet high, nearly 3 miles from Drogheda, commemorates the great battle of the Boyne, in which William III. defeated James II., July 1, 1690.

Boyn'ton, EDWARD CARLISLE: b. in Vermont about 1825; graduated at West Point in 1846. He entered the artillery; was severely wounded at Churubusco; breveted captain; assistant Professor of Chemistry, etc., at West Point (1848–55); Professor of Chemistry, etc., in the University of Mississippi (1856–61); and breveted major in 1865. He published a *History of West Point* (1863) and a *History of the United States Navy*. D. in Newburg, N. Y., May 13, 1893.

Boynton, JAMES STODDARD: b. in Henry co., Ga., May 7, 1833; practiced law; served as colonel in the civil war; resumed the practice of law; was elected to the Legislature and became president of the Senate, which office he held at the death of Gov. Alexander H. Stephens, Mar. 4, 1883; became acting Governor of Georgia Mar. 5, 1883. His successor, Henry D. McDaniel, was inaugurated May 9, 1883.

Boyton, PAUL: See the Appendix.

Boze'man: city; capital of Gallatin co., Mon. (for location of county, see map of Montana, ref. 7–F); on Northern Pacific R. R. and an affluent of Gallatin Fork of Missouri river; 98 miles S. S. E. of Helena and 65 miles N. of Yellowstone National Park. It has several banks, and its coal mines supply the Northern Pacific R. R. from Billings, Mon., to Portland, Or.—over 1,200 miles. It is the center of an agricultural community whose products are valued annually at more than $3,000,000; has grazing and stock interests yielding over $500,000 annually; and gold and silver mining interests, $300,000 annually. It has graded schools, an academy, a university school, flouring and planing mills, sash and door factory, numerous churches, etc. Pop. (1880) 894; (1890) 2,143; (1900) 3,419.

EDITOR OF "AVANT COURIER."

Bozen: See BOTZEN.

Boz'rah: an ancient city of Idumæa (Edom), often mentioned in the Bible. (See Genesis xxxvi.; Isaiah xxxiv. and liii.) It was situated to the S. E. of the Dead Sea, about halfway between the latter and Petra. Its site is probably occupied by the modern *Buseireh*, a poor village of about fifty wretched huts.

Bozzaris, bot'sa-ris, or **Botzaris**, MARCO: a Greek patriot; b. at Suli, in Albania, about 1788. He enlisted in the French army about 1808, and served several campaigns. When the Greeks took arms against the Turks in 1820, Bozzaris became the leader of a band of Suliotes, and gained several victories. He defended Missolonghi against the Turks in 1822. Aug. 20, 1823, he attacked and defeated a superior force at Carpenisi, near where the battle of Platæa was fought, but was killed in the action.

Bra: a town of Italy; province of Cuneo; on the river Stura; 38 miles S. S. E. of Turin (see map of Italy, ref. 3–B). It has manufactures of silk and metal-foundries; also a trade in grain, cattle, and wine. Pop. of commune, 15,000.

Brabançons, brăă'băăn'sōn': a class of mercenary soldiers chiefly from Brabant, whence they took their name. They served principally in the armies of England and France from the eleventh to the thirteenth centuries. They had little discipline, and were not much better than robbers.

Brabant, braa'bant, or brăă-bănt' (Fr. pron. brăă'băăn'): a former duchy of the Low Countries. In the sixth century it was conquered by the Franks. During the Middle Ages it changed masters very often, until in the fifteenth century it came to the House of Hapsburg. Charles V. left it to his son, Philip II., under whom the provinces revolted, but only the northern part succeeded in gaining its independence, and joined the Netherlands in 1648, while South Brabant remained with the Spanish-Austrian line until 1714, when it passed into the possession of the imperial line of Austria. It was conquered by the French in 1794, and divided into two provinces; in 1810 Napoleon also conquered the Dutch part of Brabant. In the treaty of Paris of 1814 Brabant became a part of the Netherlands, and was divided into the provinces of North Brabrant, Antwerp, and South Brabant. In consequence of the Belgian revolution of 1830, Antwerp and South Brabant passed to Belgium, while North Brabant remained with Holland. The inhabitants in the N. are Dutch, in the center Flemish, and in the S. Walloons. The boundary-line between the Germanic and French idioms runs S. of Brussels, past the villages of Braine l'Alleud, Waterloo, Wavre, and Sodoigne.

Brabant: a province of Belgium; bounded N. by Antwerp, E. by Limburg and Liège, S. by Namur and Hainant, and W. by East Flanders. Area, 1,268 sq. miles. Capital, Brussels. The principal rivers are the Dyle, Demer, and Senne. The surface is partly hilly and partly level; the soil is generally fertile and highly cultivated. This province contains extensive forests, mines of iron, and quarries of stone. It is intersected by several railways and canals. It has important manufactures of cotton and woolen fabrics, fine laces, hats, leather, jewelry, fine linens, ribbons, paper, machinery, etc. This is one of the most densely peopled districts in Europe. Pop. (1896) 1,212,686.

Brabant, North: a province of Holland; bounded N. by the river Meuse (or Maas), Holland, and Gelderland, E. by Limburg, S. by Belgium, and W. by Zeeland. Area, 1,980 sq. miles. Capital, Bois-le-Duc. It is drained by the Dommel, the Aa, and the Lintel. The surface is flat; the soil is generally fertile. The province is deficient in minerals and timber. Many cattle and sheep are raised here. It has manufactures of cotton, linen, and woolen goods. Pop. (1891) 574,075.

Brabourne, bray'bŭrn, EDWARD HUGESSEN KNATCHBULL-HUGESSEN, Lord: b. at Mersham Hatch, Kent, England, Apr. 29, 1829; educated at Eton, and at Magdalen College, Oxford; entered the House of Commons in 1857 as a Liberal; joined the Conservatives in 1885 through disaffection toward Gladstone's Irish and Transvaal policy; was a Lord of the Treasury 1859–66; Under Secretary of State for the Home Department 1868–71; for the colonies 1871–74; sworn of the privy council Mar. 24, 1873; elevated to the peerage in 1880; author of many tales for children, among which are *Stories for my Children* (1869); *Crackers for Christmas* (1870); *Uncle Joe's Stories* (1878); *The Truth about the Transvaal* (1881); *Friends and Foes from Fairyland* (1885), etc. He edited the *Letters of Jane Austen* (1885), his grand-aunt. D. Feb. 6, 1893. C. H. THURBER.

Brace, CHARLES LORING: philanthropist and writer; b. in Litchfield, Conn., June 19, 1826; graduated at Yale in 1846. Having traveled in Europe, he published *Hungary in 1851*; *Home Life in Germany* (1853); *Norse Folk*; *Races of the Old World* (1863); *Gesta Christi* (1882); *The Unknown God, or Inspiration among the Pre-Christian Races* (1890); and other works. He was the principal founder and first secretary of the Children's Aid Society of New York (1853), which has placed over 80,000 homeless children in rural Western homes and provided industrial schools, saving societies, and lodges for street children of the city. D. in Campfer, in the Engadin, Switzerland, Aug. 11, 1890.

Revised by HENRY A. BEERS.

Brachet, brăă'shay', AUGUSTE: French Romance philologist; b. in Tours, July 29, 1845; studied under Diez; became in 1870 Professor of Romance Philology in the École des Hautes Études at Paris; but since 1873 he has had no official position. Among his works are *Dictionnaire des doublets* (1867); *Grammaire historique de la langue française* (1867); *Dictionnaire étymologique de la langue française* (1870); a translation, with G. Paris and A. Morel

Fatio, of Fr. Diez's *Grammaire comparée des langues romanes* (1873–76). A. R. Marsh.

Bra'chial Ar'tery [*brachial* is from Lat. *bracchia'lis*, deriv. of *bracchium*, arm]: the main artery of the arm, a continuation of the axillary, as the latter is of the subclavian trunk. The brachial vessel lies upon the inside of the *humerus* or arm-bone, just back of the biceps muscle; near the elbow it passes forward and divides into the radial and ulnar arteries. Before this it gives off four smaller branches. The position of the brachial artery makes it quite practicable to compress it firmly against the bone in case of serious bleeding from a wound of the arm, forearm, or hand.

Brachiop'oda [from Gr. *βραχίων*, arm + *πούς, ποδός*, foot; in allusion to the ciliated arms]: a group of marine animals provided with bivalve shells, which in the fossil state form one of the most characteristic features of the Palæozoic rocks. They are represented by comparatively few living forms. The shells resemble somewhat those of the bivalve mollusks, with which these animals have usually been associated, but the two halves, or valves, of the shell are dorsal and ventral instead of lateral, and each valve is divisible into symmetrical halves. The ventral valve is usually the larger and more convex, and often serves directly for attachment of the animal to foreign bodies. In other cases attachment is brought about by means of a short stalk or peduncle, which passes either through a perforation in the ventral valve, or between the valves. Two long spirally coiled arms spring from the sides of the mouth, and are usually supported by a calcareous framework attached to the dorsal valve of the shell. These arms are grooved and ciliated, and serve to produce currents in the water, and thus bring food-particles to the mouth. Researches in the embryology of the Brachiopods have indicated their relationship with the *Bryozoa*, and have shown that their affinity is rather with the annulate worms than with the mollusks. David S. Jordan.

Brachis'tochrone [from Gr. *βράχιστος*, shortest + *χρόνος*, time]: the plane curve down which a material particle must slide without friction in order to pass in the shortest possible time from the upper to the lower of two given points not in the same vertical line. It is the common cycloid. The problem of the brachistochrone is celebrated in the history of mathematics. It was first proposed by John Bernoulli in 1696, and was solved by Sir Isaac Newton and James Bernoulli. It is often called "the curve of quickest descent." Revised by S. Newcomb.

Brachvogel, bra*kh*'fō-*gel*, Emil Albert: German novelist and dramatist; b. in Breslau, Apr. 29, 1824. Among his principal works are the novels entitled *A New Falstaff* (1862); *Beaumarchais* (1864); *The German Michael* (1868); and *Narcissus*, a drama. D. in Berlin, Nov. 27, 1878.

Brachycephal'ic: See Dolichocephalic.

Brachyu'ra [from Gr. *βραχύς*, short + *οὐρά*, tail]: the crabs; a tribe of decapod crustacea with the abdomen or tail short, without caudal fin, and folded beneath the thorax. See Crab.

Brack'enbury, Henry: soldier; b. at Bolingbroke, Lincolnshire, England, Sept. 1, 1837; served in the suppression of the Indian mutiny in 1857–58; in the Ashanti campaign in 1873–74; as chief of staff in the Zulu war; deputy adjutant-general of the Nile expeditionary force in 1884; succeeded Gen. Earle in command of the river column; made major-general June 15, 1885; lieutenant-general 1888. Author of *Fanti and Ashanti*; *Narrative of the Ashanti War*; *The River Column*; and of pamphlets. C. H. Thurber.

Brack'enridge, Henry Marie: judge and writer; b. in Pittsburg, Pa., May 11, 1786; son of Hugh Henry, named below. He held judgeships in Louisiana and Florida; was U. S. commissioner to the South American republics (1817–19). Among his numerous writings are *History of the Late War between the United States and Great Britain* (about 1816); a *Voyage to South America* (1820); and *Recollections of Persons and Places in the West* (1834). He was elected to Congress from Pennsylvania in 1840. D. in Pensacola, Fla., Jan. 18, 1871. Revised by Henry A. Beers.

Brackenridge, Hugh Henry: the father of Henry Marie; b. near Campbelton, Scotland, in 1748. He emigrated to the U. S. in childhood; graduated at Princeton in 1771; became a judge of the Supreme Court of Pennsylvania in 1799. He wrote a satirical work called *Modern Chivalry, or Adventures of Captain Farrago* (1796–1806). D. in Carlisle, Pa., June 25, 1816.

Bracket: a projecting arm of wood or metal employed to support a shelf or gallery. Also one of two marks [ ] used in printing to inclose a word, remark, explanation, etc. When a word in a classical work is included in brackets it implies that the word so inclosed does not properly belong to the original text, but has been either introduced by a mistake of the copyist, or has been inserted to supply an omission, correction, or explanation.

Brack'ett, Albert Gallatin: soldier; b. in Cherry Valley, N. Y., Feb. 14, 1829. He served during the Mexican war as first lieutenant Fourth Indiana Volunteers; appointed captain Second U. S. Cavalry Mar., 1855; engaged principally on frontier duty against hostile Indians in Texas prior to 1861, when, on Twiggs's surrender, he effected his escape, and was in command of cavalry at Blackburn's Ford, Va., July 18, 1861; commissioned colonel Ninth Illinois Volunteer Cavalry Aug., 1861; served during the civil war in the Western and Southwestern armies. He was promoted to be major First Cavalry, U. S. army, July 17, 1862; lieutenant-colonel Second Cavalry June 9, 1868; colonel Third Cavalry Mar. 20, 1879. After the war he commanded various departments and actively engaged in operations against the Indians. He was retired in Feb., 1891. He is author of *Lane's Brigade in Mexico* and *History of the United States Cavalry*.

Brackett, Anna C.: American educator; b. at Boston, 1836; educated at Framingham Normal School, Framingham, Mass.; taught with great success in large cities; translated the *Pädagogikals System* of Rosenkranz; author of *The Education of American Girls* (1874); *Poetry for Home and School* (1876).

Brackettville: capital of Kinney co., Tex. (for location of county, see map of Texas, ref. 5–F); in the southwest part of the State, about 30 miles from the Rio Grande. Pop. (1880) 1,126; (1890) 1,649; not returned separately in 1900.

Bract [from Lat. *brac'tea*, a thin leaf of metal]: a floral leaf, or an altered leaf, placed at the base of a flower on the outside of the calyx. It is a leaf from the axil of which a flower or floral axis is produced, instead of an ordinary leaf-bud or branch, and is regarded as the first attempt made by the leaves to change into floral organs. The bract is sometimes large and brightly colored. In several species of *Arum* it constitutes the large enveloping-leaf called a spathe. An involucre is a collection of bracts arranged in a whorl.

Brac'ton (properly **Bratton**), Henry, de: a distinguished English ecclesiastic and jurist, of whose life little is known. He was made archdeacon of Barnstaple in 1264, and later in the same year chancellor of the cathedral, which office he probably held till some time in 1268, when he is supposed to have died. For many years he was a justice in eyre and a justice of assize. His principal work, *De Legibus Angliæ et Consuetudinibus*, is a systematic treatise on jurisprudence and legislation, the plan or framework of which is borrowed from the Institutes of Justinian. The subject matter also in those branches of the law (e. g. the laws of personal property) which were still undeveloped in the common law were taken almost verbally from the Institutes or the Digest. Though this work is a landmark in the history of English law, no even tolerably reliable edition exists. In 1569 Richard Tottell edited an edition which is full of corruptions and mistranslations, and Sir Travers Twiss's edition is practically a reprint of this. The work was probably completed about the year 1258. See F. W. Maitland's *Bracton's Note-book* (London, 1887); and T. E. Scrutton's York prize essay of Cambridge University on the *Influence of the Roman Law on the Law of England* (Cambridge, 1885).
F. Sturges Allen.

Brad'bury, William Batchelder: musician and composer; b. in York, Me., Oct. 6, 1816; received musical instruction from Sumner Hill, of Boston, while still working at his trade as a shoemaker. In 1833 he attended Dr. Lowell Mason's singing-school and the Boston Academy of Music; was organist in several churches, and taught a singing-school in Machias, Me., for about a year and a half; traveled considerably, and in 1841 settled in the vicinity of New York city, teaching singing, organizing and conducting juvenile musical festivals, and composing and writing music for Sunday-schools. In 1847 he went to Leipzig, and studied there for two years. In 1849 he held his first musical con-

vention in Somerville, N. J., and in 1854 was associated in the Normal Musical Institute, North Reading, Pa.; in the same year became a partner in the piano manufacturing firm of Lighte, Newton & Bradbury. His principal books are *The Oriola* (1859); *The Golden Chain* (1861); *The Golden Shower* (1862); *The Golden Censer* (1864); *Fresh Laurels*; *The Shawm*; *The Jubilee*; and *The Keynote*. D. in Montclair, N. J., Jan. 7, 1868. D. E. Hervey.

Brad'dock: borough (founded in 1867); Allegheny co., Pa. (for location of county, see map of Pennsylvania, ref. 5–A); on B. and O., Pa. and Pittsburg and Lake Erie R. Rs., and on Monongahela river; 10 miles from Pittsburg; has 2 public schools, 4 parochial schools, steel-works, wire-mills, a furnace, and a forge. Pop. (1880) 3,310; (1890) 8,561; (1900) 15,654. Editor of "News."

Braddock, Edward: British general; b. in Perthshire, Scotland, about 1695. He commanded in a war against the French and Indians in North America. As he was marching to attack Fort Duquesne he was surprised by the Indians near Pittsburg, and was defeated and mortally wounded. D. at Great Meadows, 60 miles from the battle-field, July 13, 1755.

Braddon, Mary Elizabeth: See Maxwell.

Brad'ford: an important manufacturing town in the West Riding of Yorkshire, England; on a small branch of the Aire, and on the Leeds Railway; 9 miles by rail W. of Leeds (see map of England, ref. 6–H). It is situated at the meeting of three vales, and is built of stone. It returns three members to Parliament. Among the principal buildings are a handsome exchange, an elegant public hall, the parish church, erected in the reign of Henry VI., and a cloth-hall. The Saltaire alpaca and mohair mills, which are 3 miles from Bradford, were said to be the most splendid manufactories in England, but the industry has fallen away. Bradford is the chief seat in England of the manufacture of worsted fabrics, alpaca, mohair, etc. Broadcloths and cotton goods are also made. Mines of coal and iron are worked in this vicinity. Baptist, Independent, and Wesleyan colleges are near this city. Pop. (1891) 265,728; (1901) 279,809.

Bradford: town; Essex co., Mass.; on the south bank of the Merrimack river, 32 miles N. of Boston (see map of Massachusetts, ref. 1–I). A bridge and a railway viaduct connect it with Haverhill. It is the seat of Bradford Female Academy. Pop. (1890) 3,720; annexed to Haverhill since 1890.

Bradford: village (1861); in Darke and Miami counties, O. (for location, see map of Ohio, ref. 5–C); situated at terminus of three branches of Pa. R. R.; 83 miles W. of Columbus; has high school, railroad repair-shops, printing and shoe factories. The contiguous territory is settled with Dunkards. Pop. (1890) 1,338; (1900) 1,254. Editor of "Sentinel."

Bradford: city (settled 1823; incorporated 1879); McKean co., Pa.; on tributary of the Allegheny river, 11 miles distant; and on the Erie, Buffalo, Roch. and Pitts., Brad. Bord. and Kinzua, Allegheny and Kinz., West N. Y. and Penn., and other railways, and connected by electric railway (21 miles) with Olean, N. Y.; 79 miles S. of Buffalo (see map of Pennsylvania, ref. 2–D). It stands in the center of the most productive oil-field in the U. S. (1,550 to 2,550 feet above sea-level), and has large oil-refineries, oil-well supply shops, railroad shops, glass-works, extensive lumber interests and immense wood-working establishments, and vitrified, pressed, and enameled brick, and acid and wood alcohol works near the city; paved streets, electric lights, natural gas for light and fuel (domestic and manufacturing), fire department with 7 companies, gravity water system (springs, artesian wells, and watershed owned by the city); 19 churches, 8 large school buildings and a parochial school, and 3 daily, 3 Sunday, and 2 weekly newspapers. Pop. (1890) 10,514; (1900) 15,029. F. A. Churchill, ed. "Evening Star."

Bradford: village; Orange co., Vt.; on railroad and the Connecticut river; 29 miles S. E. of Montpelier (see map of Vermont, ref. 5–C). It has an academy and several factories. Pop. (1880) 619; (1890) 610; (1900) 614.
Editor of "United Opinion."

Bradford, Alden, LL. D.: b. in Duxbury, Mass., Nov. 19, 1765; graduated at Harvard in 1786, was a tutor there 1791–93; was successively a Congregational minister in Wiscasset (now in Maine), a clerk of the Massachusetts Supreme Court, a bookseller, secretary of State for Massachusetts (1812–24), and a journalist. Author of a *History of Massachusetts from 1764 till 1820* (Boston, 1822–29), and other works. D. in Boston, Oct. 26, 1843.

Bradford, Amory Howe, D. D.: Congregationalist; b. at Granby, Oswego co., N. Y., Apr. 14, 1846; graduated at Hamilton College 1867; studied at Auburn Theological Seminary, and finished his course at Andover Theological Seminary 1870; has been pastor at Montclair, N. J., since 1870. He is the author of *Spirit and Life* (1888); *Old Wine: New Bottles* (1892); and of numerous articles in various reviews. He is associate editor of *The Outlook*; also secretary of the American Institute of Christian Philosophy. He was Southworth lecturer on Congregationalism at Andover for 1892 and 1893.
George P. Fisher.

Bradford, Augustus W.: b. in Maryland about 1805; studied law; entered politics as a Whig; was a firm Unionist; a delegate to the peace congress 1861, and was chosen Governor of Maryland, holding the office until 1866. He was largely influential in securing the new constitution of Maryland (1864), by which slavery was abolished. In July, 1864, his house was burned by Confederate raiders. He was surveyor of Baltimore under President Johnson, and declined a position in the custom-house offered to him by President Grant. D. Mar. 1, 1881.

Bradford, Earls of, and Viscounts Newport (1815, in the United Kingdom): Barons Bradford (1794, in Great Britain), and baronets (1660); a prominent family of Great Britain.—Orlando George Charles Bridgman, the third earl, was born Apr. 24, 1819, and succeeded his father in 1865. He was member of Parliament for South Shropshire 1842–65.

Bradford, John: a distinguished preacher and martyr of the Church of England; b. in Manchester, England, about 1500; entered Catharine Hall, Cambridge, 1548; was ordained 1550. He became a chaplain to Edward VI., and after the accession of Mary was burned at the stake in Smithfield, London, July 1, 1555. He wrote many theological treatises which are published in the collections of the Parker Society. See William Stevens's *Life of John Bradford* (1832). W. S. Perry.

Bradford, Joseph M.: captain U. S. N.; b. in Sumner co., Tenn., Nov. 4, 1824; entered the navy as a midshipman Jan. 10, 1840. From Nov., 1863, to June, 1865, he served as fleet-captain of the South Atlantic blockading squadron, during which period he was frequently in battle, and was highly commended by Rear-Admiral Dahlgren, in his "general order" of June 16, 1865. D. at Norfolk, Va., Apr. 14, 1872.

Bradford, William: one of the Pilgrim Fathers; b. in Austerfield, Yorkshire, England, in 1589 (was baptized Mar. 19, 1589–90). He emigrated to New England in the Mayflower in 1620, and was elected governor of Plymouth Colony in 1621. Having been re-elected annually, he held the office till his death, except five years, when he declined the election. A patent or charter for the colony was granted in 1630 to William Bradford, his heirs and associates. D. in Plymouth, Mass., May 9, 1657. He left a *History of Plymouth Colony*, which was printed in 1856.

Bradford, William: the first printer in Pennsylvania; b. in Leicester, England, May 20, 1660; d. in New York, May 23, 1752. Being a Quaker he emigrated in 1682, and landed on the spot where Philadelphia was afterward built. In 1685 he began printing under the patronage of the Friends. His first work was the publication of an almanac in 1686, the *Kalendarium Pennsilvaniese*. In 1692 he incurred the displeasure of the dominant party in Philadelphia, through his sympathy with George Keith, and was imprisoned for libel. In 1693 he was induced by Gov. Benjamin Fletcher to remove to New York to become printer to their Majesties King William and Queen Mary. In that year he printed (1) *A Journal of the late actions of the French at Canada, with the manner of their being repulsed by His Excellency Benjamin Fletcher*; (2) the laws of the colony, commonly known as "Bradford's Laws." On Oct. 16, 1725, he began the publication of the *New York Gazette*, the first newspaper printed in New York city. In 1728 he established a paper-mill at Elizabethtown, N. J. He was printer to the government of New York for more than fifty years, and for more than thirty years the only one in the province. He was a warden of Trinity Church, in whose churchyard he lies buried. He had two sons, the younger of whom, Andrew, made a comfortable fortune as a printer and publisher in Philadelphia, where for a time he was a competitor of Benjamin Franklin. A. Growoll.

Bradford, William: marine-painter; b. in New Bedford, Mass., about 1830; d. in New York, Apr. 25, 1892. Began painting without instruction at Fairhaven and Lynn, and afterward on the coasts of Labrador and Nova Scotia. He accompanied Dr. Hayes, the Arctic explorer, on several of his voyages and painted pictures of the icy scenery of those regions. He exhibited a number of his works in London, and his *Steamer Panther in Melville Bay under the Light of the Midnight Sun* was exhibited at the Royal Academy in 1875 by order of the Queen, who purchased it. He disposed of other pictures at high prices, and soon became well known on both sides of the Atlantic. His works are interesting principally from the novelty of their subjects, and are not remarkable technically considered. He was elected an associate of the National Academy, New York, in 1874.

William A. Coffin.

Bradford, Great: a market-town of Wiltshire, England; on the river Avon; on the Kennet and Avon Canal; 10 miles by rail E. S. E. of Bath (see map of England, ref. 12–G). It has a fine old church, and manufactures of broadcloth, kerseymeres, and india-rubber goods. Pop. 5,000.

Brad'ke, Peter, von, Ph. D.: German philologist; b. in the Russian province of Livonia, June 27, 1853: studied at Dorpat and Tübingen; is Professor of Sanskrit and Comparative Philology in the University of Giessen, Hesse, Germany. Besides minor essays in periodicals, he has published *Studien und Versuche auf dem Gebiete alt-indo-germanischer Religionsgeschichte* (1885); *Beiträge zur Kenntniss der vorhistorischen Entwickelung unseres Sprachstammes* (1888); *Ueber die arische Alterthumswissenschaft und die Eigenart unseres Sprachstammes* (1888); *Ueber Methode und Ergebnisse der arischen Alterthumswissenschaft* (1890).

Brad'ish, Luther, LL. D.: b. in Cummington, Mass., Sept. 15, 1783; graduated at Williams College in 1804. He studied law; was employed as a Government agent in affairs relating to Levantine commerce; settled in Franklin co., N. Y.; became prominent in State politics; was Lieutenant-Governor (1829–43), and under Fillmore was assistant U. S. treasurer at New York. He was prominent in religious, educational, and other charitable and benevolent enterprises. D. in Newport, R. I., Aug. 30, 1863.

Brad'laugh, Charles: republican reformer and anti-socialist; b. in the East End of London, Sept. 26, 1833; educated at Bethnal Green and Hackney Road elementary schools until he was eleven; afterward successively errand-boy, coal-dealer, and free-thought lecturer; began to speak before street audiences at the age of fifteen; enlisted in 1850 in the army, and served for some time in Ireland; became clerk in a solicitor's office in 1853, and began to write under the pseudonym "Iconoclast"; edited successively the *Investigator* (1858–59), and the *National Reformer*; in 1868 began his efforts to enter Parliament, being then widely known throughout the country; contested Northampton three times in vain, but was finally returned for that borough in 1880, his colleague being Mr. Labouchere; his refusal to take the oath of allegiance, and his demand to be permitted to affirm instead, led to several exciting scenes in Parliament; thrice he lost his seat on this account, and was as many times re-elected, and in the new Parliament of 1885 he was allowed to take his seat. In 1888 he carried a bill through Parliament allowing all persons to affirm instead of taking the oath. He was also successful in moving to establish a labor bureau, and was recognized as one of the best informed men on East Indian affairs in Parliament. His personal influence grew in Parliament, where he became greatly respected by all parties for his good sense, eloquence, and kind disposition. In 1873 Mr. Bradlaugh lectured in the U. S., and was warmly received. In 1876 he joined with Annie Besant in republishing an old pamphlet on population, for which they were brought to trial and sentenced to a fine and imprisonment—a judgment overruled on appeal. In his *Impeachment of the House of Brunswick* he advocated the repeal of the Hanoverian settlement of the crown as soon as the Queen should cease to reign. D. in London, Jan. 29, 1891.

Brad'ley, Edward (better known as "Cuthbert Bede"): novelist and humorist; b. in Kidderminster, England, in 1827; was educated at Durham University; B. A. 1848: entered the Anglican ministry, and received a number of church preferments; at the time of his death had been rector of Lenton, near Grantham, since 1883. He was the author of many volumes of prose and verse, chiefly novels, of which his first venture, *Verdant Green*, a humorous story of Oxford life (London, 1853–57, 3 parts), is the best known. He contributed largely to periodical literature. D. in Lenton, Dec. 12, 1889.

Bradley, George Granville, D. D., LL. D.: Dean of Westminster; b. in High Wycombe, Dec. 11, 1821; educated under Dr. Arnold at Rugby, and at University College, Oxford, where he was a pupil of Dean Stanley; B. A. 1844; fellow of University College 1844–50; became assistant master of Rugby 1846; head-master of Marlborough College 1858; master of University College, Oxford, Dec., 1870; appointed to succeed Dean Stanley in the Deanery of Westminster Aug., 1881. Has published *Recollections of Arthur Penrhyn Stanley* (London, 1882), and lectures on *Ecclesiastes* (1885) and on *Job* (1887).

Bradley, James, D. D., F. R. S.: astronomer; b. in Sherbourn, Gloucestershire, England, Mar., 1693; excelled as an observer and as a theorist. He graduated at Oxford; B. A. 1714; was ordained as a priest, and obtained several livings, but resigned them when he became Savilian Professor of Astronomy at Oxford in 1721. In 1729 he announced the important discovery of the aberration of light, which serves to demonstrate the earth's motion around the sun. In 1742 he was appointed astronomer-royal, and began to make observations at Greenwich. His next discovery, announced 1748, was that the inclination of the earth's axis to the ecliptic is not constant, a fact which explained the precession of the equinoxes and the nutation of the earth's axis. This discovery forms an important epoch in astronomy. D. at Chalford, July 13, 1762, leaving in manuscript thirteen volumes of observations, which were published in 1798–1805. See his *Miscellaneous Works and Correspondence*, with memoir ed. by L. P. Rigaud (Oxford, 1832).

Bradley, Joseph P., LL. D.: associate justice of the U. S. Supreme Court; b. at Berne, Albany co., N. Y., Mar. 14, 1813; graduated at Rutgers College, New Brunswick, N. J., with honors, in 1836; admitted to the bar in 1839 at Newark, N. J. He married in 1844 a daughter of Chief Justice Hornblower. Besides his labors in every branch of his profession, he devoted much attention to mathematics and the study of law as a science, extending his researches to the civil law—researches which have been of great service in his judicial duties in Louisiana and Texas. Engaged in many important causes in the State and U. S. courts, he took but slight part in politics. He was formerly a Whig; warmly sustained the national cause in the civil war; headed the electoral ticket for Grant in 1868; ranked as a moderate Republican. He was appointed to the bench of the U. S. Supreme Court Mar. 21, 1870. He was a member of the electoral commission which seated Hayes in the presidential chair, and it was his vote that decided the issue. D. in Washington, D. C., Jan. 22, 1892.

Bradshaw, Henry: English scholar; b. in London, Feb. 2, 1831; entered King's College, Cambridge, 1850; fellow 1853; B. A. 1854; dean 1857–65; prælector 1868. Mar. 8, 1867, he was appointed librarian of the Cambridge University library, with which he had been connected in one or another capacity for over ten years, and he held this office at the time of his death, Feb. 10, 1886. His unsurpassed knowledge of manuscripts and early printed books and his stores of general and special information—literary, bibliographical, and antiquarian—were always at the service of students and investigators, in assisting whom he spent his time without stint. His studies in Chaucer, of whom he projected an edition, were of much importance; but only his *Skeleton of the Canterbury Tales* (printed 1868, issued in 1871 as No. 4 of his *Memoranda*) and two short notes were published. His most elaborate bibliographical work is a list of the editions of the Sarum Breviary, etc., in Procter and Wordsworth's *Breviarum secundum usum Sarum* (1886). He also issued a series of bibliographical *Memoranda* (1868–85) and contributed many short papers to the *Communications* of the Cambridge Antiquarian Society, etc.; but the amount of his publication bears no proportion to his learning and his influence on contemporary scholarship. His edition of the *Liber Niger* of Lincoln Cathedral, unfinished at his death, was completed by C. Wordsworth (*Statutes of Lincoln Cathedral*, part i., Cambridge, 1892). His services to liturgiology were commemorated in 1890 by the founding of the Henry Bradshaw Society "for the editing of rare liturgical texts." See G. W. Prothero, *A Memoir of Henry Bradshaw* (Cambridge, 1888); *Collected Papers of Henry Bradshaw* (Cambridge, 1889).

G. L. Kittredge.

Bradshaw, John: one of the English regicides; b. at Wibersley Hall, Cheshire, 1602 (baptized at Stockport church, Dec. 10, 1602); became in 1627 a barrister; chief justice of Chester in 1647; sergeant-at-law in 1648; and in 1649 president of the High Court which condemned Charles I. He conducted that cause with unfeeling sternness and severity, but with dignity, and probably with a conscientious desire to do justice to the king and the country. He afterward opposed Cromwell's ambitious designs, and the latter unsuccessfully tried to remove him from his chief justiceship. He later held various important positions. D. in London, Oct. 31, 1659, and was buried with great pomp. At the Restoration his body was exhumed from Westminster Abbey, along with those of Cromwell and Ireton, and the three bodies were hanged at Tyburn in their coffins (Jan. 30, 1660–61); the heads were then cut off and exposed in Westminster Hall, while their bodies were buried beneath the gallows.

Bradstreet, Anne: first American versifier; wife of Simon Bradstreet; daughter of Thomas Dudley; b. in Northampton, England, in 1612; removed to Massachusetts probably in 1630. Her father and her husband were both governors of the colony. She published a volume of poems in London in 1650 entitled *The Tenth Muse Lately Sprung Up in America*. These poems and her other writings have been several times reprinted (the last and best edition in 1867). D. Sept. 16, 1672. See her complete works edited by J. H. Ellis (Charlestown, Mass., 1868). Revised by Henry A. Beers.

Bradstreet, John: major-general; b. in Horbling, England, in 1711; d. in New York city, Sept. 25, 1774. When a young man he removed to America and entered the colonial army; in 1745, as lieutenant-colonel in Pepperell's (York, Me.) regiment, he figured prominently in the expedition against Louisburg. In the fall of the same year he was made a captain in the regular army, and on Sept. 16, 1746, was appointed lieutenant-governor of St. John's, Newfoundland. In the French and Indian war he fought at Ticonderoga, Fort Frontenac, and Crown Point; negotiated a treaty with the Western Indians at Detroit in 1764. Was commissioned a major-general in 1772.

Bradstreet, Simon: colonial Governor of Massachusetts: b. at Horbling, Lincolnshire, England, in Mar., 1603. He studied at Cambridge, and was for a time the steward of the Countess of Warwick; removed to Salem, Mass., in 1630, as an assistant judge; was one of the founders of Cambridge and Andover, and resided also at Ipswich and Boston. Besides holding other important positions, he was Governor (1679–86 and 1689–92). D. in Salem, Mass., Mar. 27, 1697.

Bradwardine, Thomas: English prelate and scholastic theologian; called The Profound Doctor; b. in Chichester in 1290; educated at Oxford, and attained high rank as a scholar. He became confessor to Edward III. 1338; was consecrated Archbishop of Canterbury at Avignon, July 19, 1349. His principal work, *De causa Dei contra Pelagium et de virtute causarum*, is a masterly argument for the doctrine of Augustine. He was an able mathematician of Oxford University. D. in London, Aug. 26, 1349, of the plague. See notice of his *Life* by Sir Henry Savile in his edition of Bradwardine's *De causa Dei*, etc. (London, 1618).

Brady, John Riker: jurist; b. in 1822 in New York city. In 1856 he was elected a justice of the New York court of common pleas, and in 1869 was made a justice of the Supreme Court of the State, and in 1877 was unanimously re-elected to the position. D. Mar. 16, 1891.

Henry Wade Rogers.

Brady, Nicholas, D. D.: b. at Bandon, Ireland, Oct. 28, 1659; educated at Oxford and Dublin; sided with King William against James II., and in consequence was made chaplain to the king. He received several English church preferments, but is best known for his share in the metrical version of the *Psalms* (London, 1695), which he made in conjunction with Nahum Tate (1652–1715), the poet laureate. *Tate and Brady's Psalms*, though justly ridiculed for their clumsiness, quaintness, and bombast, have some noble passages. Brady also published a *Translation of the Æneid* (4 vols. 8vo, 1726). D. in Richmond, Surrey, May 20, 1726.

Brady, William Maziere, D. D.: b. in Dublin, Ireland, in 1825, of a prominent family; graduated at Trinity College with honor. Entering the Irish State Church, he received lucrative appointments, which he hazarded, and in part lost, by his many bold and able attacks upon the Church establishment to which he himself belonged. He was one of the foremost leaders of the movement which resulted in the disestablishment of the Irish Church. In 1873 he entered the Roman Catholic Church. He is the author of several works, chiefly upon the ecclesiastical history and antiquities of Ireland and Great Britain, and has written a learned work on *The Episcopal Succession in England, Scotland, and Ireland. A. D. 1400 to 1875* (Rome, 1876–77, 3 vols.); also *Annals of the Catholic Hierarchy in England and Scotland* (London, 1883); *Anglo-Roman Papers* (1890).

Braga, braa'gă (anc. *Bracara Augusta*): a town of Portugal; capital of the province of Minho; on an eminence near the river Cavado; 39 miles N. N. E. of Oporto (see map of Spain, ref. 14–B). It is the seat of an archbishop. It has a fine Gothic cathedral and a college. Braga is inclosed by old walls and defended by a castle. Here are manufactures of linen, cutlery, firearms, jewelry, etc. It is a very ancient town, and has the ruins of a Roman temple and amphitheater. It was the capital of Lusitania after the latter had been conquered by the Suevi. Its archbishop is titular primate of Portugal. Church councils were held at Braga in 563, 572, and 672 A. D. Pop. 19,755.

Braga, Theophilo: Portuguese critic and philologist; b. in San Miguel (St. Michael), Azores, Feb. 24, 1843; educated at the University of Coimbra, and since 1872 Professor of Literature in the Curso Superior de Letras at Lisbon. He has been one of the most voluminous and at the same time influential (at least in his own country) of modern authors. A recent list of his productions embraces over ninety titles. In Portugal, Braga has been mainly influential as a democrat in politics and a positivist in philosophy. Among his works in the capacity of leader of the Portuguese Republicans are *Soluções positivas da Politica portugueza* (1879); *Dissolução do Systema constitucional* (1881). As positivist, Braga has published *Traços geraes de Philosophia positiva* (1877); *O Positivismo* (a review, 1878–79–80); *Historia universal, esboços de Sociologia descriptiva* (1879–82); besides great numbers of isolated articles and addresses. Outside of Portugal, however, Braga is chiefly known as philologist and historian of Portuguese literature. In this field his activity has been almost incredible; and, if his work suffers often from haste and impetuosity, yet, on the other hand, his contributions to our knowledge of the origins and development of the literature of the Spanish peninsula have been very important. Only a few of his works in this field can be mentioned here: *Historia da Poesia popular portugueza* (1867); *Historia da Poesia moderna em Portugal* (1869); *Historia do Theatro portuguez* (1870–71); *Historia dos Quinhentistas* (1871); *Theoria da Historia da Litteratura portugueza* (1872); *Trovadores Gallecio-portuguezes* (1871); *Manual da Historia da Litteratura portugueza* (1875); *Bocage, sua Vida e Epoca litteraria* (1877); *Cancioneiro da Vaticana* (1878); *Historia do Romantismo* (1880); *Retrato e Biographia de Camœs* (1880). Braga is also a poet, and several volumes of his verse have appeared. *Fothas verdes* (1858) and *Visão dos Tempos* (1864) are perhaps the most remarkable.

A. R. Marsh.

Bragança, brăă-gaan'săă: a seaport-town of Brazil; province of Pará; on the river Caite, near its mouth; 106 miles E. N. E. of Pará (see map of South America, ref. 3–G). It has a trade in sugar. Pop. 10,000.

Braganza, brăă-gaan'zăă: a fortified town of Portugal; province of Tras-os-Montes; on a small stream 35 miles N. W. of Mirandi (see map of Spain, ref. 13–C). It has a citadel, a college, and a castle partly ruined, which was the seat of the Dukes of Braganza. It is the seat of a Catholic bishop. The name of the reigning family of Portugal, the house of Braganza, is derived from this town, which has manufactures of velvet and other silk fabrics. Pop. 5,495.

Braganza, or **Bragança**: the name of the royal family of Portugal and the late imperial family of Brazil, which is descended from Affonso, Duke of Braganza, a natural son of John I., King of Portugal. He died in 1461. The first member of this family that became King of Portugal was the eighth duke, who began to reign as John IV. in 1640. The first Emperor of Brazil was Dom Pedro I., the eldest son of King John VI.

Brage, braa'ge [derivation uncertain, but cf. O. Eng. *bregn*, princeps]: in Scandinavian mythology a son of Odin. He is the god of poetry and eloquence, and is one of the twelve chief gods in Asgard. He is not only eminently skilled in poetry, but the art itself is from his name called

Brage, which epithet is also used to denote a great poet. He is represented as an old man with a long flowing beard, and persons with heavy beard are called after him beard-brage (skegg-bragi). His wife, Idun, keeps in a box the apples which the gods, when they feel old age approaching, have only to taste of to become young again. In this manner they preserve their youth until Ragnarok. The giant Thjasse once captured Idun with her apples and carried her to Jotunheim. This made the gods turn wrinkled and gray, but they compelled Loke to bring her back to Asgard. (See IDUN.) *Bragarœdur*, in the Younger Edda, gives a description of a banquet to Æger, the god of the sea, in Asgard, where Brage at the request of Æger tells how Idun was captured by Thjasse. At feasts given after the death of a king or jarl it was customary among the old Scandinavians for the heir of the deceased to occupy a lower bench in front of the high-seat until Brage's bowl was brought in. Then he arose, made a pledge, and drank the cup of Brage (*bragafull*).—BRAGE THE OLD is occasionally quoted in Old Norse literature as an ancient skald, but his existence is doubted. It is fair to assume that the god Brage has been changed into an historical person, and that poetry of which the authorship was unknown was ascribed to him. See Thorpe's *Northern Mythology*; Keyser's *Religion of the Northmen*; Anderson's *Norse Mythology*; and Bugge, *Der Gott Bragi*, in Paul and Braune's *Beiträge*, xiii. 187 ff. BRAGE is sometimes spelled BRAGI (*q. v.*).

RASMUS B. ANDERSON.

Bragg, BRAXTON: soldier; b. in Warren co., N. C., Mar. 22, 1817; graduated at West Point in 1837; became captain June 18, 1846, in the Third Artillery; and served with distinction at various posts until Jan. 3, 1856, when he resigned with the rank of brevet lieutenant-colonel. In the civil war he was in command of the forces of the Southern army at Pensacola operating against Fort Pickens 1861; of Second Corps at Shiloh 1862, being promoted to general on the death of Gen. A. S. Johnston; moved against Buell into Kentucky 1862, whence he was compelled to retire after defeat at Perrysville Oct. 8, 1862; defeated at Murfreesboro Jan. 2, 1863; after a brief arrest overthrew Rosecrans at Chickamauga Sept. 20, 1863; relieved from command Dec. 2, 1863, for loss of Mission Ridge in the battle of Chattanooga Nov. 25, 1863; led a small force from North Carolina to Georgia in 1864; became chief engineer to State of Alabama, and made improvements in Mobile harbor. D. in Galveston, Tex., Sept. 27, 1876.

Bragg, WALTER L.: lawyer; b. in Lowndes co., Ala., Feb. 25, 1838; graduated at Harvard in 1858. He was a captain in the Confederate army. At the close of the war he settled in Alabama and practiced law, and was the first president of its State bar association. He was president of the Alabama railroad commission and in 1877 was appointed a member of the Interstate Commerce Commission, being reappointed in 1889. D. at Spring Lake, N. J., Aug. 21, 1891.

HENRY WADE ROGERS.

Bra'gi: god of poetry in the northern mythology. See especially Bugge, *Der Gott Bragi* (in Paul and Braune's *Beiträge*, xiii. 187 ff.); and the article BRAGE.

Bragi the Old, or **Bragi Boddason**: Norwegian poet; celebrated as the most ancient skald whose name is known. He is commonly thought to have lived about 770–850, though some regard this date as too early. The meager fragments of his verse that have come down to us have been edited by H. Gering (Halle, 1886). See also Vigfússon, *Corpus Poeticum Boreale*, ii. 2 ff.

G. L. KITTREDGE.

Bra'he, TYCHO (Dan. pron. braa'*e*): astronomer; b. in Knudstrup, Scania, Sweden, Dec. 14, 1546, which at that time was a province of Denmark. He studied at Copenhagen, Leipzig, and Wittenberg, where his face was disfigured in a duel; was early fascinated with astronomy, and in 1563 began the correction of the *Alphonsine Tables*. The king, Frederic II., gave him the island of Hoëne, in the Sound, about 1575, where he built the finest observatory (Uranienborg) which ever had been erected in Europe. He enriched the science of astronomy very much, partly by his very numerous observations, partly by inventing new instruments. He formed a catalogue of 777 stars, increased by his pupil Kepler to 1,000 from the records which he left behind, and his recorded observations of the planet Mars furnished to the same distinguished successor the material from which he deduced his famous "Laws." An uncle who died in 1565 left him an estate. Having passed several years in Augsburg, he returned to his native country in 1570. He rejected the Copernican system, which in his time was not supported by the conclusive evidence we now have in its favor. In fact, Tycho's theory, which made the sun move round the earth, and all the other planets round the sun, explained all the phenomena then known equally well. After the death of his royal patron in 1588 he was first neglected, and then so persecuted by the court that he emigrated to Germany in 1597, and was induced by the Emperor Rudolph to settle at Prague, where he died Oct. 24 (N. S.), 1601. He published, besides other works, *Astronomiæ Instauratæ Progymnasmata* (1587–89). "As a practical astronomer," says Sir David Brewster, "Tycho has not been surpassed by any observer of ancient or modern times. The splendor and number of his instruments, the ingenuity which he exhibited in inventing new ones, and his skill and assiduity as an observer, have given a character to his labors and a value to his observations which will be appreciated to the latest posterity." See Brewster's *Martyrs of Science* (1841), and his *Life* by Frijs (Danish, 1871). Cf. J. L. E. Dreyer, *Tycho Brahe, Scientific Life and Work in the Sixteenth Century* (London, 1890).

Brahma [occurs in Hindi in two forms: (1) *Brahmă*, nom. sing. neut., and (2) *Brahmā*, nom. sing. masc. of a Sanskrit crude form *brahman*, meaning growth, increase, or expansion; probably from a root *bṛih*, or *vṛih*, to grow or increase. The form *Brahmā* is not found in the Vedas or Brāhmanas]: In philosophical Brahmanism the form Brahmă is used to designate the supreme, self-existent, and all-pervading soul of the universe, from which all things emanate, and to which they return. Brahmă is the Supreme Spirit, regarded as impersonal, and divested of all quality and action. It is described as absolute, eternal, without beginning or end, immaterial, invisible, and inappreciable by the senses until "the film of mental blindness has been removed." It receives no worship, but is an object of abstract meditation, the only means by which absorption into it can be attained. (See BRAHMANISM.) In Hindu mythology this impersonal Supreme Being, when dominated by Activity (one of the three eternal principles or binding qualities by the equipoise of which, according to the Sankhya philosophy, nature exists), becomes *Brahmā*, the Creator, the first member of the Hindu triad of gods (the others being Vishnu and Siva), and the lord and father of all creatures. (See VISHNU, SIVA, and TRIMURTI.) He is said to live for one hundred divine years of three hundred and sixty divine days and nights. A day and a night make a kalpa, which is equal to 4,320,000,000 mortal years. When created by Brahmā, the world remains unaltered for one of his days (2,160,000,000 mortal years). It is then consumed by fire, only the elements, the gods, and the sages surviving. When he wakes up at the beginning of the next kalpa, the process of creation is repeated, followed by a night of decay; and this takes place 36,000 times, when he expires and everything comes to an end. Brahmā is represented as of a red color, and with four heads and four arms. His vehicle is a swan. He is never worshiped by the people, and only one temple is known to have been erected in his honor. His consort is Saraswati, the goddess of learning, who is also known as *Brāhmi*.

R. LILLEY.

Brahman: a member of the sacerdotal caste among the Hindus. See BRAHMANISM and CASTE.

Brahmanism, braa'man-izm: the religion of the Hindus, established by the Brahman priests upon the basis of the *Vedas*.

All Brahmanical beliefs are founded upon the *Vedas*, the earliest literary productions of India. The literature of the *Vedas* consists of various strata. The lyric parts, the so-called *Mantras*, are prayers or hymns addressed to the personified forces of nature. Agni, the fire (*ignis*), the heavenly messenger, the heavenly guest, the carrier of the sacrifice to the gods; Indra, the Hercules, the demiurge, who is inspired by the intoxicating drink *soma* to give fight and slay the cloud-demons; Sūrya and Ushas (*sol* and *aurora*); Dyāus (Zeus) and Prithivi, the shining sky and the earth; Rudra and the Maruts, the storm-god and his companions; Varuna (Uranos), the encompassing, all-seeing sky, he who has his spies everywhere to ferret out the wrongs done by men, etc.

In connection with the worship of these divinities there grew up a vast system of sacrificial ritualism and theosophic speculation laid down in texts called *Brāhmanas*, *Sūtras*, and *Upanishads*. The *Upanishads* especially have remained the foundation of all the higher thought in Brah-

manism up to our day. They are the first exponents of Hindu pantheism. Nothing really exists, they affirm again and again, but the one Universal Spirit (called *ātman*, the self, or *brahma*, the spiritual essence), and whatever appears to exist independently is identical with that spirit. Even the earlier gods of the Vedic hymns are but manifestations of this all-power. No real self can exist separately from the one self-existent supreme self, and when by an act of that self the individualized spirits of men are allowed for a time an apparent separate existence, the ultimate end and aim of such spirits should be to attain complete reunion with the one eternal self in entire self-annihilation. Coupled with this is the doctrine of transmigration of souls (metempsychosis), which seems to rest upon a more popular foundation than pantheism, but which fused very readily with it. Metempsychosis implies the belief that every creature is born again and again in any of the countless possible forms which lie between the great self-existent and the most insignificant living atom in the universe. Every creature is again and again the prey of death until he accomplishes the union with Brahma. And the Hindus assign a reason for this distressing indestructibleness of individual existence. It is desire during life. Desire, they say, produces deeds or action, and action, whether good or bad, is by its very nature finite, and holds the actor within the chains of finite existence. Only he who knows this and acting upon this knowledge eradicates every desire by separation from the world attains to Brahma—that is, to release from the chain of finite existences.

Brahmanical pantheism is necessarily the special property of the spiritually enlightened, the Brahmans. Prior to the appearance of Bûddha these ideas remained the property of learned schools solely. To the people the Brahman philosophers gave nothing but a polytheistic worship, which kept on changing the attractive early Vedic beliefs into an idolatry growing more and more grotesque at every stage of its development. The Brahmanical priests, holding in their hands the knowledge of the sacrifice, grew into a hierarchy whose power has never been exceeded. They kept on strengthening the system of castes which even to-day is the most significant social factor in Hindu life. A disjointed mass of sacred writings full of heterogeneous doctrines has grown up, based in a large measure upon Vedic beliefs, but absorbing also at the same time much of the fetishism of the aborigines of India; it has stooped to appropriate and naturalize the adoration of the fish, the boar, the serpent, the monkey, rocks, stones, and trees. At present the essentials of Brahmanical belief may be summed up in two conditions: the admission of the spiritual supremacy of Brahmans, and obedience to the caste-rules concerning food, intermarriage, and professional pursuits. One may say that the practical religion of the 150,000,000 or more Brahmanical Hindus now living is the law of caste. The more general and abstract laws of religion and worship of the gods and idols are not ignored, but they take a distinctively secondary place. The highest law which concerns the Hindu is to eat correctly, to drink correctly, to marry correctly—that is, in accordance with the rules that obtain in his caste. See Barth, *The Religions of India* (Boston, 1882); Monier-Williams, *Brahmanism and Hinduism* (4th ed. New York, Macmillan & Co.). See also Sankhya and Caste.

Maurice Bloomfield.

Brahmapu'tra, also written **Burrampooter** (anc. *Dyardanes* or *Œdanes*): a great river of Asia. It rises in Tibet, where it first has a southerly course, and is known as the Kharta; then it has a long course eastward as the Sanpu, flowing in the valley between the Himalaya and Gangri Mountains. Opposite Eastern Bhutan it turns S. E., and is known as the Dihong river. In Northeast Assam it receives its largest tributary, the Burang river, when it becomes the Brahmaputra. Its general direction is then nearly W. S. W. until it passes through Assam and enters Bengal. It flows southward through Bengal, and enters the Bay of Bengal with the Ganges. It is connected with the Ganges not only by a common delta, but by a large branch or channel called the Jenna, which leaves the Brahmaputra about lat. 25° N. After receiving the tributary called the Meghna on the eastern side, it takes the name of that stream, and so remains to its mouth. It thus has five different names in its course. The identity of the Sanpu and Brahmaputra was long doubted by geographers, but is now settled. Its entire course is estimated at 1,800 miles. It inundates the level tracts of Bengal from April to September, and is said to discharge into the sea more water than the Ganges. The violence of its current and its *bore* (an upward wave caused by the sudden influence of the tide) render navigation difficult.

Brahmin: a member of the sacred or sacerdotal caste among the Hindus. See Caste.

Brah'mo So'maj [the Bengali form of Sanskr. *brahmasamāja*, meeting or society for worship]: a society of Theists in India. Founded in 1830 by Rammohun Roy, it increased in numbers and activity after 1842, under the leadership of Debendro Nath Tagore, who succeeded in emancipating it from Vedantism. In 1859 a new impulse was given to it by the ability and enthusiasm of Keshub Chunder Sen, who effected the separation of those who were willing to abolish caste in their communion, as the "Brahmo Somaj of India." The more conservative members remained in the Somaj or Church of Calcutta. Many of them are young Hindus educated at the English colleges. The first building for public worship of the progressive Brahmos was opened at Calcutta in 1869. The number of avowed Brahmos is probably not more than between 4,000 and 5,000, but large numbers of the educated natives sympathize with the movement. Keshub Chunder Sen, in his sermons and published tracts, avowed a belief in the unity of God, in immediate revelation, in the necessity of a new birth, in the immortality of the soul, and in the efficacy of prayer. His morality was pure, and he inculcated reverence for the character of Jesus Christ, but repudiated the doctrines of his divinity, mediation, and atonement as taught in the New Testament. This "Unitarian Theism" is said to resemble the theological rationalism of Theodore Parker. See *Six Months in India*, by Miss Mary Carpenter; *Hours of Work and Play*, by Miss F. P. Cobbe; an article in the *Contemporary Review* on *Indian Theism*, etc. (1869); Dr. Jardin's paper in *Proceedings of the Allahâbâd Conference* (1872); Mozoomdar's *Life and Teachings of Keshub Chunder Sen* (1888); the English work of Rammohun Roy (*q. v.*) (1888).

Revised by C. K. Adams.

Brahms, braams, Johannes: musician; b. in Hamburg, Germany, May 7, 1833; studied first under his father, and, being encouraged by Schumann in 1853, resolved to devote himself to a musical career. In 1861 he left Hamburg for Vienna, where he made his residence, and died there Apr. 3, 1897. His principal works are four symphonies for full orchestra, several overtures, and other orchestral works: *Rinaldo*, a cantata (for male voices); *Noenia*; *Song of Destiny*; *German Requiem*; *Song of the Fates* (for six-part chorus); *Rhapsodie* for alto solo and male chorus); *Song of Triumph*: *Ave Maria* (for female voices); *Funeral Hymn*: *Thirteenth Psalm* (for female voices). These choral works are all exceedingly difficult, but very effective when well sung. The admirers of Brahms consider him the true successor to Beethoven, and his first symphony was considered so fine by some critics as to rank after Beethoven's *Ninth*, and was called the *Tenth Symphony*. His orchestral works are much more frequently heard than his choral compositions, owing to the great difficulties in the latter. He also wrote many songs, ballads, and small choruses. D. E. Hervey.

Braidwood: city (founded in 1860); Will co., Ill. (for location of county, see map of Illinois, ref. 3–G); on Chicago and Alton R. R.; 58 miles from Chicago; has 5 churches, 5 public schools, coal-mining and agricultural industries. Pop. (1880) 5,524; (1890) 4,641; (1900) 3,279.

Editor of "Bulletin."

Braila, brăa-cc'la (Turk. *Ibraila*): a fortified town of Roumania; on the left bank of the Danube; about 100 miles from its mouth and 102 miles N. E. of Bucharest (see map of Austria-Hungary, ref. 8–N). Large quantities of grain and other produce are shipped at this place, which is the chief port of Roumania. Pop. 29,000.

Braille Alphabet: See Blind, Education of the.

Brain: the *encephalon* or contents of the cranium; the material instrument of thought, impulse, and perception in man and the higher animals. Only vertebrates have a true brain; in others ganglia or nerve-centers exist, but the "cephalic ganglia" of insects and other invertebrate animals are not strictly homologous with the brain.

The central nervous system of vertebrated animals consists of the *spinal cord* (see Medulla Spinalis), contained within the spinal canal of the vertebral column, and the expanded and highly differentiated *encephalon*, lying within its protecting bony case, the cranium. Disregarding the

exceptions presented by certain species and individuals, the development of the brain advances from the lowest class of vertebrates, the fishes, through amphibians, reptiles, birds, to mammals, reaching its culmination in man. On the one hand, the *amphioxus*—a peculiar fish, regarded as the lowest vertebrate, and remarkable for the rudimentary condition of its organs—possesses the least developed brain, this important organ being represented by an imperfectly differentiated cerebral vesicle in which the anterior end of the spinal cord ends; so immature is the brain in this animal that it was formerly regarded as entirely absent. In man, on the other hand, the brain attains its highest development, especially in those peculiarities indicative of intellectual power.

The ratio between the weight of the encephalon to that of the entire body increases as the zoölogical scale is ascended; thus in fishes the average ratio is (according to Leuret) about as 1 to 5,668; in reptiles, 1 to 1,321; birds, 1 to 212; mammals, 1 to 186; in man, 1 to 36. The elephant has the largest brain, in actual weight, of all animals, sometimes reaching 9 or 10 lb.; next is that of the whale, about 5 lb. The heaviest human brains have never weighed so much as this, yet the proportion of weight of the brain to the whole body of the elephant is but as 1 to 500. In some small animals and birds the ratio is relatively high; as in the marmoset, 1 to 22; field-mouse, 1 to 31; linnet and canary-bird, 1 to 20; and the blue-headed tit, 1 to 12. But it must be remembered that the *kind* of brain varies also; while the sensory-motor portions of the brain are of much greater relative size in the lower animals than in man, those parts associated with the highest intelligence, as the cerebral hemispheres, are especially conspicuous in the human brain. There is an obvious connection between the degree of cerebral development in the different groups of animals and their intelligence; the brain of man is greatly superior to any other in its development. As Huxley has pointed out, the difference in the *structure* of the brains of men and of the higher apes is not very marked, and the disparity in *size* is less than between the highest and the lowest of the quadrumana. But the gap is a wide one, since an average European child of four years old has a brain twice as large as an adult gorilla, whose weight is perhaps four times as great.

An appreciation of the plan upon which the primitive nervous system is formed is essential to a correct understanding of the adult brain. The earliest representative of the cerebro-spinal axis is the *neural tube*, formed by the folding in of the outer layer of the embryo along its dorsal surface. Later, the anterior end of the neural tube expands into three primary *cerebral vesicles*—anterior, middle, and posterior; the anterior and posterior of these subsequently subdivide, five partially constricted sacs, known as fore-brain, inter-brain, mid-brain, hind-brain and after-brain, now representing the future encephalon. These vesicles, together with the neural canal, constitute a single thin-walled tube, whose relatively large original lumen becomes proportionately reduced by the growth, thickening, and differentiation of its walls, being represented in later life by the ventricles of the brain and the central canal of the spinal cord.

In the typical vertebrate brain certain divisions are recognized, which correspond to its primitive condition; these are:

(1) *Prosencephalon*, comprising the structures of the cerebral hemispheres, together with the olfactory lobes;

(2) *Thalamencephalon*, including the thalami optici and the other parts about the third ventricle;

(3) *Mesencephalon*, embracing the structures around the Sylvian aqueduct, with the crura cerebri below and the optic lobes, or corpora quadrigemina, above;

(4) *Epencephalon*, corresponding to the cerebellum and pons Varolii;

(5) *Metencephalon*, consisting principally of the medulla oblongata.

In fishes, those parts which represent the cerebral hemispheres are generally no larger than the optic lobes; a condition to which, at a certain stage of development, the brain of the human embryo presents a near resemblance. In amphibia and reptiles there is not much advancement, but the cerebral hemispheres are larger and the cerebellum smaller. Birds have a considerable increase in the size of the hemispheres, which, in them, cover the olfactory ganglia in front and the optic lobes behind; the cerebellum in them is large. To each of these the embryonic human brain has, at certain stages, a resemblance.

Mammals present great diversity, from the smooth-brained (Lissencephala of Owen) Monotremata, Marsupialia, and Rodentia, up through the other groups to the highly convoluted (Gyrencephala) and otherwise complex brains of the anthropoid apes, as the gorilla and chimpanzee. In the higher apes the cerebral hemispheres roof over and partly conceal, when looked at from above, the cerebellum behind, as well as the olfactory bulbs in front; in the lemurs, however, the cerebellum is uncovered, and the surface of the cerebrum is almost devoid of convolutions.

In the human brain, the arrangement of its parts is so profoundly modified by the excessive development of the cerebral hemispheres that the correspondence between the typical vertebrate brain and the adult human organ becomes masked.

The average weight of the adult human brain in the male is about 49½ oz. (1,400 grammes), or slightly more than 3 lb. avoirdupois; in the female, about 44 oz. The usual difference of 4 to 6 oz. between the two is to be attributed to the lesser general body-weight in the female, and not to inferiority of cerebral development, since the ratio of the brain-weight to that of the entire body has been shown to be practically identical in both sexes. The proportionate weight of the brain to that of the body is greatest at birth, being then about as 1 : 6 (Tiedemann), diminishing gradually to the tenth year, when the ratio is 1 : 14; at the twentieth year, 1 : 30; after that period, 1 : 36·5. The brain attains its greatest weight at about the fortieth year; after that time a diminution is said to take place at the rate of about 1 oz. for each decade.

The relation between brain-weight and intelligence also must be admitted with reservations. While it may be accepted that in general heavy brains are associated with high intelligence, as in the comparison of nations and races, yet brain-weight can not be relied upon as the index of mental capacity in individuals, notwithstanding the conspicuous correspondence between intellectual endowment and high brain-weight in the well-known examples: Cuvier, 1,861 grammes (65·7 oz. avoir.); Byron, 1,807 grammes (63·8 oz.); Schiller, 1,580 grammes (55·8 oz.); Gauss, 1,492 grammes (52·7 oz.); Dante, 1,420 grammes (50·2 oz.), and others. On the other hand, the brains of men of acknowledged intellectual superiority have weighed less than the average, while some of the heaviest brains recorded have belonged to ignorant and illiterate individuals. Weight alone, therefore, may be regarded as suggestive, but by no means conclusive, evidence of intelligence; the development of the cerebral convolutions, the amount of cortical gray matter, and the number of ganglion nerve-cells are all factors to be considered in drawing accurate comparisons between brains.

The capacity of the cranium closely corresponds with the central development; the average capacity of the normal cranium is about 1,400 cubic cm. (85 cubic inches). Skulls have been divided into three classes: those belonging to a middle group, or *mesocephalic*, with a capacity of from 1,350 cubic cm. (82 cubic inches) to 1,450 cubic cm. (88 cubic inches); those below 1,350 cubic cm. capacity being *microcephalic*; those above 1,450 cubic cm., *megacephalic*. The Eskimo and European possess the largest cranial capacity; the Hindu the smallest. The cranium of idiots may be reduced to correspond to a brain-weight of only 23 oz.

It is usual to describe the human encephalon as composed of four chief divisions—*cerebrum*, *cerebellum*, *pons*, and *medulla oblongata*. These are enveloped within the skull by protecting membranes, which, from without inward, are the *dura*, *arachnoid*, and *pia*. The dura (mater) is the outer dense fibrous investment, closely adhering to the cranial bones in many places, and sending vertical partitions between the hemispheres of the cerebrum and cerebellum, and supporting and separating the hind part of the former from the latter by a horizontal septum. The arachnoid is an extremely delicate, web-like structure, usually so closely applied to the dura that it is frequently overlooked. The pia (mater) is the vascular tunic of the brain, supporting and conveying the blood-vessels supplying the nervous tissue, lying closely applied and following all the irregularities of its surface.

The cerebrum in the human brain greatly exceeds the other parts both in volume and weight, constituting about ·87 of the entire brain-weight. It consists of two *hemispheres* (Fig. 1, *a* and *b*) divided by a deep median cleft, the *longitudinal fissure* (*c*), in which the sickle-like fold of dura, *the falx*, projects; the separation of the hemispheres in front and behind is complete, the two halves, however, being connected by a transverse bridge, the *corpus callosum*, situated

at the bottom of the fissure, and occupying a little more than half its length.

The surfaces of the hemispheres in the adult human brain present a complicated arrangement of *convolutions* and in-

Fig. 1.—Brain viewed from above, showing some of the principal fissures and convolutions: *a*, *b*, cerebral hemispheres, separated by *c*, the longitudinal fissure; *d*, placed at the anterior border of the central fissure; *e*, part of parieto-occipital fissure; *F*, *P*, *O*, frontal, parietal, and occipital lobes.

tervening *fissures* (Fig. 1), resulting from the extensive folding of the cerebral surface taking place during the growth of the organ, greatly increased superficial area being thereby secured without undue augmentation of volume. While on cursory examination the convolutions seem disposed without order, comparison shows that they are grouped according to definite plans for each class of animal.

The under and outer surface of each hemisphere of the cerebrum of man presents a deep oblique incision, the *fissure*

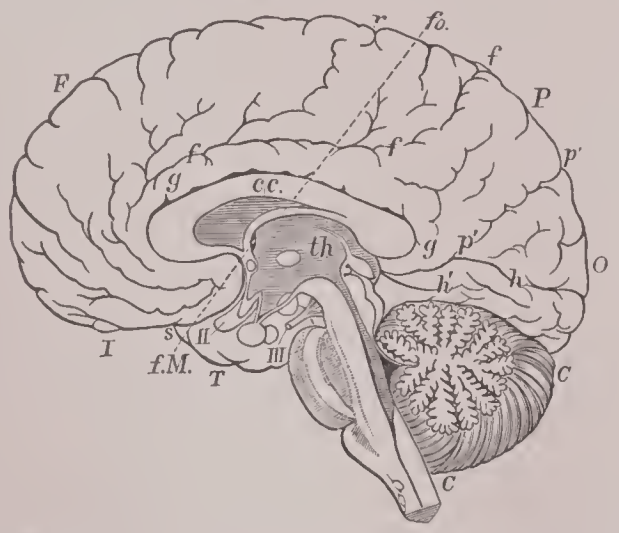


Fig. 2.—Median section through the brain, exposing mesial surfaces. *F*, *P*, *T*, and *O*, the frontal, parietal, temporal, and occipital lobes; *C*, cerebellum; *cc*, corpus callosum; *th*, thalmus (the letters are placed in third ventricle, seen in longitudinal section); the Sylvian aqueduct, shown leading from third to fourth ventricle; *f. M.* foramen of Monro, the communication between the lateral and third ventricles.

of Sylvius (Fig. 3, *a*), which begins on the base of the brain and passes outward, upward, and backward, to become a conspicuous landmark on the lateral aspect of the cerebrum. The less marked but important *central* or *Rolando's fissure* runs more nearly vertical, extending from close to the fissure of Sylvius almost to the superior margin of the hemisphere (Fig. 1, *d*). A third important incision, the *parieto-occipital* fissure (Fig. 1, *e*), is scarcely seen on the lateral or external surface, but appears on the inner or mesial as a cleft extending from the upper margin of the hemisphere, about midway between the central fissure and the posterior end of the brain, downward and forward for a variable distance.

These cardinal fissures divide each hemisphere into five principal divisions—the *frontal*, *parietal*, *occipital*, *temporo-sphenoidal*, and *central lobes*. The frontal lobe (Fig. 1, *F*; Fig. 3, *e*) includes the anterior part of the hemisphere, its posterior boundary being the fissure of Sylvius and the central fissure. The parietal lobe (Fig. 1, *P*) lies between the central fissure in front, the parieto-occipital fissure behind,

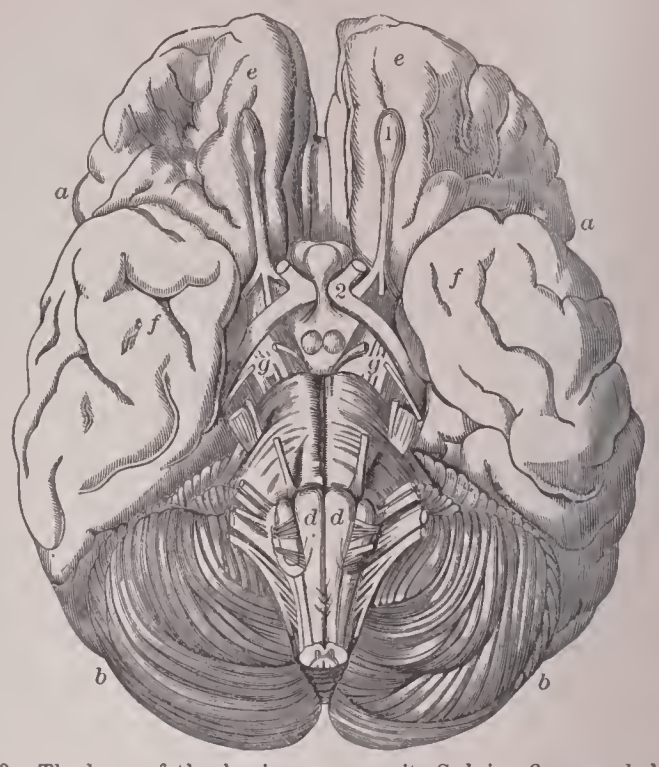


Fig. 3.—The base of the brain: *a*, opposite Sylvian fissure; *b*, hemispheres of cerebellum; *c*, pons; *d*, medulla (the latter is on the anterior pyramids); *e*, *f*, frontal and temporo-sphenoidal lobes; *g*, crura of cerebrum; 1, olfactory bulb; 2, optic chiasm. Cranial nerves seen emerging from sides of pons and medulla.

and the Sylvian fissure below. The occipital lobe (Fig. 1, *O*) includes the part of the hemisphere lying behind the parieto-occipital fissure, being separated by the latter from the parietal lobe above, but fusing with this and the temporo-sphenoidal lobe below and in front. The most dependent portion of the hemisphere, limited in front and above by the fissure of Sylvius and fusing behind with the parietal and occipital lobes, constitutes the temporo-sphenoidal lobe (Fig. 3, *f*). At the bottom of the Sylvian fissure, covered in and masked by the overhanging parts of the frontal and parietal lobes, lies the central lobe or island of Reil. Each of these lobes is subdivided by secondary fissures into a number of convolutions. The convolutions bordering the central fissure (Fig. 1, *d*)—ascending frontal (precentral) and ascending parietal (postcentral)—are of especial interest as being the areas presiding over the motion of certain important regions of the body, as will be presently described.

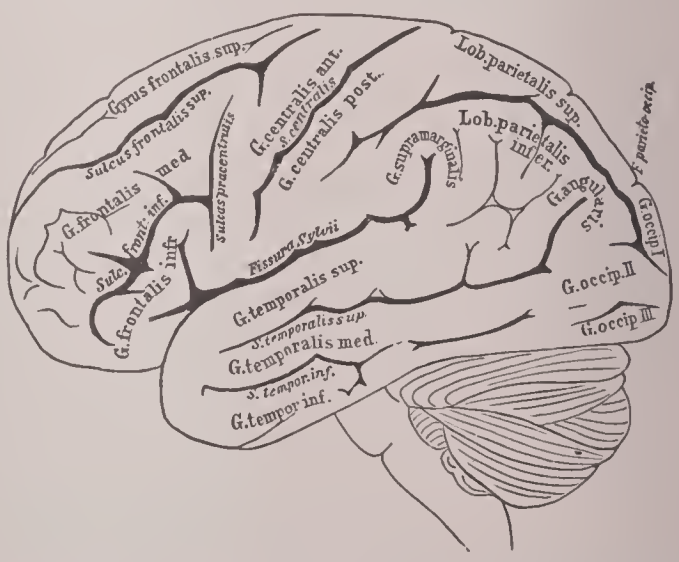


Fig. 4.—Lateral view of brain, showing the principal fissures and convolutions of the cerebral hemisphere, the cerebellum, pons, and oblongata in outline.

Without here considering the minute structure of the organ under consideration (for which see Histology), it must be remembered that the brain and spinal cord are composed of two kinds of nervous tissue—gray and white matter. The gray matter is the principal seat of the ganglionic nerve-

cells, hence its importance for the origination of impulses; the white matter, on the contrary, is chiefly composed of tracts of nerve fibers. In the cerebrum and cerebellum, the gray matter forms a continuous external or *cortical* layer, usually some 3 to 4 mm. thick, in which the nerve fibers, establishing communication with more or less remote parts of the body, end. In addition to the gray matter of the cortex, other large masses of this tissue, as the corpus striatum and optic thalamus, lie within in cerebrum, where they form the so-called "basal ganglia."

In order to examine the interior of the cerebrum, successive horizontal slices may be removed from the upper part of the hemispheres. Above the level of the transverse bridge, or *corpus callosum* (Fig. 5, *a*), the sections show large solid areas of white matter bordered by the gray cortical layer. On removing the corpus callosum, two large intracerebral cavities, the *lateral ventricles*, are exposed (Figs. 5 and 6), one in either hemisphere. These are irregular cavities, prolonged by their anterior, posterior, and lateral horns or *cornua*, respectively, into the frontal, occipital, and temporosphenoidal lobes. The ventricles, of which there are four true ones—the *two lateral*, the *third* and the *fourth*, together with the so-called *fifth* ventricle, which does not correspond with a true ventricle, being a space really without the neural tube—represent the remains of the cephalic divisions of the primitive neural canal.

Certain irregularities project into the sides and floor of the lateral ventricles. The most important and conspicuous are the *corpus striatum* (Fig. 6, *b*), occupying the sides and floor of the anterior portion of the cavity, and the *optic thalamus* (Fig. 6, *a*), situated behind and to the inner side of the former. The striatum comprises masses of white and gray matter; of the latter are the intra-ventricular portion, or *caudate nucleus*, appearing within the lateral ventricle, and the extra-ventricular part, or *lenticular nucleus*; these two are separated by a conspicuous tract of white matter, the *internal capsule*, composed of bundles of nerve fibers passing from the cerebral cortex to the deeper basal ganglia and to the tracts connecting the cerebrum with the subjacent divisions of the brain.

The *third ventricle* is a T-shaped cavity, the vertical arm being a narrow cleft (Fig. 6, *d*) between the mesial surfaces of the thalami (Fig. 6, *a*), while the horizontal limb extends over the upper surface of the latter, being roofed in by the delicate vascular membrane, the *velum interpositum*, an

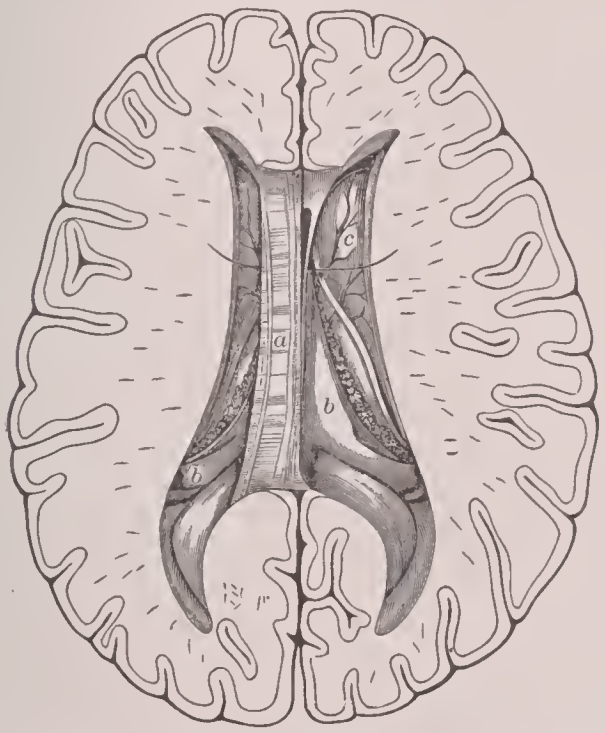


FIG. 5.—Horizontal section of the brain, about at the level of the corpus callosum (*a*), which has been partly removed to expose the underlying lateral ventricles, whose anterior and posterior horns extend into the frontal and occipital lobes.

extension of the pia. Three connecting bands—anterior, middle, and posterior *commissures*—bridge the cleft of the ventricle and connect the two thalami; the middle commissure is composed of gray matter, the other two of white. The thalami are composed largely of gray matter interspersed with bundles of fibers. At the extreme anterior end of the third ventricle a Y-shaped opening, the *foramen of Monro*, establishes communication between the lateral and third ventricles, while at its posterior extremity the narrow *aqueduct of Sylvius* leads from the third to the fourth ventricles. The so-called *fifth ventricle* (Fig. 6, *f*) is a narrow slit, included within the *septum lucidum*, separating the lateral ventricles and roofed in by the corpus callosum above; it does not correspond to a true ventricular cavity, having no communication and being really a cut off portion of the great longitudinal fissure.

Immediately behind the third ventricle and above the aqueduct of Sylvius four tuberosities are seen (Fig. 6, *g*), arranged as upper and lower pairs; these are the *corpora quadrigemina* of the human brain, and correspond to the singly paired optic lobes, which in other classes, especially in fishes and amphibia, constitute very conspicuous parts of the brain, sometimes even exceeding the cerebral hemispheres. Above the corpora quadrigemina is situated a peculiar cone-shaped organ, the *pineal body* (Fig. 6, *h*), whose significance was for centuries a riddle. Among other theories as to its function, Descartes regarded it as the seat of the soul. Recent comparative researches justify the belief that this body represents in man and the higher animals the degenerate remains of what, in past ages, in lower classes was a functionating third organ of sight—the *pineal eye*.

The *cerebellum*, or little brain, weighing about one-eighth as much as the cerebrum and contributing about one-tenth of the weight of the entire brain, occupies the posterior fossa of the cranium. In man it is completely covered in above by the highly developed cerebral mantle, being separated from the cerebrum by the *great transverse* (*Bichat's*) *fissure*, and the horizontal partition of dura, the *tentorium*.

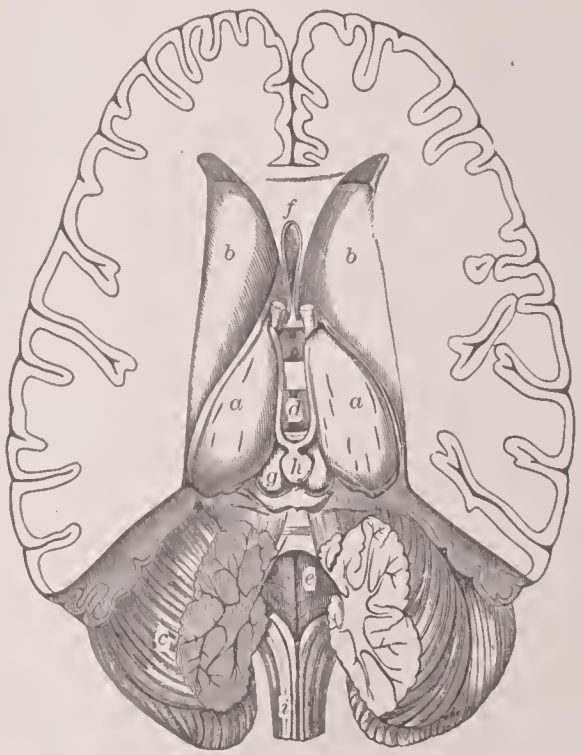


FIG. 6.—Horizontal section of the brain below the level of corpus callosum, exposing lateral (*b*, *b*), third (*d*), and fourth (*e*) ventricles; *f*, cleft within septum lucidum called fifth ventricle; *b*, *b*, interventricular surface of striatum, corresponding to nucleus caudatus; *a*, *a*, upper surface of thalamus; *g*, corpora quadrigemina; *h*, pineal body. Posterior parts of hemispheres have been removed to show cerebellum (*c*), the median portion of the latter cut away to expose fourth ventricle (*e*) and medulla (*i*).

The cerebellum consists of two hemispheres (Fig. 3, *b*, *b*), partially separated by a deep valley traversed by various commissural tracts. In addition to the separation into an upper and lower portion effected by the great *horizontal fissure*, each hemisphere is divided into a number of lobes by secondary fissures, on the upper surface there being two, on the lower five, such lobes. The exterior of the cerebellum presents numerous thin folds or laminæ, which, on transverse section, exhibit a characteristic foliated appearance—the *arbor vitæ* of the older anatomists—of the cortical layer of gray matter covering in the central white stems of nerve fibers. By means of a pair of anterior stalks, or *peduncles*, the cerebellum directly communicates with the anterior division of the encephalon, through the posterior peduncles, with the subjacent medulla, while the transverse fibers of the pons constitute the commissure uniting the hemispheres.

The remaining divisions of the brain—the pons and medulla—contain chiefly white matter, being made up largely of bundles of nerve fibers passing from the spinal

cord to higher portions of the nervous axis. The *pons* (*Varolii*) (Fig. 3, *c*) unites the various segments of the encephalon, connecting the cerebrum above, the cerebellum behind, and the medulla below. It appears as a quadrate body lying above the medulla, between the hemispheres of the cerebellum, and beneath those of the cerebrum. Alternate layers of transverse and longitudinal fibers, together with a limited amount of gray matter, constitute its mass; the transverse bundles connect the cerebellar hemispheres, while the longitudinal contain the fibers passing to and from the higher centers. At the upper border of the pons the longitudinal fibers are collected into two rounded stalks, the *cerebral crura* (Fig. 3, *g*), which diverge and enter the base of the hemispheres, forming the immediate bond of union between the cerebrum and pons, and constituting the great highway for the conveyance of nervous impressions to and from the cerebrum.

The *medulla oblongata* (Fig. 3, *d*), the most dependent division of the brain, extends from the lower border of the pons to become continuous with the spinal cord below. It is composed principally of the tracts of nerve fibers of the spinal cord (see MEDULLA SPINALIS), which are continued into the medulla to become rearranged as the *anterior pyramids*, *lateral tracts*, *restiform bodies*, and *posterior pyramids*. The most conspicuous of these are the anterior pyramids (*d*), which include the fibers derived from the anterior and lateral columns of the cord; at the lower end of these pyramids a crossing or *decussation* of part of the bundles takes place, by which arrangement fibers connected with one hemisphere pass to the opposite half of the cord and body, a fact of importance in explaining the phenomena of palsy. On the posterior surface of the medulla the *restiform* bodies are the largest tracts, collecting the fibers from the posterior and lateral columns of the cord, and becoming the posterior peduncles of the cerebellum. The *olivary bodies* are two prominent oval masses situated on the anterior surface of the medulla, near its upper part, between the anterior pyramids and the lateral tracts. The space included between the upper surface of the pons and medulla below, and the cerebellum and its attachments above, is the *fourth ventricle* (Fig. 6, *e*), continuous with the third through the Sylvian aqueduct in front, and with the central canal of the spinal cord behind. The floor of the fourth ventricle contains a layer of gray matter, derived practically as the continuation of that of the cord from below; this sheet of gray substance is of especial interest and importance on account of its relation to the deep origin of many important cranial nerves.

On examining the exterior of the base of the brain (Fig. 3), in addition to the lobes, convolutions, fissures, pituitary and mammillary bodies, and other details of its surface, there is seen the superficial origin of the twelve pairs of cranial nerves, named in the order, from before backward, in which they emerge from the surface of the encephalon. The *first* or *olfactory* nerves extend along the under surface of the frontal lobe, parallel with the median fissure, terminating in bulbous expansions (Fig. 3, 1), and represent the olfactory lobes of many animals. The *second* or *optic* nerves diverge outward and forward from the point of their junction and decussion, the *chiasm* (Fig. 3, 2), the widely expanded *optic tracts* winding backward across the crura to end in the thalami and corpora quadrigemina. The *third* or *motor oculi* nerves appear at the inner borders of the crura, while the *fourth* or *pathetic* wind round the crura from without in, usually lying close to the anterior border of the pons. The *fifth* or *trifacial* nerves, among the most important of those given off from the brain, are seen emerging on either side from the anterior part of the pons. The *sixth* or *abducent* nerves appear at the lower border of the pons in the depression between the pons and medulla. Beginning at the upper end of the latter, groups of fibers, composing the *seventh* (*facial*), *eighth* (*auditory*), *ninth* (*glossopharyngeal*), *tenth* (*pneumogastric*), and *eleventh* (*spinal accessory*) nerves, escape from the group between the restiform body behind and the olivary body and lateral tract in front. The *twelfth* or *hypoglossal* nerve arises superficially from the anterior surface of the oblongata between the pyramids and olivary bodies. For many other details of the complex structure of the brain, which must be here omitted, the reader is referred to special works on anatomy.

As has been stated already, the central masses of white matter, contributing so large a portion of the bulk of the brain, are composed of bundles of nerve fibers. The arrangement of these fibers is very complex, and the accurate determination of their course is a subject of great difficulty. Only a brief outline of the general plan of their distribution is here possible. The nerve fibers of the cerebrum are arranged in four principal groups: (1) those uniting the various parts of the same hemisphere; (2) those connecting identical areas of the two hemispheres, being the fibers composing the callosum and the anterior commissure; (3) fibers passing between dissimilar points of the two hemispheres; (4) those extending from the cortex directly or through the basal ganglia, into the crura, and *vice versa*, by their diverging course forming the *corona radiata*. Numerous fiber-tracts are found within the cerebellum, the principal ones affording connections with the adjacent parts, as well as uniting the various points of the cerebellum itself.

Regarding the *functions* of the structures constituting the encephalon, much uncertainty still exists; it may be assumed, however, that, in the present state of our knowledge, the cerebral hemispheres are the seat of all psychical activities involved in the processes of thinking, feeling, and willing. After destruction of these parts, the functions essential to the maintenance of life are carried on uninterruptedly, but without the accustomed guidance of intelligent volition. Both hemispheres participate in these psychical activities, so that impairment of one may be overcome by the other. From the anatomical peculiarities already described, it will be readily appreciated that the connection of the cerebral cortex with the other parts of the brain is essential for the exercise of will power and intelligence. It may be regarded as highly probable that every voluntary act influencing a given part of the body is under the control of some definite area of the cerebral cortex. Such areas have been determined with accuracy by experiment and disease for some few functions; among these, that the movements of the lower extremity, upper limb, and face are controlled respectively by the upper, middle, and lower thirds of the cortical substance bounding the central fissure—that is, of the ascending frontal and parietal convolutions. The area for speech is situated chiefly at the posterior part of the inferior frontal convolution of the *left* hemisphere, the central lobe, or the island of Reil, at the bottom of the Sylvian fissure, being also probably involved. Hearing is attributed to the upper temporal convolution, while sight is probably connected with a center situated within the occipital lobe (*cuneus*), embracing possibly the neighboring part of the parietal. Smell and taste seem to be associated in their areas, their joint center being ascribed a position on the inner and under side of the temporal lobe. Integrity of the paths conducting impulses from the cortical centers is, of course, essential for the performance of function; when the uniting tract of nerve fibers is damaged, as by an apoplectic clot, the stimulus is interrupted, and those parts beyond the obstruction, supplied by the affected fibers, remain unresponsive to volition, or paralyzed. Regarding the functions of the striatum and thalamus very little is known with certainty. The corpora quadrigemina are believed to be intimately concerned in maintaining co-ordination of movement and equilibrium, as well as connected with the deep origin of the nerves of sight. The cerebellum apparently exercises great control over exact co-ordination of movement; neither psychical activity, volition, nor consciousness is disturbed by injuries limited to this part of the brain. The medulla contains the areas presiding over many reflex acts, among these being the centers controlling respiration, coughing, sneezing, swallowing, vomiting, and others. In conclusion, it may be repeated that every part of the body influenced by will probably is supplied by nerves, which, in addition to the communication with ganglion-cells of the basal ganglia or spinal cord, are connected with some definite presiding cortical area, although our present knowledge of these intricate relations enables us to locate but few of the many controlling centers which undoubtedly exist. See LOCALIZATION, PHYSIOLOGY, and PSYCHOLOGY. G. A. PIERSOL.

Brain'ard, JOHN GARDINER CALKINS: poet; b. in New London, Conn., Oct. 21, 1796. He graduated at Yale in 1814. He published a volume of poems in 1825, and was for six years editor of the *Connecticut Mirror*. D. in New London, Sept. 26, 1828. See *Memoir of Brainard*, prefixed to his works, by J. G. Whittier, 1832.

Brain-coral: one of several species of massive actinoid coral in which the furrowed surface of the coral resembles the convolutions of the brain. "Over the curved surface of a live 'brain-stone' are stretched the soft organic parts of the coral, while in the superficial furrows lie the stomachs which

have a similar serpentine form to the convolutions in which they lie. Upon the surface of the brain-stone, arranged in lines, are found rows of mouths, each opening into that stomach or part of the stomach which lies just beneath them." (Fewkes, in *Standard Natural History.*)

DAVID S. JORDAN.

Braine, DANIEL LAURENCE: rear-admiral U. S. navy; b. in the city of New York, May 18, 1829; entered the navy as a midshipman May 30, 1846. In 1861–62 he commanded the steamer Monticello, taking part in the engagement with the battery at Sewell's Point, near Norfolk, Va., May 19, 1861, and in the capture of Forts Hatteras and Clark, N. C., Oct. 5 of the same year. Retired May 18, 1891.

Braine-le-Comte, brān'le-kōnt': a town of Belgium; province of Hainault; on the railway from Brussels to Valenciennes (see map of Holland and Belgium, ref. 11–D); has a church built about 1300, also cotton-mills and dye-works. Fine flax is raised in the vicinity. Pop. (1890) 776.

Brain'erd: city; capital of Crow Wing co., Minn. (for location of county, see map of Minnesota, ref. 6–D); on Northern Pacific R. R. and Brainerd and Northern, and on east bank of Mississippi river; 136 miles N. of St. Paul, 115 miles W. of Duluth; has 8 public-school buildings, 15 churches, mammoth shops of Northern Pacific R. R., water-works, electric lights, electric street railway, and immense saw-mills, now (1892) being constructed. The surrounding district is good farming land. Pop. (1880) 1,865; (1890) 5,703; (1900) 7,524.

EDITOR OF "TRIBUNE."

Brainerd, DAVID: missionary; b. in Haddam, Conn., Apr. 20, 1718. He entered Yale College in 1739, but was expelled in 1742 for an offense growing out of an excess of religious zeal. It is probable that his ardent evangelistic efforts were offensive to his college superiors. In 1743 he began his famous labors among the Indians in a village about halfway between Stockbridge, Mass., and Albany, N. Y. The year following he went among the Delawares in Pennsylvania, and afterward to Crossweeksung in New Jersey, where he had his most signal success. In the summer of 1747 he returned to Massachusetts in broken health, and died at Northampton, Oct. 9, 1747. Jonathan Edwards, to whose daughter he was engaged to be married, and at whose house he died, published a memoir of him in Boston, 1749; new edition, with his journals, by Sereno E. Dwight, in New Haven, 1822; best edition by Sherwood (New York, 1884).

Brainerd, JOHN: a younger brother of David Brainerd; b. at Haddam, Conn., Feb. 28, 1720; graduated at Yale College in 1746; and was for a time successor to his brother as missionary among the Indians in New Jersey. In 1757 he was settled at Newark, and in 1777 at Deerfield, N. J., where he died Mar. 18, 1781. See his *Life*, by Thomas Brainerd (Philadelphia, 1865).

Brainerd, THOMAS, D. D.: of the same stock as David and John Brainerd; b. at Leyden, N. Y., June 17, 1804; graduated at Andover Theological Seminary, Massachusetts, in 1831. From 1831 to 1833 he was pastor of the Fourth Presbyterian church in Cincinnati, O.; from 1833 to 1836 edited the *Cincinnati Journal* and *Youth's Magazine*; from 1837 till his death was pastor of the Pine Street church, Philadelphia. He was a leader of the New School party. He published in 1865 the *Life of John Brainerd*, etc. D. in Scranton, Pa., Aug. 21, 1866. See his *Life* by Mary Brainerd (Philadelphia, 1870).

Brain-fever: a popular name for CEREBRAL MENINGITIS (*q. v.*), a dangerous disease, characterized in its earlier stages by very high fever and intense headache, usually followed by delirium and death. Inflammation of the brain itself (encephalitis) is less common, but is even more fatal than the former. It is not easy to discriminate between the two during life. Cold applications to the head and mild but persistent derivative treatment are generally indicated.

Brain'tree: town; Norfolk co., Mass. (for location of county, see map of Massachusetts, ref. 3–I); on Old Colony R. R.; 10 miles S. of Boston. Here are manufactures of machinery, woolen goods, boots and shoes, paper, tacks, cordage, etc. Pop. (1880) 3,948; (1890) 4,848; (1900) 5,981.

Braize, or **Becker,** or **Porgy**: names applied in Great Britain to *Sparus pagrus*; a sea-fish allied to the American scup, and valued as food.

Brake: a thicket; a place overgrown with shrubs, brambles, or ferns. In the U. S. a thicket of canes is called a "canebrake." The name is also applied to *Pteris aquilina* and many other large ferns.

BRAKE: an instrument used to break flax or hemp; the hand or lever by which a pump is worked; a large harrow used in agriculture; a sharp bit or snaffle (of a bridle).

BRAKE: a machine attached to the wheels of heavy carriages and railroad cars, which, when pressed against the wheels, retards or stops their motion by friction. Patents have been obtained in the U. S. for numerous machines or inventions for this purpose. Among these are "steam car-brakes," in the use of which the friction is produced by steam-power, and the engineer of a locomotive applies the brakes by the turning of a cock; and the "Westinghouse air-brake," also controlled by the engineer, now extensively used. See RAILWAY EQUIPMENT under RAILWAYS.

Bra'ma: a genus of fishes of the family *Chætodontidæ* having the body very deep and compressed, a single elongated dorsal fin, and a forked tail, the points of which are widely divergent. The *Brama raii*, sometimes called *bream*, is common in the Mediterranean, and is highly esteemed for food.

Bramah, bray'ma, JOSEPH: machinist and inventor; b. in Stainborough, near Barnsley, Yorkshire, England, Apr. 13, 1749. He carried on business in London, and gained distinction by numerous and valuable inventions, among which are a safety lock, a hydrostatic press, and improvements in fire-engines and steam-engines. D. in Pimlico, London, Dec. 9, 1814.

Bramah's Press: See HYDROSTATIC PRESS.

Bramante: architect. See LAZZARI.

Brambling, Bramblefinch, or **Mountain Finch**: a small bird (*Fringilla montifringilla*); nearly allied to the chaffinch, than which it is rather larger. The predominant colors of the upper parts are black and brown, with white bands on the wings. The belly is white, and some of the wing-coverts are yellow. It breeds in the northern parts of Sweden and Norway, and visits England, Italy, and other countries as a winter bird of passage.

Bramhall, JOHN: Anglican prelate; b. at Bramhall Hall, Cheshire; baptized at Pontefract, Nov. 18, 1594; educated at Cambridge; B. A. 1612; became Bishop of Derry 1634; imitated Laud's policy of intolerance, which lost Ulster to the king and drove the bishop to take refuge in France; while in Paris engaged in a losing controversy with Hobbes on the question of freedom of the will; at the Restoration made Archbishop of Armagh 1661. D. at Armagh, June 25, 1663.

Brampton: town; capital of Peel co., Ontario, Canada (for location, see map of Ontario, ref. 4–D); situated at junction of Can. Pac. and Grand Trunk Railways; 21 miles W. of Toronto; has manufactures of flour, farming implements, gas-pipe, chandelier, pumps, etc., and a large trade. Pop. (1881) 2,920; (1891) 3,252.

EDITOR OF "CONSERVATOR."

Bram'well, Sir FREDERICK JOSEPH, Bart., D. C. L., F. R. S.: b. in London, Mar. 7, 1818. From his boyhood he evinced a great interest in mechanics. In 1834 he was apprenticed to John Hague, mechanical engineer, with whom he continued a few years as principal draftsman; in 1853 commenced business on his own account as a civil engineer; in 1856 was elected associate of the Institution of Civil Engineers, in 1862 to full membership; in 1867 was member of the council; in 1884–85 was president. From 1871 to 1875 he was president of the Society of Mechanical Engineers. In 1881 was knighted for his services in the promotion of technical education; in 1886 received the honorary degree of D. C. L. from Oxford; in 1889 he was created a baronet. Civilian member of Ordnance Committee since 1881. W. R. H.

Bran: the husk or outer covering of wheat, which in the process of flouring is separated from the fine flour. In 100 parts of bran there are of water, 13·1; albumen, 19·3; oil, 4·7; husk (with a little starch), 55·6; ash or saline matter, 7·3. Calico-printers use bran and warm water to remove coloring-matter from those parts of their goods which are not mordanted. Bran and the flour united—i. e. unbolted wheat flour—make a good bread, which is considered more digestible than that made of fine white flour. See FLOUR.

Branch (in botany): a part of any organ or member of the plant-body which has grown out from another similar organ or member. Thus we have root-branches and stem-branches, branches of leaves, branches of stamens, branches

of hairs, etc. Among the lower plants we find branching cells, branching threads, branching thallomes, etc. Popularly the term is often erroneously restricted to stem-branches.

In systematic botany *branch* is a great division of the vegetable kingdom; thus we speak of the branch of *Protophytes*, the branch of *Bryophytes*, etc. See VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Branch, JOHN: b. at Halifax, N. C., Nov. 4, 1782; graduated at the University of North Carolina in 1801; became a lawyer; was made a judge of the superior court; Governor of North Carolina (1817–20); U. S. Senator (1823–29); Secretary of the Navy (1829–31); member of Congress (1831–33); Governor of Florida Territory (1844–45); besides holding other important offices. D. at Edgefield, N. C., Jan. 4, 1863.

Branch, LAWRENCE O'BRIEN: son of the preceding; b. in Halifax co., N. C., July 7, 1820; graduated at Princeton in 1838; was a Democratic representative in Congress from 1855 to 1861. He was made a brigadier-general in the Confederate army in 1861, and was killed at Antietam, Sept. 17, 1862.

Branchiop'oda [from Gr. *βράγχια*, gills + *πούς, ποδός*, foot]: a sub-order of entomostracous *Crustacea*, deriving their name from the peculiarity of having the gills, which are numerous, attached to the feet. They are small, many of them almost microscopic, and abound in stagnant fresh waters. A few are found in brine pools. They possess distinctly segmented bodies, and have numerous pairs of flattened swimming-feet. The carapace is flat and shield-shaped, or more frequently takes the form of a bivalve shell. They are enormously reproductive by parthenogenesis. Revised by D. S. JORDAN.

Branchios'toma [from Gr. *βράγχια*, gills + *στόμα*, mouth]: the lancelets; the only genus of the vertebrate class LEPTOCARDII (*q. v.*). The name *Branchiostoma* is prior to that of *Amphioxus*, and should be used rather than the latter.

Brand, Sir HENRY: See HAMPDEN, VISCOUNT.

Brande, WILLIAM THOMAS, F. R. S.: chemist; b. in London, England, Feb. 11, 1788. He lectured with success on chemistry at the Royal Institution, and filled for many years an important office in the mint. Among his works are a *Dictionary of Science, Literature, and Art* (1842, n. e. 1875) and a *Manual of Chemistry*. D. Feb. 11, 1866.

Brandeis, FREDERICK: See the Appendix.

Bran'denburg: the most important province of Prussia, and that which formed the nucleus of the Prussian kingdom. It corresponds nearly to the old *Mark* of Brandenburg, and has an area of 15,376 sq. miles. It is mostly a level plain which has but little elevation above the sea. It contains numerous lakes, is intersected by the Oder, and also drained by the Warthe, the Spree, the Havel, and the Elbe, which latter forms part of its W. boundary. The soil is sandy and moderately fertile. The province is traversed by several canals and railways. It has extensive manufactures of cotton, wool, linen, silk, paper, leather, sugar, etc. The chief towns are Potsdam, Königsberg, and Frankfort-on-the-Oder. The inhabitants are mostly Protestants. It is divided into two regencies (*Regierungsbegirke*) and thirty-three circles. This country was conquered by Charlemagne in 789 A. D. The first Margrave of Brandenburg was Albert the Bear, who is called the founder of the house of Brandenburg. He began to reign in 1134. Early in the fifteenth century the margrave became an elector of the German empire, and took the title of Elector of Brandenburg. Frederick William, who became elector in 1640, added the duchy of Prussia and part of Pomerania to his dominions, and his son took the title of King of Prussia in 1701. Pop. (1895) 2,821,695.

Brandenburg (anc. *Brennaborch* or *Brennabor*): a town of Prussia; in province of same name; on both sides of the river Havel, and on the Berlin and Magdeburg Railway; 38 miles by rail W. S. W. of Berlin (see map of German Empire, ref. 3–F). It is inclosed by walls, and divided by the river into the old and new town, between which, on an island, is a quarter called "Venice," containing a castle and a mediæval cathedral. The town has a riding academy, a gymnasium, a Realschule, and a public library; also manufactures of woolen and linen goods, hosiery, paper, leather, etc. Pop. (1880) 28,685; (1890) 37,823.

Brandenburg, New: a town of Mecklenburg-Strelitz; near the N. end of Tollensee; 18 miles N. N. E. of Strelitz and 53 miles W. N. W. of Stettin (see map of German Empire, ref. 2–G). It has wide and regular streets, and is said to be the most beautiful town in Mecklenburg-Strelitz. It has a grand-ducal palace, and manufactures of cotton and woolen goods, damasks, paper, and chemical products. Pop. (1890) 9,323.

Bran'des, CARL EDVARD COHEN: Danish journalist, politician, and dramatic writer; b. in Copenhagen, Oct. 21, 1847. In political and literary principles he is in full sympathy with his brother, GEORG BRANDES (*q. v.*). Of his plays may be mentioned *Et Besøg* (A Visit, 1882); *En Forlovelse* (A Betrothal, 1884); *Kærlighed* (Love, 1887); *En Politiker* (A Politician, 1889). He has published two works on the drama: *Dansk Skuespilkunst* (Danish Dramatic Art, 1880) and *Fremmed Skuespilkunst* (Foreign Dramatic Art, 1881).

G. L. KITTREDGE.

Brandes, GEORG MORRIS COHEN: Danish critic and literary historian; b. in Copenhagen, Feb. 4, 1842. Brandes is a radical in religion and politics, and the energy with which he proclaimed his views in his lectures and writings led to his withdrawing from Denmark and settling in Berlin (1877). In 1883 he was induced to return to Copenhagen by an association of private persons, who assured him a yearly salary of 4,000 crowns for ten years as public lecturer on belles-lettres. To his influence is ascribed in great part the "realistic" movement in recent Danish literature. His chief work, *Hovedstrømninger i det 19de Aarhundredes Literatur* (The Main Currents in the Literature of the Nineteenth Century), appeared in six volumes, 1872–90. Other works of importance are: *Kritiker og Portrætter* (Critiques and Portraits, 1870; 2d ed. 1885); *Danske Digter* (Danish Poets, 1877); *Moderne Geister* (1882; translated by R. B. Anderson as Eminent Authors of the Nineteenth Century); *Mennesker og Værker i nyere europæisk Literatur* (Men and Works in Modern European Literature, 1883); *Det moderne Gjennembruds Mænd* (Men of the Modern Awakening, 1883; 2d ed. 1891); *Berlin som tysk Rigshovedsted* (Berlin as Imperial Capital, 1884–85); *Ludvig Holberg* (1885); *Indtryk fra Polen* (Impressions of Poland, 1888); *Indtryk fra Rusland* (Impressions of Russia, 1888); *Essays* (2 vols., 1889).

G. L. KITTREDGE.

Branding: a mode of punishment formerly practiced in Greece and Rome upon slaves and convicts. Under Constantine the face was protected from such disfigurement. It was a mark of degradation provided for in the canon law, and in France galley-slaves could be branded down to 1832. In England vagabonds, gypsies, and brawlers might be burnt in the cheek or forehead from the days of Edward VI. to 1636. From the time of Henry VII. this penalty was inflicted in the case of all clergyable offenses (see BENEFIT OF CLERGY), but it was abolished by an act of Parliament in 1822. Branding had then become obsolete, except in the case of deserters from the army, who were marked with the letter D, not by a hot iron, but by ink or gunpowder. By the British Mutiny Act of 1858 it is enacted that the court martial, in addition to any other punishment, may order the offender to be marked on the left side, 2 inches below the armpit, with the letter D, such letter to be not less than 1 inch long, but the practice was abolished in 1879.

Bran'dis, CHRISTIAN AUGUST: professor at Bonn University; b. at Hildesheim, in Hanover, Feb. 15, 1790; son of Joachim Dietrich Brandis, a celebrated physician. He edited, with Emmanuel Bekker, a critical edition of *Aristotle*. He was the secretary of King Otho in Greece. His main work was a history of the Greek and Roman philosophies (2 vols., 1835–44; the third volume appeared in 1860–66), and a *History of the Development of Greek Philosophy* (2 vols., 1862–64). D. in Bonn, July 24, 1867. Cf. Bursian's *Geschichte der Classischen Philologie in Deutschland*, p. 917 ff. (Munich, 1883).

Brandis, Sir DIETRICH, Ph. D.: forester; b. in Bonn, Germany, Mar. 31, 1824; took his degree as doctor of philosophy at Bonn in 1848; appointed superintendent of forests in Pegu 1856; spent his life from that time to 1883, when he retired, in the care of the forests in the British possessions in India and Burma. He wrote numerous important monographs on the forests of India, and organized schools there for the instruction of the natives in their preservation. In 1887 he was made knight commander of the order of the Indian Empire.

Brandis, JOHANNES: metrologist; first decipherer of the Cypriote inscriptions; b. in Bonn, Germany, Dec. 14, 1830; d. in Linz, July 8, 1873. Author of *Das Münz-Mass- au. Gewichtswesen in Vorderasien bis auf Alexander d. Gr.* (Berlin, 1866). See E. Curtius, *Alterthum u. Gegenwart*.

Brandon: town; province of Manitoba, Canada (for location, see map of Canada, ref. 9–H); on Can. Pac. and N. P. and Man. Rys. It is surrounded by prairies, and the chief industries are stock-raising and farming. Pop. (1891) 3,778.

Brandon: township; Rutland co., Vt. (for location of county, see map of Vermont, ref. 7–B); on Cent. Vermont R. R.; near Otter Creek; 16 miles N. N. W. of Rutland. It has a graded academy, two parks, and manufactures of iron castings, carriages, flour, lime, lumber, paint, marble, etc. An elegant hotel was built in 1892. Pop. (1880) 3,280; (1890) 3,310; (1900) 2,759. EDITOR OF "UNION."

Brandt, HERMANN CARL GEORGE, M. A.: philologist; b. in Vilsen, Germany, Dec. 15, 1850; graduated at Hamilton College (1872); studied in Auburn Theological Seminary, and in Göttingen, Strassburg, and Freiburg, Germany. Instructor in Hamilton College (1874–76); associate professor in Johns Hopkins University; Professor of French, German, and Philology in Hamilton College (since 1882). Besides contributions to periodicals and to journals of societies, he has published an edition of Lessing's *Nathan der Weise* (1879); *German Grammar for High Schools and Colleges* (1884; 6th ed. 1892); *German Reader* (1889; 3d ed. 1892).

Brandy [abbreviation of *brandewine*, *brandy-wine*, from Dutch *brandewijn*, lit., burnt wine; so Germ. *Branntwein*]: the liquid obtained by distilling the fermented juice of the grape. It is generally manufactured from white and pale-red wines. White wine yields a richer brandy than red wine, as it contains more of the essential oil of grapes, to which the flavor of the brandy is due. The peculiarities of the wine pass to a certain extent to the brandy. Wines which taste of the soil communicate the same taste, the *goût de terre*, to the brandy distilled from them. Wines of Selleul in Dauphiny yield a brandy having the odor and taste of Florentine iris; those in St.-Pierre in Vivarais give a spirit which smells of violet. The stronger the wine the greater the yield. The wines of the south of Europe, being richest in alcohol, yield the most brandy. The usual yield is from 100 to 150 gal. from 1,000 gal. of wine. The best brandy, that distilled in the department of Charente, known as *cognac* and *armagnac* (names of towns), is made from very choice wines. Inferior brandies are distilled from dark-red wines of France, Spain, and Portugal; also from the fermented *marc* or refuse of the grape, and from the lees of wine and the scrapings of the casks. The catawba brandy, made from the lees of catawba wine in Ohio, is a very good brandy, though it has the peculiar flavor of this wine. The brandy distilled from catawba marc has an unpleasant taste, and contains much fusel oil. The wines of California yield brandy abundantly and of good quality. Various other liquors are known as brandies, such as "cider brandy" or "applejack," distilled from cider or from the "pomace" or refuse ground apples from the cider-press. This, when new, is a harsh, fiery liquor, but is much improved by age. "Peach brandy" is extensively made from the pulp of ripe peaches in some of the Southern States.

Fresh brandy is colorless, and remains so in glass vessels. The sherry-wine color which brandy generally exhibits is either derived from the cask or from burnt sugar purposely added. Brandy is almost pure alcohol and water, the percentage of alcohol varying from 48 to 56 per cent. It has an agreeable vinous, aromatic odor, and a peculiar well-known taste. Its specific gravity is from 0·902 to 0·941. Besides alcohol and water it contains the volatile oil of the wine; a little acetic acid, acetic ether, aldehyde, etc., together with the coloring-matter and tannic acid derived from the cask.

Brandy for medical use should be free from disagreeable odor and taste, and should be at least four years old. The advantage of keeping brandy a few years in the cask is due to the oxidation and removal of the ranker fusel oils, and to the precipitation of possible traces of copper or lead derived from the still by the tannic acid of the cask.

The greater part of the brandy and cognac of commerce is made from alcohol derived from Indian corn—rectified and deodorized whisky. This is diluted to proof, 50 per cent., and flavored with acetic ether, œnanthic ether, oil of grapes, argol, and tannin, and colored with burnt sugar. It is improved by the addition of a little real brandy, and by keeping it a few years in the cask. The following recipe for cognac brandy is taken from the circular of a New York firm, whose business it is to supply the necessary materials to the manufactures of wines and liquors: "To 40 gal. of spirit, double distilled and free from odor, and reduced to proof with distilled water, add $\frac{1}{6}$ oz. of our best cognac oil distilled from grapes, $1\frac{1}{2}$ pt. burnt-sugar coloring, and $\frac{1}{4}$ oz. of tannin." At the prices charged for the materials this choice brandy would cost the compounder $1.25 per gal., and would sell at from $10 to $25.

Brandy is an esteemed cordial and stomachic. It is frequently given in the sinking stages of low fevers and to convalescents, and to check diarrhœa. C. F. CHANDLER.

Brandy Station: on railroad; Culpeper co., Va. (for location, see map of Virginia, ref. 5–G); 56 miles S. W. of Alexandria; the scene of conflicts between the Federal and Confederate forces on Aug. 20, 1862, June 9, Sept. 13, and Oct. 11, 1863. Pop. (1880) 201.

Brandywine Creek: formed by East and West branches, which unite in Chester co., Pa. It flows southeastward into the State of Delaware, and enters the Christiana creek near Wilmington. It furnishes water-power for numerous mills. On its banks, in Chester County, the British general Howe defeated Washington, Sept. 11, 1777.

Branford: borough; New Haven co., Conn. (for location, see map of Connecticut, ref. 11–G); in Branford township; on N. Y. and N. H. R. R. (Shore Line Div.), and on Long Island Sound, 8 miles E. S. E. of New Haven. The harbor admits vessels of 300 tons. Its principal industries are agriculture, quarrying, and the manufacture of locks and malleable-iron fittings; is a place of summer resort. The Blackstone Memorial Library (cost, $300,000) was opened June, 1896. Pop. of township (1880) 3,047; (1890) 4,460; of borough (1900) 2,473.

Branks: an instrument formerly used in England and Scotland for the punishment of scolding women. It was of various forms, but consisted essentially of a bridle of iron or leather, to which was attached a piece of iron which held the tongue firmly. It is asserted that in some obscure places in England its use came down to quite recent times.

Bran'nan, JOHN MILTON: soldier; b. in the District of Columbia in 1819; graduated at West Point in 1841; colonel Fourth Artillery Mar. 15, 1881; Sept. 28, 1861, brigadier-general U. S. volunteers. He served in suppressing Canada border disturbances 1841–42; in the war with Mexico 1846–48; engaged at Vera Cruz, Cerro Gordo, La Hoya, Contreras, and Churubusco (brevet captain), and the city of Mexico (severely wounded at Belen Gate); adjutant First Artillery 1847–54; in Florida hostilities 1856–58. In the civil war he served in command of the department of Key West, Fla., 1862; in the department of the South 1862–63; on expedition to St. John's River, Fla. (brevet lieutenant-colonel); at Pocotaligo, S. C., and several minor actions; in Tennessee campaign 1863; engaged at Hoover's Gap, Tullahoma, Elk river, and Chickamauga (brevet colonel); as chief of artillery department of the Cumberland 1863–65; engaged at Missionary Ridge; in the various operations of the Atlanta campaign 1864 (brevet brigadier-general); in command of the district of Savannah, and temporarily of department of Georgia 1865–66. Brevet major-general Mar. 13, 1865, for meritorious services in the field. Retired Apr. 19, 1882. D. in New York city, Dec. 16, 1892.

Brant, JOSEPH THAYENDANEGA: a Mohawk Indian chief; b. in 1742; sent to the Indian school which grew into Dartmouth College; fought in the British army in the war of the Revolution; distinguished himself in Col. Leger's expedition against Fort Stanwix and at Oriskany in 1799. He prepared a version of the *Gospel of St. Mark* in Mohawk, which was published with the Mohawk *Book of Common Prayer* in 1787. D. Nov. 24, 1807. A colossal statue erected in memory of him was unveiled at Brantford, Ontario, Oct. 13, 1886. See W. L. Stone's *Life of Brant* (1838).

Brant, braant, SEBASTIAN: German poet; b. at Strassburg in 1458. He was appointed an imperial counselor by the Emperor Maximilian. He wrote a satirical poem entitled *Das Narrenschiff* (The Ship of Fools, 1494), a Latin translation of which (1497) made Brant famous throughout Europe. He held up to ridicule the vices and follies of his time, although without direct religious intention. Alexander Barclay made an English translation of it (London, 1509; best ed. by T. H. Jamieson, 1874, 2 vols.). Though not possessed of great poetical gifts he was one of the most influential authors of his time who may be classed among the forerunners of the literature of the Reformation. D. in Strassburg, May 10, 1521. See Zarncke's excellent edition of the *Narrenschiff* (Leipzig, 1854). Revised by JULIUS GOEBEL.

Brant'ford: a city of Ontario, Dominion of Canada; capital of Brant County; on Grand river and the Grand

Trunk and the Brantford, Waterloo and Lake Erie Rys.; 24 miles W. S. W. of Hamilton and 84 miles S. E. of Goderich (see map of Ontario, ref. 5–D). Here are large railway machine-shops and engine-houses, and manufactures of brass and iron castings, and farming implements; center of magnificent agricultural country. Pop. (1881) 9,616; (1891) 12,753. EDITOR OF "EXPOSITOR."

Brant Goose: See BARNACLE GOOSE.

Brantôme, brăñ'tōm', PIERRE DE BOURDEILLES, Abbé and Seigneur de: French historian; b. of a noble family at Périgord about 1540. He served in the army in several campaigns, and gained the favor of Charles IX., at whose court he passed some years. He wrote *Les Vies des Hommes Illustres et grands Capitaines*, etc., a work of high reputation. His style is charming, vivacious, *naïf*, sometimes descending to gossip, and sometimes rising to eloquence. Another work of his is *Vies des Dames galantes*. D. July 15, 1614.

Bra'shear City, now MORGAN CITY, La. (*q. v.*).

Bras'idas (in Gr. Βρασίδας): a Spartan general in the Peloponnesian war which began in 431 B.C. He relieved Megara in 424, and gained several victories over the Athenians. He was killed in 422 B.C. at Amphipolis, where he was opposed to the Athenian general Cleon. His memory was long honored by annual sacrifices.

Brass [O. Eng. *bræs*; origin obscure]: an important alloy of copper and zinc, extensively used for a great variety of purposes in the arts on account of the ease of working and its acceptable color. It is made (1) by fusing in crucibles copper and zinc, placing the latter below; considerable of the zinc is lost during the operation, owing to its volatility; (2) by heating copper in grains or sheets with oxide of zinc and charcoal; (3) the ancient method, by heating copper with calamine, a native ore of zinc, and charcoal. Different varieties of brass adapted to special uses are obtained by varying the proportions of the component metals. Common brass for ordinary purposes, which is cast in molds and finished by turning and filing, contains about 70 parts of copper and 30 of zinc. *Muntz* or *yellow metal*, which is rolled into sheets and used for sheathing ships, contains from 50 to 63 parts of copper and 37 to 50 of zinc. *Tombac*, *pinchbeck*, *prince's metal*, *Mannheim gold*, *mosaic gold*, *similör*, etc., contain 80 parts or more of copper to 20 or less of zinc. A little lead diminishes the ductility, while tin increases the hardness of brass. Articles of brass are cleaned by immersion in *aqua fortis* (nitric acid), and lacquered with shellac in alcohol. Brass is harder than copper, is malleable and ductile, and can be readily cast, rolled, stamped, and turned in the lathe. Next to iron in its different forms, it is the most important metal used in the arts.

Brasses, Monumental: sheets or plates of brass, upon which are engraved figures of men and women, in attempted portraiture of the dead, accompanied by heraldic devices, etc. Many still exist in England, which date from the latter part of the Middle Ages; some in their original position, let into the floor or wall, and others preserved in churches and museums. They are valuable for the study of mediæval art, of costume, arms, and heraldry. RUSSELL STURGIS.

Brasseur de Bourbourg, brăs'sẽr' de-boor' boor', CHARLES ÉTIENNE: a French abbé; b. in Bourbourg, Sept. 8, 1814; lived for a long time and traveled extensively in North and Central America; held various half-ecclesiastical positions in Mexico, and published *Histoire de Canada* (2 vols., 1851); *Histoire des nations civilisées du Mexique et de l'Amérique Centrale* (4 vols., 1857–59); *Gramatica de la lengua Quiche* (1862); and others relating to the Mayas civilization. D. in Nice, Jan. 8, 1874.

Brassey, THOMAS: railroad contractor; b. near Chester, England, Nov. 7, 1805; apprenticed to a land-surveyor; obtained in 1834 his first contract through George Stephenson to build a viaduct between Stafford and Wolverhampton; built the Great Northern Railway, the Grand Trunk in Canada, besides lines in Italy, the Crimea, Denmark, the Argentine Republic, France, Australia, and India. His operations were on an enormous scale, and he accumulated an estate valued at $35,000,000. D. at Hastings, Dec. 8, 1870. See his *Life*, by A. Helps (1872).—His son, Lord THOMAS: b. in Stafford in 1836; educated at Rugby and at University College, Oxford; sat in the House of Commons from 1865 to 1886; an admiralty lord; was made baron in the latter year. He greatly improved the naval administration, about which he published valuable treatises, and was an enthusiastic yachtsman, visiting all parts of the world in the Sunbeam. His wife, a granddaughter of the Earl of Essex, published several narratives of these voyages, and died Sept. 14, 1887, on her trip home from Australia, and was buried at sea.

Bras'sica: a genus of herbaceous plants of the family *Cruciferæ*; distinguished by a round and tapering two-valved pod (*silique*), globose seeds in one row in each valve, and conduplicate cotyledons. The species of this genus, which comprises the cabbage, cauliflower, broccoli, turnip, rape, etc., are natives of the temperate and cold regions of Europe and Asia. The species just named are extensively cultivated in gardens and fields. See CABBAGE and TURNIP.

Brathwaite, RICHARD (1588–1673): poet; educated at Oxford and Cambridge. Wrote *The Golden Fleece* (1611); *The Poet's Willow* (1614), pastorals; a collection of satirical verses; and *Barnabee's Journal* in doggerel and Latin rhymes, which came to its eleventh edition in 1876. His *Life* is prefixed to the ninth edition in 1818.

Brattleboro: town; Windham co., Vt. (for location of county, see map of Vermont, ref. 9–C); on Cent. Vermont and Vermont Val. R. Rs., and on Connecticut river; 60 miles N. of Springfield, Mass. It is the seat of the Vermont Asylum for the Insane, and the trade-center of Southeastern Vermont, and has the Brooks Library, bestowed by George J. Brooks in 1887. The Estey Organ Company is the leading manufacturing establishment. West Brattleboro has an academy. The town is noted for its beautiful natural scenery. Pop. of township (1880) 5,880, including 4,471 in village; (1890) 6,862; village, 5,467; (1900) 6,640; village, 5,297. EDITOR OF "PHŒNIX."

Brauns'berg: a town of Prussia; province of East Prussia; on the river Passarge; about 35 miles S. W. of Königsberg (see map of German Empire, ref. 2–J). It has manufactures of woolen and linen goods, and an active trade. Pop. (1890) 10,851.

Bravo-Murillo, braa'vō-moo-reel'yō, JUAN GONZALEZ: a Spanish statesman; b. in province of Badajoz, June, 1803; became in 1847 minister of justice; then of public instruction and of the finances. In 1851 he became the head of a new cabinet, in which position he followed a reactionary policy. In Apr., 1868, he again became president of the cabinet. On the expulsion of the queen in 1868 he followed her to Bayonne. D. in Madrid, Jan. 11, 1873.

Brawn: a preparation of food obtained from the flesh of the wild boar or of swine. After removing the bones and squeezing out much of the fat, the flesh is rolled and bound with a string. It is then successively stewed and baked with various preparations of herbs, wines, and spices, after which it is steeped in a solution of brine. Mock brawn is the flesh of the pig's head and feet cut into small pieces, boiled, pickled, and finally pressed into the shape of a collar. The term also denotes the muscular part of the human body.

Braxton, CARTER: planter; b. in Newington, Va., Sept. 10, 1736. He graduated at William and Mary College in 1756; was elected to the Continental Congress in 1775; signed the Declaration of Independence. D. in Richmond, Va., Oct. 10, 1797.

Bray (anc. *Bibracte*): a small parish in Berkshire, England; 22½ miles W. of London. Pop. 5,750. Famous for its vicar, who changed his religion three times during the reigns of Henry VIII., Edward VI., Mary, and Elizabeth, that he might "live and die the vicar of Bray."

Bray [in ancient Gaelic *Bray* meant marsh]: a fashionable watering-place of Ireland; at the mouth of the river Bray; 12 miles S. E. of Dublin; partly in the county of Dublin, but chiefly in the county of Wicklow (see map of Ireland, ref. 9–J); connected by 2 railways with Dublin; has 2 hotels, 6 churches and chapels, a bank, a court-house, a dispensary, a savings-bank, a newspaper, and some trade by sea. Pop. 6,600.

Brazen Sea: a great bowl of cast metal, probably of copper or bronze, which stood in the priests' court in Solomon's temple. (1 Kings vii. 23–26; 2 Chr. iv. 2–5; Josephus's *Antiquities*, viii. 3, 5). Its purpose was to hold water for the ablutions of the priests—e.g. their hands and feet (Ex. xxx. 18, *sqq.*). The brazen sea stood upon twelve oxen, the latter facing outward. The exact shape and size of the brazen sea are not known, but the best commentators think its contents exceeded 11,000 wine gal. It was broken up by the Chaldæans at the destruction of the temple, and the pieces taken to Babylon (2 Kings xxv. 13; Jer. lii. 17).

Brazen Serpent: the name of a copper or bronze figure of a serpent erected by Moses during the journey of the Israelites from Egypt to the land of promise, for the miraculous cure of those who had been bitten by venomous serpents (Num. xxi. 5, *sqq.*). This brazen serpent became an object of superstitious worship among the Israelites, and was consequently destroyed by Hezekiah (2 Kings xviii. 4). In accordance with John iii. 14, the brazen serpent is regarded as a type of Christ.

Brazil, United States of (Port. pron. braă-zeel'): the largest country of South America, occupying about two-fifths of the continent in the central and eastern parts; bounded E. by the Atlantic, and N. W. and S. by all the other South American countries except Chili. Length from N. to S. over 2,600 miles; greatest breadth, probably 2,700 miles. The extreme latitudes claimed are 5° 10′ N. and 33° 45′ S.; the extreme longitudes, 34° 40′ and about 74° W. Area by official figures (1892), 3,209,878 sq. miles; but this includes large tracts claimed by Venezuela, Colombia, and Bolivia. The northern and a part of the western boundaries are all uncertain and mostly in unexplored regions.

Topography.—Three main divisions are at once apparent: 1, the Brazilian plateau, with the coast and central mountains; 2, the great depressions of the Amazon and Paraguay, meeting in the center of the continent, and framing the first division on the northern and western sides; 3, a strip of land N. of the Amazon, forming a part of the Guiana plateau. This view of the surface will be clear if we imagine the continent to sink six or seven hundred feet; the ocean would then fill the Amazonian and Paraguayan depressions, leaving Central and Eastern Brazil as a great island, while Guiana would be another island to the N.

Mountains.—The Brazilian mountains border the southeastern edge of the first division, sending branches into the interior. Structurally the coast range begins in Uruguay, but it only takes a decidedly mountainous form from about lat. 29° 30′ S.; thence it follows the coast northeastward in a strip 50 miles wide, rapidly broadening from lat. 24° S., until, near Rio de Janeiro, it attains its extreme width of about 250 miles. Here there are two well-marked parallel chains: the Serra do Mar, ending on the coast near the mouth of the Parahyba, and the Serra da Mantiqueira; the latter range again divides N. of the Parahyba, and the branch nearest the coast dies out near Bahia; the other and higher one skirts the eastern side of the São Francisco valley to where that river turns eastward. Beyond the São Francisco there are isolated low ranges nearly to Cape São Roque. The average height of the coast range is perhaps 5,000 feet. Itatiaia, in the Mantiqueira sub-chain, attains 8,900 feet, and is probably the highest point in Brazil; the Organ Mountains in the Serra do Mar, at the head of Rio de Janeiro Bay, have peaks over 7,000 feet high. The scenery, especially on the coast from Cape Frio southward, is indescribably grand and beautiful.

The Serra dos Vertentes is a spur or ridge stretching westward from the Mantiqueira range and separating the head-waters of the Paraná from those of the São Francisco. Two mountain-chains extend northward from it, over the plateau: the Serra da Canastra between the São Francisco and Tocantins river systems, ending about lat. 10° S., and the Goyaz or Pyrineos Mountains, between the Tocantins and Araguaya. This latter range is of unknown northward extent; it contains peaks said to be over 7,000 feet high. The above enumeration includes all the true mountains in Brazil.

The Brazilian Plateau.—This extends from the mountains to the great river-depressions, and is separated from the northeastern coast only by a strip of low land 30 to 50 miles wide; it is partly divided by the Canastra, Goyaz, and Vertentes ranges. The average elevation is probably about 2,700 feet higher toward the mountains, falling gently northward to 700 or 800 feet as it approaches the Amazon. The surface is sometimes flat, oftener hilly or rolling. Nearly everywhere the outer edges are cut down abruptly, appearing from below like mountains, and the plateau itself is excavated by numerous deep river-valleys, the sides of which present similar escarpments. The bluffs are commonly but wrongly represented on our maps as mountain-ranges, seaming all Central and Eastern Brazil.

The Paraguayan Depression.—The Upper Paraguay flows through a vast swampy plain, the Brazilian portion of which is some 250 miles wide, and only 400 feet above the sea. (See PARAGUAY.) There are some isolated hills, the Serra dos Dourados, skirting the west shore of the river on the borders of Bolivia, and a similar chain crosses the river about lat. 21° S., passing into Paragnay.

The Amazonian Depression.—Along the lower Amazon this is a plain from 50 to 150 miles wide; above the Rio Negro and Madeira it spreads out so as to include, probably, all Northwestern Brazil. This upper portion, so far as we know, is a perfectly flat expanse, nowhere more than 200 or 300 feet above sea-level; the flood-plain itself is in parts 150 miles or more wide, narrowing below. The Brazilian plateau does not appear to be continued beyond the Madeira, and the Amazonian depression, following that river and the Madeira, is hardly separated from the Paraguayan swamps.

The Guiana Plateau.—The Brazilian portion stretches from the Rio Negro to the Atlantic, its southern edges appearing as the "table-topped hills" of Almeyrim and Velha Pobre, 20 miles N. of the Amazon. These are about 2,000 feet high, nearly flat above, and resemble the Brazilian plateau in structure and appearance.

Islands.—The only outlying islands are the volcanic rocks of Trindade and Fernando de Noronha, with the neighboring islets. Fernando de Noronha is used as a penal settlement; the others are desert. The Abrolhas and Rocas are dangerous reefs near the coast, the former with a few inhabitants. Santa Catharina, São Sebastião, and many smaller islands on the southeastern coast, and Maranhão on the northeast, are high islands separated from the mainland only by narrow channels. Marajó, at the month of the Amazon, is essentially an alluvial formation, and there are numerous low islands in the river estuary.

Harbors.—The southeastern coast has many excellent landlocked harbors, as well as the channels sheltered by São Sebastião and Santa Catharina islands. The whole northeastern coast is essentially without harbors, except the Bay of Maranhão and the Pará estuary.

Rivers.—The Amazon and its tributaries form the finest system of navigable rivers in the world. Ocean-steamers can ascend to Peru, and smaller ones far beyond. The Purús, Içá, and most of the upper Brazilian affluents are unobstructed almost to their sources; the Madeira and Negro have rapids in their middle courses, but are navigable above; the Tapajós, Xingú, and many smaller rivers and secondary branches admit steam-navigation in their lower courses. The Tocantins has an open channel for about 150 miles; above it is obstructed by rapids, but small steamers now ply on the upper Tocantins and Araguaya. The most important eastern river of Brazil is the São Francisco, about 1,800 miles long. Steamers ascend to the Paulo Affonso cataract, 148 miles; and above the falls a free course of 1,000 miles is now navigated. The Urugnay and upper Paraná, where they border on Brazil, are more or less obstructed; but the Paraná, with its Brazilian tributaries, promises to be of great importance in the future. Large steamers ascend the Paraguay to Corumbá (lat. 19° S.), and beyond that the river and its tributaries are navigated by smaller vessels. These channels form the principal outlet of Eastern Brazil.

Lakes.—Brazil has no large interior lakes. The Lagoa dos Patos and the Lagoa Merim of the S. are large, freshwater estuaries, with a narrow outlet, the Rio Grande do Sul. These lakes and the river Guahyba and its branches form an internal waterway of great value for this part of Brazil. The numerous lakes of the Amazonian and Paraguayan flood-lands are shallow but sometimes quite large. There are numerous lagoons along the coast.

Climate.—Generally speaking, Brazil has a moderately warm and very healthful climate. The heat is nowhere excessive, being modified by the regular winds and the elevation of the plateau. The warmest region is in the Paraguayan depression. On the Amazon the temperature rarely rises above 93° F. in the hottest hours, and the nights are cool. The mountain region is moderately warm on the coast, temperate at greater elevations, and the southern extremity of Brazil has a mild winter from May to September, with occasional slight snow. Rains are abundant nearly everywhere, but especially on the Amazon and in the coast range, where the dry season is only marked by less plentiful showers. The great plateau has perhaps the most delightful climate in the world. Here the months from May to October are cool, and nearly or quite rainless. A portion of Northeastern Brazil (Ceará, Rio Grande do Norte, Parahyba, and portions of Maranhão, Pernambuco, and Bahia) is less abundantly watered, and is subject to periodical droughts, sometimes lasting several years; that of 1877–80 depopu-

lated a large region, and caused the death of 500,000 persons.

Yellow fever appears in some of the coast cities almost every year during the warmer months; but severe epidemics of it are only occasional, principally at Santos and Rio de Janeiro. Malarial fevers are local and seldom severe.

Distribution of Plant Life.—The warm and damp Amazonian depression is covered with a thick tropical forest, with long extensions lining the affluents. Eastward the forest land is narrower and much broken by open lands. The coast range forms another forest region, the higher portions southward being composed of *Araucaria* pines. There is a third large forest region on the upper Paraná, and a coast strip from Pernambuco southward. The southern end of Brazil, from lat 30° S., is mostly open grassland. The Brazilian and Guiana plateaus are partly open, partly covered with a peculiar scattered growth of low trees, bushes, and grass called *cerrado*; but there are numberless small patches of forest on the hillsides, about streams and springs, and lining the ravines. The Paraguayan swamps are generally open, with a rank growth of grass.

Geology.—The coast range and interior mountains are formed of very ancient metamorphic rocks and granites. There are no recent volcanoes, but ancient volcanic rocks have been reported. The great plateau is composed of nearly horizontal strata, among which the Devonian, Carboniferous, and Cretaceous seem to be most widely spread. These reappear on the Amazon and in Southern Brazil. In the Amazonian depression these older rocks are covered with sandstones and clays, partly, at least, of later Tertiary age. Immense quantities of bones of quaternary animals have been found in caves in the southeastern portion of the plateau.

Minerals.—For more than a century Brazil was the principal gold and diamond producing country of the world. The most productive regions for both were Minas Geraes, Matto Grosso, Goyaz, and Bahia. The gold was obtained from surface washings, which are now nearly abandoned; but several quartz mines are worked productively in Minas Geraes and elsewhere. The lowering of the market price for diamonds, caused by the discovery of South African mines, made the Brazilian washings unlucrative. They are now worked only on a small scale. It is the opinion of experts that the riches of Brazil, in both gold and diamonds, are far from being exhausted. Silver, copper, and lead ores have been reported, but not in paying quantities; the immense and very rich deposits of iron are as yet nearly useless, owing to the lack of coal. Coal occurs in Southern Brazil, and is mined on a small scale, but the quality is inferior. Rock crystals, or "Brazilian pebbles," are exported from Goyaz and Bahia, and agate, carnelians, and petrified wood from Rio Grande do Sul.

Fauna and Flora.—These are both extremely rich, Brazil being the most characteristic portion of the great neo-tropical region. (See AMERICA, SOUTH.) Among the important forest products may be mentioned rubber (Amazon and Ceará), Brazil-nuts (Amazon and Maranhão), sarsaparilla, Tonka beans, various vegetable oils, and drugs. There are a vast number of beautiful cabinet woods, but almost the only one exported is rosewood, and this in small quantities. Among the larger Brazilian animals are tapirs, jaguars, stags, ostriches, alligators of several kinds, and large water-snakes. The fisheries of the Amazon and coast are very productive.

Agriculture.—Brazil has a large amount of fertile land, especially in the southeastern portion and on the Amazon; but a great portion of the plateau is probably only fitted for grazing. By far the most important product is coffee, in which Brazil stands first in the world. It constitutes more than half of her exports, the principal coffee region being in the coast range of São Paulo, Minas Geraes, Espirito Santo and Rio de Janeiro. Sugar is largely produced in Pernambuco, Bahia, Ceará, and elsewhere, and tobacco in Bahia. The cotton crop is now insignificant. Cacao is one of the principal products of the lower Amazon. Mandioca, maize, beans, rice, and tropical fruits and vegetables are largely raised for home consumption. The most important grazing districts are Rio Grande do Sul and Northeastern Brazil from Pernambuco to the Amazon; the herds of the interior are still small.

Manufactures.—Generally these are on a small scale, though collectively important. Cigars are largely manufactured at Bahia, and paper, furniture, saddles, hats, beer, rum, and many other articles in the southern cities.

Railroads and Transportation.—In 1898 there were 8,178 miles of railroads in operation, 4,989 miles building, 4,670 miles surveyed, and 8,440 miles projected, the most complete systems being in the coffee regions of São Paulo, Minas, and Rio; a large portion of these roads were constructed with a Government guarantee of interest on the outlay. All the large rivers have regular steam-navigation, with excellent vessels, and there are several Brazilian lines of coasting steamers. The country has 10,143 miles of telegraph lines; there is a submarine cable to Europe, and one is projected to the U. S. Good common roads are only found near the coast.

Education.—Primary education is general throughout Brazil, but the country schools are poor; in the cities and larger towns there are excellent schools (called *collegios*), and provisions for the study of law, medicine, and theology. Most of the cities have libraries, and some of them museums. Young Brazilians seeking higher education generally go to Portugal or France. See PORTUGUESE-BRAZILIAN LITERATURE.

Government.—It is a federal republic, very similar in form to that of the U. S. The president and vice-president are elected for four years, and can not be re-elected for the next succeeding term; senators are elected for nine years, and deputies, or members of the lower house, for three years. The states are completely independent in matters of their own internal administration. Freedom of religious worship is guaranteed by the Constitution. The president and congress are elected by practically universal suffrage. There are twenty states and a federal district (Rio de Janeiro).

Population.—This was estimated in 1896 at 16,300,000, and is probably too large. Over one-third are classed as white, but this includes a large number mixed with Indian and a smaller proportion with Negro blood. One-fifth are Negroes and as many more mulattoes; about 400,000 are civilized Indians; the remainder mixed races. The official estimate of 600,000 wild Indians is greatly exaggerated; the tribes are small, and altogether probably do not number 250,000. (For ethnology, see INDIAN TRIBES OF SOUTH AMERICA.) The great mass of the population is gathered in Southeastern Brazil. The interior and the Amazon valley are very thinly settled, and only partially explored. The largest cities are Rio de Janeiro, the capital, estimated, 350,000; Pernambuco, 190,000; Bahia, 80,000; Pará, about 50,000; São Paulo, Fortaleza, Maranhão, Parahyba, and Porto Alegre, all above 35,000. The whites are mainly of Portuguese descent, but in Southern Brazil there are several hundred thousand German colonists.

History.—Before Brazil was discovered, Spain and Portugal had regulated their claims of conquest by the treaty of Tordesillas. (See TORDESILLAS.) By this all new lands E. of about lon. 50° W. were assigned to Portugal. Accordingly, when the Spaniard Vicente Yanez Pinzon discovered the northeast coast of Brazil (Feb. and Mar., 1500), he did not take possession, and his voyage has little historical importance. The same year a Portuguese fleet was dispatched to India under Pedro Alvares Cabral. For some reason he stood far out in the Atlantic, and on Apr. 22 fell in with the Brazilian coast S. of Bahia. He took possession for Portugal, followed the coast for some distance, and then proceeded on his course to India, first sending back a ship with tidings of his discovery. Some other explorations were made, but Portugal was so much occupied with her Indian conquests that Brazil was long neglected. The first colony, São Vicente, S. of Rio, was formed by Martin Affonso de Sonza in 1532; and about this time the coast was divided into sections, which, as hereditary captaincies, were granted to distinguished Portuguese on the agreement that they should settle them. These correspond to the modern coast provinces, now states of Brazil. Bahia was founded in 1549, and became the capital. Spain did not dispute the rights of Portugal to Brazil, but other nations made attempts to colonize it. Such were the short-lived French colonies at Rio de Janeiro (1555–60) and Maranhão (1612–14). Attempts of the Dutch commenced in the Amazon early in the seventeenth century. They seized Bahia (1624) and held it for a year, and in 1631 they took Pernambuco and formed a powerful colony around it. Constantly at war with the Portuguese, they were finally driven out in 1654. After 1640 Brazil was governed by viceroys, and in 1762 the capital was changed from Bahia to Rio de Janeiro. During the eighteenth century the colonies developed rapidly, owing to the increasing importance of the sugar industry, and the discovery of rich gold and diamond mines in the interior. Armed expeditions in search of mines and of Indian slaves penetrated far into the interior,

founding towns in Goyaz, Matto Grosso, and even on the head-waters of the Madeira. Some of them attacked the Spanish missions of PARAGUAY (*q. v.*). The armies of Napoleon drove the prince regent, Dom John, out of Portugal, and he took refuge in Brazil (1808), making his capital at Rio de Janeiro. He succeeded to the Portuguese throne in Mar., 1816, and in Apr., 1821, returned to Portugal, leaving his son, Dom Pedro, as regent in Brazil. The prince placed himself at the head of the movement for independence, and on Sept. 7, 1822, definitely refused obedience to Portugal; a constituent assembly was convoked; Brazil was declared an independent empire, and on Dec. 1, 1822, Dom Pedro was crowned as Emperor Pedro I. of Brazil. There was some opposition and fighting, principally in the northern provinces, which did not entirely cease until 1837. For political reasons Pedro I. was compelled to abdicate Apr. 6, 1831, in favor of his son, Pedro II. The latter being a minor, the country was governed by a regency. His majority was proclaimed, and he assumed the crown in 1840.

Uruguay had formed a part of Brazil from 1821 to 1825, under the name of the Cis-Platine state. The dictator Rosas, of Buenos Ayres, having attempted to annex that country, Brazil made war on him, defeating him in 1852, and Uruguay remained independent. The war with Paraguay (1865–69) was brought on by the dictator Lopez of that country, and ended in his defeat and death. (See PARAGUAY.) Brazil was the last slave-holding state in America. A gradual emancipation law was passed in 1871, but the final extinction of slavery was due to a remarkable popular movement. Probably 200,000 slaves were freed by private means, and two provinces were emancipated before the abolishment of slavery was decreed (May 13, 1888) by an almost unanimous vote of parliament. In 1889 a sudden revolution forced the Emperor Pedro II. to abdicate; a provisional government under Fonseca succeeded; a federal constitution was adopted Feb. 24, 1891, Fonseca being first president. He was deposed in Nov., 1891, and succeeded by Floriana Peixoto, against whom several states and the navy rebelled in 1893–94, but this movement collapsed in Mar., 1894, when Prudente Moraes was elected president. The most notable events since that time have been the occupation of Trinidad by Great Britain in 1895, the great financial crisis of 1897, and the revolt in the Rio Grande in 1895, and that of the Fanatics of Canudos in 1897. Dr. Manoel Ferraz de Campos Salles was inaugurated president Nov. 15, 1898.

LITERATURE.—The *Catalogo da Exposição de Historia do Brazil* (Rio de Janeiro, 1881, 2 vols.) is a very complete bibliography of the country.

O Brazil Geographico e Historico (Rio de Janeiro, 1884, *et seq.*), founded on Wappaus' *Handbuch*, but with extensive additions by Brazilian scholars; Macedo, *Corographia do Brasil* (Rio de Janeiro, 1873); *Brazil* (Bulletin No. 7 of the Bureau of American Republics, 1891); *The Mappa Geral do Brazil*; the works of Denis, Carvalho, and Andrews.

History.—Porto Seguro, *Historia Geral do Brazil*; Southey, *History of Brazil.* The works of Pereira da Silva, Capistrano de Abreu, Macedo Teixeira de Mello, and Abreu e Lima.

Ethnology.—Martius, *Ethnographie Amerikas zumal Brasiliens* (Leipzig, 1867); Brinton, *The American Race* (New York, 1891).

Geology.—Hartt, *Geology and Physical Geography of Brazil* (Boston, 1870). The works of Derby, Gorceix, Lund, and Eschwege.

Zoölogy and Botany.—Wallace, *Geographical Distribution of Animals*; Martius, *Flora Brasiliensis.*

Travels.—Bates, *Naturalist on the Amazon*; Martius, *Reise in Brasilien*; Burton, *The Highlands of the Brazil*; Bigg-Wither, *Pioneering in South Brazil*; Wells, *Three Thousand Miles through Brazil*; Saint-Hilaire, Castelnau, Gardner, Koster, and Agassiz. HERBERT H. SMITH.

Brazil: railroad junction; city, and capital of Clay co., Ind. (for location of county, see map of Indiana, ref. 8–C); 16 miles E. N. E. of Terre Haute. It is an important center of the block coal and iron business. Pop. (1880) 3,441; (1890) 5,905; (1900) 7,786.

Brazil Cabbage: a Calla-like plant with large arrow-shaped leaves (*Xanthosoma sagittifolium*), of the family *Araceæ*, native of the West Indies, and now cultivated in Brazil for its thick, erect, nutritious rhizome, as well as for its foliage, which is cooked for food. This and other species of the genus are commonly grown in conservatories.

Brazilian Grass: popular name of a substance used in the manufacture of hats, sometimes called chip hats. It is not grass, but the leaves of a species of palm (*Chamærops argentea*) which are imported from Cuba.

Brazilian Literature: See PORTUGUESE LITERATURE IN BRAZIL.

Brazil-nuts: the seeds of the *Berthollelia excelsa*, a beautiful tree of the family *Myrtaceæ*. This tree, which

1 2 3

Brazil-nut: 1, represents the round woody pericarp, about one-fifth the natural diameter of an example of moderate size; 2, one of the nuts or seeds, half the natural length; 3, section of the same.

attains a height of 100 feet or more, abounds on the banks of the Orinoco and in the northern parts of Brazil, and bears a round woody pericarp nearly as large as a man's head. This pericarp contains about twenty-four seeds or nuts, which have the form of a triangular prism, and a hard shell inclosing a white kernel, which is very agreeable when fresh, but soon becomes rancid. They yield a large quantity of oil, which is valuable for burning in lamps. Many Brazil-nuts are exported from Pará to Europe and the U. S.

Brazil-wood: an important dyewood obtained from the *Cæsalpinia crispa*, a tree of the family *Leguminosæ*. There are several varieties, known as Pernambuco, Lima, Santa Martha, Sapan or Japan, etc. The wood contains a colorless principle. *brazilin* ($C_{16}H_{14}O_5H_2O$). This changes by oxidation to *brazilein* ($C_{16}H_{12}O_5$), the red coloring-matter which gives the wood its value. Pernambuco and Lima wood contain as high as 2·7 per cent. of brazilein, Sapan 1·5, and Santa Martha (also called Peach or Nicaragua) still less. Brazil-wood is very heavy and hard, is pale when freshly cut, but becomes red by exposure to the air. The coloring-matter is soluble in water, but more so in alcohol or ammonia. Brazil-wood has been largely supplanted by artificial dyes. It is used in calico-printing and in wood-dyeing, but it is not satisfactory.

Brazil-wood.

Revised by IRA REMSEN.

Bra'zos: one of the largest rivers of Texas; rises in the high table-land in the northwest part of the State; flows first nearly eastward to Baylor, then S. E. for about 200 miles, and subsequently S. S. E. till it enters the Gulf of Mexico. Its whole length is estimated at 900 miles. In the rainy season, from February to May inclusive, it is navigable for steamboats about 300 miles from its mouth.

Bra'zos Santia'go: an inlet and seaport of Texas; in Cameron County (for location of county, see map of Texas, ref. 8–H); between the north end of Brazos island and the south extremity of Padre island. It has some trade, but it has a bad and shifting bar. The settlement is on Brazos island, in lat. 26° 04′ N., lon. 97° 12′ W.

Brazza, Pierre Savorgnan, de: French explorer in Africa; b. on board ship off Rio de Janeiro, Jan. 26, 1852; entered the French navy 1870; explored the Ogowai 1876–78; continued his explorations in the country N. of the Congo, founding Franceville and many other stations 1878–85; appointed governor of the important dependency thus secured to France 1886.

Breach of Contract: See Contract, Breach of.

Breach of the Peace: See Peace, Breach of the.

Breach of Promise: See Marriage.

Bread: the most common kind of prepared food; made from the flour or meal of some grain, moistened with water, and mixed or kneaded till of a uniform consistence. It may or may not be *raised* by the development of carbonic acid in the mass, or of other gas. It is formed into loaves or cakes, and finally baked before a fire or in an oven.

I. *Bread which is not raised* is often called *unleavened* bread. This may be made from the whole grain by soaking it in water, forming it in the hands, and either drying it in the sun or baking it before a fire. This is the simplest process of bread-making, and is still practiced to some extent among savages. Generally unleavened bread is made from grain which has been pounded or brayed in a mortar or between flat stones, reduced to meal in a mill, or even further reduced to flour. Coarse oat, barley, and pease meals are in Scotland made into bread by simply kneading with water, flavoring with salt, and baking before a fire. Wheat bread is made in a similar manner in many localities. The *passover cakes* of the Israelites were thus prepared. In the U. S., especially among the poorer classes in the South, Indian corn-meal is thus made into corn-bread. From wheat flour, sea-biscuit and the various kinds of crackers are prepared.

II. *Raised bread* is bread which is made porous and spongy by the aid of some gas, produced either before or during the baking. This gas may be carbonic acid, either generated by fermentation, produced by the decomposition in the bread of an alkaline bicarbonate, or mingled with the flour in solution in water under pressure. It may be air which is incorporated with the dough during the kneading and expanded during the baking, as in pastry, sponge cake, etc., or it may be carbonate of ammonia, which is vaporized during the baking.

The best bread is made of wheat flour, although the flour of rye, oats, and other grain is used. (See Flour.) Wheat flour owes its superiority to the large percentage of gluten which it contains. This body, when moistened with water, becomes adhesive, elastic, and tenacious, and holds the bubbles of gas formed during the process of raising the loaf, although it be distended to a spongy mass several times the original volume of the dough. The other cereals contain scarcely any gluten; hence it is difficult to make light-raised bread from them. (See Gluten.) The bread from wheat flour is whiter than that of other grains.

1. *Fermented bread* is prepared either with leaven or yeast. Leaven is dough—i. e. flour and water—in a state of incipient putrefaction. When flour is moistened with water and placed in a warm situation, spontaneous chemical action begins in the nitrogenous constituents, casein, fibrin, gluten, etc. This change extends later to the sugar, gum, and starch. At one stage of the decomposition the products of vinous fermentation may be detected, alcohol and carbonic acid; at a later stage an acid fermentation supervenes, producing lactic acid. The alcohol, carbonic acid, and lactic acid are formed from sugar, either the small quantity originally contained in the flour, or an additional quantity formed during the decomposition from the gum and starch. (See Fermentation.) The change of sugar in the vinous and lactic acid fermentations is shown in the following formulæ:

$$\underset{\text{Sugar.}}{C_6H_{12}O_6} = \underset{\text{Carbonic acid.}}{2CO_2} + \underset{\text{Alcohol.}}{2C_2H_6O.}$$

$$\underset{\text{Sugar}}{C_6H_{12}O_6} = \underset{\text{Lactic acid.}}{2C_3H_6O_3.}$$

Where leaven is used for making bread a portion of the dough is set aside at each baking to serve as leaven for the next. The process of making the bread is very simple. The proper quantity of flour is mixed with tepid water, the leaven, and a little salt, the whole being well incorporated by kneading. The mixture is placed in a warm situation and left over night to ferment. If the leaven is in the proper stage of decomposition, it will induce vinous fermentation, producing alcohol and carbonic acid gas; the latter, held by the elastic and tenacious gluten, will expand the mass into a light, porous sponge, which becomes in the oven a palatable loaf. If, however, the leaven be in a more advanced stage of decomposition, or if some other necessary condition fail, instead of alcohol and carbonic acid, lactic acid will be formed, and the dough will not be *raised* by gas, but will be heavy and sour. To avoid this latter result, saleratus, bicarbonate of potassa, or soda is added to the dough. This neutralizes the lactic acid as fast as it is formed, and by liberating carbonic acid gas at the same time inflates the sponge and makes it light and porous. Were there any certainty as to the quantity of lactic acid that would be generated, it might be possible to add the proper amount of saleratus to neutralize it, but in practice there is generally an excess or a deficiency. In the former case the bread is alkaline, yellow, and disagreeable; in the latter case, sour. Leaven is also liable to communicate a disagreeable taste and odor.

Notwithstanding the difficulty of making good bread with leaven, and the frequent failures in private families, in Paris, where bread-making has reached a high degree of perfection, the bread is raised chiefly by leaven, a little yeast only being added to facilitate the fermentation. According to Prof. Horsford, the following is the common method practiced in Paris: At eight o'clock in the evening a mass of paste (leaven or sour dough) is taken, composed of 8 kilog. of flour and 4 kilog. of water. This is left until six o'clock in the morning, and constitutes the main leaven; 8 kilog. more of flour and 4 kilog. of water are then added; this forms the first quality of leaven. At two o'clock in the afternoon 16 kilog. of flour and 8 of water are added; this is the second quality of leaven. At five o'clock the complete leaven is prepared by adding 100 lb. of flour and 52 kilog. of water, mixed with from 200 to 300 grammes of yeast. At seven o'clock 132 kilog. of flour and 68 kilog. of water, holding in solution 2 kilog. of salt, and mixed with from 300 to 600 grammes of yeast, are added to the leaven, and made into well-kneaded dough.

With this quantity of paste five or six batches of bread are made in the following manner: *1st Batch.*—This is composed of half the dough prepared as above, which is molded and left to rise, and then set in the oven. The bread of this first baking is sour, rather brown, and not particularly light. *2d Batch.*—The dough remaining of the first batch is mixed with 132 kilog. more of flour and 68 kilog. of water, mixed with the same proportion of salt and yeast as the preceding batch. Half of this dough forms the second baking, the bread of which is whiter and better than the first. *3d Batch.*—The same quantity of flour, water, and salt, with 300 grammes of yeast, is again added to the dough, of which half is baked as usual. *4th Batch.*—Same proceeding as for the third. *5th Batch.*—This is prepared like the foregoing, and produces what is called fancy bread, the finest quality of any.

The use of leaven is of great antiquity. The usual agent for raising bread in the public bakeries in the U. S. and in many families is yeast, either obtained from some brewery or specially prepared for the purpose. The following is a recipe in common use in New England: "Take eight good-sized potatoes, boil, mash fine, pass through a sieve, and work in a cup of flour. Thin to a cream with hot water, and add a teaspoonful of salt and a tablespoonful of sugar. When cooled to lukewarm, add a cupful of old yeast, and set aside in a warm place. In six hours the yeast will be ready to use. Bottled it will keep for a week. Use a cupful for two loaves of bread."

A very essential element of success in bread-making is thorough kneading. When the bread has risen sufficiently it is baked. There is a loss of about 25 per cent. in baking, chiefly water. In bread raised by fermentation some alcohol is evolved. Liebig estimated that 150,000 gal. of alcohol are thus lost annually in London alone, and 12,000,000 gal. in Germany. Efforts have been made to save it by condensation, but thus far without success.

The carbonic acid which gives lightness to fermented bread is derived chiefly from the small amount of sugar contained in the flour. If wheat is exposed to dampness after harvesting, or if the flour has been exposed to heat and moisture, the albumen which it contains is transformed into diastase (see Beer), which possesses the property of changing starch to dextrin (gum) and sugar. Bread made from such flour is sweet, sticky, heavy, and dark-colored. Several substances have been used to prevent these results. Alum

is said to have been extensively used in London; its use being now forbidden by law, lime-water was recommended by Liebig, and is largely used by the Glasgow bakers. Sulphate of copper is a poisonous salt, said to be used in Belgium, $\frac{1}{30000}$ to $\frac{1}{15000}$ being sufficient for the purpose. Mege-Mouriès announced some years ago (*Comptes Rendus*, xxxvii. 775; xxxviii. 351, 505; xlii. 1122; xliv. 40, 449; xlvi. 126; xlviii. 431; l. 467) the discovery of a body, "cerealine," found almost wholly in the bran, which possesses properties similar to those of diastase. He devised means for getting rid of this agent, or at least of its effects, and the following method of bread-making bears his name. It is assumed that 100 kilog. of wheaten meal have given

72 kil. 750 grammes finest white flour,
15 " 750 " dark groats,
11 " 500 " bran.

1. At six o'clock in the afternoon take 40 liters * of water at 18° R. (72½° F.), add 70 grammes of pure yeast, or 700 grammes common grocer's yeast, and 100 grammes of starch-sugar. (Instead of the yeast and sugar, take, if necessary, 26 grammes of tartaric acid.) The place where the mixture is set aside must be maintained nearly at the temperature of 18° R. 2. The next morning, at six o'clock, the fluid will be saturated with carbonic acid. Stir in the 15 kilog. 750 grammes of groats. Fermentation will commence immediately. 3. At two o'clock in the afternoon add 30 liters of water, and pass the whole through a very fine silk or silver-wire sieve, to separate the fine bran. 4. The 70 liters with which the groats have been treated, after passing through the sieve, will be reduced to about 55 liters, with which the 72 kilog. 750 grammes of white flour and 700 grammes of salt are to be kneaded into a dough. (The bran is again extracted with 30 liters of water, and the extract employed in the next batch.) 5. The dough is then placed in baking-pans to ferment. 6. When raised, it is placed in the oven.

The baking of bread can be effected at 212° F., but no crust will be formed; to secure the best result a temperature of 350° to 570° F. should be employed. A high heat should be avoided at first, lest a hard crust be formed, while the interior of the loaf remains unbaked. One hundred pounds of flour yield from 125 to 135 lb. of bread, the increase being due to the water added. The most common faults of wheat bread are due to its being (1) *sour*, from the flour having been partly spoiled, the yeast or leaven having been too old, or the dough having been allowed to stand too long before baking; (2) *bitter*, from excess of yeast or bad yeast; (3) *heavy*, from insufficient kneading, raising, or bad leaven; (4) *moldy*, from the flour having been kept too long in a damp place.

Graham bread is made from the unbolted meal of wheat, a mixture of bran and flour; it is used by dyspeptics. *Rye bread* is largely used in Northern Europe, and to some extent in the U. S. It is dark-colored, is harder than wheat bread, and has a peculiar taste.

2. *Substitutes for Fermentation.*—Carbonic acid may be developed in the dough by the decomposition of bicarbonate of potassa (saleratus) or of bicarbonate of soda by some acid. Sour milk, hydrochloric acid, tartaric acid, bitartrate of potassa (cream of tartar), and the acid phosphate of lime have been used for this purpose. They give rise respectively to lactate, chloride, tartrate, double tartrate (Rochelle salt) of potassium or sodium, or to (in the case of the last mentioned) a mixture of phosphate of lime and soda or potassa. As neither of these agents causes fermentation, none of the elements of the flour is lost, and a greater yield of bread is claimed. This saving is, however, very trifling, as the loss in fermentation is small. The use of the acid phosphate of lime, suggested by Prof. Horsford, is claimed to restore to the flour the phosphates of the wheat which were removed in the bran. The process has been commended by Liebig. One strong recommendation for these "baking-powders" is the fact that bread may be mixed and baked at once, without the delay of several hours which is necessary where fermentation is resorted to. As cream of tartar and acid phosphate of lime do not act on bicarbonate of soda in the absence of water, either of these acid salts may be mixed with the flour, together with the bicarbonate, thus producing what is now extensively sold in the U. S. under the name of "self-raising flour," which is already salted, and merely requires to be mixed with water and baked to produce a palatable loaf. Carbonate of ammonia (sal volatile) is sometimes used alone to raise bread; being very volatile, it is converted into vapor during the baking, and raises the loaf to a light sponge. Mr. Dauglish introduced *aërated bread*, which is prepared by kneading flour in a closed vessel with water supersaturated under pressure with carbonic acid gas. On bringing the dough into the air, the carbonic acid gas set free by the removal of the pressure expands it into a sponge. "Sponge cake" is raised by means of air which is incorporated with the flour by first beating eggs to a froth, stirring in the flour, and quickly baking. "Pastry" is made flaky, but not really spongy like bread, by mixing flour and water to a dough, rolling it out into sheets, applying butter liberally, doubling over the sheet, rolling it out again, and again applying butter. These operations are repeated till the dough becomes a sheet of innumerable layers of dough alternating with a thin coating of butter. On exposing this to the heat of the oven, the different layers of dough separate, either from the expansion of the imprisoned air or from steam, and the mass becomes light and flaky.

C. F. CHANDLER.

* A liter of water weighs 1,000 grammes = 1 kilog. = 2·2 lb. avoirdupois.

Breadal'bane, MARQUISES OF: Marquises of Breadalbane 1885, Earls of Holland, Viscounts of Tay and Paintland, Lords Glenorchy, Benederaloch, Ormelie, and Wreik (1677, in Scotland), and baronets (1625, in Scotland), a prominent family of Scotland.—GAVIN CAMPBELL, the seventh earl and first marquis, was born in 1851, and succeeded his father in 1871.

Breadfruit-tree: an important tree (*Artocarpus incisa*) of the family *Artocarpaceæ*; a native of Southern Asia, of the islands of the South Pacific, and of the Indian Archipelago, now naturalized in some of the West Indies. This tree

Breadfruit.

grows to the height of 40 or 50 feet, and has large, glossy, dark-green leaves, which are pinnatifid or deeply divided into pointed lobes. The leaves are sometimes 18 inches long. The fruit, which is a *sorosis*, is nearly spherical, and is covered with a rough rind, which is marked with small irregularly hexagonal divisions, having each a small prominence in the middle. The fruit sometimes weighs 4 lb. or more, contains a large portion of starch or feeula, and is a principal part of the food of the natives of the South Sea islands. The pulp is juicy and yellow when it is fully ripe, but it is in a better condition for eating before it arrives at that stage of maturity. When it is gathered before ripeness and baked, the pulp is white and mealy, very nutritious, and resembles wheat bread. The usual practice is to cut the fruit into three or four slices, and bake them in an oven. Sometimes the people of a village join to make a huge oven —a pit 20 or 30 feet in circumference—in which several hundred breadfruits are baked at once on heated stones. Baked in this mode, the bread will keep good for several weeks. The tree produces two or three crops in a year. It has been introduced into the West Indies with some success. The timber, which is light and of a rich yellow color, is used in building houses and for other purposes, but if exposed to the weather is not very durable. A sort of cloth is made of the fibrous inner bark. The tree abounds in a glutinous milky juice, which, when boiled with cocoanut oil, is used as a cement and as birdlime. Revised by CHARLES E. BESSEY.

Breadnut: the fruit of the *Brosimum alicastrum*, a tree of the family *Artocarpaceæ*; a native of Jamaica. It is allied to the breadfruit. The genus *Brosimum* has staminate and pistillate flowers on separate trees in globose catkins. Its fruit is a one-seeded drupe, which is edible, and is used instead of bread after it has been boiled or roasted. The tree has ovate, lanceolate, evergreen leaves, and abounds in a gummy milk.

Revised by CHARLES E. BESSEY.

Breakwater: a structure designed solely to tranquilize the surface of a body of water by preventing the entrance or formation of waves from the sea. It is intended primarily to provide shelter from storms, and must therefore be so placed as to bear the shock of the waves, winds, and currents tending to destroy it. Its function is therefore different from that of a mole, jetty, quay, or sea-wall, which has to fulfill other conditions, but often under more favorable exposures.

The fundamental purpose of a breakwater being protection, its location, plan, sections, dimensions, material, and mode of construction must be influenced to a great extent by the physical features and forces existing at the site of the proposed artificial harbor, advantage being taken of any natural formations which would reduce cost and increase stability.

This class of structure applies chiefly to artificial harbors, but the same general requirements exist with reference to the entrances to many natural harbors, especially where they are located inside of the general coast-line. It will therefore seem more appropriate to defer to their special headings the general consideration of the several forces involved in the problem, and to describe here only the various types and precedents found in our principal ports.

For this purpose breakwaters may be grouped into (*a*) those which project from a cape or headland, and are consequently *attached*; (*b*) those which are isolated, *insular* or detached; (*c*) those which are rigidly supported on the bed of the sea, *permanent*; (*d*) those which are upheld by the water, *floating*; (*e*) those which perform the double purpose of breaking the force of the waves by the outer slope, while they regulate the currents on the inner, *reaction*; (*f*) and those which require to be combined to produce a sufficiently tranquilizing effect, *composite*.

Instances of most of these types may be found in the various forms of sandy islands, spits, and hooks which bestud an alluvial coast, and a study of which will convey a good idea of the best forms and sections for similar materials and exposures, but as the engineer is required to apply wood, stone, or metal, the slopes and dimensions must be modified accordingly. To secure the desired protection, two methods are available. The first is to oppose the force of the waves by a resistance *en masse*; the second, by a neutralization of surface movements by disintegration and deflection. Both of these are in use, but the former is in general far more effective, as it is also more expensive.

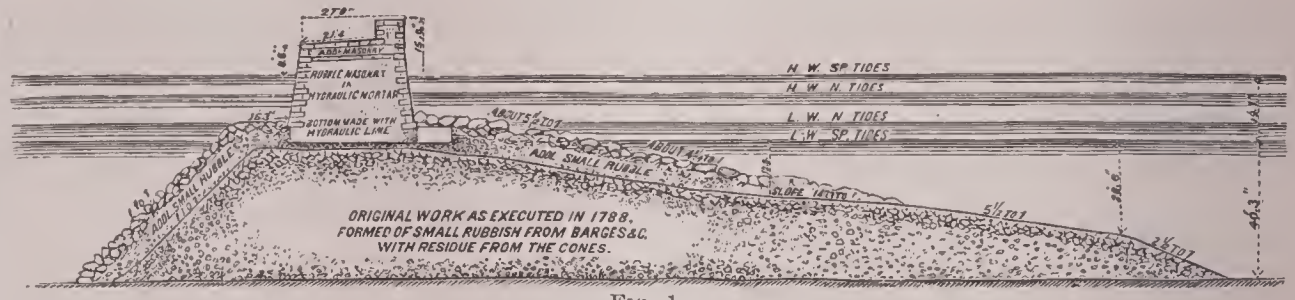


FIG. 1.

An instance of the application of both methods is found in the history of the breakwater of Cherbourg, on the north coast of Normandy, where the tide rises 18 feet. The crescent-shaped bay is embraced between Cape de la Hogue and Barfleur, and contains several rocky islands, which do not afford sufficient shelter. The French Government, after mature consideration and experiments made at Havre, decided to adopt the plans of M. Louis Alexander de Cessart, of building ninety large timber cones, having a diameter of 142 feet at base, 113 feet at top, 65 feet high, and weighing 1,000 tons net, to be floated by large casks from the ways to the site, sunk, and ballasted with rock. The depth from low water varied from 6 to 7 fathoms, hence the tops would project from 8 to 10 feet above high water. The first cone was placed in position June 23, 1786, and the last June 19, 1788, or two years later. Twenty-one cones were made, but only eighteen were used, the others being sold during the Revolution. The intervals between them were quite variable. The first space, between centers, was 513 feet; the second, 159; the third, 184, etc., some of the distances being as great as 1,845, 1,630, and 1,310 feet; so far apart, in fact, as to be inoperative, and to defeat the object of their existence; hence it happened that in a few years they were destroyed by the waves. The total length of this breakwater between the centers of the extreme cones was 12,470 feet (nearly 2½ miles). The gap between the first cone and the fort on Île Pelée was 3,269 feet, while that at the western end was 7,685 feet, making the total width of the bay 23,424 feet, or nearly 4½ miles.

These cones were ballasted by throwing into and around them 3,703,703 cubic yards of stone, at a cost of $3,100,000, which was subsequently utilized in the riprap breakwater of later date. The total cost of this original work was $4,512,200, or nearly $362 per lineal foot, proving it to be a very expensive experiment.*

The rubble mound which remained had been cut down by storms to 14 feet below low water, having an inner slope of one on one (45 degrees) and an outer or sea slope of one on ten. The National Assembly of 1791 authorized De Cessart to raise it to high water, but it was not done at that time. In 1804 a number of large blocks were placed on the center, and the battery replaced upon them.

Thereafter until 1830 little was done except to preserve the central battery, and to raise the remainder by means of rubble to low-water level; but finding it extremely difficult to maintain it in that position, and feeling that, in order to secure the desired tranquillity within the roadstead, it was necessary to raise the superstructure at least from 9 to 10 feet above high water of spring-tides, it was finally resolved, at the recommendation of several engineers, to construct a wall of solid masonry, with almost vertical sides, from low water upward, upon the top of the rubble base: this upright wall extends from thence up to the full height of 6 feet above the level of high water of spring tides; it is composed of rubble masonry faced with granite ashlar or dressed stone, in horizontal courses from 18 inches to 2 feet thick, and 3 to 4 feet wide, set in mortar. This part of the work is 36 ft. 3 in. wide at the base, and 29 ft. 3 in. wide at the top, the outer slope being 6 to 1, and the inner slope nearly the same: on the outside of this superstructure there is a solid parapet 8 ft. 3 in. thick, 6 feet high, and 8 ft. 6 in. wide at the top. The exterior base of this wall is founded on a bed of beton or concrete, set in wooden boxes or cases 10 feet long, 6 ft. 6 in. wide, and 3 ft. 3 in. deep, dove-tailed together, and well bedded in and covered with large blocks of rubble stone.

No sooner was this vertical wall raised above the level of high water than it presented such a sudden resistance to the waves, rolling upward along the rubble slope, that they broke against the face of the vertical wall with the greatest violence, and rising perpendicularly against it, fell down upon the rubble, undermining the base of the vertical wall and threatening to overwhelm it entirely. To obviate this, it became necessary to raise the rubble slope still higher, and to cover the surface with large heavy blocks, well wedged together: still this only partially remedied the evil, for, notwithstanding this casing, during heavy N. W. and N. E. gales at high water the waves beat with such violence against it that heavy masses of water wash over the top, so as to render it both difficult and dangerous to walk along it, although nearly 10 feet above high water of the highest tides; and it was proposed in 1850 to carry the rubble slope still higher in front of it; also to raise the wall 8 feet higher.

Sir John Rennie draws the following "conclusions" from the experience furnished by this structure:

"First. The plan of making the *digue* or breakwater isolated or detached from the shore is the best, and, if carried into effect with greater judgment, would have been more advantageous to the harbor.

* For a detailed account, see Cresy's *Enc. of Civil Eng.*

"Secondly. The cone system, although ingenious, was inapplicable and failed.

"Thirdly. The rubble system for the mass of the work is correct, and if blocks of greater size had been employed the result would have been more advantageous in economy of time, labor, and materials.

"Fourthly. The vertical wall system is inferior to the flat slope."

As this breakwater was designed to fulfill the double purpose of defense from the sea and from the enemy, it involved the combination of rubble mound and masonry superstructure with parapet and fortification, which increased the cost over that having to meet but a single condition.

The experience of the ancient Phœnicians and of the Sidonians, Egyptians, Romans, and Carthaginians, who built extensive moles of large masses of rock, has not been utilized in the modern structures which have been developed during the past century to meet the modified requirements of an extensive commerce operated by steam, and of the greater exposures to violent forces to which they are subjected.

These requirements have led to important modifications in the design and section of the breakwater, whereby the height of the rubble work is limited to from 15 to 25 feet below the surface of mean low water, that it may be kept below the disturbing action of storm-waves, and the capping thereof by a high wall of masonry extending above high water and sufficiently thick to resist the impact of the sea.

In plan it is important that there should be no re-entrant angle or convergent walls to compress the waves, and it is often necessary on exposed sea escarpments to deposit large concrete or natural blocks, weighing from 10 to 50 tons, to resist the force of the sea. These are known as *wave-breakers*.

Engineers at present have the benefit of an extended experienee, and in consequence can approximate their designs to those which have withstood the tests of time and the elements under similar conditions of material and exposures.

The result is that, in general, for a riprap breakwater the estimates are based upon a section of from 12 to 30 feet in width on top, rising to from 5 to 12 feet above high water, and having slopes of one on one on the harbor, and one on two or one on three on the sea side, capped by a revetment of rocks weighing from 2 to 10 tons each, laid as closely as possible above mean low water, and sometimes filled in with cement. The mean section of the breakwater at the mouth of Delaware Bay, resulting from an exposure to the easterly storms of the Atlantic for upward of fifty years, has the

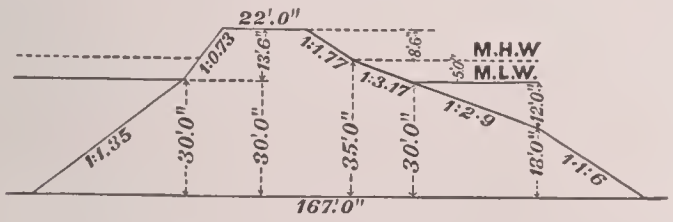


FIG. 2.—Mean section of present breakwater.

form shown in Fig. 2, where it will be seen that the bottom slope below the twelve-foot plane is 1 to 1·6 outside, and 1 to 1·3 inside. Within the wave-zone it is about 1 to 3, and above that level it increases again to 1 to 1·7. This section for a depth of 32 feet mean low water would contain 495·3 square yards, and require 165·1 cubic yards for each lineal foot of the work. At this site it was found that for this part of the work each cubic yard of volume, *in situ*, was equal to 1·5 gross tons of stone.

As the harbor formed by this breakwater is one of the oldest of its kind in the U. S., a brief reference to its plan will prove instructive. It was authorized by act of Congress passed May 24, 1828, and was designed upon the experience derived from Cherbourg and Plymouth. The first load of stone was delivered Apr. 18, 1829. It is located on the west bank of Delaware Bay in the lee of Cape Henlopen, lat. 38° 47′ N., lon. 75° 06′ W.

It is an artificial harbor formed by a breakwater of *pierre perdue*, 2,558 feet long on top, and extending in a straight line tangent to the cape at the time of its inception. The nearer extremity was 4,200 feet from the beach. There is an ice-breaker 1,359 feet long, making an interior angle of 146° 15′ with the axis of the breakwater, which latter would cut it at its middle point if produced. Thus between the ice-breaker and breakwater there was left a gap of nearly a quarter of a mile. Their tops were about 14 feet above mean low water. The stones vary in weight from ¼ to 7½ tons. By the year 1839 there were deposited 835,000 tons, at a cost of $1,880,000, giving a rate of $2.25 per ton in place, but the structure was not said to have been completed until 1869, when the total volume was estimated to be 892,528 tons and the cost $2,123,000.

The structure itself has withstood very well a number of severe storms, but its defective location, with reference to the currents, has caused injurious shoaling throughout the protected area, which will be more fully described under HARBORS. To provide additional shelter, as well as to improve the depths, the operation of closing the gap has been in progress for some years. A mattress-sill, 2 feet thick and 100 wide, has been laid as a foundation for a riprap mound which it was intended to raise to a height of 12 feet below the plane of mean low water, with a top width of 48 feet and slopes of ½. This was to have been capped by a concrete monolith, having the dimensions shown in Fig. 3.

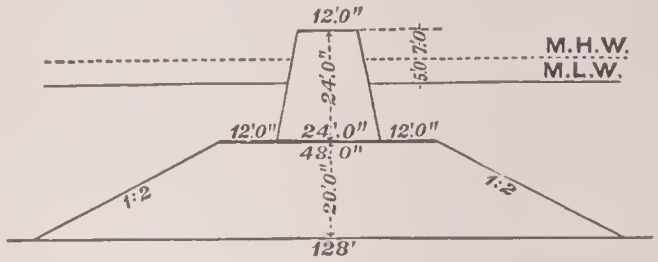


FIG. 3.—Section of the project of 1882.

This project was the result of a mature and careful digest of the more modern structures under similar exposures, made by Mr. Louis Y. Sehermerhorn, C. E., from whose condensed report the following extracts are taken:

Description of breakwaters consisting of a concrete superstructure founded upon a random stone substructure.

Such breakwaters have been built at the following localities:

LOCALITY.	Latitude north.	Longitude east.
Colombo, Ceylon, Indian Ocean	7°	80°
Madras, India, Indian Ocean	13°	80°
Mormugao, India, west coast	22°	69°
Manora, India, Arabian Sea	25°	67°
Kustendjie, Turkey, Black Sea	44°	29°
Odessa, Russia, Black Sea	46°	31°
Fiume, Austria, Adriatic Sea	45°	15½°
Ymuiden, Holland, North Sea	52½°	4½°

The following table gives the principal dimensions of these breakwaters:

LOCALITY.	Base of superstructure below M. L. W.	Top of superstructure above M. L. W.	Total height of superstructure.	Width of superstructure.	Range of tides.	Height above high water.	Depth of water over situ.
Colombo	*20	12	32	34	2·0	10	18–40
Madras	22	8	30	24	3·3	4·7	24–45
Mormugao	†18	‡20	38	30	6·0	14	20–28
Manora	15	9	24	24	8·7	0·3	18–30
Kustendjie	†16	12	28	12–18	....	12	12–20
Odessa	22	10	32	22–28	....	10	20–30
Fiume	22¾	....	24	23¾	1·5	1·5	20–70
Ymuiden	†25	18	43	28–38	5·5	12·5	10–30

* Rubble and 10-ton bags of concrete extend about 5 feet above the base.

† Sea-face and slope protected with large concrete blocks.

‡ Includes a parapet 7 feet high and 15 feet thick.

The exposure to which these breakwaters are subjected may be divided into two classes, the five subjected to ocean exposure falling into the first class, and the remaining three into the second class. In the first group the foundations of the concrete superstructure are placed from 15 to 25 feet below mean low water. This might have been adopted for two reasons, viz.: (1) economy of construction; (2) stability of the work.

In the case of Ymuiden breakwater, where the rubble base was only 3¼ feet in thickness, it seems highly probable from the known absence of stone within reasonable distance from the site of the work that the depth of 25 feet was chosen from grounds of economy. Excluding Ymuiden, for the remaining four works the depth of the concrete foundation varies from 15 feet at Manora to 22 feet at Madras.

The radical difference between the action of a vertical wall and flat slopes of random stone has resulted in material changes of opinion as to the limiting depth of wave disturbance, and where a depth of 12 feet was formerly considered

sufficient to place rubble-stone beyond the action of waves, depths of 18 and even 22 feet are now advocated and used.

At Alderney the rubble base was originally placed at 12 feet below mean low water, but before a condition of stability was attained the top of the rubble mound at the base of the superstructure had been reduced to a depth of between 15 and 18 feet, and even at this depth it was necessary to maintain the top of the rubble with added material to replace that which was swept away. There is most manifest economy in either placing the rubble so low at the first as to secure its stability, or else protecting it with stone too large to be removed. Otherwise the stability of the whole work is endangered, or else a large annual expense must be incurred to supply the waste and thereby insure the work.

At Tynemouth, where the superstructure is founded at a depth of 20 feet below mean low water, it has been necessary to protect the top of the rubble mound on the sea-face with a double row of large concrete blocks.

At Colombo the base of the superstructure at 2,000 feet from the shore, and in water 30 feet deep, is placed 16 feet below mean low water, but the sea-face of the work is protected by large rubble-stone raised to a height of 5 feet above the base, and such stone further protected with a close layer of 10-ton bags of concrete. At 3,000 feet from the shore, and in water 40 feet deep, the superstructure is carried to a depth of 20 feet below mean low water, and then protected by large rubble and concrete bags.

At Madras the base of the superstructure, founded 22 feet below mean low water, seems to have been sufficiently deep to protect the top of the rubble base from the effect of wave recoil. Nevertheless, in the amended project for the extension of the Madras breakwater, a wave-breaker is provided along the sea-face of the superstructure, consisting of large random blocks of concrete piled against the sea-face and extending to the plane of high water.

At Mormugao the base of the superstructure, founded 18 feet below mean low water, has been protected on its sea-face by a wave-breaker consisting of 20-ton concrete blocks extending above the plane of high water.

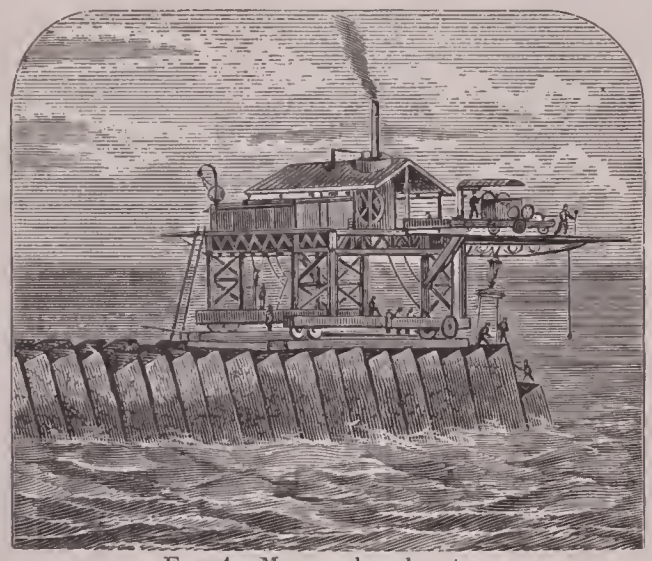


FIG. 4.—Manora breakwater.

At Manora the superstructure, founded at 15 feet below mean low water, has not suffered from any reduction of the rubble base. This is probably due to the reduced exposure of the locality, joined with the fact that the superstructure is so low, practically the plane of mean high water, that the seas easily pass over the work, and consequently greatly reduce the back draught or recoil of the waves.

At Kustendjie the superstructure, founded at 16 feet below mean low water, is protected on the sea-face with large random stone blocks, which extend about 8 feet above the base of the superstructure.

At Odessa, where the superstructure is founded 22 feet below mean low water, the rubble base has not required protection.

At Ymuiden, although the superstructure is founded at a depth of 25 feet below mean low water, the sea-face is provided with a wave-breaker of large concrete blocks extending above the plane of high water. This added precaution was probably made necessary for the reason that the rubble base was only 3¼ feet in thickness, and being founded on yielding sand, it became imperatively necessary to protect the sea-face from currents which would produce scour and the consequent settlement of the entire work.

With the exception of the Manora breakwater, the top of which is not above mean high water, we find that even when the base of the superstructure is placed at from 18 to 22 feet below mean low water it has been considered necessary to give increased assurance to the rubble base by special protection. While the formation of wave-breakers undoubtedly strengthens an otherwise weak superstructure, it is highly probable that the expenditure of a less amount of money applied toward placing the foundations at a lower level, or in giving increased thickness to the superstructure, would produce better results.

From the foregoing it may be inferred that, in localities subject to ocean exposure, the best modern practice would place the base of the superstructure at from 15 to 22 feet below mean low water, and even then give the top of the rubble mound additional security by the use of large stone or concrete blocks.

The novel feature of construction in the breakwaters at Colombo, Madras, Mormugao, Manora, and Kustendjie consists in the inclination of the blocks at various angles to the horizon, that they might settle independently without destroying the integrity of the structure. The original design

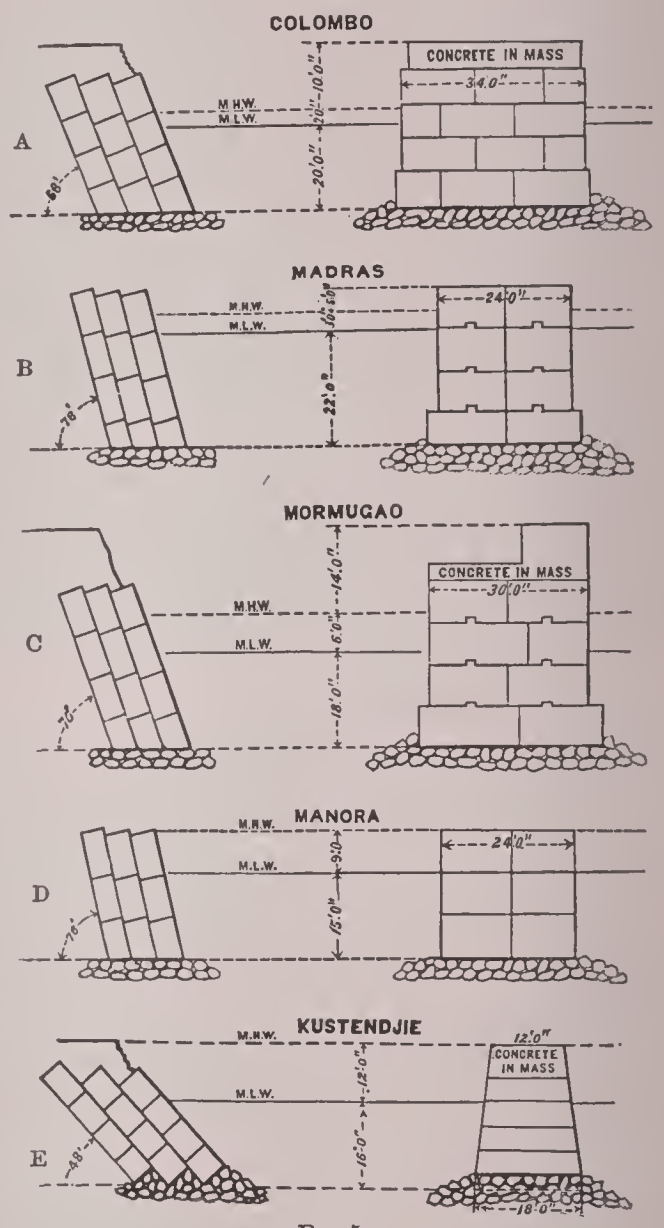


FIG. 5.

is attributed to Mr. Parkes, member of the Institute of Civil Engineers, London, and it has been successfully applied in the structures cited. The inclinations adopted are shown in the accompanying figures, as well as the depths, heights, and widths.

The cost of these several works was affected by a number of variable elements.

Thus at Colombo the ordinary labor was performed by prisoners, who received 37½ cents per day of eight hours. The cement, tools, and machinery, and skilled supervision were brought from England. Stone was carried 12 miles by rail, and the breakwater was connected with the shore and the quarries by a track. The cost, exclusive of dredging and reclamation, but including administration, was $2,430,000. The rubble mound was in part made by dumping from steam-barges, and was leveled by divers. The

total length was 4,212 feet for the western breakwater, and it was proposed to erect a rubble mound between its extremity and the shore 2,000 feet long, and having a harbor entrance at its western end of 800 feet in width to be capped by heavy blocks. The commerce of this port had increased from 446,100 tons in 1869 to 1,205,900 in 1879.

The Madras work cost $2,402,000; that at Manora $529,000; and that of Mormugao $420,000.

The average progress at Colombo was 150 linear feet per month of superstructure, 34 feet wide and from 24 to 28 feet high, or about 8,000 tons per working month. On one occasion 720 tons were set in twelve hours. At Madras the average rate was 7,000 tons per month; at Manora it was but 6,000 tons.

In considering the question of the proper dimensions to be given to a breakwater superstructure, more valuable indications are to be obtained from the cases of failures of works than in those which have proven successful.

The Madras breakwater failed entirely from an error in the details of construction, by which no bond was given to the blocks of the superstructure in a direction transverse to the axis of the breakwater. The Manora breakwater contained the same source of weakness, but its reduced height (the plane of high water) saved the superstructure from a fate similar to that of Madras.

Of the remaining breakwaters which have been considered Colombo furnishes the only case of partial failure which could be used as a valuable indication of the necessary section of a breakwater to withstand the action of an exposure similar to that of Colombo. As originally designed, the breakwater was rectangular in section, with the dimensions shown in A, Fig. 5.

The breakwater was given a width of 50 feet, so as to utilize the top as a quay. This width of 50 feet consisted of a sea-wall 24 feet thick, hearting-wall of rubble-stone 14 feet thick, and a harbor-wall 12 feet thick. In the construction of the work the sea-wall was kept about 700 feet in advance of the harbor-wall.

In July, 1878, when the breakwater had attained an extension of about 1,300 feet from the shore, and when the 24-foot thick sea-wall was 700 feet in advance of the harbor-wall, an unusually heavy southwest monsoon caused a horizontal displacement of the outer end of the advanced sea-wall "to the extent of 15 inches, pivoting on a point 150 feet landward, and lowering the outer end 12 inches, diminishing to nothing 450 feet inshore. . . . The signs of weakness which indicated the inadequacy of the sea-wall to sustain unaided the thrust of the sea" led to a modification of the hitherto adopted plan. The use of the breakwater as a quay was abolished, because it was found that the waves swept over the top of the work with too much force to permit its use for such a purpose. The failure of a superstructure 24 feet in thickness to withstand the shock of the seas had been demonstrated; consequently the further progress of the sea-wall was delayed until the harbor-wall could be brought up to its outer end. Then the dimensions of superstructure were modified by omitting the rubble-hearting between the sea and harbor walls, and uniting the two walls in one section 34 feet in thickness. This width was continued for the remaining 3,000 linear feet of the breakwater.

At the time of this failure of the sea-wall the top of the concrete blocks had not yet been covered with the monolith of concrete 4 feet in thickness, which, after all settlement had ceased, was finally placed so as to unite the tops of the blocks. Although an increased stability would have been given to the wall by this concrete capping, yet, on the other hand, the added height of 4 feet would have subjected the superstructure to an increased displacing force from the waves. This experience at Colombo was most valuable, and indicates that under a similar exposure the thickness of the superstructure to insure stability must be something greater than 24 feet. With the wall 34 feet in thickness, no difficulty has subsequently occurred, and of course it is not demonstrated that a less thickness than 34 feet would not have insured stability. The failure of the wall when 24 feet thick and the success of the wall when 34 feet thick simply indicates that somewhere between these limits assured stability was reached.

At Colombo five joggles are cut in the blocks to prevent transverse movement.

At Madras the blocks of each sloping section are connected by a mortise and tenon 4½ inches wide by 2½ deep, but there was at first no lateral connection between the blocks, so that the breakwater was broken in 1881.

At Mormugao, in addition to the mortise and tenon, there were vertical joggles 15 inches square extending through the two upper courses, and the top course was united by cramps of 2-inch square iron and by vertical dowels 7 feet long. At Kustendjie the blocks extended through the entire width, and were not connected by any binding materials.

In these four places, after settlement had ceased, a coping of concrete in mass was spread over the upper ends of the blocks to protect them from the recoil of the falling waves.

At Mormugao there was a slight tendency for the angle of the slope to flatten and become concave at the second or third courses above the base.

At Colombo, Madras, and Manora no such tendency toward the slipping of the lower blocks and consequently flattening of the slope is alluded to in the description of these works.

At Colombo the ultimate settlement of the tops of the blocks was from 8 to 18 inches. This was allowed for by keeping the outer end of the work slightly higher when first laid.

At Madras the settlement was from 6 inches to 4 feet, the latter being over a yielding bottom of sand and mud.

At Manora the settlement was excessive, and was from 3 to 4 feet. At this locality the deposition of the rubble mound but slightly preceded the construction of the superstructure, and its settlement was not complete before the superstructure was added. In addition to this the sand bottom yielded to the rubble to an unexpected degree.

At Mormugao the settlement of the superstructure was from 1½ to 2 feet, and quite even in extent.

The principle of using sloping blocks, arranged in more or less vertical sections independent of each other, was devised to overcome the difficulty adhering to settlement and the resulting dislocation of blocks bonded and arranged in horizontal planes. Again, in the system of ordinary horizontal bond the outer end of the work required to be left in an unfinished condition from the necessity of stepping back the successive courses of masonry on each other. With the system of sloping blocks the outer end of the work is at all times in a closer and more secure condition.

The sloping-block system was first adopted at Manora in 1870, and directly afterward at Kustendjie, then at Madras and Colombo, and lastly at Mormugao in 1880.

Vernon-Harcourt, in discussing the various forms of breakwaters, says: "The mixed system (an upright wall founded upon a rubble mound) will probably have the most extended application; and of all varieties of the type the best appears to be a superstructure founded some 20 feet below low water, upon a simple rubble base, formed of large concrete blocks laid with overhanging cranes upon the sloping-block principle, securely connected vertically and horizontally, and capped with concrete in mass after settlement has ceased."

In setting concrete blocks two methods have been used—viz., from staging and from cranes. The great advantage possessed by cranes over staging upon exposed sites is that, while the latter must be left exposed to storms, the former can always be run back into shelter. And although the first cost of suitable cranes for handling heavy blocks is quite large, their use dispenses with the great labor, ultimate cost, and delay incident to the use of staging.

The advantage seems so entirely in favor of cranes that they have practically taken the place of staging in modern works. At Kustendjie alone staging was used, but the total length of the breakwater was only 253 linear feet, and the work would not have economically carried any large expenditure for plant.

Notwithstanding the success of these several precedents and the determination to use this method of closing the gap at the Delaware breakwater, a change of executive officers, involving a review of the project, has resulted in a return to the riprap mound, based upon its simplicity and economy. It was found that in the more recent work 101,713 gross tons of stone have made 86,700 cubic yards of fill, giving only 1·17 gross ton required per yard, as contrasted with 1·5 in the older parts of the work. This was tested by stones weighed into barges, resulting in 1·15 tons per yard. The usual unit being 100 lb. per cubic foot for broken stone of average specific gravity, it would give 1·18 tons to the cubic yard, thus confirming the later estimate of material. On this basis to complete the closure of the gap there would be required 79,000 tons below low water at $3.00, and 27,000 tons above at $4.00, with contingencies, amounting to $400,000 as compared with a minimum of $500,000 for the mixed rubble and block system. The section of the present proj-

ect, as approved by the division engineer, Col. William P. Craighill, is illustrated in Fig. 6.

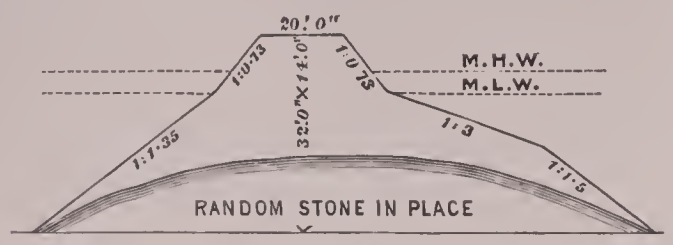


Fig. 6.

It is expected that the work will be completed in two years, and that the shoal, now stretching from the shore to the breakwater with depths of less than 15 feet, will be cut asunder by the currents aided by dredging.

Many other instances of riprap breakwaters might be cited, but they are mere modifications of those already alluded to. Probably one of the most important for its size and cost is that at Block island, at the eastern end of Long Island Sound, 14 miles from Montauk Point and 10 miles from Rhode Island mainland. The structure is only 1,000 feet long, having a gap 200 feet wide left between 300 and 500 feet from its outer end, which is to be closed. It was built between 1870 and 1879 at a cost of $354,125.59. This cost includes also the small inner harbor used by coasters and fishermen.

The Plymouth breakwater on the south coast of England was built in 30 feet of water at a cost of $1,470 per lineal foot. Between its commencement in 1812 and 1847, 3,600,000 tons of stone have been placed in the work, at a total cost, including the lighthouse, of $7,500,000. The breakwater is 5,100 feet long on top. The opening left on the western end is 4,300 feet and that on the eastern end is 2,200 feet wide, with depths of from 5 to 7 fathoms.

At Portland, England, the depth is twice as great (60 feet), but, the exposure being less, it has not been found necessary to cap the mound. The mean tide is 6¾ feet and the total height is 72 feet. The breakwater is massive, having a base of 340 feet, and containing 545 cubic yards per lineal foot. It was built under favorable circumstances, at a cost of $625 per foot, or $1.15 per cubic yard. The inner arm extends 1,700 feet to a gap of 400 feet, beyond which there is the outer mole, 6,400 feet in length, extending northward and inclosing an area of 2,130 acres, which constitutes the harbor. In this case one ton of the Portland stone was found to measure 20 cubic feet in the mound; hence one cubic yard would require 1·35 tons of stone.

Between 1849, when the work was commenced, and 1871, 5,731,000 tons were placed in the work. The mound was built from staging 18 feet above high water, supported on screw piles and carrying five lines of rails. The labor was furnished by convicts.

To reduce the quantity of material required for the mound, M. Poirel substituted concrete block at Algiers in 1834. Here a small island had been connected with the mainland in 1530 by a rubble mound 574 feet long and 118 feet wide on top. A rubble breakwater extended southward from the island 410 feet, inclosing a harbor of about 11 acres. But these structures required constant renewals. After the capture of Algiers by the French in 1830, concrete blocks, containing from 13 to 26 cubic yards, were used to protect the mole, and subsequently in reconstructing it a row of blocks in place was first laid in sizes varying from 80 to 260 cubic yards. Outside of this a row of heavy blocks was deposited, and the space between was filled with rubble. Behind this protecting mound a trench was excavated to 6½ feet below low water, which was filled with concrete in mass. It cost $400,000 for a length of 650 feet. The seaward extension of the northern breakwater was made by sinking blocks of 13 cubic yards directly in the sea. The outer slope was ¼, the inner ⅔. Since 1840 the harbor has been extended by curving the northern breakwater eastward 2,300 feet, and by building a southern wing out to meet it, leaving an opening of 1,115 feet in width for an entrance. The outer end of the breakwater is in 10 fathoms of water and the harbor covers 220 acres.

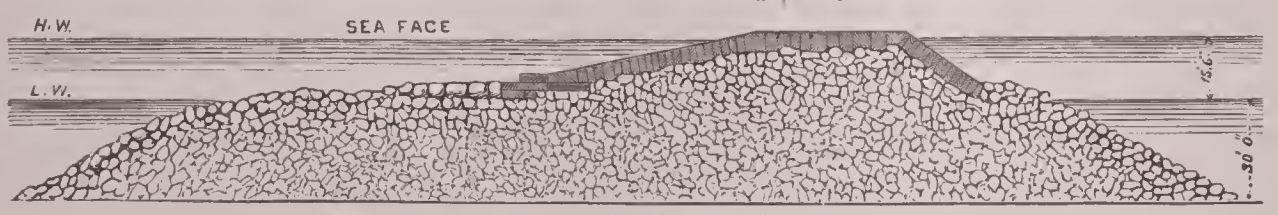


Fig. 7.—Section of the Plymouth breakwater.

In other situations destitute of suitable stone another form, the vertical-wall system, is adopted. In this mode the walls are built upright from the bottom, and as all the material below low water is put in place by diving apparatus, and is of an expensive nature, the cost of a work executed in this way is very great. The Dover breakwater is the most prominent example. It is built up solidly from the bottom of the sea, the exterior facing being of ashlar granite blocks, and the hearting of rectangular blocks of concrete, built in the same way as ashlar masonry up to the level of high water, above which it is filled in with concrete.

Concrete blocks are a costly substitute at best for rough quarry stone (when that is at hand), and with a system of construction which requires each block to be "laid" (under water) the expense must be very great. The Dover breakwater has cost over $2,000 per lineal foot.

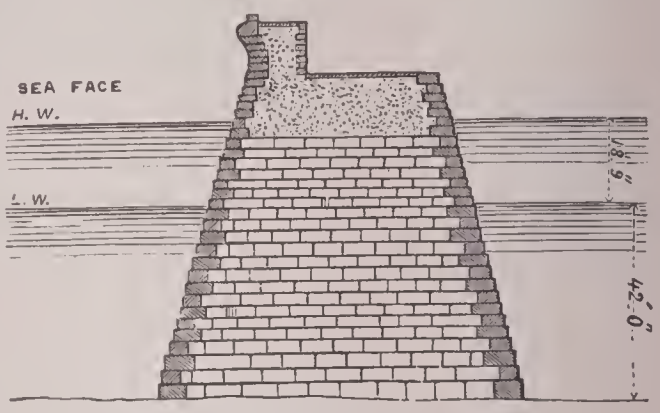


Fig. 8.—Dover (West) breakwater.

This method is only applicable where there is a good foundation sufficiently hard to resist the wave recoil and scour.

Floating Breakwaters.—Opinions differ greatly as to the utility of structures of this class, and the experience thus far is not very satisfactory, being based mainly upon wooden towers chained together and anchored. Many iron and steel forms have been patented, but not tried; among these may be mentioned that of the late Mr. Greenway Thomas, who designed floats in the form of a triangular prism with concave sides of 10 feet width and height, capped by a triangular pyramid. These buoys were anchored at three points and placed at intervals of 12 feet apart. Thus they were expected to decompose the waves and produce smooth water. An occasional expedient at sea is to lash spars and sails into a huge raft, in lee of which protection may be found. The use of oil is a well-known resort in severe storms, but these are temporary expedients belonging rather to the navigator than to the engineer.

In other cases floating iron caissons or cylinders have been suggested, revolving about horizontal axes, and having fins or flanges to check the rotation—but these only exist on paper. The estimated cost of these floating structures is about $100,000 per mile, so that if efficient they have much to commend them, as they can be placed in position rapidly, and may be shifted or removed without injury to channels or currents. The main objection urged to their use is the liability to break loose and injure shipping or other property.

Caissons or Cribs.—In fresh water, as on the Great Lakes, most of the breakwaters are composed of cribs framed on shore, and then towed to the site of the work and sunk. These are then filled with stone and covered with planks and caps, making piers as well as breakwaters. Where there are no teredo to eat up the timber, they form comparatively durable structures, but in sea water they will only last a few years, and hence are inapplicable. Here a temporary caisson may be used, filled with concrete or lined with walls, leaving cells to be filled with sand ballast. These large masses, weighing 400 to 500 tons, form a core, which may be prepared in a sheltered cove, and be towed in train to the work, and be scuttled, filled, and covered by riprap, making a rapid and cheap mode of construction, capable of be-

ing carried on continuously by day and night, and avoiding the scour incidental to the embankment method of building out. A breakwater constructed on this plan could be built for less than $1,000,000 per mile in 30 feet depth.

Foundations for breakwaters upon shifting or irregular bottoms have been constructed of concrete in bags, deposited from large hollow barges capable of handling masses weighing from 50 to 100 tons at a time, and upon these have been erected monoliths of concrete in mass, with parapet and covered way, as at Newhaven, Aberdeen, Fiume in Austria, etc.

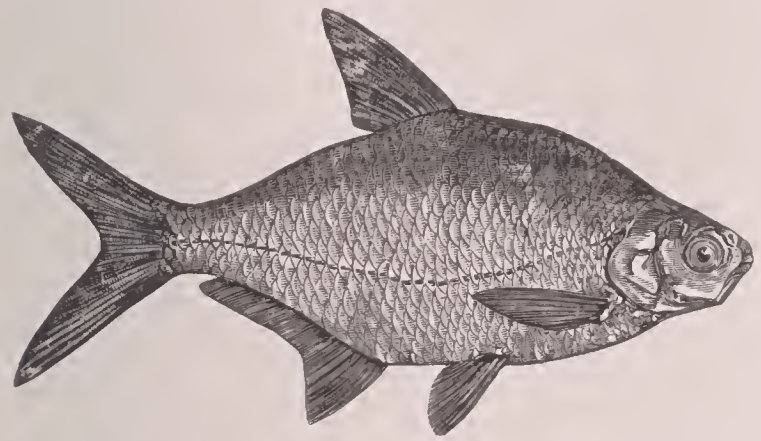
Bibliography.—*Proceedings of the Institution of Civil Engineering* (London); *Proceedings Société des Ingénieurs Civils* (Paris); *Reports of the Chief of Engineers, United States Army* (Washington, D. C.); *Harbors*, by Sir John Rennie; *Harbors and Docks*, by L. F. Vernon-Harcourt (London); *Cours de Construction des Ports de Mer*; Minard, *Mémoire sur les Travaux à la Mer*; Poirel, *Annales des Ponts et Chaussées*; Stevenson on *Harbor*; *Encyclopædia of Civil Engineering*, Cresy; Spon's *Dictionary of Engineering*.

Lewis M. Haupt.

Bréal, brā'aal', Michael Jules Alfred: French philologist; b. in Landau, Rhenish Bavaria, Mar. 26, 1832; studied in Germany with Bopp; became in 1866 Professor of Comparative Grammar in the Collège de France; in 1875 director of the École des Hautes Études. He has published *Étude des origines de la religion Zoroastrienne* (1862); *Hercule et Cacus, étude de mythologie comparée* (1863); a translation of Bopp's *Grammaire comparée des langues indo-européennes*, with introduction and additions (5 vols., 1867–74); and various works upon education in France.

A. R. Marsh.

Bream [Fr. *brême* < O. Fr. *bresme*; of Germ. origin]: a name given to several species of fishes. One is a fresh-water fish of the family *Cyprinidæ*, the *Abramis brama*. It is



The bream.

found in many rivers and lakes of Europe. Related species (*Notemigonus*) occur in North America. The name sea-bream is given to various European fishes of the genera *Pagellus*, *Spondyliosoma*, *Brama*, etc. The name bream or brim is also often applied in the East and South to species of *Lepomis*, or sunfish (see Sunfish), fresh-water fishes of the U. S., remarkable for beautiful colors, and esteemed for food.

Revised by David S. Jordan.

Breast: See Mammary Glands.

Breast, Abscess of: chiefly due to infection through fissured nipple of a breast overfilled with milk. It is prevented by care and cleanliness, and best treated by a brisk purge, support to the breast, quinine, febrifuges and the unloading of the breast, thorough rubbing, and inunctions of warm camphorated oil. When abscess is formed, it must be poulticed or incised.

Revised by William Pepper.

Breast Wheel: in hydraulics, a water-wheel so placed as to be struck by the stream of water nearly on a level with the axle, the lower quadrant of the circumference on the side opposed to the stream being placed in a race or channel concentric with the wheel, through which the water is conducted in its descent. See Water-power.

Breastworks: See Fortifications.

Breath: See Respiration.

Brechin, brech'in: a town of Forfarshire, Scotland; on the left bank of the South Esk; 38 miles by rail S. S. W. of Aberdeen (see map of Scotland, ref. 9–I). It stands on an abrupt declivity, and some of the streets are very steep. It has a cathedral, part of which was built in the thirteenth century, now used as a parish church. Adjacent to this church is a remarkable round tower 85 feet high, and surmounted by a spire of 25 feet. Here are manufactures of linens and sailcloth, bleaching-works, etc. It is the seat of a bishop of the Scottish Episcopal Church. Pop. (1891) 8,955.

Breck, James Lloyd: Episcopal clergyman and pioneer educator; b. in Philadelphia, June 27, 1818; educated at Flushing, L. I., by Dr. Muhlenberg, and at the General Theological Seminary, New York; with two or three others formed an ascetic associate mission for frontier work; they founded Episcopal schools at Nashotah, maintained at first by receipts through the mail. In 1850 Dr. Breck moved to Minnesota, and founded at Crow Wing a mission to the Chippewas; eight years later he began the church schools at Faribault; in 1867 went to California, opened an associate mission at Benicia, and founded schools for youth of both sexes; here he died Mar. 30, 1876. He was an advanced High Churchman of monastic spirit and unusual zeal.

Breck'enridge: village and railroad junction; capital of Wilkin co., Minn. (for location of county, see map of Minnesota, ref. 6–A); on the Red River of the North; 217 miles W. N. W. of St. Paul. Steamers ply between this point and the Manitoba settlements. Pop. (1890) 655; (1900) 1,282.

Breckinridge, Gen. James: a soldier of the Revolution; b. near Fincastle, Botetourt co., Va., Mar. 7, 1763; graduated at William and Mary College in 1785; became an eminent Federalist lawyer in Virginia. He was a member of Congress (1809–17), and co-operated with Jefferson in establishing the University of Virginia. He was one of the originators of the Chesapeake and Ohio Canal. D. in Fincastle, Va., Aug. 9, 1846.—His brother John (1760–1806), a U. S. Senator from Kentucky, Attorney-General to President Jefferson, and a supporter of his measures, was the ancestor of the Kentucky Breckinridges named below.

Breckinridge, John, D. D.: Presbyterian divine and polemic; b. at Cabell's Dale, Ky., July 4, 1797; graduated at the College of New Jersey, Princeton, in 1818; studied at the Princeton Theological Seminary 1819–21; was tutor in the college 1820–21; chaplain to Congress 1822–23; pastor in Lexington, Ky., 1823–26; in Baltimore, Md., 1826–31; corresponding secretary of the board of education 1831–36; Professor of Pastoral Theology in Princeton Theological Seminary 1836–38; secretary of board of foreign missions 1838–40; president of the African Colonization Society; and at the time of his death president-elect of Oglethorpe University, Georgia. D. in Cabell's Dale, Ky., Aug. 4, 1841.

Breckinridge, John Cabell: statesman and general; grandson of John, noted above; b. near Lexington, Ky., Jan. 21, 1821. He studied law; practiced at Lexington, and was elected to Congress by the Democrats in 1851. He was chosen Vice-President of the U. S. in 1856, when James Buchanan was elected President. In 1860 he was nominated for the presidency by the Anti-Douglas Democrats who seceded from the convention that met at Charleston. His competitors were Abraham Lincoln, John Bell, and Stephen Douglas. Breckinridge received seventy-two electoral votes, being supported by all the Southern States except Virginia, Kentucky, Tennessee, and Missouri. Having been elected to the U. S. Senate, he took his seat in Mar., 1861; but he joined the Confederate army in the autumn of that year. He served as major-general at the battle of Stone river, which ended Jan. 2, 1863, and at Chickamauga, Sept. 19 and 20 of that year. In May, 1864, he defeated Gen. Sigel at Newmarket, in Virginia. He became secretary of war at Richmond in Jan., 1865; visited Europe about five months later; returned to the U. S. in 1868. D. in Lexington, Ky., May 17, 1875.

Breckinridge, Robert Jefferson, D. D., LL. D.: Presbyterian minister; b. at Cabell's Dale, Ky., Mar. 8, 1800; an uncle of the preceding. He graduated at Union College in 1819; practiced law in Kentucky eight years (1823–31); then turned to theology, and was pastor in Baltimore 1832–45; president of Jefferson College 1845–47; became pastor in Lexington, Ky., in 1847, Professor of Theology at Danville in 1853; resigned 1869. He published *Travels in Europe* (Philadelphia, 1839) and several works on theology. His principal work is in two volumes, *The Knowledge of God, Objectively Considered* (New York, 1857), and *The Knowledge of God, Subjectively Considered* (1859). He was a loyal friend of the Union in the civil war and presided over the convention in Baltimore which in 1864 renominated Mr. Lincoln. D. in Danville, Ky., Dec. 27, 1871.

Breckinridge, William Campbell Preston, LL. D.: Congressman; b. in Baltimore, Md., Aug. 28, 1837; studied at Centre College, Danville, Ky.; became a lawyer; served in the Confederate army as colonel of the Ninth Kentucky Cavalry; was afterward Professor of Equity Jnrisprudence in Cumberland University: represented Seventh District, Kentucky, from 1886 till 1895.

Brec'on, or **Breck'nockshire**: an inland county of South Wales; area, 719 sq. miles. It is bounded N. by Radnor, E. by Hereford, England; S. by Glamorgan, and W. by Caermarthen. The surface is occupied by several mountain-ranges and deep, beautiful, and fertile valleys. The highest point of this county is Brecknock Beacon, which has an altitude of 2,862 feet. Old red sandstone underlies the southern and middle parts of the county, and Silurian rocks are found in the N. The chief rivers are the Wye (which forms the N. E. boundary), the Usk, Elan, and Tawe. The staple products are oats, barley, wheat, and cattle. It has extensive iron-works. The climate is moist, but temperate and salubrious. Capital, Brecon. The other principal towns are Builth, Crickhowell, and Hay. The Welsh language is still that of the peasantry and of the middle class. Pop. (1891) 57,031.

Brecon, **Brecknock**, or **Aber-Honddu**: a town of Wales; capital of county of same name; finely situated in a valley on the river Usk; at the mouth of the Honddu; 38 miles by rail W. S. W. of Hereford (see map of England, ref. 11–E). It has beautiful promenades, an old castle, a collegiate church, and a college; also considerable manufactures. Pop. 6,500.

Breda': a town of Holland; in North Brabant; situated at the confluence of the navigable rivers Aa and Merk; 16 miles S. S. E. of Dordrecht (see map of Holland and Belgium, ref. 7–E). It is connected by railway with Antwerp and The Hague. It has a castle built in 1350, a Gothic cathedral, the spire of which is 362 feet high, and a magnetic observatory; also manufactures of linens, carpets, hats, soap, leather, etc. This town can be protected against an invading army by inundating the country around it. It is celebrated as the scene of the "Compromise of Breda," by which the patriots protested against the tyranny of Philip II. in 1566, and as the place from which Charles II. issued the "Declaration" which preceded his restoration in 1660. Pop. (1891) 22,536.

Bredahl, bray-daal', Christian Hviid: Danish poet; b. Oct. 30, 1784; d. Jan. 16, 1860. *Dramatic Scenes*, in six parts, appeared, the first in 1819 and the last in 1833. This is his chief work, and there are passages in it that by their glowing pathos and powerful diction remind us of Shakspeare. He wrote several dramas that were well received by the public. Rasmus B. Anderson.

Bredero, Gerbrand Adriaensz: Dutch poet and playwright; b. in Amsterdam, 1585: d. in Amsterdam, 1618. He belonged to the middle class, and his education was comparatively meager. Like Shakspeare, he knew "small Latin and less Greek." He was trained to be a painter, but his heart was in literature. The defects of his education were in a measure made good by association with the best spirits of his time—Grotius, Heinsius, Scriverius, Vondel, Coster; and his talents were such that he became the best writer of comedy Holland has produced. Still, his lack of the classics made him essentially mediæval and romantic in his sympathies, as is shown by the themes of his plays. These fall into two classes: tragi-comedies (essentialy *comedias de capa y espada*)—*Rodderijk ende Alphonsus* (1611); *Griane* (1612); *Lucette* (1616); *de Stomme Ridder* (1618)—and pure comedies: *de klucht van de Koe* (1612); *Symen sonder soeticheyt* (1612); *van de Meutenaer* (1613); *Het Moortje* (based on the *Eunuchus* of Terence, 1615); *de Spaensche Brabander Jerotimo* (based on a French trans. of Hurtado de Mendoza's *Lazarillo de Tormes*, 1617). The last piece is commonly regarded as Bredero's *chef d'œuvre*. Besides his plays, Bredero wrote poems in a singularly direct and imaginative style; and these were published in 1622 under the title *Boertigh amoureus ende aendachtigh groot liedtboeck*. His complete works were published in Amsterdam, 1638, and often since. See J. ten Brink, *G. A. Bredero, hist.-aesth. studie van het nt. blijspel der XVII. eeuw* (Utrecht, 1859). A. R. Marsh.

Bree, bray, Mathieu Ignace: Flemish historical painter; b. at Antwerp, Feb. 22, 1773. Among his works are *Rubens Dictating his Last Will* (in the Antwerp Museum); *Entrance of Napoleon into Antwerp*; and *Van der Werff Addressing the Famished Populace during the Siege of Leyden, 1574*. He was director of the Academy of Fine Arts in Antwerp, where he died Dec. 15, 1839.

Breeches Bible: See Bible (*Modern Versions*).

Breech-loading Firearms are those which are loaded by putting the cartridge directly in at the breech instead of ramming it in at the muzzle. It is said that breech-loading guns were used early in the reign of Henry VI. of England, and it is certain that they were used in Scotland about that time. There are several ancient specimens in the Tower of London. Many attempts to improve this kind of arms have been made, and of late with much success. Among the most celebrated weapons of this character are the Armstrong and Whitworth guns, the Krupp steel guns, the *mitrailleuse*, and among small-arms the needle-gun and the Chassepot, Enfield, Grecner, Lebel, Martini, Mauser, Sharps, Snider, Spencer, Ward-Burton, and Remington rifles.

Breed: a variety produced in any animal species in consequence of domestication, by changes somewhat analogous to those which occur in cultivated plants. The changes originated by breeding (artificial selection) are in some species, as in the dog and pigeon, very marked, producing external, and even structural, differences which, if they were permanent and originated by natural and unexplained causes, would confessedly be regarded as sufficient to establish difference of species or even genus. But the fact that thoroughbred animals, when neglected or allowed to go wild, tend to revert to the original type, and the not less important fact that animals of the most widely different varieties of the same species will (with a few possible exceptions) breed freely with each other, producing fertile young (which is rarely the case with those of different species), are by many held to show a radical difference between varieties or breeds and species. The study of the variations produced by artificial selection suggested to Darwin the name "natural selection" as applied to analogous processes in nature.

Some of the results of artificial selection on animals are truly marvelous. The numerous varieties of the dog and the pigeon have been, to a great extent, produced by design; animals being bred to develop certain desired peculiarities, the principle being that "like produces like," or that certain qualities possessed by the parent may be perpetuated and increased in the offspring. The milk-producing qualities of the Ayrshire cow, the butter-making excellence of the Jersey breed, the long-wooled Cotswold sheep, and the new breeds of easily fattened swine, afford illustrations of the industrial importanec of this remarkable plasticity or adaptability of the various domestic animals—an adaptability which has only of late been scientifically studied, and the limitations of which are as yet not well known. See Darwin, *Domesticated Animals and Cultivated Plants* (1867).
Revised by David S. Jordan.

Breed, David Riddle, D. D.: Presbyterian minister; b. in Pittsburg, Pa., June 10, 1848; graduated at Hamilton College (1867), and from Auburn Theological Seminary (1870); pastor in St. Paul, Minn. (1870–85), and in Chicago, Ill., from 1885; has published several little books, one of which, *More Light*, has a very wide circulation in a number of languages. He has also published *Abraham, the Typical Life of Faith* (Chicago, 1886); *A History of the Preparation of the World for Christ* (1891); and *Heresy and Heresy* (1891).

Breese, Kidder Randolph: captain U. S. navy; b. in Philadelphia, Apr. 14, 1831; entered the navy as a midshipman Nov. 6, 1846. At the close of 1861 he commanded the third division of Porter's mortar flotilla; took part in the bombardment of Forts Jackson and St. Philip; participated in the attacks on Vicksburg during June and July, 1862; took part in nearly all the severe engagements on the Mississippi and its tributaries during 1863 and 1864; was engaged as fleet-captain in the naval assault on Fort Fisher of Jan. 15, 1865, and commanded the storming party. D. at Newport, R. I., Sept. 13, 1881.

Breese, Samuel Livingston: rear-admiral U. S. navy; b. in New York in 1794; entered the navy in 1810; served against Great Britain and Mexico; became captain in 1841, and rear-admiral in 1862. D. at Mt. Airy, Pa., Dec. 17, 1870.

Breese, Sidney: b. at Whitesboro, Oneida co., N. Y., July 15, 1800; graduated at Union College in 1818. In 1821 he was called to the Illinois bar; attained distinction; an officer in the Black Hawk war, U. S.; State attorney 1822–27; appointed U. S. attorney for Illinois; U. S. Senator from Illinois (1843–49); speaker of the Illinois Legislature

in 1850. He was made circuit judge in 1835, and again in 1855, becoming chief judge of that bench. He was one of the originators of the Illinois Central R. R. D. at Pinckneyville, Ill., June 27, 1878.

Breeze: a soft wind, a gentle gale. *Land and Sea Breezes.*—In a fair day, near the seashore, an hour or two after sunrise, a gentle wind begins to blow from the sea toward the land, gradually increasing in force during the day. With the declining sun the sea-breeze loses its power, and dies out before sunset. A lull then ensues, after which a land-breeze sets in from the land toward the sea, and continues all night until before sunrise, when another calm occurs. The cause of these alternate winds is to be found in the fact that the land is more readily heated by the rays of the sun, and more quickly cooled in their absence, than the sea. In an island, for instance, in proportion as the sun rises above the horizon the land becomes warmer than the neighboring sea. Their respective atmospheres participate in these unequal temperatures; the fresh air of the sea rushes from all directions in the form of a *sea-breeze*, which makes itself felt along the whole coast, and the warmer and lighter air of the island will ascend into the atmosphere. During the night it is the reverse. The island loses heat by radiation, and cools quicker than the sea. Its atmosphere, having become heavier, flows into that of the sea in the form of a *land-breeze*; and this interchange lasts until the temperature, and consequently the density, of the two atmospheres has again become the same. This is the phenomenon observed almost daily on nearly all the seaboards.

Mountain-breezes.—Similar alternate breezes are observed to play between the great mountain-chains and the neighboring plains, as in the Alps. On a fair day strong breezes rush up the valley toward the overheated mountain-slopes, and descend with equal force during the night; for during the day the mountains absorb more heat than the neighboring free atmosphere, and radiate more during the night. See Winds.

Brehm, braym, Alfred Edmond: b. at Renthendorf, Saxe-Weimar, Feb. 2, 1829; studied natural history under his father, the famous ornithologist, Christian Ludwig Brehm; traveled in Egypt, Nubia, and the Sudan; visited Spain and Norway; went once more to Africa in 1862 in company with Duke Ernst of Saxe-Coburg-Gotha; was made director of the zoölogical garden in Hamburg 1863, and removed in 1867 to Berlin, where he founded the great aquarium. He published *Illustrirtes Thierleben* (6 vols., 1863), which was translated into French, and of which a new edition in 10 vols. appeared in 1868; *Das Leben der Vögel*, *Die Thiere des Waldes*, etc. D. in his native place, Nov. 15, 1884.

Brehon Law: the law by which Ireland was governed generally before the conquest, and to some extent as late as the eighteenth century. It was so called from the brehons who expounded it, and who were a class of jurists or law professors existing among the Irish according to a system common to the Gauls, Britons, and other Keltic nations. The office of brehon was often hereditary in families, and was of great importance, partly because the brehons preserved the laws in written form and not by tradition, as was the case with the bards, who also were clothed with a certain legal authority. The brehons were still in the full exercise of their functions as late as the reign of Elizabeth, as is shown by the Government records at Dublin, and traces of them are found in the early part of the eighteenth century. The largest body of these laws is preserved in a Gallic manuscript called *Shanchus Mór*, which was compiled in the first part of the fifth century. This manuscript, together with others, has been published in fac-simile and translated by a royal commission appointed in 1852, not, however, without numerous errors, owing to a lack of profound knowledge of old and modern Gaelic, and to the obscurity of the subject-matter. These show us that there existed in ancient Ireland a system of laws in which the property and personal rights of individuals were minutely regulated. There was a complicated system of land-tenure from monarch to slave through landlords and tenants, under which much of the land was held in common for tillage or pasturage. There were petty kingdoms, and divisions and sub-divisions of these, held together in a system not unlike the feudal system of England, but more loosely organized. The grades of rank were numerous, and the right to claim a certain rank depended upon the possession of a fixed amount of cattle, agricultural implements, and household goods. The laws governing marriage allowed great liberty to the husband in contracting irregular relations. They gave to the wife the right to alienate a portion of her separate estate, and to control to some extent her husband's right of alienation. The provisions governing the distribution of the estates of deceased persons were very minute, but obscure by reason of the technicality of the language employed. The putting out of children to be nursed and educated, which was practiced by the rich, was regulated with great particularity by laws which prescribed the fees to be paid, the instruction to be given to the children, the conditions upon which they could be returned before the end of pupilage, etc. In the law of torts all offenses, except murder, were condoned by fines or mulcts, and the amounts of these fines and the persons responsible for their payment were prescribed, in some cases the family being made liable therefor, and in other cases sureties somewhat after the manner of the old English institution of frank-pledge. The nature of the courts by which these laws were enforced was not clearly stated; the process, however, is more fully outlined, and included distress and other proceedings, in principle resembling the common law of England. This ancient body of laws is valuable for the light it throws upon the customs of the people and their household and public life, and upon the history of totemism, feudalism, the evolution of the clan, tribe, and state, and other kindred subjects. See Sir Henry S. Maine's *Lectures on the Early History of Institutions.*

F. Sturges Allen.

Brei'tenfeld: German village; 5 miles N. of Leipzig; the scene of two victories of the Swedes over the Imperialists, the first by Gustavus Adolphus over Tilly, Sept. 17, 1631, the second by Torstenson over Archduke Leopold and Piccolomini, Nov. 2, 1642. It also figured in the battle of Leipzig, Oct. 16, 1813.

Brei'tinger, Johann Jacob: German critic; b. in Zurich, Mar. 1, 1701. He was a friend and a collaborator of Bodmer. His chief work is the *Critische Dichtkunst* (Zurich, 1740), in which he expounds the æsthetic principles which helped to revolutionize German poetry. See Braitmaier, *Geschichte d. poet. Theorie*, etc., 1888. D. in Zurich, Dec. 15, 1774.

Julius Goebel.

Breitman, Hans: See Leland, C. G.

Brem'en: a state and free city of Germany; on both sides of the river Weser; about 45 miles from the sea and 60 miles S. W. of Hamburg; lat. 53° 4′ 36″ N., lon. 8° 48′ 54″ E. Area, 99 sq. miles (see map of German Empire, ref. 3–D). The city is divided into the old and the new town, the former of which is on the right bank of the river, and has narrow, crooked streets. The new town, which is connected with the old by two bridges, is more regular. The old ramparts have been leveled and converted into beautiful promenades and pleasure-grounds. The most remarkable edifices are the cathedral, built about 1,100; the fine old Gothic town-hall, with a famous wine-cellar; the exchange, the museum, and the observatory of Olbers. Bremen has a large public library, a normal school, a theater, and a hospital; also manufactures of woolen and cotton goods, beer, liquor, sugar, paper, starch, and cigars. As a commercial city this is one of the most important of Germany, having an extensive foreign trade, especially with the U. S., to which it ships about half of the total German emigration. It is connected by railway with Hanover, Bremerhaven, and other towns. Vessels drawing 7 feet of water can ascend to this point; large ships stop at Bremerhaven. The trade of Bremen has increased rapidly in the last fifteen years. The chief articles of export are woolen goods, linens, glass, hemp, hides, rags, wooden toys, and wool. The imports consist of cotton, coffee, sugar, rice, tobacco, wines, dyewoods, oil, tea, etc. Ship-building is carried on here extensively. The imports in 1890 amounted to 749,938,507 marks, and the exports to about 706,600,000 marks. The number of emigrants that embarked here in 1890 was 140,410. Pop. of city proper (1890) 124,887; (1895) 141,894.

Bremen was founded before 788 A. D., and was made a bishopric by Charlemagne. It was one of the chief towns of the Hanseatic League. In 1815 it was admitted into the Germanic confederation by the Congress of Vienna. In 1888 it joined the German Zollverein. The government of this city and the territory attached to it is a nominal republic, the total population of which in 1890 was 180,443. It is governed by a senate, forming the executive, and a house of burgesses, invested with the power of legislation.

Revised by C. K. Adams.

Bremen: town; Marshall co., Ind. (for location of county, see map of Indiana, ref. 2–E); on Balt. and Ohio R. R.; 13 miles N. E. of Plymouth, the capital of the county. It is a manufacturing town in an agricultural and lumbering district. Pop. (1880) 1,028; (1890) 1,076; (1900) 1,671.

Bremer, Fredrika: a popular Swedish novelist; b. in Åbo, Finland, Aug. 17, 1801. She was educated at Stockholm, and became in early youth familiar with German literature. Her first story, *Axel and Anna*, appeared in 1828 as No. 1 of *Sketches from Every-day Life* (*Teckningarutur hvardagslifort*), a general title under which she continued to publish stories until 1848. Some of the best known of these sketches are *The President's Daughters* (*Presidentens döttrar*, 1834); *Nina* (1835); *The Neighbors* (*Grannarne*, 1837); *Home* (*Hemmet*, 1839); *Brothers and Sisters* (*Syskonlif*, 1848). *The Bondmaid* (*Trälinnan*, 1840) is in another style. Miss Bremer visited the U. S. in 1849, and after her return to Sweden published *The Homes of the New World* (*Hemmen i den nya verlden*, 1853–54). *Hertha* appeared in 1856, and *Father and Daughter* (*Fader och Dotter*) in 1858. D. at Arsta, near Stockholm, Dec. 31, 1865. Most of Miss Bremer's stories have been translated into English, French, and German. See her *Life, Letters, and Posthumous Works*, edited by her sister Charlotte (New York, 1868).

Bremerha'ven: a town and port of Germany; on the right bank of the Weser, near its mouth; about 35 miles N. N. W. of Bremen (see map of German Empire, ref. 2–D). It is a part of the state of Bremen. It has an outer and an inner harbor, built by the citizens of Bremen (1827–30) for the accommodation of large ships which can not ascend the river. Pop. (1890) 16,335.

Brendan: See St. Brendan.

Brenham: city; capital of Washington co., Tex. (for location of county, see map of Texas, ref. 5–I); on Hous. and Tex. Cen. and Gulf, Col. and Santa Fé R. Rs.; 70 miles S. W. of Houston. It is in a fertile region adapted to the growth of cotton, corn, and small grain; has fine public school, large cotton-seed oil-mill, 2 cotton compresses, 2 foundries, electric-light system, and a number of small factories. Pop. (1880) 4,101; (1890) 5,209; (1900) 5,968.

Editor of "Banner."

Bren'ner Pass: lowest pass in the main chain of the Alps; on the route between Innspruck and Botzen; 4,775 feet above the level of the sea. The mountains on each side rise about 7,500 feet above the pass, which is open at all seasons of the year. In 1868 a railway was opened through this pass from Innspruck to Botzen, at which point it connects with the railways of Germany and Italy. At the summit of the pass is the small village of Brenner.

Bren'nus [Celt., king]: a famous chief of the Senones, a tribe of ancient Gauls who crossed the Apennines in 390 B. C., invaded the Roman state and defeated its army. Brennus then captured Rome, except the capitol, which he besieged for about six months. During this siege he attempted to surprise the garrison by night, but he was repulsed by Manlius, who was awakened by the cackling of some geese. The Romans purchased peace by the payment of 1,000 pounds of gold. To increase the price Brennus is said to have thrown his sword on the scale. See, on this subject, Arnold's *History of Rome*.

Brennus: a Gallic chief who invaded Greece with a large army about 280 B. C., and ravaged Macedonia and Thessaly. He was defeated at Delphi by the Greeks, who were said to have been aided by an earthquake.

Brenta'no, Clemens: German novelist and dramatist; b. in Frankfort-on-the-Main, Sept. 9, 1778. He was a brother of Goethe's friend, Bettina von Arnim; was a romanticist, and with unsettled mystic tendencies, so that for six years his dominant task was recording the revelations of the nun of Dülmen. He produced dramas entitled *Ponce de Leon* (1804) and *The Foundation of Prague* (1816). Among his admired novels is *The History of Caspar the Brave and the Fair Annerl*. In conjunction with Arnim he published the collection of ballads called *Des Knaben Wunderhorn* (1806–08; 2d ed. 1815). D. in Aschaffenburg, June 28, 1842.

Brentano, Lujo: economist; b. in Aschaffenburg, Bavaria, Dec. 18, 1844; educated at Dublin and at German universities; professor in Breslau 1872, in Strassburg 1882, in Vienna 1888, in Leipzig 1889, in Munich 1891. Author of work on *English Guilds* (1870); *Die Arbeitergilden der Gegenwart* (1871–72); *Das Arbeitsverhältnis gemäss dem heutigen Recht* (1876); *Die Arbeitsversicherung* (1879); and other works on English and German social questions.

Brentford: a market-town of England; capital of Middlesex; on the Thames; at the mouth of the Brent; 7 miles W. S. W. of London (see map of England, ref. 12–J). It is connected with Kew by a bridge across the Thames; has large gin-distilleries and the works of the West London Water Company. It consists mostly of one long street. The town is rich in historical interest, and has frequently been alluded to by Shakspeare and other dramatists. Pop. (1891) 13,736.

Brenton, William: colonial Governor; emigrated to Boston from Hammersmith, England; held important offices in Massachusetts and Rhode Island, where he was several times Lieutenant-Governor. He was President of Rhode Island (1660–61) and Governor (1666–69); acquired large estates as a surveyor; name perpetuated in Brenton's Reef. D. in Newport, 1674.

Brenz (in Lat. *Brentius*), Johann: German reformer; b. at Weil, in Swabia, June 24, 1499; was educated at Heidelberg, and became a Protestant under Luther's influence. He was a popular preacher at Halle, in Swabia, from 1522 to 1546, until, with the outbreak of the Smalcald war, he became an exile. Called by Duke Christopher to Stuttgart in 1553 as provost of the cathedral church, he thoroughly reorganized the Würtemberg Church, giving it its Church Orders, Confession, and Catechism. He participated in many theological conferences, and wrote extensive volumes of expository lectures. In his defense of Luther's doctrine of the Lord's Supper he is sometimes charged with being a Ubiquitarian. D. in Stuttgart, Sept. 17, 1570. See his *Life* by J. Hartmann (Elberfeld, 1862).

Revised by Henry E. Jacobs.

Bres'cia: a province of Lombardy, Italy; bounded N. by the Tyrol, E. by Lago di Garda and Verona, S. by Cremona, and W. by Bergamo. Area, 1,644 sq. miles. The soil is fertile. Silk and wool are among the staple productions. It has manufactures of woolen goods, firearms, and cutlery of superior quality. Capital, Brescia. Pop. (1890) 501,531.

Brescia (anc. *Brixia*): a handsome city of Lombardy, Italy; capital of province of same name; pleasantly situated on a wide plain and on the river Garza; 62 miles by rail E. N. E. of Milan (see map of Italy, ref. 2–C). It is on the railway which connects Milan with Venice. It has an old cathedral, a mediæval structure, and a new marble cathedral (Duomo Nuovo) commenced in 1604; also many churches richly adorned with works of art by celebrated masters, an episcopal palace, a college, a renowned public library (Biblioteca Quiriniana), a museum of antiquities, a botanic garden, and a theater. The Temple of Hercules, dating from the second century, was excavated in 1822, and is an archæological museum. Here are manufactures of cutlery, silk, linen, and woolen fabrics, paper, and wine. The streets and public squares are adorned with numerous fountains. Brixia was a very ancient town, and was the capital of the Cenomanni, a Gallic tribe. It was plundered by Attila, but soon recovered from this injury. The Emperor Otho I. declared it a free city about 936. It was bombarded and taken by the Austrian general Haynau in 1859. Pop. (1890) 43,354.

Bres'lau, or **Breslaw** (in Lat. *Bratislavia*; Polish *Wraclaw*): a large city of Prussia; capital of Silesia; on the river Oder; at the mouth of the Ohlau; and on the railway from Berlin to Vienna; 221 miles by rail S. E. of Berlin; lat. (of observatory) 51° 6′ 56·5″ N., long. 17° 2′ 18″ E. (see map of German Empire, ref. 5–I). It is, next to Berlin, the most populous city of Prussia. It is divided by the Oder into the old and new towns, which are connected by numerous bridges. The new town has wide and regular streets. It is the seat of a Roman Catholic bishop. The most remarkable edifices are a cathedral founded in the twelfth century, St. Elizabeth's church, the theater, the Rathhaus, exchange, mint, and university buildings. The university has a library of 350,000 volumes. Breslau contains other public libraries, an observatory, a botanic and zoölogical garden, four gymnasia, and numerous other schools of different kinds. It has an extensive trade, and is the greatest market for wool in Germany. It has manufactures of woolen, linen, cotton, and silk fabrics, broadcloths, lace, jewelry, soap, earthenware, starch, and ardent spirits. The number of distilleries in it is about 100. Railways extend to Dresden, Posen, Warsaw, and Vienna. Breslau is first mentioned by Dit-

mar, the chronicler, in 1000 A. D., and it seems to have been founded about that date. It became the seat of a bishop in 1052, and the capital of an independent duchy in 1163. Reduced to ashes by the Mongolians in 1241, it recovered, and in 1261 joined the Hanseatic League. In 1335 it came under Bohemia, and after the battle of Mohacz it passed to Austria. In 1741 it was taken by Prussia. Pop. (1890) 335,186; (1895) 373,163.

Brest (Lat. *Brestum*): a fortified city and seaport of France; department of Finistère; 314 miles W. of Paris (see map of France, ref. 3–A); said to be the strongest military port in France. It is on the north shore of the road of Brest, in lat. 48° 23′ N., lon. 4° 29′ W. Its outer harbor is one of the best and most capacious in Europe, having ample room for 500 ships of the line. The harbor or road communicates with the ocean by a single channel called the Goulet, which is 1,750 yards wide. In the middle of this channel are the Mignan rocks, which render the entrance of hostile ships very difficult and dangerous. The outer harbor or roadstead is about 6 miles long, and is defended by powerful batteries. The inner harbor is also secure and spacious. From its natural advantages and the strength of its defensive works, Brest is considered one of the first naval stations of Europe. Here are five large basins, extensive quays, an arsenal, vast magazines, large barracks, and a prison, the Bagne, which can accommodate 4,000 convicts. Brest is the western terminus of a railway which extends to Paris viâ Rennes and Le Mans. The city is built on the slopes of several hills, and is divided into two parts, which can communicate only by boats. It is encircled by ramparts, which, being planted with trees, form pleasant promenades. It has a naval school, a medical school, a communal college, besides numerous other schools, a public library, a botanic garden, an observatory, etc. This port has little trade except for the supply of the naval department, and its industry is confined to the equipment of the navy. This place was not of much importance until Cardinal Richelieu commenced in 1631 the fortifications, which were completed by Vauban. A submarine telegraph cable connects this harbor with Duxbury, Mass. Pop. (1881) 66,110; (1891) 75,854; (1896) 74,538.

Brest Litovsk′: a town of Russia; province of Grodno; 92 miles S. of Grodno (see map of Russia, ref. 8–B). It has several factories and considerable river trade, and is the seat of a United Armenian bishop. Pop. 39,901.

Bretagne (in Lat. *Britannia Minor*), usually called **Brit′tany** in English, or **Little Brittany**: a former province of France; extensive peninsula; bounded N. by the English Channel, and W. and S. W. by the Atlantic Ocean. It is now comprised in the departments of Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, and Loire-Inférieure. It was divided into Haute-Bretagne (Upper Brittany), capital Rennes, and Basse-Bretagne (Lower Brittany), capital Vannes. Among the other towns are Brest, Quimper, and St.-Malo. The surface is partly mountainous, and the scenery wild and beautiful. This province, which in ancient times was called *Armorica*, was settled by the Cymri, a Celtic race to which the ancestors of the Welsh belonged. It contains large tracts of heath nearly uncultivated, and extensive forests. The outline is indented with numerous bays and inlets, which afford facilities for navigation and commerce. Brittany abounds in ancient monuments and cromlechs, which are ascribed to the Druids. The modern Bretons are tenacious of their ancient customs and peculiarities, and are generally Catholics. They are more loyal and devout than the majority of the French. Their language (the Armorican) is peculiar, and closely resembles the Welsh. This region and its people have a special interest for antiquarians. It became subject to the Franks in the time of Charlemagne. In 848 A. D. Nominoé, an Armorican chief, assumed the title of King of Bretagne, and defeated the army of King Charles the Bald. The Normans conquered it in the tenth century.

Geoffroi, Count of Rennes, became in 992 the first Duke of Bretagne, which continued to be an almost independent feudal duchy until it was annexed to France in 1531. Pop. (1891) 3,162,272. See Daru, *Histoire de Bretagne* (1826); Courson, *Histoire des Peuples Bretons, etc.* (1847).

Brethren: See Plymouth Brethren (so called); also Dunkers and United Brethren in Christ.

Brethren and Sisters of the Free Spirit: a sect of extremely pantheistic and immoral semi-monastic enthusiasts, which probably originated in the sect of Almericians, followers of Amalric of Bena, who died in 1209. Their principal doctrines were, according to the testimony of their Catholic prosecutors, our only source of knowledge: (1) God is all that is; (2) man is therefore God; (3) through sin (origin unexplained) there has come about a separation between man and God; (4) the reunion comes when man recognizes this union with God; (5) when he does, then he knows himself as God does, is perfect, and sin is impossible. The consequence was of course the grossest immorality. They suffered much from the severity of the authorities, but became very numerous in Germany, France, and Italy. The sect lasted till about 1450. They were otherwise known as *Homines Intelligentiæ* (men of understanding), also as Adamites, Turlupins, Schwestriones, Picards, etc.; and it is believed that the immoral "Adamites" now existing in Bohemia are their descendants.

Brethren of the Christian Schools: same as Brothers of the Christian Schools (*q. v.*).

Brethren of the Common Life (in Lat. *Fratres Vitæ Communis*): an association of pious men founded in Deventer, Holland, by Gerhard Groot about 1376. They had all possessions in common, wore a uniform dress, ate at the same table, and pursued the same tasks. They took the three monastic vows of obedience, poverty, and celibate chastity, but discipline was maintained, generally according to the rule of St. Augustine, without lifelong vows. Later, "Sisters of the Common Life" appeared. They lived in special houses, the sexes apart. The head of each band of brothers was called the rector; of sisters, the Martha; the head of all the brothers, the "father," who lived at Deventer; of the sisters, the "head Martha," who lived at Utrecht. The brothers supported themselves by teaching and copying manuscripts. They were forbidden to beg. For this reason the mendicant orders opposed them. In the popes they found, however, supporters, and the Council of Constance indorsed them. From Holland they spread to Northern Germany, Italy, and Portugal. In 1460 they numbered 130 houses. Their schools were famous. Thomas à Kempis belonged to them, and Wessel and Erasmus were educated by them. Luther and Melanchthon esteemed the brotherhood highly, and many of them became Protestants; others connected themselves with the Jesuits and other Roman Catholic orders, and before 1650 the fraternity was extinct. See S. Kettlewell, *Thomas à Kempis and the Brothers of the Common Life* (London, 1882, 2 vols.; 2d ed. 1884).

Revised by S. M. Jackson.

Breton, bre-tōṅ′, Émile Adelard: landscape-painter; brother and pupil of Jules Breton; b. at Courrières, Pas-de-Calais, France; first-class medals, Paris Expositions, 1878 and 1889; Legion of Honor 1878; medals at Centennial Exhibition, Philadelphia, 1876, and Vienna Exposition 1873. A fine winter landscape by him is in the Luxembourg Gallery, Paris.

W. A. C.

Breton, Jules Adolphe: painter of French peasant-life in village and field; b. at Courrières, May 1, 1827. He was a pupil of Félix de Vigne and of Drölling, and began exhibiting at the Salon about 1850. His first recompense was a third-class medal at the Paris Exposition of 1855, and in his artistic career since then he has been plentifully besprinkled with honors. He received the medal of honor at the Salon of 1872, and was made commander of the Legion of Honor in 1889; member of the Institute 1886. His pictures are excellent from the technical point of view, and his earlier work particularly evinces true poetic sentiment. In later pictures, however, the sentimental side of his art is sometimes too prominent, and the sturdy vigor of his earlier period is lacking. *Blessing the Harvest* (1857), *Calling Home the Reapers* (1859), *Evening* (1861), and *The Gleaner* (1877), all in the Luxembourg Gallery, are among his best works, *Blessing the Harvest* being one of the works with which he first attracted wide public notice. *Evening in a Hamlet of Finistère*, a picture of rare poetic quality, was sold in the Seney sale in New York in 1885 for $18,000, considered at that time a very high price for a picture by a modern artist, but it was surpassed by the price paid for his picture *The Communicants*, at the Morgan sale a few years later, which brought $45,000. His pictures are very popular in the U. S., and some important ones are owned by collectors in that country.

William A. Coffin.

Bretonic Language: The Bretonic or Armoric language is one of the few surviving remnants of the Celtic stock. The language of Basse-Bretagne, like its population, is an immi-

gration from England, and is therefore most closely related to the Welsh and the extinct Cornish; in fact, in the earliest records scarcely distinct from them. It is now divided into several dialects, of which the chief are those of Léon, of Tréguier, of Cornouailles, of Vannes. They are all more or less mixed with French loan-material, and are gradually yielding place entirely to the French. The orthography of Bretonic is essentially the French. The scanty earliest monuments of the language date from the eighth century, and consist almost entirely of glosses to Latin texts and proper names in mediæval documents. With the end of the fifteenth century begins the Bretonic literature proper, which is almost exclusively religious in content; hymns, lives of saints, etc., especially a series of religious dramas, or the so-called Mysteries. The nineteenth century presents also several secular poets. The most important element of the literature is constituted, however, by the tales and songs collected from popular tradition. The best survey of the development of language and literature is obtained from J. Loth's *Chrestomathie bretonne* (1890). See also Celtic Languages.

R. Thurneysen.

Breughel, brü'gel, Jan: Flemish painter; b. in Brussels in 1568; called Velvet Breughel, in reference to the material of his clothing. He painted landscapes, animals, flowers, and small figures, which are finely finished. Among his chief works are several pictures of *Adam and Eve in Paradise*, which are in the museums of the Louvre, Berlin, and The Hague. The figures of these were painted by Rubens. D. in Antwerp, Jan. 13, 1625.

Breughel, Pieter: Flemish painter; father of the preceding; b. at Breughel, near Breda, about 1520. He painted with success village festivals, comic subjects, and the amusements of rustic life. D. in Brussels in 1569.

Brevard', Ephraim, M. D.: b. in Mecklenburg co., N. C., about 1750; graduated at College of New Jersey in 1768; educated for a physician, and practiced at Charlotte, N. C.; became secretary of the noted Mecklenburg convention, which met in May, 1775, and was one of the committee to prepare resolutions. As such he participated in drafting its resolutions, which after 1819 were reputed to contain a famous declaration of independence, nearly fourteen months before Congress took a like step. He died in Charlotte, N. C., in 1783, but nothing was found in his papers corresponding to the declaration, although he was the secretary of the convention. He and six brothers entered the continental army; he was taken prisoner at Charleston, S. C., in 1780, and never recovered from the hardship of his imprisonment. See Mecklenburg Declaration of Independence.

Breve: in music, a note formed thus ▭, or ▭|, or ||▭||, and equivalent to two semibreves. The note for a whole bar in modern notation is called a semibreve. The breve is now used only in *alla capella* movements, psalm-tunes, and fugues, or at the close of a composition.

Brevet' [Fr. letters patent, license, commission; liter., a short writing, from Lat. *brevis*, short]: a military term applied to a class of commissions granted to officers of the U. S. army, and to the army and navy officers of Great Britain. Formerly in Great Britain a general brevet was issued upon special occasions, such as coronations, the end of a great war, the birth of an heir to the throne, etc., and when no occasion of this kind occurred they were issued at intervals of about six years, for the purpose of giving to officers a rank and pay commensurate with their length of service. From the time of James II. this general brevet formed a part of the military system of England, and was an implied condition upon an officer entering the service. The brevet advanced all officers of the army above the rank of lieutenant one grade in rank and pay, i. e. a captain became a major, a major became a lieutenant-colonel, etc. The officers of the navy received a similar advance. Brevets based upon some of the above-mentioned occurrences were issued in 1837, 1838, 1841, 1846, 1851, and 1854. Brevets were also conferred upon officers for acts of conspicuous gallantry in the field. In 1854 this system was changed and restricted. A brevet, without increase of pay, is now conferred upon an officer after five years' service as lieutenant-colonel, and, with a limited increase of pay and right to command, upon officers of lower rank for distinguished services in the field. In the U. S. brevets may be conferred for distinguished services upon officers of all ranks, by nomination by the President and confirmation by the Senate, in the same way that other appointments are made. Brevets, however, give no additional pay, and confer upon the officer the right to command according to his brevet rank only upon special assignment by the President. In the U. S. army a relation between pay and length of service is established by allowing to officers of the lower grades a certain increase of pay for each five years' continuous service.

James Mercur.

Bre'viary [from Lat. *brevia'rium*, abridgment, summary, deriv. of *brevis*, short]: an abridgment or epitome; also a book containing the daily service of the Church of Rome or of the Greek Church. It is so called, probably, because it was abridged from another service-book, called *Plenarium officium*, the "full service." The Roman Catholic Church has several breviaries, some being used in particular dioceses or in special monastic orders, but the *Breviarium Romanum* (Roman Breviary) is the most generally used, and is rapidly taking the place of the others throughout the Latin rite, and it has been translated into some of the Eastern rites. It is in four parts, the Psaltery, or psalms for canonical hours; the *Proprium de Tempore*, for festivals in honor of Christ; the *Proprium de Sanctis*, for festivals of special saints; and the *Commune Sanctorum*, for other days. The Greek Breviary (ὡρολόγιον) or "dial" is used in the Greek Church and the Roman Catholic churches of the Greek rite. (See Canonical Hours and Liturgy.) There is a translation of the *Roman Breviary* by John, Marquis of Bute (2 vols., Edinburgh and London, 1879).

Brevier': in typography, a type which is larger than minion and one size less than bourgeois. This cyclopædia is in brevier. See Printing.

Brevipen'nes [from Lat. *brevis*, short + *penna*, wing]: in the system of Cuvier, that tribe of birds which comprises the ostrich, cassowary, emeu, rhea, etc. They have wings so short that they are not fit for flight, but they serve to accelerate the speed with which the birds run on the ground. Their sternum (breast-bone) has no keel or ridge, a character now used to define the sub-class *Ratitæ*. The gigantic *Dinornis* and some other fossil birds exhibit the characters of the brevipennes. Birds of this tribe flourish only in solitudes and deserts, and are destined to extinction, as the progress of population is hostile to their increase or existence. See Cursores.

Revised by D. S. Jordan.

Brevoort', James Renwick: landscape-painter; b. in Westchester co., N. Y., July 20, 1832; pupil of Thomas Cummings; National Academician 1863. He lived for a long time in Florence, and painted Italian scenery; visited Holland and Switzerland also, and painted subjects which he found in those countries. Studio in New York.

W. A. C.

Brewer: city; Penobscot co., Me. (for location of county, see map of Maine, ref. 8–E); on Boston and Maine R. R., and on Penobscot river, opposite Bangor. Pop. (1880) 3,170; (1890) 4,193; (1900) 4,835.

Brew'er, David Josiah: jurist; b. in Smyrna, Asia Minor, June 20, 1837; graduated at Yale College in 1856, and at the Albany Law School in 1858; judge of the Supreme Court of Kansas 1870–81; and of the circuit court of the U. S. for the eighth circuit from 1884 until his appointment by President Harrison in 1889 as an associate justice of the Supreme Court of the U. S. Jan. 1, 1896, Mr. Cleveland made him a member of the Venezuela boundary commission, and he became its president.

Brewer, Ebenezer Cobham, LL. D.: Church of England clergyman and author; b. in London, May 2, 1810; educated at Trinity Hall, Cambridge; ordained in 1836. Author of *Guide to Science* (1850), translated by author into French; *Dictionary of Phrase and Fable* (21st ed. 1888); *Reader's Handbook* (12th ed. 1888); *Theology in Science* (1863); *History, Political and Literary, of France* (1863); *History of Germany* (1881); *Dictionary of Miracles* (1884); *Historic Note-book* (1891); about thirty educational works, and numerous pamphlets under various pseudonyms. D. Mar. 6, 1897.

Brewer, John Hyatt: See the Appendix.

Brewer, Leigh Richmond, D. D.: Missionary Bishop of Montana; b. in Berkshire, Vt., Jan. 20, 1839; graduated at Hobart College 1863 and at the General Theological Seminary 1866; ordained deacon July 1, 1866; was rector at Carthage and Watertown, Central New York; consecrated as missionary bishop Dec. 8, 1886.

Brewer, Thomas Mayo, A. M., M. D.: b. in Boston, Mass., Nov. 21, 1814. His grandfather, Col. James Brewer, was a well-known patriot of the Revolution and a leader in the "Boston tea-party" of 1773. Dr. Brewer graduated at

Harvard College in 1835, and at the Massachusetts Medical School in 1838. After two years of professional labor, in 1840 he became editor of the Boston *Atlas*, then a leading Whig paper; in 1857 became a partner in the publishing-house of Brewer & Tileson. Dr. Brewer was actively engaged for a lifetime in professional and business duties, but was best known as a thorough and enthusiastic ornithologist. In 1839 he edited a new edition of Wilson's *Ornithology*, for which he prepared a synopsis of all North American birds then known. He was a personal friend of Audubon. One volume of a fine work of his on the *Oölogy of North America* was published by the Smithsonian Institution, but the publication was suspended on account of its great cost. He also wrote most of the biographical portion of the *History of North American Birds*, of Baird, Brewer, and Ridgway (3 vols. of which were published by Little, Brown & Co. in 1874). D. in Boston, Mass., Jan. 23, 1880.

Brewer, William Henry: b. at Poughkeepsie, N. Y., Sept. 14, 1828; educated at the scientific school of Yale College and at the universities of Heidelberg and Munich; Professor of Chemistry and Geology in Washington College, Pa. (1858–60); first assistant in the geological survey of California (1860–64); Professor of Chemistry in the College of California; Professor of Agriculture in the Sheffield Scientific School, New Haven, Conn., since 1864. He prepared *Botany of California*, etc.

Brewerton, Henry, LL. D.: soldier; b. at Newburg, N. Y., Sept. 25, 1801; graduated at West Point 1819; colonel Corps of Engineers Apr. 22, 1864; served as assistant professor at the Military Academy 1819–21; in construction of fortifications 1821–32: Cumberland road 1832–36; improvement of Hudson river 1836–42; building Fort Montgomery, N. Y., 1841–45; superintendent of the Military Academy 1845–52; constructing defenses of Baltimore harbor 1852–64; of the Delaware 1862–64; of Point Lookout, Md., 1864–65; and of Hampton Roads 1864–70; improvements of harbors in Maryland 1852–64; and member of engineer and other boards 1839–67. Brevet brigadier-general Mar. 13, 1865, for long, faithful, and meritorious services, and retired from active service Mar. 7, 1867. D. at Wilmington, Del., Apr. 17, 1879.

Brewing: See Beer.

Brew'ster, Benjamin Harris, LL. D.: b. in New Jersey, Oct. 13, 1816; was seriously hurt by fire when a child; graduated at Princeton 1834; admitted to the Philadelphia bar 1838; soon appointed by President Polk to pass upon the claims of the Cherokee Indians against the U. S.; in 1867 appointed attorney-general of Pennsylvania; had a large practice, and was noted for the force and grace of his pleas. In Dec., 1881, he was appointed by President Arthur Attorney-General of the U. S., and held that office till Mar., 1885. D. in Philadelphia, Pa., Apr. 4, 1888.

Brewster, Sir David, LL. D., D. C. L., F. R. S.: natural philosopher; b. in Jedburgh, Scotland, Dec. 11, 1781. He was educated at the University of Edinburgh, and became in 1808 editor of the *Edinburgh Encyclopædia*, for which he wrote many articles. He received in 1815 the Copley medal of the Royal Society for an *Essay on the Polarization of Light by Reflection*. He invented the kaleidoscope in 1816. In conjunction with Prof. Jameson he founded the *Edinburgh Philosophical Journal* in 1819. As his relations as an editor brought him into frequent communications with the most eminent scientific men, and he was naturally one of the first to recognize the benefit which would accrue from regular intercourse among laborers in the same field, he, in articles in the *Quarterly Review*, threw out a suggestion which became the cause of the formation of the British Association for the Advancement of Science. It held its first meeting at York in 1831, and Brewster and Herschel had the chief part in shaping its constitution. About this date the Royal Society awarded to him the Rumford gold and silver medals for his discoveries in optics. He was knighted in 1832, and elected in 1849 one of the eight foreign associates of the French Institute. In 1850 he invented the stereoscope. Among his works are a *Treatise on Optics* (1831); *More Worlds than One* (1854); and *Memoirs of the Life and Writings of Sir Isaac Newton* (2 vols., 1855). In 1859 he was chosen principal of the University of Edinburgh. His wife was a daughter of Macpherson, the author of Ossian's poems. D. near Melrose, Feb. 10, 1868.

Brewster, William: one of the Pilgrims of Plymouth; b. at Scrooby, England, in 1560; was educated at Cambridge; entered the public service; became a Nonconformist, and in 1607 was imprisoned at Boston, Lincolnshire. He was liberated with great expense and difficulty, and went to Leyden, where he taught English. In 1620 he removed to America on the Mayflower's first voyage. He was ruling elder of the Church, preaching frequently, but never administering the sacraments. D. at Plymouth, Mass., greatly venerated, Apr. 10, 1644. See his *Life* by A. Steele (Philadelphia, 1857).

Brewton: town; capital of Escambia co., Ala. (for location of county, see map of Alabama, ref. 7–C); on L. and N. R. R.; 100 miles S. of Montgomery, near Conecuh river; has a collegiate institute, five churches, large lumber-mills, sash and door factory. In its vicinity are large vegetable farms, the produce of which is sent to Northern markets. Pop. (1890) 1,115; (1900) 1,382.

Editor of "Standard Gauge."

Brialmont, brē̆e'ăăl'mōn', Alexis Henri: engineer and military writer; b. in Venloo, province of Limburg, the Netherlands, May 25, 1821; entered the military school of Brussels in 1839; graduated as *sous-lieutenant du génie* (engineers) in 1843. Entered the staff corps (*l'état-major*) as captain 1855; became colonel 1868; chevalier of the order of Leopold 1846—officer 1859, commander 1870; major-general Mar. 25, 1874; member of the Belgian Academy of Sciences in 1865. He is now a lieutenant-general retired. As an officer of engineers he participated in the fortification of Antwerp and Diest, and when the present magnificent system of fortifications was decided upon he had the distinguished honor of planning works "unrivaled in Europe in the intelligent application of true principles of art to a great practical example." Col. Brialmont became an acknowledged authority on the modern art of fortification. His military publications are numerous; among the most important may be named: *Précis d'Art Militaire* (1850, 4 vols. 12mo); *Considérations Politiques et Militaires sur la Belgique* (1851–52, 3 vols. 8vo); *Histoire du Duc de Wellington* (1856–57, 3 vols. 8vo); *Études sur la Défense des États et sur la Fortification* (1863, 3 vols. 8vo, with atlas); *Études sur l'organisation des Armées* (1867, 1 vol. 8vo); *Traité de Fortification Polygonale* (1869, 3 vols. 8vo, with atlas); *La Fortification à Fossés Secs* (1872, 3vols. 8vo, with atlas); *Études sur la Fortification des Villes Capitales* (1873); *Les Régions Fortifiées*; *Tir plongeant et obus torpilles*; *La Fortification du Temps Présent* (1885). He is the author of the article on Intrenched Camps in the present work.

Brianchon's Theorem: in conic sections, the reciprocal of Pascal's theorem; first discovered by Brianchon. It was thus enunciated: "The three diagonals of every hexagon circumscribed to a conic meet in a point."

Briançon, brē̆e'ăăn'sōn (anc. *Brigantium*): a town of France: in the department of Hautes-Alpes; on the river Durance; 56 miles S. E. of Grenoble, and near the Italian frontier (see map of France, ref. 7–I). It is strongly fortified; is the principal French arsenal among the Alps, and is considered almost impregnable. Pop. (1891) 6,580.

Briansk'; a town of Russia; government of Orel; on the river Desna; 74 miles W. N. W. of Orel (see map of Russia, ref. 8–D). It has several churches, a cannon-foundry, an imperial building-yard, and a manufactory of small-arms. Pop. 15,000.

Bribery [from O. Fr. *bribe*, piece of bread, a gift to a beggar]: in criminal law, a taking or giving of a reward or consideration with the intent to corruptly influence a person in the performance of the duties of a public office or function, judicial or otherwise. The offense is completed by the corrupt taking or giving, whether the act contemplated be legal or illegal or be performed or not. An unaccepted offer to give or receive a consideration with such a corrupt intent constitutes an attempt to bribe. Both these acts were indictable offenses at the common law; but by statute in many cases acts have been made bribery which were not punishable as such at common law. A mere present after the performance of the act desired, without a previous corrupt understanding, does not constitute bribery. The giving or receiving of a consideration to corruptly influence a voter in a public election is bribery at common law as well as under the statutes, by which this subject is now generally regulated. The bribing of a juror is comprehended in the term Embracery (*q. v.*). Bribery is a serious offense against public probity, and the U. S. Constitution declares that the President and other civil officers are liable to im-

peachment for "treason, bribery, and other high crimes and misdemeanors." Revised by F. Sturges Allen.

Brice, Calvin Stewart: U. S. Senator; b. at Denmark, O., Sept. 17, 1845; A. B., Miami University, 1863; LL. D. 1892; served in the Union army 1862–65, after which he was admitted to the bar at Cincinnati 1866; on the Tilden electoral ticket in 1876 and the Cleveland electoral ticket in 1884; delegate-at-large from Ohio to the St. Louis Democratic national convention 1888; chairman of Democratic national committee 1889. In 1890 he was elected U. S. Senator from Ohio. D. in New York, Dec. 15, 1898.

Brick: a species of artificial stone made by molding plastic clay into blocks, and burning them. A very inferior quality of bricks is made by simply drying the blocks in the sun. The earths most employed in brickmaking are (1) the plastic clays, composed principally of silica and alumina in varying proportions; (2) the loams or sandy clays; and (3) the marls, which are either sandy, clayey, or calcareous, according as silica in the form of sand, alumina, or carbonate of lime preponderates in the mixture. These brick-clays almost always contain a small percentage of oxide of iron, carbonate of lime, soda, and carbonate of magnesia. The purer clays contain about 1 part of alumina to 2 of silica, with a percentage of water varying greatly among the different clays. They all mix up freely with water in either large or small proportions, and are characterized by a tenacious plasticity. If molded and baked, they shrink and warp greatly out of shape, and crack. Hence these rich clays all have to be tempered with sand, ashes, or cinders before they can be used for bricks. Some clays contain too much sand, and are weak and brittle after burning; these must be mixed with the richer clays. From the greatly varying character of the raw material, it results that the methods pursued in brickmaking must vary among different localities. Some clays require but very little change in the natural proportion of their ingredients, and but very little labor to prepare them for molding into bricks, it being merely necessary to add the requisite quantity of water to render the clay plastic; while others, such as the fire-clays and some of the marls, have to be pulverized by machinery before they can be reduced to a sufficiently plastic condition. The red color of burnt bricks is caused by the presence of a small percentage of oxide of iron, generally the protoxide. When there is more than 10 per cent. of iron oxide present the clay burns to a blue and almost a black color. A large percentage of iron, if lime also or an excess of silica be present, renders the clay fusible. Some clays contain lime and very little or no iron. These burn white, and require a less intense heat than any other clays to produce hard brick, the lime being a flux on the silica. When carbonate of lime, whether as chalk, marl, nodules of calcareous petrifactions, or in any other form, is present in the clay, it is converted into quicklime in burning, and only such portions of it will combine with the silica and alumina as come into actual contact with them. The balance remains quicklime, which will slake when the bricks become wet, and destroy them. Hence clay containing too much carbonate of lime is unfit for bricks. Other clays contain iron and lime with an excess of the latter, in which case the bricks burn to a light dun or a whitish color. Magnesia generally produces a brown color.

The presence of iron pyrites is objectionable, for the burning expels the sulphur, leaving oxide of iron or a basic sulphate, which occupies less volume than the original pyrites, and makes the bricks porous and weak. Vegetable remains, such as roots, grass, etc., should be excluded for a similar reason.

It is impossible to ascertain, by chemical analysis alone, whether or not a given clay or any mixture of two or more clays will make good bricks. The best chemical tests will furnish only a close approximation. The composition of four clays—two suitable for common bricks and two for fire-brick—is given below. Nos. 3 (from Stourbridge, England) and 4 are the fire-brick clays:

COMPONENTS.	No. 1.	No. 2.	No. 3.	No. 4.
Silica	50·40	49·44	51·80	58·40
Alumina	24·00	34·26	30·40	35·78
Oxide of iron		7·74	4·14	3·02
Carbonate of lime	2·70	1·48	.....	
Carbonate of magnesia	1·30	5·14	0·30	2·72
Water, etc.	21·60	1·94	13·11	
Totals	100	100	99·75	99·92

Some of the fire-clays contain as high as 65½ to 66 per cent. of silica, 27½ to 26½ per cent. of alumina, and 5½ to 6 per cent. of oxide of iron, the balance being the alkalies and water.

Fire-bricks are used for lining furnaces, kilns, ovens, etc., subjected to an intense heat that would destroy common bricks or stone. The Stourbridge fire-bricks are noted for their excellence. The clay is dug up and exposed from three to eighteen months, according to the weather, in "spoil heaps," spread over as large an area as practicable, until thoroughly disintegrated by weather and frost; in winter three months will suffice. The clay weighs 6 tons to 7 cubic yards, and some of the spoil heaps contain 10,000 tons. After weathering, the clay is ground in a circular pan under two cylindrical stone rollers, each weighing 2½ to 3¼ tons, and faced with iron. After grinding, the clay is carried on an endless band to a "riddle" of 4 or 6 meshes to the inch for fire-bricks, 6 to 10 meshes for fine cement clay, and 12 to 14 meshes for glass-house or pot clay. After passing the riddle the clay is tempered with water to a suitable degree of plasticity, and is then passed through a cylindrical cast-iron pug-mill, where it is cut and stirred by revolving helicoidal blades, which force it out through an opening at the bottom in the form of a bar, which is received and carried by an endless band to the molding-shed. The fire-bricks are molded by hand in the usual manner, dried in artificially heated sheds at a temperature of 60° to 70° F., or by the sun in clear weather. They are burned in circular domed kilns or cupolas called ovens, where they remain from eight to fourteen days, being subject to the intensity of flame or white heat for about four days and three nights. In burning, the heat is slowly increased and gradually lowered, and the burnt contents require seven days to cool. Most of the kilns contain 12,000 bricks—some, exceptionally, 30,000 to 35,000. The chimney-stack is on the outside, and the flame burns with a down draught, descending through holes in the floor. Coal is used for fuel.

Excellent fire-bricks are made in New Jersey at Perth Amboy, Woodbridge, South Amboy, Trenton, and other places in the vicinity. The process of manufacturing is essentially the same as for common bricks. The fire-clays of these localities contain generally more alumina and less silica than those of Stourbridge, England, and are therefore richer, the alumina reaching in some cases as high as $37\frac{1}{10}$ to $39\frac{7}{10}$ per cent., with only $43\frac{2}{10}$ to $45\frac{3}{10}$ per cent. of silica. The composition of the bricks consists of about $\frac{5}{8}$ raw clay, $\frac{1}{8}$ cement, $\frac{1}{8}$ kaolin, and $\frac{1}{8}$ fine sand. The cement is fire-clay that has been burnt; the kaolin is a clay consisting of very fine sand, mica, and fire-clay, found in the vicinity, and the fine sand is clean, coarse, angular-grained quartz, found remarkably pure near by.

The leading type of the machines used at Haverstraw, N. Y., and vicinity for the manufacture of common bricks, where about 2,000,000 per day are made during the working season, is shown in Fig. 1, and is known as the "Vervalen machine." The object of this machine is merely to fill the molds more rapidly than could be done by hand, and not to produce a pressed brick.

A is a wooden box or tub about 3 ft. 4 in. square inside, and from 4 ft. 6 in. to 5 feet high, into which the clay to be molded is cast. B is a vertical iron shaft about 5 inches in diameter, geared with the engine shaft C, which imparts to it a horizontal rotary motion. The lower end of B is provided with a heavy casting, shaped like the letter S, called the *wiper*, which sweeps the clay through a lateral opening in the front side of A into the cast-iron box D.

The shaft B is provided with a number of projecting arms, from fourteen to twenty-two, which clear the sides of the tub by about an inch, and serve to mix the ingredients before they are expelled by the wiper. When, however, the clay is previously mixed by a tempering wheel, these arms are removed, leaving only the wiper, and the tub then serves merely as a hopper. The bottom of the cast-iron box D is provided with six openings, through which the prepared clay is forced into corresponding openings in the mold E. A sort of rectangular piston works up and down in the box D by means of a connecting-rod, F, run by a drum, G. A crank at the end of the drum-shaft H communicates a stroke of about 7 inches to the piston, which stroke, however, can be diminished at pleasure by shifting the position of a pin at the lower extremity of F. The bottom of the piston does not come nearer than about 6 inches to the bottom of the box D.

The action of the machine will now be readily understood. The prepared clay is swept by the wiper out of A into D,

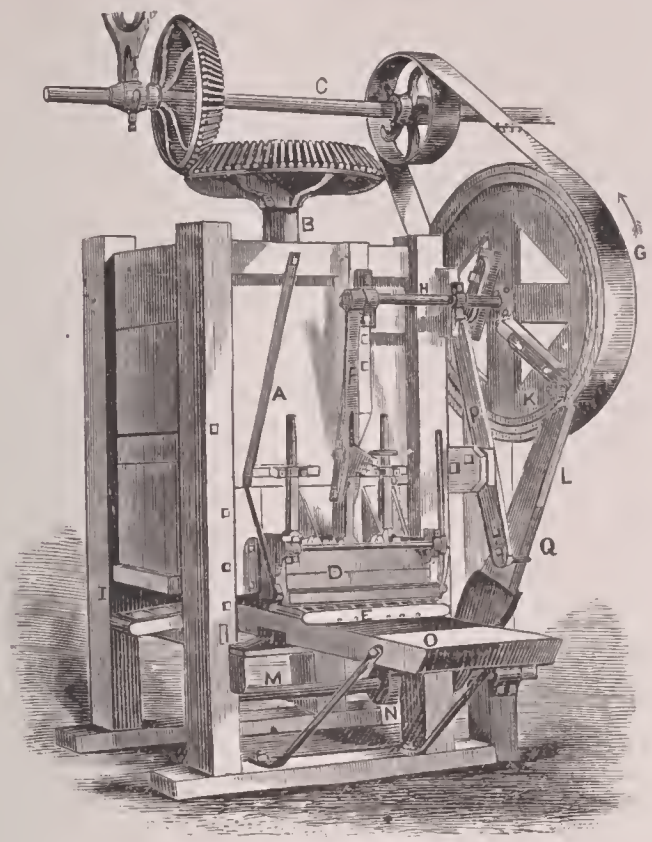


Fig. 1.—Vervalen machine.

whence it is expelled by a down stroke of the piston into a mold placed under it. While this mold is being filled an empty one is inserted behind it through the aperture I. The drum G continuing its revolution in the direction of the arrow, a cam, K, strikes the lever L, throwing it forward, as shown in the figure. It carries with it the shaft M, which by means of a horizontal rod attached to two cranks (one of which is shown partially in the figure at N) and passing behind the empty mold, forces it forward, thrusting out the full one upon the table O, and placing the empty mold in position to be filled. The drum G continuing its revolution, another cam, placed so as to clear the top of the lever L, strikes the upper arm of the lever P, causing it, by means of the projection Q, to return L to its primitive position. A chock prevents L from falling too far back. And so on.

Whenever the nature of the materials used admits, the mixture of the ingredients is made by the pug-mill working in the tub. In this case a rectangular pit is prepared directly behind the machine, capable of containing the amount of clay required for a day's work. The clay is placed overnight in this pit, and is wet down with a certain amount of water, varying according to the nature of the clay used. In the morning the other ingredients, consisting of sand and anthracite coal-dust, are carted to the pit and roughly mixed by two spaders, who afterward throw it up into the tub, where the pug-mill completes the mixing.

The proportion of sand used varies according to the quality of the clay and the relative proportions in which the two are found in the bank. It may be taken, on an average, at one-third sand to two-thirds clay. The Haverstraw sand is of excellent quality, and, more than the clay, gives the bricks of this locality their peculiar character. Coal-dust is used in the average proportion of 3 pecks to the 1,000 bricks. For burning properly in the kilns, a certain number of what are called *double-coal* bricks is required, in which the proportion is about 5 bush. of dust per 1,000 bricks. When mixed in a circular pit by means of a "tempering-wheel," the clay and coal-dust are disposed in alternate layers and cut up by the wheel. The sand is then added and incorporated by the wheel. The operation consumes the entire day.

When the molds, which are made mostly of cherry or locust wood, and contain six bricks each, are thrust from under the press upon the table, they are placed on trucks and wheeled under the drying-shed. The bricks are thrown out upon the flat. When sufficiently dry they are "edged up" by means of an instrument called an *edger*, then "spatted," or tapped with a flat board called a "spatter," to give them a clear edge, and then "hacked up," or placed in long and narrow rows on edge. When dry enough—that is, in one to three days, according to weather—they are built up in "arches," set on edge in the order called "three over one." The arches contain 28,000 to 35,000 bricks each, and are 6 bricks or 4 feet wide, about 44 bricks or 30 feet deep, and from 45 to 55 courses high. Each arch has an opening at the bottom—hence the name—in the center of its width, in which the wood used in baking is placed. On the outside are placed the "double-coal" bricks, to the number of about 3,000 per arch. Bricks containing only the usual proportion of coal would not burn properly at this distance from the fire.

A number of arches, five, ten, or more, are built up contiguously, so as to form a solid mass. The whole is then covered with a dry wall of baked bricks, the lower courses being one brick thick and the rest half a brick. At the bottom they leave a vacancy between the wall and the face of the arch, which gives a batter to the covering wall, and affords a better draught. Arch-irons or cast-iron frames having an opening of about 1 sq. foot are inserted in the openings, and the whole is smeared over with clay. The heap so prepared is called a kiln. This system of burning is pursued rather than that with permanent kilns, on account of the greater number of bricks which may be burned in a given space. At Haverstraw yards controlling only 200 feet frontage can thus make from 5,000,000 to 6,000,000 bricks per season of 150 working days.

About four cords of wood are used per arch, and the burning requires six days, fires being lit on Monday morning and drawn on Saturday evening. Molding is usually carried on during the forenoon of each day—about five to six hours—the rest of the day being spent in "hacking up," etc.

The machines above mentioned turn out, in ordinary working, ten molds or sixty bricks per minute, or 18,000 to 20,000 per forenoon. They require the following plant and help per machine: 25 molds, 4 trucks, and 8 men. If operated by steam, a machine turning out 18,000 per day requires 8 horse-power nominal, high pressure.

The standard of full work in this section is to turn out 1,000 bricks per day for every soul employed, from the time the clay is dug till the bricks are loaded in the vessels. Thus an establishment employing forty hands, all told, should turn out 40,000 bricks per day.

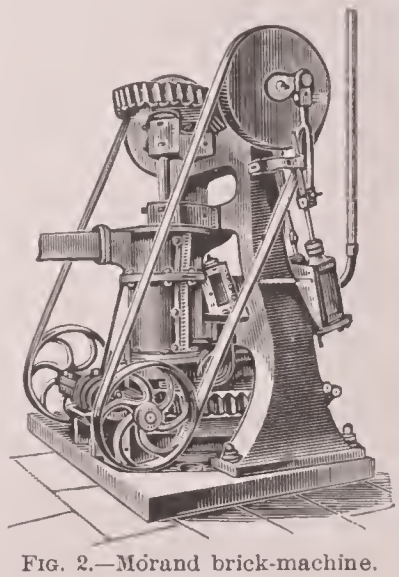


Fig. 2.—Mórand brick-machine.

The Morand brick-machine, Fig. 2, consists essentially of a pug-mill, under which revolves a horizontal iron table, in which there are eight openings or molds of the size of a brick. The mill mixes the clay, and forces it downward by its helicoidal arms through a slot in the bottom of the mill, thus filling the molds as they pass under the slot. Each mold then passes under a pressure-plate, which confines the clay on top, while a movable plate, which closes the mold at the bottom, is forced up by passing over a cam. This compresses the plastic brick, forcing out the air and excess of clay through a small hole in the pressure-plate. After passing the pressure-plate the bricks are thrust up to the top of the table, and then moved automatically to an endless band, which carries them away. From the band they are loaded upon cars, which convey them into drying-ovens. They go to the kiln the next day. See Kilns.

Three qualities of brick are taken from the kiln. Those forming the top and sides of the arches are called *arch brick*, those from the interior of the pile are *body brick*, and those from the exterior are *soft brick*. The arch bricks are hard and often brittle and weak from overburning; the soft bricks are underburned, and fit only for backing and filling. The body brick is of the best quality. Good bricks should be of regular shape, have parallel surfaces, plane faces, and sharp edges and angles. They should be of uniform texture, and should ring when struck a sharp blow with a hammer. The amount of water absorbed is an index of the durability of brick, and the best qualities should not absorb more than 10 per cent. of their weight of water after seven days' immersion. The higher the specific gravity the better is the quality of the brick, as a general rule.

The compressive strength of brick is extremely variable. A mean value may be stated at 2,500 lb. per square inch, but soft brick will scarcely bear more than one-tenth of this, while the best pressed brick will stand 7,000 lb. per square inch, or more. It is a general rule that the durability of brick increases with both its tensile and compressive strength. Compressive tests of brick are not easily made so as to give reliable results, owing to the difficulty of securing specimens with surfaces truly parallel. Tests for transverse or flexural strength are easier to make, and in general more satisfactory. These can well be executed by supporting the middle of the brick upon a fixed bar as a fulcrum, and hanging stirrups upon the ends to support a barrel for carrying the loads. Let l be the length of the brick from the center of one stirrup to that of the other, b the breadth and d the depth of the brick, and W the load which is placed in the barrel to cause rupture. Then if S be computed from the formula

$$S = \frac{3Pl}{bd^2},$$

this gives the quantity called the modulus of rupture. If b, d, and l be taken in inches, and P be in pounds, then S is in pounds per square inch, and the higher the value of this the better, other things being equal, is the brick.

The following are the average results of some of the tests made upon different qualities of brick used in the arch lining of the Vosburg tunnel on the Lehigh Valley R. R. The compressive strengths here given are comparative only as

MAKER AND NUMBER OF TESTS.	Class.	Per cent. of water absorbed to original weight.	Compressive strength, pounds per sq. inch.		Modulus of rupture, pounds per sq. inch.
			Cracked.	Crushed.	
C., 24 tests.	Very hard.	12·6	823	3,060	445
	Hard.....	13·6	1,408	2,541	530
	Medium...	17·2	795	1,274	290
E., 50 tests.	Very hard.	6·4	3,870	5,537	1,588
	Hard.....	15·4	1,960	3,063	893
	Medium...	18·9	2,695	4,287	641
	Soft.....	22·2	1,102	2,205	269

they were made in a wheel press which gave a shock to each brick as the stress was applied. It is interesting to note that the bricks began to crack under about one-half the stress which caused final rupture.

The paving-brick used in Western cities is made of fire-clay containing about 69 per cent. silica, 15 per cent. alumina, 5 per cent. of water chemically combined, 3 per cent. lime, 2·5 per cent. iron, and 2·5 per cent. magnesia. Such brick is semi-vitrified, has a specific gravity of over 2, is very tough, and often makes a good pavement for light traffic. The best qualities of such brick will absorb less than 5 per cent. of their weight of water after ten days' immersion. The following are mean results of a few tests of paving-brick for absorption, made by C. P. Chase in 1890, and also for com-

NAME.	Specific gravity.	PER CENT. OF ABSORPTION AFTER—		
		Three days.	Five days.	Ten days.
Ottawa, Ill.....	2·35	3·11	3·44	4·01
Burlington, Ia.....	2·28	1·62	1·79	1·84
Clinton, Ia.....	2·27	2·56	2·76	2·83
Galesburg, Ill.....	2·24	4·46	4·58	4·62
Bardolph, Ill.....	2·07	2·68	3·04	3·18
Common red.....	1·82	15·13	16·06	16·50

parison results for a common red brick. It is stated that the percentage of absorption varied almost directly with the degree of vitrification. The average compressive strength of paving-brick is about 7,000 lb. per square inch, but some varieties tested have given, for small specimens cut from the brick, results as high as 10,000 and 12,000 lb. per square inch. See the articles MASONRY and PAVEMENTS; also Baker's *Masonry Construction* (1891), and, on the manufacture of brick, several discussions in *Transactions* of the American Society of Civil Engineers for June, 1888.

Revised by MANSFIELD MERRIMAN.

Brick, Archæology of: The use of clay as a building material, in the form of bricks dried in the sun or kiln-burnt, dates from the earliest antiquity, not only in the Tigris-Euphrates valley, but in Egypt and other countries (Gen. xi. 3; Ex. i. 14; v. 7, 8). The great pyramid of Sakarah, supposed by Mariette to be the oldest in Egypt, and attributed by Maspéro to the fifth and sixth dynasties (more than 3,000 years B. C.), is of brick, as are many other lesser pyramids. Sun-dried brick was used by Osirtasen III. (twelfth dynasty) in his fortresses at Koummeh and Semneh, and by later monarchs for the circuit-walls of their temples, while burnt bricks served for the construction of dams, dikes, granaries, and other public works.

In the valley of the Tigris-Euphrates brick was practically the only building material, sun-dried brick forming the whole mass of the enormous terraces and thick walls of Assyrian and Chaldæan architecture. Scarcity of fuel in Assyria compelled an economy in the use of burnt brick, which was less pressing in Chaldæa, where some even of the most ancient terraces, as at Warkah and Mugheir, are faced with enameled or glazed bricks of brilliant colors. To preserve these enormous clay mounds from destruction by the infiltrations of rain-water, they were provided with elaborate drains, which offer us some of the earliest examples of arched construction. They were built without centerings by ingenious processes still in vogue in those regions, and their decay accounts for the ruin of the terraces and palaces above them. It was customary to stamp the bricks with the name of the reigning monarch, a fact of the greatest service in archæological investigations.

The Romans, however, deserve the credit of the greatest advances in the use of brick, which was by them very generally employed to face their concrete masonry, the facings being first built and the spaces between filled with concrete or beton. The Roman vaulting was of concrete, poured upon a skeleton of brick ribs, or over a thin shell of flat tiles laid edge to edge upon the centerings. Brick thus played a large part in the development of Roman architecture. The Byzantine architects also used brick as a material of construction, occasionally allowing it to appear externally in red bands alternating with bands of stone, a practice afterward copied by the Arab architects of Cairo. In the Middle Ages brick fell into general disuse, the settling of brick masonry and the massiveness it requires making it undesirable for the lofty vaulted structures of the Gothic architects, with their striving after slenderness and general lightness in the supporting masses. In Lombardy, however, and in Venice, it found more favor, and the use of terra-cotta in conjunction with brick supplied the element of grace and elegance otherwise lacking.

In New Mexico, Arizona, and Mexico, *adobe*, a species of unburnt brick, was used, not only by the Spaniards but by the Pueblos and other native races long before the advent of the Spaniards. Excellent bricks are found in Peru, and the Chinese and the people of India and Persia have also shown high skill both in the making and in the artistic use of plain and enameled or glazed bricks.

A. D. F. HAMLIN.

Bridge, JOHN FREDERICK: musician; b. in Oldbury, Worcestershire, England, Dec. 5, 1844; educated first by his father, and then by Mr. Hopkins, of Rochester cathedral; studied composition under Sir John Goss. His first appointment was, at the age of twenty-one, as organist of Trinity church, Windsor. In 1868 he took the degree of Mus. Bac. at Oxford; in 1869 was appointed organist of Manchester cathedral; in 1874 took the Mus. Doc. degree at Oxford, for which, as a degree exercise, he wrote the oratorio *Mount Moriah*. He was then appointed deputy organist of Westminster Abbey, and on the death of James Turle became full organist. His next work was the cantata *Boadicea*, followed by a setting of the *Hymn of St. Francis d'Assisi*. For the Birmingham festival of 1885 he set Gladstone's Latin version of *Rock of Ages*, as a motet for baritone solo and chorus. At the Queen's jubilee in 1886 he composed the jubilee anthem, by royal command. His oratorio *The Repentance of Nineveh* was composed for the Worcester festival of 1890, and the cantata *Callirhoe* for the Birmingham festival of 1888. For the Gloucester festival of 1892 he composed a short cantata on Dante's paraphrase of the Lord's Prayer, in the *Purgatorio*, canto xi. Dr. Bridge's church music is very much in favor, and he has also written some very fine songs, part-songs, and madrigals, both for male and mixed voices.

D. E. HERVEY.

Bridge, JOSEPH COX: musician; brother of Dr. John Frederick Bridge; b. in Rochester, England, Aug. 16, 1853; chorister and subsequently assistant organist at the cathedral; studied under his brother and John Hopkins, and took the degrees B. A. 1875, Mus. Bac. 1876, M. A. 1878, and Mus. Doc. 1879, from Oxford; appointed organist of Chester cathedral in 1879, where he still remains; revived

the Chester music festival in 1879, and at the festival of 1885 produced his oratorio *Daniel*. He is the conductor of several societies at Chester and Bradford. His compositions are chiefly for the church. D. E. Hervey.

Bridge, Magnetic: a device for the application of the principle of Wheatstone's bridge (see Bridge, Wheatstone's) to the measurement of magnetic resistances. See also Magnetism of Iron.

Bridge, Wheatstone's: See Wheatstone's Bridge.

Bridge of Allan: town of Stirlingshire, Scotland; so named from the bridge across the river Allan, which bounds it on the W.; situated at the southern base of the western termination of the Ochil Hills (see map of Scotland, ref. 11–G). Pop. 3,500. It has several elegant churches, fine hotels, and numerous lodging-houses. About 50,000 visitors frequent it annually on account of its mineral waters and mild and salubrious climate.

Bridgeport: a city, custom-house port, and important railroad and commercial center; one of the county-seats of Fairfield co., Conn. (for location, see map of Connecticut, ref. 12–E). The township was founded in 1821, and the city charter granted in 1836. It is situated on an inlet of Long Island Sound; at the mouth of Pequonnock river, which is bridged in many places; 58 miles N. E. of New York and 18 miles W. S. W. of New Haven; lat 41° 10′ 30″ N., lon. 73° 11′ 46″ W. It has lines of steamboats connecting it with New York, and a small steamer plying between it and Port Jefferson, L. I. It is on the N. Y., N. H. and H. R. R., and is a terminus of the Naugatuck and the Housatonic R. Rs. It now (1893) has an area of nearly 15 sq. miles, including East Bridgeport (or the part east of the Pequonnock river), and Black Rock at the other side of the city. Black Rock harbor is a favorite stopping-place for yachting squadrons, and will accommodate large vessels. Bridgeport has a fine school system; a large and well-managed public library (richly endowed by private bequest); a scientific society, having a fine collection of Indian relics; historical society, hospital, orphan asylum, energetic board of trade, and other public institutions and societies. There are many large and beautiful buildings, among which are U. S. post-office and custom-house, Y. M. C. A. building, the Barnum Memorial Institute (bequeathed to the Scientific and Historical Societies), and the Fairfield County court-house. It has three fine parks, of which Seaside park has a sea-wall and shore-drive 2 miles long. Here is a statue of Elias Howe, the inventor of the sewing-machine.

Industries.—Bridgeport is one of the chief manufacturing cities of the State, having, according to the census of 1890, 555 industrial establishments with a capital of $19,094,180, giving employment to 12,763 persons, and paying in wages annually $7,492,092. The cost of the materials employed is $10,173,212, and the value of the product $21,829,776. The industries which are especially noteworthy are the manufacture of carriages and wagons, corsets, sewing-machines, hardware, articles of aluminium and aluminium bronze, articles of brass, and forging. Here is a large grain elevator. The city has an ample water-supply, electric lights and gaslight system, and such other equipments as are necessary for an enterprising manufacturing and commercial city. Pop. (1870) before the annexation of Black Rock, a part of Fairfield, 18,969; (1880) 27,643; (1890) 48,866; (1900) 70,996.

Editor of "Evening Post."

Bridgeport: railroad junction; Belmont co., O. (for location of county, see map of Ohio, ref. 5–I); on the Ohio river, opposite Wheeling, with which it is connected by a bridge. Pop. (1880) 2,395; (1890) 3,369; (1900) 3,963.

Bridger's Pass: a defile in the Rocky Mountains; in the south part of the State of Wyoming. The overland mail route passed through it before the Pacific R. R. was opened. It is "a narrow gallery, walled by noble precipices of red granite and metamorphic sandstone, rising directly from the traveler's side to the almost perpendicular height of from 1,000 to 2,500 feet, and is several miles in length."

Bridges: A bridge is a structure spanning a valley, river, or other space, and intended to serve for the passage of men, animals, or vehicles. The most obvious and simple bridge is a tree thrown across the stream, and hence, says Rankine, "the first man who bridged a torrent with a fallen tree had in him something of the engineer." Another primitive method, practiced in some mountainous regions of South America, and also in China, is the suspension of a rope across a stream, to which a hammock is so hung that it can be drawn across from shore to shore; these are made of such stability that even mules are carried over in the hammocks. The fallen tree is the prototype of the modern girder, or truss bridge, and the rope is the germ from which the suspension bridge has been developed. Pontoons, or floating assemblages of boats, were constructed by the ancient Egyptians, and in modern times are of much use in military operations. See Bridges, Military.

A bridge consists of a substructure and a superstructure, the former being the abutments and piers, which are usually of masonry, and the latter being the timber or metal framework which is supported by them. There may be two abutments and one span of a superstructure, while for two spans an intermediate pier is required. The number of spans and piers will be determined in any given case by local conditions, the general problem being to devise such an arrangement that the total cost may be the least possible. As a rough rule it may be said that the greatest economy will be attained when the cost of the substructure is equal to the cost of the superstructure. The methods of constructing piers and abutments are described in the articles Foundation and Masonry, while here the superstructure, or bridge proper, receives chief attention.

Bridge structures are formed of arches springing from one abutment to another, or of trusses and girders resting upon the abutments, or of chains or cables suspended from towers. Thus arises the fundamental classification into arch bridges, truss bridges, and suspension bridges. But before considering the different forms under each of these classes an historical review of their development is perhaps best secured by dividing them into stone, timber, and iron structures. Truss bridges are far more numerous at the present day than any other form, and these may be built as fixed independent spans, as continuous over several spans, as drawbridges, and as cantilever structures. The articles Flexure, Moment, Stresses, and Strength of Materials deal with some of the mechanical principles employed in the computation and design of bridges.

The total length of a bridge is an index of its magnitude, but the length of its greatest span more often indicates the difficulty of its construction and its rank as an engineering work. The following is a list of the total lengths of several of the longest and most important bridges of the world:

	Feet.
New Tay bridge, Scotland	10,780
Ohio river bridge, Cairo, Ill.	10,560
Forth bridge, Scotland	8,295
Missouri river bridge, Kansas City, Mo.	7,633
Poughkeepsie bridge, N. Y.	6,770
Victoria bridge, Montreal, Canada	6,520
New Susquehanna bridge, Havre de Grace, Md.	6,315
East river bridge, New York	5,989
Cincinnati and Newport bridge, Ohio river	5,925
Cincinnati and Covington bridge, Ohio river	5,360
Rapperswyl bridge, Lake Zurich	5,333
Ohio river bridge, Louisville, Ky.	5,280

In general, these lengths include masonry or viaduct approaches as well as the main spans. In the following description of bridges of different classes those of longest span and of the greatest importance as engineering constructions at the time of their erection will, as a rule, receive principal attention.

Stone Bridges.—These were first constructed by the Romans, and eight over the river Tiber are described in history. Ruins of bridge structures are now found in different parts of the ancient Roman empire. The greater portion of the bridge of Aleántara upon the Tagus still remains as a fine example of masonry construction. It had six arches, the whole length being 670 Spanish feet, and the roadway being 205 feet above the bottom of the river. During the Middle Ages there existed a fraternity known as "Brothers of the Bridge," originally formed to secure the safe passage of travelers over rivers, which erected many stone bridges in France. The first stone bridge in London was begun in 1176 by Peter of Colechurch, a priest, and its construction occupied thirty-three years; it had nineteen arches of small span, with very wide piers. Few important structures were built, however, from the time of the Roman decadence until the middle of the eighteenth century. The Westminster bridge completed in 1750 had fifteen spans, the largest being an arch of 76 feet width. The finest of the earlier French bridges is that by Perronet, over the Seine at Neuilly, completed in 1774. It

consists of five arches, each 128 feet in span and 32 feet rise. The soffits of the arches are constructed of a conoidal form, perhaps to allow the easy passage of water in times of flood. Other stone bridges are mentioned in the article ARCH.

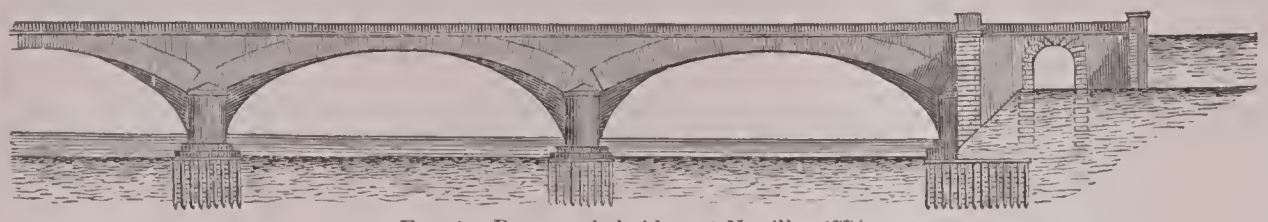


FIG. 1.—Perronet's bridge at Neuilly, 1774.

Culverts are small masonry bridges which allow the passage of streams through embankments. Excluding these, comparatively few stone bridges will be found on the railroads in the U. S. The Black Rock tunnel bridge, built in 1836 by Moncure Robinson, on the Philadelphia and Reading R. R., has five arches of 72 feet span and 16½ feet rise. The Pennsylvania R. R. has a number of stone bridges on its line between Harrisburg and Pittsburg, some of which have spans of nearly 100 feet. The cheapness of timber during the first half of the present century, and the great development of iron bridge construction since, have prevented the erection of the more costly stone structures. As it is found, however, that the life of iron bridges is much less than was at first supposed, stone bridges are now regarded with more favor on account both of durability and expense of maintenance.

Timber Bridges.—The oldest wooden bridge on record is the pons sublicius which was built at Rome across the Tiber, 621 B. C. It is celebrated for the combat of Horatius Cocles, a Roman knight, who saved the city by his noble defense of this bridge. The word *sublicius* is believed to imply wooden piers or piles. We have no satisfactory description of this structure, or of other ancient bridges, until 55 B. C., when Cæsar constructed a trestle or pile bridge across the Rhine near Bonn, the following account of which is given in his *Commentaries*:

"Timbers of a foot and a half thickness, sharpened at the foot, and of a length corresponding to the depth of the river, were assembled in couples, allowing an interval of 2 feet between them. Thus united by means of suitable apparatus, they were let down into the water, not vertically like ordinary piles, but inclined in the direction of the current, and thus driven. Another couple with opposite inclination was then fixed (or driven) 40 feet below the first. These double pieces, thus disposed, received at their extremity a beam of 2 feet thickness, which filled the interval between the pieces of each pair, and which was thus supported at each end by double ties. This framework composed of pieces inclined in opposing directions, strongly connected with each other, formed a very solid combination; for the property of such a disposition of materials is that the force of the current adds to its stability by exerting a strong pressure on the assemblage. After making a number of similar structures, placed at equal distances and extending from shore to shore, a continuous flooring was added composed of beams covered with fascines. Besides these arrangements inclined (brace) piles were driven on the lower side and connected with the rest of the work, forming a whole capable of resisting the greatest impetuosity of the current."

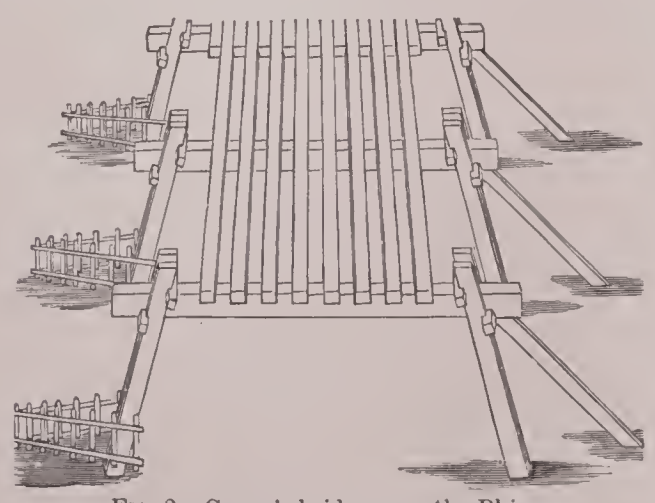


FIG. 2.—Cæsar's bridge over the Rhine.

This description clearly indicates a trestle bridge composed of bents protected by fenders. The cut is one of Rondelet's "restorations" of this interesting structure; its length was probably about 1,800 feet, and Cæsar says that ten days were occupied in its construction.

The longest timber span on record was built about 1760 by Ulric and John Grubenmann, over the Limmat river, near Baden. Its span was 366 feet, without intermediate support. This structure, like all other wooden bridges erected before the present century, was constructed with little regard to the principles of the economic disposition of materials, although it shows much skill in details of carpentry. It was destroyed by the French in the campaign of 1799. The cut shows one-half of the span only.

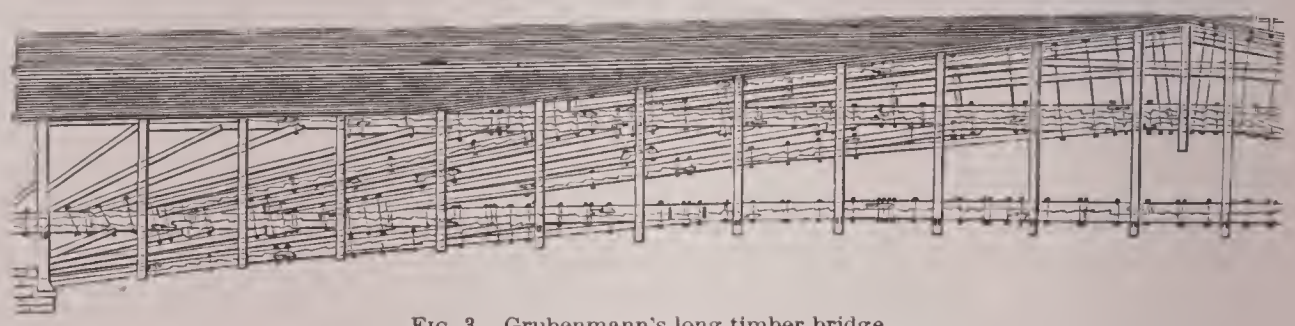


FIG. 3.—Grubenmann's long timber bridge.

The germs of the theory of trusses, and the definite division of a bridge into an upper chord, a lower chord, and inclined web members, are seen in bridges erected by Theodore Burr and by Timothy Palmer early in the present century. The oldest bridge now standing in the U. S. was built by Burr at Waterford, N. Y., in 1804, and consists of four spans of 154, 161, 176, and 180 feet in the clear; the timber is hewn yellow pine. In 1805 Palmer built the bridge over the Delaware river at Easton, Pa., which has three spans of 163 feet in the clear, or 195 feet between centers of piers; this bridge is also still in use, and only about one-sixth of the original timber has been renewed. Palmer also built in 1806 a bridge over the Schuylkill at Philadelphia, known as "the permanent bridge," which had two side spans of 150 feet and a central span of 195 feet. This bridge, like others of this period, was covered with boards to protect the framework from the weather. Palmer was a "self-taught architect," of Newburyport, Mass., but his structures display genius as well as practical knowledge. Burr's bridges are likewise noteworthy, particularly the one at Trenton, N. J., having five spans, the longest of 203 feet, and the one at Harrisburg, Pa., consisting of twelve spans of about 210 feet each; a portion of this last bridge is still in use. Previous to the year 1816 there were fourteen bridge patents issued by the U. S. patent office, but the nature of most of them is unknown, as the records were destroyed by fire.

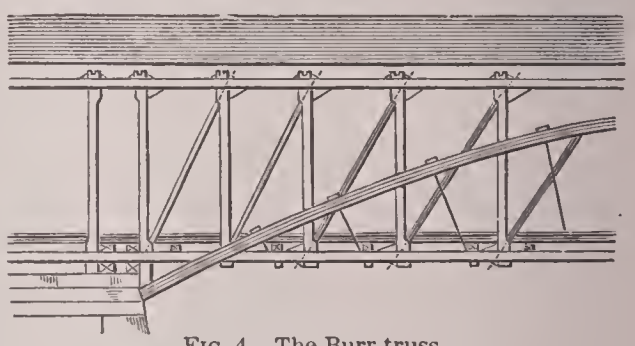


FIG. 4.—The Burr truss.

Thomas Pope, "architect and landscape gardener," published, in New York in 1811, the first American book on bridge construction, which, while giving descriptions of many European structures, is mainly devoted to advocating

a scheme of his own called "the flying pendant lever bridge," and which boldly sets forth a plan for a span of 1,800 feet

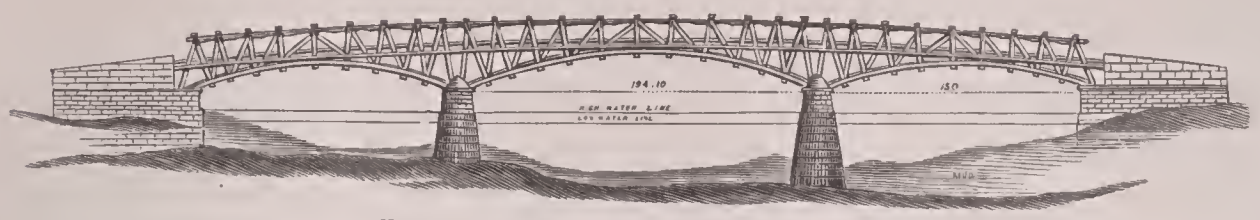


FIG. 5.—Palmer's bridge at Philadelphia, 1806.

over the Hudson river. The inventor gives his plan of construction in great detail, together with a view twice repeated of the entire bridge. But, as it was to be built out from its abutments without aid of false works, he has given a view (Fig. 6) of the half bridge thus projected, with the motto:

Like half a rainbow rising on yon shore
While its twin partner spans the semi o'er
And makes a perfect whole that need not part
Till time has furnished us a nobler art.

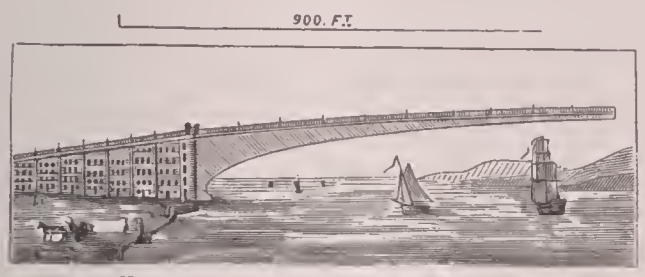


FIG. 6.—Thomas Pope's flying bridge.

The plan of building out arms from shore abutments and uniting them at the middle is a distinctive feature of the modern cantilever bridge. Pope had the idea, but built only a model of 50 feet span. It would not be possible, however, to erect a long span bridge with his details of construction.

In 1812 Lewis Wernwag built a bridge called "the Colossus" over the Schuylkill river at Fairmount, which had a clear span of 340 feet. As its rise was 38 feet, it acted like an arch as well as a truss, and, in fact, the upper part of one of the abutments is said to have moved 3 or 4 inches

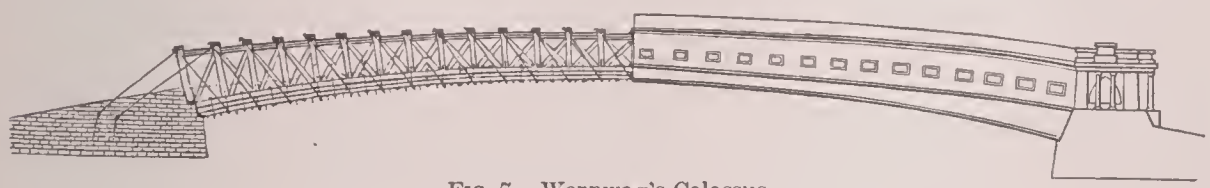


FIG. 7.—Wernwag's Colossus.

under the thrust. The double diagonal bracing connecting the upper and lower chords shows that its builder had considered the distorting action of moving loads. The lattice truss of Ithiel Town, introduced about 1820, was a form easy to construct for short spans, being made mostly of plank, but its use added little to the science of bridge construction.

In 1830 Col. S. H. Long, of the U. S. engineers, took out a patent for a truss, of which Fig. 8 shows one-half of the original drawing of the side elevation. In 1836 he published at Concord, N. H., a pamphlet of 75 pages, describing the features of his system. It had the great merit of providing

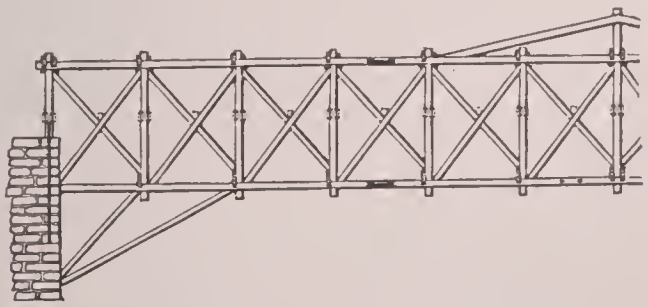


FIG. 8.—Long's truss, 1830.

diagonal counter braces to stiffen the truss under the action of the moving load, and these were fastened by wooden keys or wedges which were made adjustable, so that the structure could be stiffened at any time. The first bridge on this plan was on the Washington road, 2¼ miles from Baltimore, which had 109 feet span, and others were probably built on the Baltimore and Ohio R. R. Long's influence upon bridge building depends less upon bridges actually constructed by him than upon the clear recognition of the function of counter braces in stiffening the structure, "whether loaded or unloaded." Among other wooden bridge trusses devised after this time, should be mentioned those of Herman Haupt (1839) and D. C. McCallum (1851), the latter of which had a curved upper chord and the counter braces so arranged that the bridge could be stiffened by lengthening them when it was loaded. But about this time timber began to give way to iron. Details regarding early American timber bridges may be found in Duggan's *Stone, Iron, and*

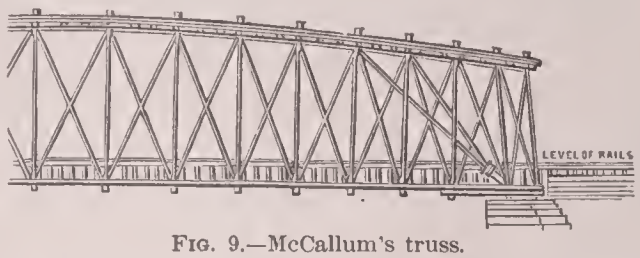


FIG. 9.—McCallum's truss.

Wood Bridges of United States Railroads (New York, 1850), and in Haupt's *General Theory of Bridge Construction* (New York, 1851).

Combination Bridges.—A combination truss is one which has some members made of timber and others of iron. William Howe in 1840 patented such a bridge, having its chords and diagonal braces of timber, and the vertical members of wrought iron. The braces butt at each end against cast-iron angle blocks, and the vertical ties have nuts at each end so that they can be firmly tightened. This bridge became very popular on account of facility of construction, satisfactory action under the passage of loads, and cheapness, and it was extensively built for highway and railway service. The cut shows one-half of a bridge whose span is about 140 feet. For railroad bridges greater in span than this the trusses were usually stiffened with arches, after the style of the Burr bridge. Many bridges were built on the Howe plan with spans of 200 feet or more. One of the most notable was the bridge on the Philadelphia, Baltimore and Wilmington R. R. over the Susquehanna river at Havre de Grace, which was completed in 1850. This had a total length of about 3,500 feet, there being thirteen spans of 250 feet each, and a draw span of 176 feet. The construction of this bridge occupied five years, and its cost was nearly $2,000,000. The figure shows an elevation of the drawbridge and of one of

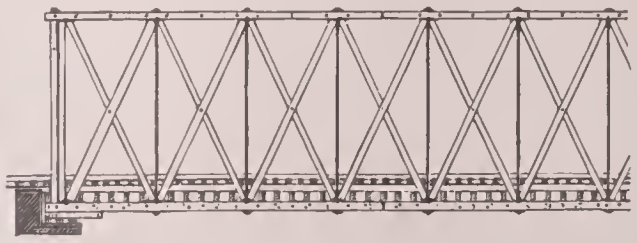


FIG. 10.—The Howe truss, 1840.

the fixed spans. Most of the Howe truss bridges in the Eastern and Middle States have been replaced by iron structures, but numbers of them are found in the Southern and

FIG. 11.—Havre de Grace bridge, 1850.

Western States, and they are still frequently built in localities where timber is cheap. For the greater part of the U. S., however, iron bridges are cheaper for spans of over 150 feet, and they are not only of longer life under natural wear, but are far less liable to decay and to destruction by fire.

In 1844 Thomas W. and Caleb Pratt patented a truss hav-

ing the upper and lower chords and the vertical posts of timber, while all the inclined members, except the two end ones, were made of adjustable iron rods. A skeleton diagram of the Pratt truss closely resembles one of the Howe truss, yet the principle of transmission of the stresses and the details of construction are quite different. As a combination bridge it never attained a popularity equal to that

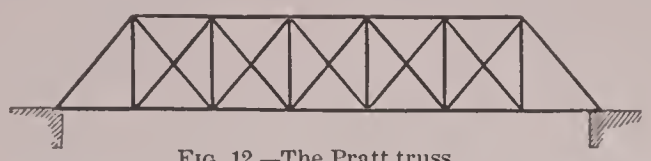


Fig. 12.—The Pratt truss.

of the Howe, as its methods of connecting the timber and iron members are quite complicated. Soon after 1850, however, it began to be constructed entirely in iron, and in this form has probably been more extensively built than any other one kind of truss. The Howe truss, on the other hand, is not well adapted for construction wholly in iron, and but few were ever built. The ill-fated Ashtabula bridge, which failed Dec. 29, 1876, causing the death of about ninety persons, was an iron Howe truss of 154 feet span.

Metallic Bridges.—Cast iron was employed during the latter part of the eighteenth century in the construction of several arched bridges in England (see Arch). Owing to the cheapness of timber in America, iron was little used prior to 1850, the first iron bridge erected being in 1840 over the Erie Canal. This had cast-iron girders, which were strengthened by wrought-iron suspension rods, and the span was about 77 feet. In the same year Squire Whipple built a truss with curved upper chord of cast iron and a straight lower chord of wrought iron, forming what is now called the bowstring truss. A number of these with spans of 100 feet and over were built in subsequent years. A truss invented by Wendell Bollman and another by Albert Fink were introduced soon after 1850, and extensively built in Maryland, Ohio, and westward; these had chords and posts of cast iron, and tension rods of wrought iron. Fig. 13 shows part of the old bridge between Louisville, Ky., and New Albany, Ind., where several Fink trusses are seen, the long channel span being a Warren truss with auxiliary verticals inserted. It will be noticed that the Fink truss has a pair of long tension rods running from the abutments to the

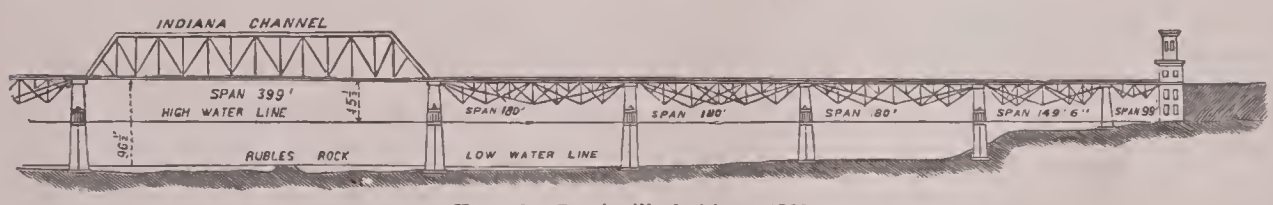


Fig. 13.—Louisville bridge, 1869.

foot of the central post, then each half span is subdivided by a post to whose foot a shorter pair of rods are connected, and so on with smaller divisions, thus forming a structure without a lower chord. It has not proved an economical truss, and could not be used for long spans, so that now it is rarely or never built.

In 1853 Squire Whipple built near Troy, N. Y., a railroad bridge of 146 feet clear span, the top chord and posts being of cast iron, and the lower chord and diagonal rods of wrought iron. This is the Pratt type, with a double system of posts and diagonals, usually called a double intersection truss, or more often a Whipple truss. This form has been extensively used in wrought iron, particularly for long spans, until about 1885, when it began to go out of use. Figs. 18 and 22 show the Whipple truss, and it will be observed that by its use the panel lengths can be made shorter than in the Pratt form of Fig. 12, with the same inclination of diagonals. This is advantageous in lessening the cost of the floor system, and the truss is only going out of use because other methods of securing the same results have been devised.

The forms of trusses which had been used for combination bridges, and for compound structures of cast and wrought iron, suffered more or less modification when wrought iron alone came to be employed, and some of these will receive mention below. The Howe truss, as an iron structure, proved an uneconomical and inconvenient arrangement, notwithstanding its great success as a combination bridge, while the Pratt truss, which was little built in wood and iron, proved admirably adapted for the use of wrought-iron connections. Under the sharp competition of bridge-builders every advantage that theory could indicate or that experience could suggest was seized upon to render structures both safe and economical.

Cast iron did not prove a satisfactory material for railroad bridges on account of its liability to failure under repeated stresses and sudden shocks. As we have seen, wrought iron was employed for tensile members in the first American bridges, but it was not until 1863 that a structure wholly of wrought iron was built. This was a bridge for the Lehigh Valley R. R. at Mauch Chunk, Pa., and even in this cast-iron joint details were employed. After this date the use of wrought iron increased with great rapidity, and at the present time cast iron would not be allowed except for highway bridges of short span and light traffic. Standard specifications for railroad bridges forbid the use of cast iron even for small joint blocks and bridge seats, although such are often allowed for highway structures.

Steel as a material for bridge construction began to be used about 1870, the first extensive application being in the great St. Louis arches in 1873, and later in the trusses of the suspension bridge over the East river between New York and Brooklyn. It is now extensively used in the form of plates for floor beams and of eye bars for the tensile members, and many entire bridges have been made of mild steel, the mechanical properties of which do not greatly differ from those of wrought iron. As steel is stronger than wrought iron, and qualities of suitable ductility and resilience can now be readily obtained at about the same cost per pound, its use is steadily increasing.

Classification.—In dealing with the subject from an historical point of view, and in tracing the development of different forms, a classification of bridges into stone, timber, and metallic, such as is given above, is very useful. But a comprehensive survey must include a division according to the principles employed in their construction. It is true that some structures exist in which the principles are so combined that their classification is quite difficult, but it has been found as a general rule that composite systems are not economically advantageous, and the tendency has long been toward simplicity of arrangement under forms which are capable of definite computation. For instance, Fig. 11 shows an arch combined with a truss, an old arrangement which is now universally abandoned except as a temporary expedient, for it is quite impossible to determine what proportions of the load are carried by the two different systems.

The three broad fundamental principles under which bridges may be classified are those of the beam, the arch, and the rope, which give rise respectively to the girder or truss bridge, the arched bridge, and the suspension bridge. The first of these exerts only vertical pressure upon its piers or points of support, while the second and third bring either outward thrusts or inward pulls upon the abutments or anchorages.

The words girder and truss are often used synonymously; but the first properly refers to a structure in one piece, or made of several pieces riveted together, so that it acts like a solid beam. For spans less than 30 feet bridges are often made by using solid iron or steel I beams, which are now rolled in sizes as high as 20 inches in depth. For spans between 30 and 90 feet plate girders are extensively used; these are made of iron plates and angles riveted together so as to form one solid structure. Lattice girders are also riveted, but instead of a plate connecting the flanges, diagonal pieces crossing each other are used. Box or tubular girders are formed by arranging iron plates, angles, and other shapes so as to inclose a hollow rectangular space, as seen in Fig. 20.

A truss consists of an upper chord, a lower chord, and of diagonal members connecting them, the whole forming an open framework so arranged that the principal members are subject only to tensile or compressive stresses. A truss having numerous diagonal members riveted to the chords is called a lattice girder. A truss having its members connected by pins at all principal joints is a pin bridge.

A girder or truss bridge is called simple, or independent, when supported only at each end, and it is continuous when it extends over more than two supports. A drawbridge is one that can be moved, usually by swinging around a cen-

tral pivot, so as to allow vessels to pass the structure. A cantilever was primitively any beam or truss projecting out from a wall, but a cantilever bridge now means a structure formed by two trusses extending from opposite abutments over two piers and united by another shorter simple truss.

In Europe the riveted system of construction now generally prevails. In this system the web members are connected to the chords by means of rivets, many plates being used at each joint to render this possible. In the U. S., however, the system of pin connections for these principal joints is universally used for bridges greater in span than 150 feet. Riveted trusses require much work in the field, while for pin trusses the erection is far simpler. It is claimed that riveted structures are less liable to failure than pin-connected ones: while, on the other hand, it is claimed that the stresses in the latter are more determinate, so that the material can be proportioned to give greater uniform security in all parts. Good bridges can be made upon either system, and considerations of economy will generally decide which is to be adopted in any given case.

Theory and Design of Trusses.—Bridge trusses erected prior to 1840 were rarely well arranged to carry the stresses that were brought upon them. The first publication in the U. S. dealing with the theory of the subject was that of Squire Whipple in 1847, and from that date computations and rational design became possible. It is not intended here to explain the theory of the computation of stresses, but a brief popular statement of a few fundamental principles will be useful before taking up the description of the great bridges of the world.

A Howe truss (Fig. 10) is formed by an upper chord which is always in compression, a lower chord always in tension, and certain web pieces which connect them. Of these web members the vertical ones are under tensile stress and the inclined ones under compressive stress. In the Pratt truss (Fig. 12) and in the Whipple truss (Fig. 18) the web members are arranged so that the vertical ones take the compression and the inclined ones the tension; this is a better arrangement than in the Howe truss, since a long bar or column is liable to bend under compressive stress, and must be stiffened to prevent this by the use of extra material. In the Howe truss one series of web braces provides for the action of the dead or permanent load, while the smaller ones, known as counter braces, prevent the distension under the live or rolling load. So in the Pratt and Whipple trusses there are main ties and counter ties which act in a similar manner. The stresses in the chords are greatest near the middle of the truss, as are also the stresses in the counters; the stresses in the main members of the webbing, however, are greatest near the ends of the truss. Now, to insure economy of material, the sizes of members must be proportional to the stresses that they are to carry; hence it is that the chords of a simple truss are smallest at the ends and greatest at the middle of a bridge, while the main bracing is greatest in size at the ends and least at the middle. The stresses in the chords under a given load vary with the height of the truss, the higher the truss the less being the stresses. Thus, as far as the chords are concerned, economy is secured by making a truss very high; but as the length of the web members increases with the height a limit exists, and this in practice results in making the height usually less than one-fifth of the span, or for long bridges one-tenth of the span.

The triangular truss, in which the webbing consists of members forming a series of equilateral triangles, each member being adapted for both tension and compression, was proposed in 1846 by Neville, a Belgian engineer, but was first built in England by Capt. Warren about 1850, and is hence called the Warren truss. In Fig. 14 is shown a skeleton diagram with spheres at the several apex points of the upper chord to represent the loads, the mark + denoting the compressive stress under a uniform load, while the mark — denotes tensile stress. In 1851 a railroad bridge on this system was built over the Trent, having a span of 240 feet, cast iron being used for compression members and wrought iron for tension members. In 1853 the Crumlin viaduct, formed of ten spans of 150 feet each, was erected on the same system, using wrought iron throughout. The piers of this structure were made of cast-iron posts with wrought-iron braces, the height of the highest pier being 170 feet, the whole forming a handsome structure.

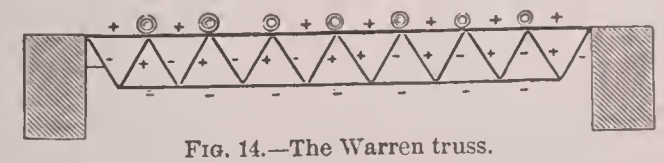


Fig. 14.—The Warren truss.

The bowstring truss, one form of which is shown by Fig. 15, originated in an attempt to economize material by making the chords of uniform section throughout. If this were done in a truss with parallel chords the end chord members

Fig. 15.—Inverted bowstring truss.

would have an excess of material, but by making one of the chords curved the stresses were rendered approximately uniform; for a parabolic curve the straight chord is strained alike throughout its entire length. The form in Fig. 15 is really an inverted bowstring truss, the name being originally applied to the case where the upper chord was curved and in compression and the lower one straight and in tension. Bridges with such trusses were first built by Laves in France about 1835 of timber and iron, and later they were erected of cast and wrought iron in England by Brunel, and in the U. S. by Whipple. This principle of construction has proved an economic one, and it is used to a greater or less extent in some of the longest truss bridges ever erected (see Fig. 23).

The lenticular truss has both upper and lower chords curved either in parabolic or circular lines. Such bridges were erected soon after 1840 in France, and were developed about 1850 in England and about 1860 in Germany into an important economic system of design. The horizontal line

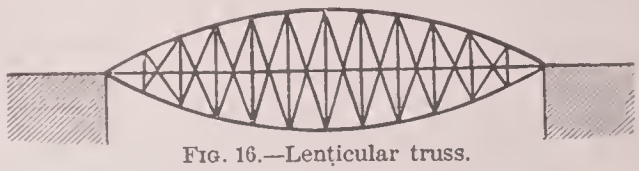


Fig. 16.—Lenticular truss.

in Fig. 16 indicates the position of the floor of the bridge, and does not represent a chord, the functions of these being fulfilled by the curved members alone. By properly proportioning the depths at the various panels the strains in the chord members can be made nearly equal, so that they can be of uniform section throughout; the web members are also found to vary less in size than in trusses where the chords are parallel. It is probable that this form of truss is the one which will ultimately be found to afford the greatest degree of economy as far as material alone is concerned. The longest one yet constructed is that designed by Brunel, and completed in 1859, to carry a railway across the Tamar river at Saltash, near Plymouth, England; this is 455 feet in span, and at that date was an engineering work of great magnitude. In this bridge the roadway was hung below the lower chord (see Fig. 21), but it is also sometimes placed above the upper chord.

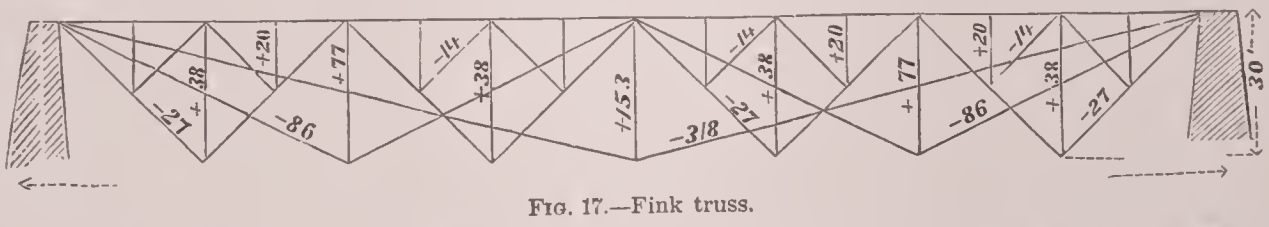


Fig. 17.—Fink truss.

The loads which the trusses are to carry are known in advance, and from these the stresses are computed by the principles of statics. (See Graphic Statics and Stresses.) The live load is that of a crowd of people on a highway bridge and of a train on a railroad bridge. The dead load is the weight of the bridge itself. It was formerly the practice to take the live load for a railroad bridge as a uniform rolling weight of about 2,000 lb. per linear foot per track, the exact figure being somewhat greater for short spans than for long ones on account of the greater shock due to the passage of trains, and most of the structures erected prior to 1875 were designed under such an assumption. From these loads the stresses are computed and written on a diagram called the

strain-sheet. In Fig. 17 is shown a strain-sheet of a Fink truss of 242 feet span and 30 feet depth, where are given the stresses due to a live load of 1·3 tons per foot and a dead load of 1·25 tons per foot, tensile stresses being marked with a minus sign and compressive stresses with a plus sign. The stress in the upper chord is compression, and is uniform throughout.

The Whipple truss, shown in the skeleton diagram of Fig. 18, consists of a double system of diagonals each of which

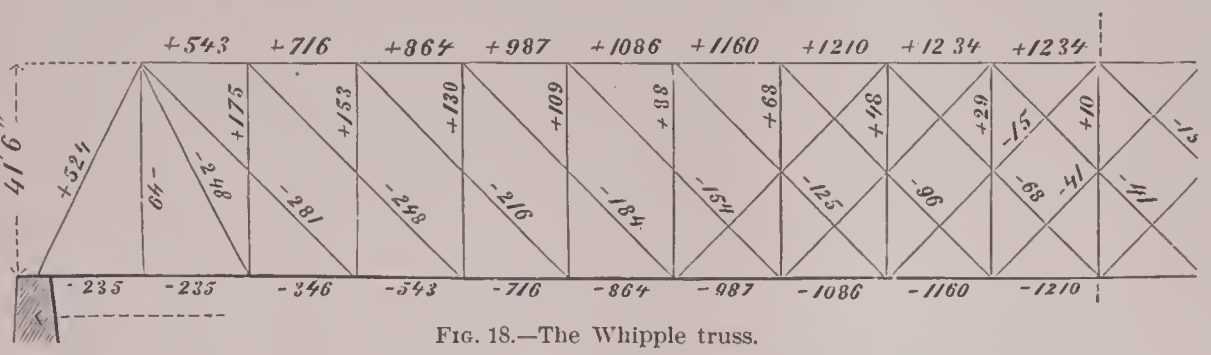


Fig. 18.—The Whipple truss.

is separately computed for the loads that come upon it. The cut gives the strain-sheet of the bridge built at Cincinnati in 1872, the span being 415 feet and the depth 41½ feet. This bridge carries a single track railroad on its lower chord, and outside of each truss is a highway track supported by projecting floor beams. The dead load was taken as 2½ tons per linear foot, and the live load at 1½ tons for the railroad and ¾ tons for the highway (see Fig. 22).

About 1875 the practice arose of taking a greater load per linear foot for the locomotive than for the train. For example, in the long span built over the Ohio at Cincinnati in 1877 it was required that the stresses should be computed for two locomotives coupled together, each of them weighing 36 tons on a 12-feet wheel base, or with tender 66 tons on a base of 50 feet, followed by cars weighing 0·9 ton per linear foot. About 1880 this method began to go out of use, and the practice was introduced of taking the actual wheel loads of a locomotive in their actual positions, the carload being, as before, considered as uniformly distributed. Theoretically the static stresses are more determinate under the assumption of exact concentrated loads than if they be regarded as distributed; but when the increased dynamic stresses due to the sudden application of the load are considered, which are indeterminate and can only be allowed for approximately, it is doubtful if these refinements of computation are either necessary or advantageous.

In Fig. 19 are shown the stresses on a drawbridge truss of 358 feet total length and 26 feet depth, caused by a dead load of 0·95 ton per linear foot and a live load of 1·25 tons

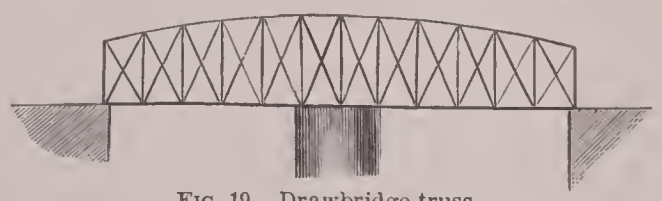


Fig. 19.—Drawbridge truss.

per linear foot. It is seen that the chords take both tension and compression, one kind of stress occurring when the draw is open and the other when it is closed and subjected to the live load. This truss is also of the Whipple type.

Tubular Bridges.—The Britannia bridge over the Menai Straits, in Wales, designed by Robert Stephenson, was completed in 1850. It has two spans of 460 feet and two of 230 feet, made of cast and wrought iron, forming a rectangular tube 1,380 feet long, 28 feet in depth, and 13 ft. 8 in. wide in the clear, through which a single track passes. Fig. 20 shows a section of the structure, but in reality there are two independent tubes side by side for the passage of trains in opposite directions. The shore spans of 230 feet were built in place on false works, but the long central spans were built on shore, floated out on pontoons, and lifted into place by hydraulic presses. The cost of the bridge, inclusive of substructure, was about $3,000,000.

The Victoria tubular bridge across the St. Lawrence river at Montreal, Canada, also designed by Robert Stephenson, was completed in 1860, having occupied six years in construction. It has twenty-five spans, the middle one being 330 feet, and each of the others 242 feet long, the whole, with abutments, being nearly 1¼ miles long. The tubing of this bridge is not cellular at top and bottom, as is the Britannia. The ironwork was made in England, even to the punching of the rivet-holes, and each span was built in place on false works. The cost was about $7,000,000.

Although these tubes form very strong and stiff bridges, yet it is now universally recognized that their erection was an error of judgment which retarded the development of economic bridge design. The train passes through the tube, as through a tunnel, in darkness and smoke, so that from the point of view of a traveler they are unfavorably regarded. Their great weight and the large amount of workmanship render them the most costly of all structures; indeed, both the Britannia and the Victoria bridges proved ruinous to the companies that built them. Simultaneously with the attempt to bridge large spans by the tubular plan in England and Canada the suspension principle was being applied for the same purpose in the U. S., although it had been rejected by the British engineers when considering the designs for the structure over the Menai Straits.

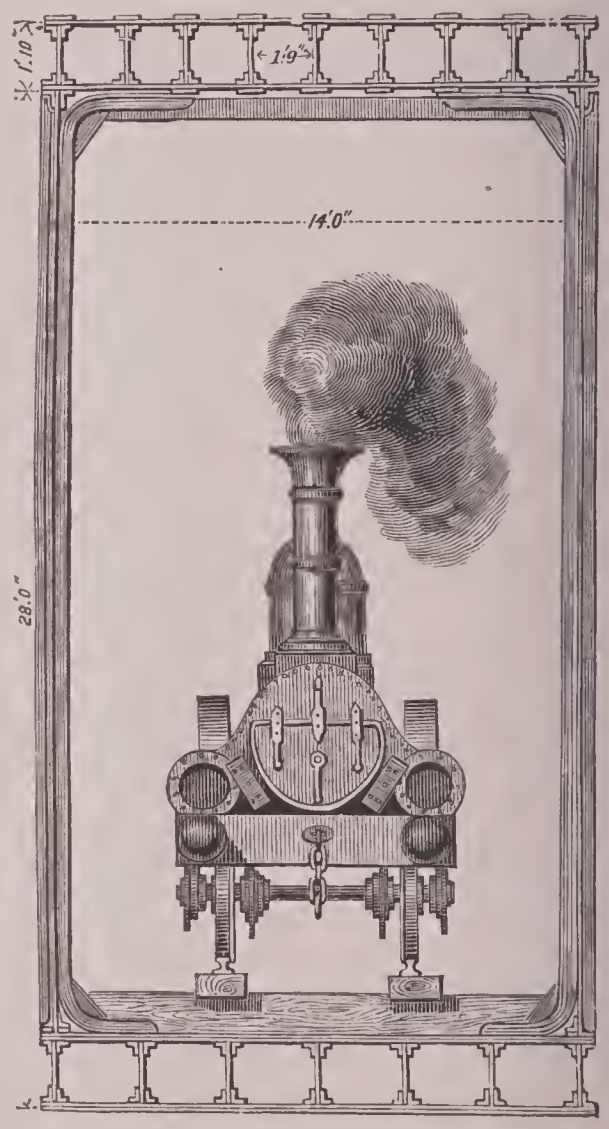


Fig. 20.—The Britannia tube, 1850.

Simple Truss Bridges of Long Span.—A bridge of more than 300 feet span is usually regarded as "long," but the number of these has become so great that a mere enumeration would occupy too much space. The following descriptions are, as a rule, limited to those spans which exceed 400 feet, and from these are selected such as are noteworthy on account of new principles of design, difficulties of construction, or special engineering features of interest.

The Saltash bridge has already been mentioned as an example of the application of the lenticular system to long spans. The whole structure has nineteen spans, two of 455 feet from center to center of piers and the others are 69½ feet each, making a total length of 2,240 feet. The main piers are 190 feet in height from the top to the foundation,

and they were sunk in open wrought-iron caissons. The upper chord, or arch as it is sometimes improperly called, is made of wrought-iron plates, forming a tube of an elliptical cross-section, its width being 16 ft. 9 in. and its depth 12 ft. 3 in. The lower chord is formed of suspension chains, and its horizontal pull counteracts the thrust of the upper chord, so that the resultant pressures on the supports are vertical. Each of the main trusses was constructed entire on shore, floated out on pontoons, and raised into place by hydraulic presses.

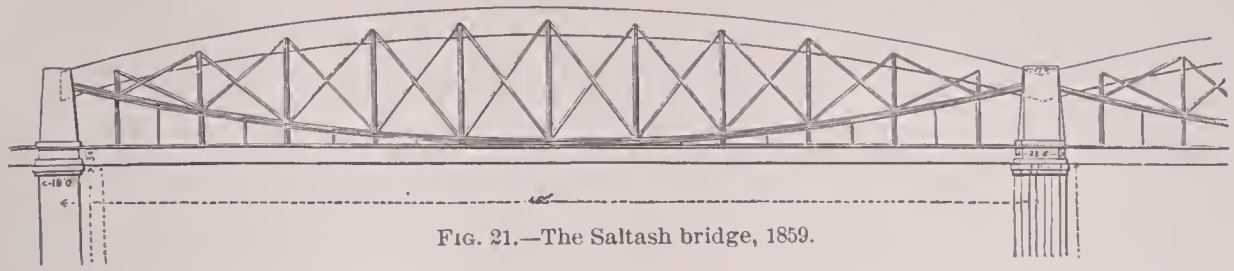


Fig. 21.—The Saltash bridge, 1859.

The Ohio river bridge at Louisville, Ky., designed by Albert Fink and completed in 1869, has a channel span of 400 feet, another fixed span of 370 feet, a draw span of 264 feet, and twenty-four other spans, the total length being 5,218 feet. A part of this bridge is shown in Fig. 13. At the time of its erection the channel span was the longest in America, and the whole bridge was regarded as an engineering work of great magnitude. The long channel spans were arranged with through trusses, while the others had deck trusses, the clear headway below the latter being 90 feet above low water. The extreme rise of the Ohio river is about 40 feet, and on this account the construction of foundations and the erection of false works are often attended with great danger.

The bridge over the Ohio river between Newport and Cincinnati, built in 1872 by the Keystone Bridge Company, J. H. Linville chief engineer, has a channel span of 420 feet, which is shown in Fig 22. The style of construction is that of the Whipple truss, which has also been extensively used for other long-span bridges. The entire structure ranks among the longest in the world, having twenty-three spans, aggregating 5,925 feet in length.

The Kuilenburg bridge, built by G. Van Diesen over the Leek, in Holland, in 1866, has one span of 515 feet between centers of piers. This is a lattice girder with a triple system of webbing, the upper chord being curved, and the truss resembling in general outline that shown in Fig. 9. For a number of years this span stood at the head as the longest of simple truss bridges.

In 1877 another bridge over the Ohio river at Cincinnati was completed by the Keystone Bridge Company, which had five spans aggregating 1,600 feet, the channel span being 519 feet between centers of piers, or 515 feet between centers of end pins. The general style and appearance of this span is like that shown in Fig. 22. The depth of this truss was 51½ feet and its width 20 feet, it being for a single-track railway. The lower chord was 106 feet above low-water mark. The weight of iron in one of the 300 feet spans was 657,400 lb., while that in the channel span of 515 feet was 2,634,400 lb., or nearly four times as much. In the progress of the design and construction of this bridge tests of materials and members were made upon an extensive scale, and knowledge thus obtained which proved of great value to the engineering profession.

In 1885 the bridge over the Ohio river at Henderson, Ky., was completed, which has a total length of 3,688 feet, and is composed of sixteen spans, the longest being 525 feet from center to center of piers. Since that date the development of the cantilever system has somewhat interfered with the design of simple trusses of long span, yet at least four over 500 feet in length have been erected. The bridge of the Baltimore and Ohio R. R. over the Susquehanna river at Havre de Grace, Md., includes two spans of 375 feet each, four spans of 475 feet each, and two spans of 515 feet each. The channel span of the Ohio Connecting Railway bridge at Pittsburg is 523 feet, and special interest attaches to this, as it was built on false works on shore and then the whole floated across the river on barges into its place on the piers. The bridge of the Norfolk and Western Railroad over the Ohio river at Ceredo, West Va., completed in 1892, has two spans of 301 feet each, two of 304 feet each, and one span of 521 feet, all being with bowstring trusses, and similar in general style to those in Fig. 23.

In 1886 occurred an interesting international competition for the erection of a bridge structure 2,900 feet long over the Hawkesbury river in New South Wales, Australia. Plans and proposals were submitted by fourteen bidders, two from Australia, one from France, eight from England and Scotland, and three from the U. S., the lowest bid being $1,364,690 and the highest $3,413,590 for both foundations and superstructure. The contract was awarded to the Union Bridge Company, of New York, and the work completed in

Fig. 22.—Cincinnati and Newport bridge, 1872.

1889. The piers are especially noteworthy on account of their great depth, and as having been sunk under very unfavorable conditions. (See Foundations.) The bridge has two spans of 408 feet each and five spans of 416 feet each, all being typical American trusses in the general features of design.

The longest simple truss span yet erected was built by the Phœnix Bridge Company in 1888 over the Ohio river at Cincinnati, its length being 550 feet between centers of piers, or 545 feet between centers of end pins. The bridge also has two other spans, each 490 feet in length. All the spans carry a double-track railroad, together with two roadways and sidewalks, so that they are the heaviest simple trusses ever constructed. Fig. 23 shows that the style of arrangement presents features radically different from the Whipple truss, not only in the curved outline of the upper chord, but in the arrangement of the webbing, whereby a double system is avoided and the long posts are strengthened by short horizontal struts. The truss of the central span is 84 feet in depth at the middle. The weight of iron and steel in the three spans is almost exactly 10,000,000 lb.; besides these there are approaches consisting of shorter spans which make the total length of the structure over one mile, so that in

all 20,360,000 lb. were used. The erection was accompanied with difficulties on account of unusual floods in the river, and the false works of one of the spans, together with about 700,000 lb. of iron and steel members, were swept away in a complete wreck. As an illustration of the perfection of American methods of construction and erection, it may be mentioned that the actual shop-work on the superstructure

The Lachine bridge, designed by C. Shaler Smith, and erected by the Dominion Bridge Company in 1887 over the St. Lawrence river at Montreal, is shown in Fig. 24. It consists of two central through spans of 408 feet each, and two side deck spans of 269 feet each, forming a continuous truss over five supports. The structure has great interest on account of the graceful and pleasing manner in which the

FIG. 23.—Cincinnati and Covington bridge, 1888.

began in Mar., 1888, and that the last of the three spans was coupled and traffic passed over on Dec. 25 of the same year.

The bridge over the Ohio river at Cairo, Ill., opened in 1889, includes two through spans of 518½ feet, seven of 400 feet, three deck spans of 249 feet, and thirty-eight spans of viaduct structure, making a total length of 10,560 feet. The cost of the substructure was $1,189,744 and of the superstructure $765,616.

Continuous Bridges.—A continuous truss extends over three or more supports, so that a load placed on one of the spans causes stresses in the other spans. Many such bridges have been erected in Europe, but the system has found little favor in the U. S. In a simple truss the stresses in the members are not affected by slight changes in level of the supports, but in a continuous truss they would be materially altered. A simple truss has the upper chord always in compression and the lower chord always in tension, but in a continuous truss the upper chord is in tension and the lower one in compression for some distance on each side of a pier (see FLEXURE), and a portion of each chord is liable to receive either kind of stress under the action of a passing load. Theory indicates that when several spans are to be bridged the continuous system requires less material than simple trusses, but this is apparently overbalanced by the uncertainties arising from the causes just mentioned.

Among the continuous bridges in England may be mentioned that over the Wye at Chepstow, having three spans of 100 feet each and one span of 305 feet. In Ireland the Boyne viaduct at Drogheda, built in 1855, has three spans of 141, 267, and 141 feet. In Germany is found the bridge over the Weichsel at Dirschau, having six continuous spans of 397 feet each. The Victoria tubular structure at Montreal, Canada, is continuous over one pier and disconnected at the next, thus making continuous bridges of two spans, each of 242 feet in length.

The bridge designed and built by C. Shaler Smith in 1877 over the Kentucky river is an interesting one, as it forms one of the connecting links between the continuous and the cantilever systems. The distance to be bridged was 1,125 feet at an elevation of 275 feet above the low-water level of the river, and it was divided into three spans of 375 feet each by two piers. As false works were impracticable, the structure was built out from each shore abutment, one panel after the other, until the piers were reached, and the process was then continued until the two halves met over the middle of the river, where they were united. Thus a continuous bridge of three spans was formed, but on account of the great height of the iron piers, and their alteration in length under changes of temperature, the chords were cut at a distance of 300 feet from each abutment, and the webbing was so arranged that horizontal stresses could not be transmitted. Thus the structure was converted into two simple trusses, each 300 feet in length, and a central truss 525 feet long. Each of the simple trusses was supported at one end by the shore abutment and at the other end by the projecting or cantilever part of the central truss. The disadvantages of permanent continuity were thus avoided, while all the advantages of this method of erection were secured.

transition from the deck to the through span is made, as well as for its low cost when compared with its neighbor, the Victoria tubular bridge. The following comparative details of these structures are valuable, as showing the prog-

FIG. 24.—Lachine bridge at Montreal, 1887.

ress made in the science and art of bridge design and erection during the short space of thirty years:

ITEMS.	Lachine.	Victoria.
Total length, in feet	3,535	6,520
Number of piers in water	12	24
Velocity of current, in miles	8 to 12	2 to 8
Depth of water, in feet	20 to 90	22
Time of building piers	1 year	6 years
Longest span, in feet	408	330
Minor spans, in feet	240	242
Masonry in piers, cubic yards	11,000	100,500
Iron and steel in bridge, tons	3,690	9,000
Total cost	$1,250,000	$7,000,000
Cost per linear foot	$354	$1,073

Drawbridges.—The usual type of drawbridge in the U. S. is that shown in Fig. 19. The truss is symmetrical, and rests on a turntable on the central or pivot pier. Two equal openings are provided when the draw is turned. When it is shut, the truss is a continuous one of two spans, and liable to be acted upon by the live load. When the draw is swung open the live load can not come on it, and it consists of two semi-girders or cantilevers, connected together over the pivot pier. In the first case the upper chord is under tension for a certain distance over the pivot pier, and under compression throughout the rest of its length, and the reverse holds for the lower chord. In the second case the top is in tension and the bottom is in compression. It is therefore necessary to make these chords so that they will resist both kinds of stress.

The practice among American bridge-builders is to consider the permanent load as at all times supported by the pivot pier, whether the draw be open or shut. The live load is provided for by considering the draw as a continuous girder on three supports. The depth of drawbridges is generally made greater over the pivot pier than at the ends. This gives an increase of depth where it is needed, while the truss is kept shallow at the ends, where any increase of weight

beyond what is absolutely needful is injurious, as increasing the stresses when the draw is open. Drawbridges are turned by gearing on the circumference of the pivot pier worked by hand or by steam.

The span of a drawbridge is usually estimated from end to end, and thus includes the space occupied by the center pier. A large number of such drawbridges with spans exceeding 300 feet have been built over the navigable rivers in the U. S. The Missouri river has several with openings of 160 feet in the clear. On the Mississippi river there is one of 362 feet span at Quincy, one of 380 feet span at Keokuk, and one at Louisiana, Mo., which has a span of 444 feet with two openings of 200 feet each in the clear.

The Arthur Kill drawbridge on the Baltimore and Ohio R. R., over the arm of the sea between Staten Island, N. Y., and the mainland of New Jersey, was built in 1888 by the Keystone Bridge Company. It is a single track draw of 496½ feet between centers of end piers, 54 feet deep at the middle, and 30 feet deep at the ends, and gives a clear waterway of 206 feet on one side and 214 feet on the other. The weight of the draw is supported by a rim-bearing turntable with 54 cast-steel rollers turning in a track 24 feet in diameter. When the draw is closed the ends are lifted by wedges, so that each half is independent of the other, and the structure becomes two simple trusses instead of being continuous. The ends can be lowered and the draw be swung open in three minutes.

The longest drawbridge yet constructed is that designed by Alfred P. Boller, and built in 1890 by the Union Bridge Company as a part of the railroad bridge over the Thames river at New London, Conn. In Fig. 25 are seen at the ends two deck spans of 150 feet each, then two through spans of 310 feet each, and in the middle the draw span of 503 feet, whose upper chord is reversed in curvature from the usual practice, the whole presenting a most graceful appearance. The draw is noteworthy not only on account of its length, but it carries two tracks, and each truss is proportioned for a moving load of two 86-ton locomotives followed by a train-load of 3,000 lb. per linear foot. The central height of the draw is 71 feet, the end height is 25 feet, the clear distance between tresses is 26 feet, and its weight is 1,300 tons.

FIG. 25.—Thames river bridge, New London, Conn., 1890.

Cantilever Bridges.—This type of truss bridge, which has been introduced and perfected since 1882, will be understood by a consideration of Fig. 26, which gives a skeleton diagram of the Niagara cantilever. $A\,C$ is a truss having a shore arm, $A\,B$, and a river arm, $B\,C$; it is supported by the anchorage A and the tower B. On the other side of the river is a similar truss, $F\,D$, supported at F and E. Connecting these two is a simple independent truss, $C\,D$. In the figure the chords appear continuous, but, in reality, these are arranged with sliding joints near C and D, so that no horizontal stresses can be transmitted. A load placed anywhere on $A\,B$ is supported at A and B; a load placed on $B\,C$ causes a downward pressure at B and an upward pull at A, and a load placed anywhere on $D\,F$ can produce no effect at either A or B. A load placed on the central span $C\,D$ is, however, carried to C and D in proper proportions, just as if C and D were the abutments of a simple truss, and then these proportions are transferred to the left and right respectively. The arm $B\,C$ is the cantilever part of the truss $A\,C$, and from this circumstance arose the term "cantilever bridge."

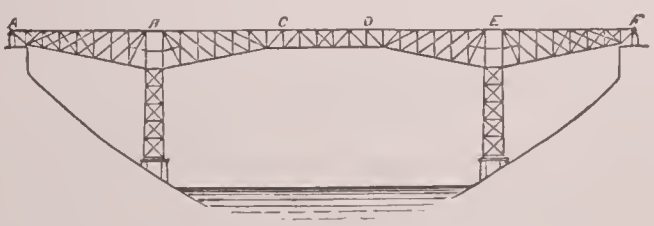


FIG. 26.—Niagara cantilever bridge, 1883.

Germs of the idea of a bridge with a projecting or cantilever arms are seen in the design made by Thomas Pope in 1811, and in a patent granted to A. Canfield in 1833. The Kentucky river bridge of 1875, often quoted as an application of the cantilever principle, can not be so regarded except in the method of its erection; it is rather a continuous bridge, modified by making permanent points of inflection according to principles which were well known. But the very great advantage of being able to erect a truss system over a deep chasm without the use of false works, which is a feature of both systems, has caused them to be sometimes confounded in principle. In 1870 Prof. W. P. Trowbridge proposed a design for a bridge across the East river at Blackwell's island, in which is seen a central truss supported by two cantilever arms, and in 1876 Charles Macdonald made plans for the same bridge showing similar features. In these designs the object appeared to be to modify the suspension system by avoiding the cables and the horizontal tensions caused by them.

A cantilever bridge was designed by Charles C. Schneider in 1882, and erected over the Niagara river during the following year, within 7½ months from the date of its commencement. Its total length is 910 feet, span of the shore arm 195 feet, length of the river arm 175 feet, length of the central truss 175 feet, and clear span between the towers 470 feet. The bridge is 245 feet high above the surface of the river, and the steel towers are 130 feet high. The erection was effected by constructing false works under the shore arms, and, when these were completed, building out the trusses, panel by panel, until they met over the middle of the river. The upper and lower chords were then disconnected near C and D, making $C\,D$ a simple truss, independent of the rest of the bridge. The cost of the bridge, exclusive of approaches, was about $600,000.

In 1885 a steel cantilever was erected over St. John river, New Brunswick, which has a total length of 813 feet, a clear central span of 477 feet, a shore arm of 191 feet, a river arm of 191 feet, and a central truss of 144 feet. The great advantage of the method of erection was here again demonstrated, so that since 1885 cantilever bridges have been built in such numbers as almost to escape record. For short spans they have not been able to displace simple trusses, but for spans between 400 and 800 feet, where false works are difficult of erection, they seem to be more economical than the simple truss, the arch, or the suspension system.

The bridge over the Hudson river at Poughkeepsie, completed in 1889, has a total length of 6,767 feet, the five spans over the river being 548, 525, 546, 525, and 548 feet between

centers of piers. Of these the first, third, and fifth are true cantilever spans, having a central truss connecting the arms which project in each direction from the second and fourth spans. Fig. 27 shows one of these fixed connecting spans, and also one of the cantilever spans. In this method of construction the fixed spans are erected upon false works, and their projecting arms are then built out in both directions. The economy of the cantilever system in erection is thus gained only for each alternate span, but for the fixed spans the advantage of the continuous system is gained without its disadvantages. This bridge is also noteworthy on account of the great depth of the foundations of the piers. See FOUNDATION.

FIG. 27.—Poughkeepsie cantilever bridge, 1889.

The bridge across the Colorado river at Red Rock, Cal., was built in 1890 by the Phœnix Bridge Company, and carries a single-track railroad. At that time it was the largest span of the cantilever type in the U. S. Its general arrangement is like that of the Niagara cantilever, except that it is a through bridge. The shore arms and the river arms are of the same length, 165 feet each, while the central truss is 330 feet long, thus making the distance between the piers 660 feet, and the total length 990 feet. The entire weight of iron and steel in the structure is 3,500,000 pounds, and it was erected in eighty working days, the total cost, exclusive of masonry work, being $230,160.

The bridge over the Mississippi river at Memphis, Tenn., designed by George S. Morison, and completed in 1892, contains two cantilever spans and one fixed span longer than any heretofore constructed in the U S., and next to the Forth bridge they are the longest truss spans in the world. The fixed span is 621 feet in length, and the cantilever spans are each 790 feet, consisting of two cantilever arms 169 feet long and a central truss of 452 feet. The bridge is a through railroad structure 78 feet high and 30 feet wide between centers of trusses, and the clear height of the lower chord above low water is 110 feet. The bridge proper is 2,600 feet long, and the iron viaduct approach is 2,300 feet in length. The material is mostly steel, and some of the pins used are 14 inches in diameter and nearly 5 feet long.

The Forth bridge, famous as having the longest spans in the world, remains to be noticed. In 1880 a design was made, having two suspension spans of 1,600 feet each, and the contract was awarded, but financial reasons necessitated its abandonment. In 1881 a design on the cantilever plan was made by the engineers, Benjamin Baker and John Fowler, having projecting arms 615 feet long, and a central truss 500 feet long. The general features of this plan were adopted, and under it, with some modifications, the structure was built. Work was begun in 1883, and the bridge was opened for traffic early in 1890. It consists of two shore arms, each 680 feet long, and two main spans, each 1,710 feet long. Fig. 28 shows one shore arm and one main span, with the middle pier, or a little more than one-half of the whole cantilever structure. Beginning at the end the successive distances are, in order, a shore arm of 680 feet, a tower of 155 feet, a cantilever arm of 680 feet, a central truss of 350 feet, a cantilever arm of 680 feet, and the middle tower of 270 feet length; then follows the other cantilever span of the same dimensions and its shore arm, the whole forming a structure symmetrical with respect to the center of the middle tower. Each of the towers has the great height of 343 feet, and they rest upon low masonry piers placed 120 feet apart transversely across the bridge. The width of the bridge at the central truss is, however, only sufficient for two railway tracks, so that the cantilever trusses are not parallel, but converge toward the ends; and as the tops of the towers are nearer together than the bases, the members of the truss do not lie in a plane, but in a warped surface. The compression members are, as a rule, tubular, the principal ones being 12 feet in diameter, while the tension members are mostly lattice girders. The whole structure is of steel, of which 51,000 tons were used on the main spans, and the cost, without the approaches, was about $13,000,000.

Arched Bridges.—The truss bridges above described form a distinct class intermediate between the arch and suspension systems. In a truss bridge one chord is in tension and the other in compression, while the points of support receive only vertical pressures. In a suspension bridge the main cables are in tension, and a horizontal pull is brought upon the abutments. In an arched bridge the main ribs are mostly subject to compressive stresses, while the abutments

FIG. 28.—The Forth cantilever bridge, 1890.

receive a horizontal thrust in addition to the vertical pressures. Some arched bridges have been described near the beginning of this article, and under ARCH those of widest span will be found mentioned. An arch is usually more graceful in appearance than a truss, and it seems to produce on the mind of the traveler a feeling of greater security. In the neighborhood of cities the question of æsthetics is an important one that can not be overlooked, and hence an arched bridge is sometimes preferred when a simple truss of equal strength could be erected for much less money.

The great arched bridge at St. Louis, of which an illustration is given in the article ARCH, has two spans of 497 feet and one of 515 feet in the clear, and a total length, including abutments, of 1,700 feet, and it carries two railroad tracks, together with a highway on the upper deck. Its cost was about $5,300,000, or $3,150 per linear foot, while that of the Poughkeepsie cantilever bridge, which has two railroad tracks only, was about $840 per linear foot. The steel for the St. Louis arches was, however, very costly, and at the present time a similar bridge could be erected at a much lower figure.

The Washington bridge over the Harlem river, shown in Fig. 29, is a highway structure of beautiful and imposing

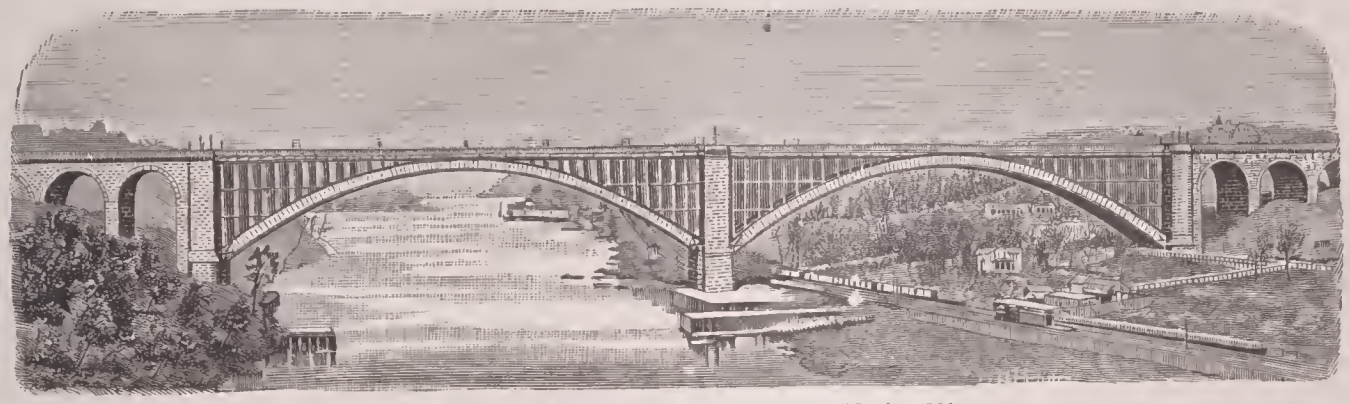


FIG. 29.—The Washington bridge at New York, 1889.

appearance. It has two metal arches, each 510 feet in clear span, and seven masonry arches each of 60 feet, the total length being 2,375 feet. The width of the roadway is 80 feet, and its height above mean high tide is 151 feet. Work was commenced in July, 1886, and the structure was completed in Feb., 1889, at a cost of $2,850,000, or $1,200 per linear foot. The webbing of the arches is formed by solid plates with radial stiffness at intervals, thus giving them an appearance as if made of masonry voussoirs. This structure was built by the city of New York, William R. Hutton being the engineer.

The word viaduct is applied to a bridge where the towers are high, crossing a valley or chasm. Some viaducts are also supported by one or more metallic arches. The great arch of the Garabit viaduct, 541 feet in span and 169 feet in rise, is shown in Fig. 30, which indicates also the method of erection, it having been built out from the abutment piece by piece and supported by cables fastened to the tops of the towers; the suspension rope shown above the span was used in transporting the materials from the completed roadway

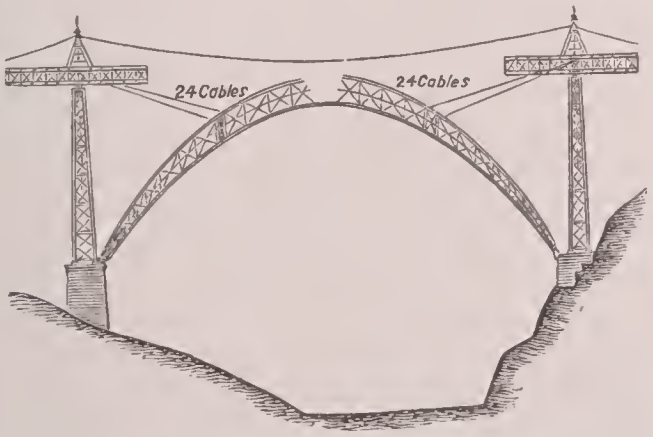


FIG. 30.—Arched viaduct at Garabit, France, 1885.

of the viaduct to their places in the arch. A method of erection somewhat similar was used in the St. Louis bridge, but the arches of the Washington bridge were built on timber false works. In general, it may be said that the erection of arched bridges is more difficult and costly than that of other kinds. In regard to the limiting spans possible under different systems, the arch and the simple truss stand at present on a close equality, the former having 541 feet and the latter 550 feet; but these distances are far surpassed by the suspension system with 1,695 feet, and by the cantilever system with 1,710 feet. See ARCH, AQUEDUCTS, and VIADUCT.

Suspension Bridges.—The modern suspension bridge consists of a platform hung from cables, which are stretched across a river, being supported by two towers and anchored at abutments. The platform is the roadway over which the traffic passes, and this is usually stiffened by a truss. Statements regarding ancient suspension bridges in China of several hundred feet in length are found in the writings of travelers, but definite descriptions are lacking, and probably, like the rope and chain bridges of the eighteenth century, most of them were arranged with the roadway platform laid directly on the chains. In 1741 such a chain bridge was erected in England over the Tees. It was a rude foot-walk of 70 feet span and 2 feet width only, and exercised no influence on the development of the present system. The main span of a modern suspension bridge is the distance between the towers, and there are usually two side or shore spans.

The first true suspension bridge having the roadway hung from cables was erected by Jacob Finlay in 1801 over Jacob's creek, near Greensburg, Pa. It had two chains, one on each side of the bridge, with links of the same length as the distance between the floor joists. These chains passed over towers, and each was bolted to four large anchor stones at the ends. The span between the towers was 70 feet, and the width of the roadway was 12½ feet. A patent was granted to Finlay in 1808, but before this date eight of these bridges had been erected, the longest being over the Schuylkill river, with 306 feet span, "aided by an intermediate pier." Others were built at Cumberland, Md., at Wilmington, Del., at Brownsville, Pa., and one over the Potomac above Washington, which is shown in Fig. 31. This

FIG. 31.—Potomac bridge, 1805.

had a span of 130 feet, a roadway 15 feet wide, and the chains were made of 1¼-inch wrought-iron bar. These bridges are mentioned in the book of Thomas Pope, published in 1811, and it has been thought by some writers that the knowledge of the system was thus introduced into Europe.

In 1809 John Templeman built a suspension bridge near Newburyport, Mass., having 240 feet span and two road-

ways each 15 feet in width. In 1815 one was constructed over the Lehigh river at Allentown, Pa., which had two spans of 230 feet each and a roadway 30 feet wide. This was badly damaged by fire in 1828, and soon after was carried away by a flood. All suspension bridges built up to this date had cables made of chains or links of bar iron. In 1816, however, White and Hazzard constructed a foot-bridge across the river at the falls of the Schuylkill, above Philadelphia, whose cables were made of six wires, $\frac{3}{8}$ of an inch in diameter, and thus a new epoch of development was instituted. The span of this structure was 408 feet, its cost was $125, a toll of one cent was charged for passage, and only eight persons were allowed upon it at one time.

The suspension system received no serious attention in Great Britain until 1814. In that year Telford instituted experiments on the tenacity of wrought iron, and concluded that it was possible to bridge spans of 1,000 feet on the suspension plan. In 1819 Samuel Brown built a bridge of 449 feet span across the Tweed, and in 1826 Telford completed the Menai chain bridge, which had a total length of 1,710 feet and a span of 580 feet. The Conway bridge, completed about the same time, had a span of 327 feet, and the Montrose bridge, finished in 1829, had a span of 432 feet. All of these structures had chains composed of straight bars several feet long, united by coupling bolts, the Menai bridge, for instance, having sixteen such chains, each of five wrought-iron bars, 9 feet long, $3\frac{1}{4}$ inches wide, and 1 inch thick. They were deficient in rigidity, and indeed the one over the Tweed was blown down six months after its erection, so that the system was gradually abandoned in England, and about 1850 the tubular girder was regarded as best adapted to long spans.

Suspension structures were built soon after 1820 in France, Belgium, and Germany, and a high degree of development was reached in 1834, when the long bridge at Freiburg in Switzerland was completed. This has a span of 870 feet, and is suspended at the height of 167 feet above the river. It is thus 319 feet longer than the Menai bridge, and 65 feet higher. It is supported on four cables of iron wire, each containing 1,056 wires, the united strength of which is capable of supporting three times the weight which the bridge will ever be likely to bear. It was subjected to several severe tests; for instance, 15 pieces of artillery, drawn by 50 horses, and accompanied by 300 people, passed over it at one time, and were collected in as close a body as possible, first on the center and then at the two extremities. A depression of $39\frac{1}{3}$ inches was thus produced, but no sensible oscillation was occasioned.

To resume the history of the development of the suspension system in the U. S., the name of Charles Ellet first claims notice. In 1842 he built a bridge of wire cables, 358 feet in span, over the Schuylkill river, to replace the wooden one erected thirty years before by Wernwag. In 1846 he built the Monongahela bridge at Pittsburg, which consisted of eight spans of 188 feet each, and at this date he expressed the conviction that "any span within 1,500 feet, with the usual deflection, can be made perfectly safe for the support of railroad trains as well as common travel." In 1847 he built a foot-bridge of about 800 feet span across the Niagara river 2 miles below the falls. In 1848 he constructed the Wheeling bridge over the Ohio, remarkable at the time as the longest span in the world, 1,010 feet; it was 24 feet wide, having both a roadway and a foot-walk, and had twelve cables containing a total of 6,600 wires. This bridge was blown down in 1854, nearly all the cables breaking at the anchorage.

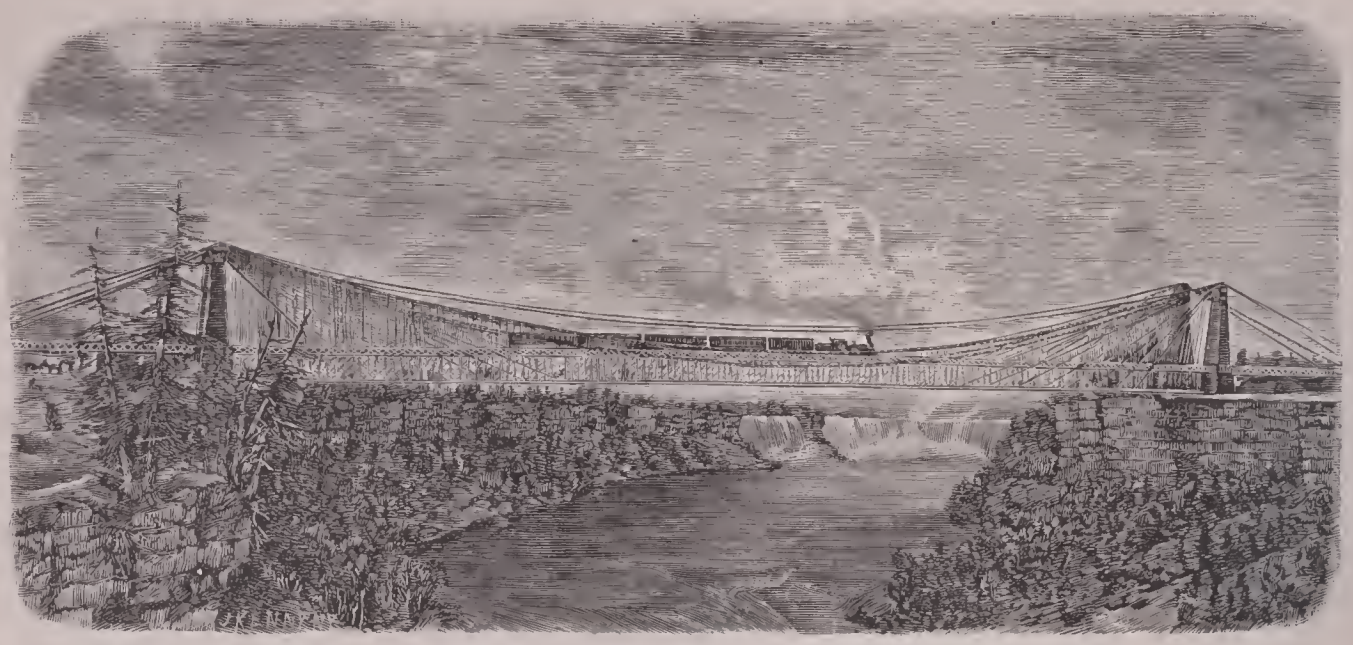


Fig. 32.—Niagara suspension bridge, 1854.

The perfection of the suspension system and its adaptation to railroad bridges of long span is due to John A. Roebling. The defect of the system was the lack of rigidity and the oscillations produced by wind. This he remedied by using deep stiffening trusses at each side of the roadway, aided by horizontal and vertical stays extending out from the towers. His first great work, the Niagara bridge, completed in 1854, has a span of 821 feet and a width of 15 feet, and carries two decks, the lower for highway and the upper for railway traffic. Each deck is supported by two cables $10\frac{1}{2}$ inches in diameter, composed of seven strands of 520 wires each. The trusses had wooden chords and posts, and wrought-iron diagonals, and the towers were of stone. In 1881 these trusses were replaced by new ones of steel and iron, and in 1887 the stone towers were taken out and wrought-iron ones erected. This bridge demonstrated the feasibility of the system for long spans under railroad traffic, but a few years after it had been rejected by the English engineers in favor of the tubular plan. Among the other bridges designed by Roebling space only permits a notice of two. The Cincinnati and Covington bridge, completed in 1867, has a span of 1,057 feet and a total length of 2,252 feet. This carries roadway traffic only, and is supported by two wire cables of $12\frac{1}{2}$ inches diameter. The greatest of all, however, is the East river bridge, connecting the cities of New York and Brooklyn, which has a main span of 1,595 feet and two side spans of 930 feet each, and carries two tracks of a cable railway, two roadways, and a foot-walk. The article Brooklyn gives a description and illustration of this grand structure, and the difficult work of sinking the piers is recorded in the article Foundation.

Methods of stiffening a suspension bridge by trussing the cables have also been employed, the most notable being the Point Street bridge at Pittsburg, Pa., designed by E. Hemberle, and built in 1878, which has a span of 800 feet and a deflection of 88 feet. In the common suspension system the cables pass over the towers on saddles which may have a slight horizontal motion, but in the stiffened system the plan of fastening them rigidly to the towers may be used. Two cables connected by bracing may be employed, thus forming an inverted rigid arch, as in the Grand Avenue bridge at St. Louis, built in 1891, which has a main span of 400 feet. A design for a bridge of this character over the Hudson river, between New York and Jersey City, has been made by Gustav Lindenthal. Its main span is to have the great length of 3,100 feet, which is nearly double that of the East river bridge, and the shore spans will be 1,800 feet each. The cables, four in number, are to be in pairs, and each will be about 50 inches in diameter. They will be

hinged to the towers by pins of hollow forged steel 25 feet long and 40 inches in diameter, and being braced together the calculation will be analogous to those of the elastic arch with hinged ends.

One of the first large suspension structures substituting steel for stone in the construction of the towers is the new East river bridge between Manhattan and Brooklyn boroughs, New York city.

Fig. 33 shows a view of the structure. In detail its dimensions are as follows: Length of entire bridge between terminals, 7,200 feet; length of main span, center to center of towers, 1,600 feet; extreme width of bridge, 118 feet; height of masonry in tower foundations above high water, 23 feet; minimum height of bridge above mean high water of spring tides for 200 feet on each side of center of main span, 135 feet; height of axis of cables at top of towers above high water, 332 ft. 8½ ins.; two stiffening trusses between towers, distance apart from center to center, 67 feet; width of carriage-ways, each, 20 feet; width of 2 footwalks, each, 12 feet; width of 4 trolley-car tracks, center to center, 9¾ feet; width of 2 elevated railroad tracks, center to center, 11 feet; grade of approaches, 3 per cent. The bridge will furnish accommodations for 4 surface railroad tracks, 2 tracks for elevated trains, 2 roadways for vehicles, 2 footways for pedestrians, and 2 cycle paths. The estimated cost is $8,000,000, exclusive of the right of way.

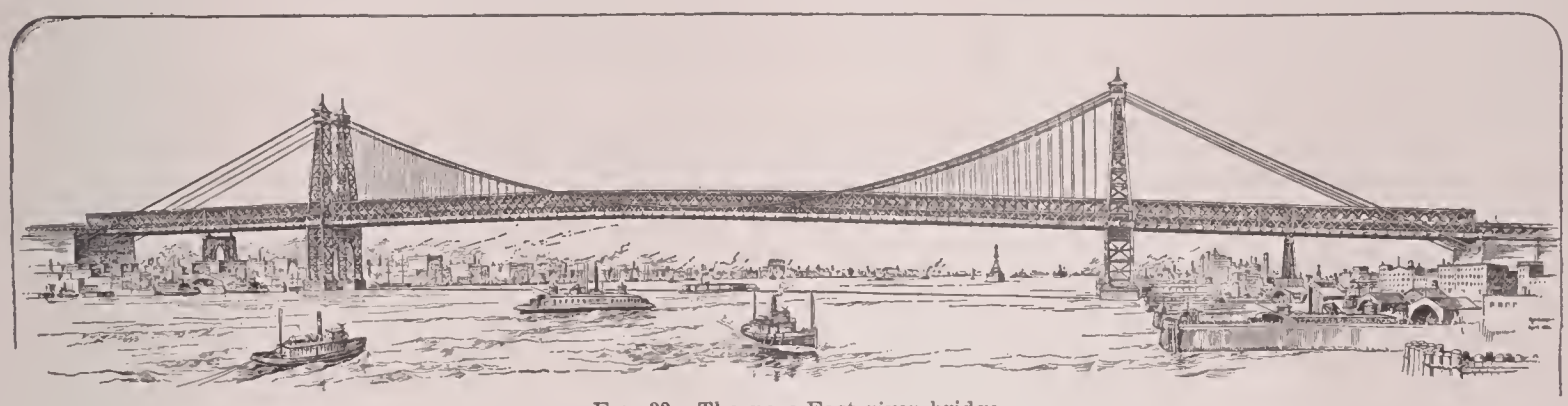


Fig. 33.—The new East river bridge.

A commission to carry on the work of construction was appointed, by authority of the Legislature, first by the mayors of New York and Brooklyn and afterward by Mayor Van Wyck, of Greater New York.

In 1901 the officials of the enterprise were: Mayor, Robert A. Van Wyck; chief engineer, Leffert L. Buck; commissioners—Borough of Manhattan, Lewis Nixon, Smith E. Lane, James W. Boyle; Borough of Brooklyn, Julian D. Fairchild, James D. Bell, John W. Weber.

The commission was authorized to construct a bridge from the foot of Broadway, Brooklyn, to the foot of Delancey slip, Manhattan. The original commission purchased all the rights of the East River Bridge Company, which was organized in 1892 to build a bridge between the same points, for $200,000 on Dec. 18, 1895.

The route agreed upon by the commission is from a point between South Fifth and South Sixth Streets to a point near the foot of Delancey Street, Manhattan.

There are about 1,500,000 feet of timber, 10,000 cubic yards of concrete, 45,000 cubic yards of stone masonry, and 1,600 tons of cable anchor steel in each anchorage. The Manhattan anchorage rests on 3,500 piles and the Brooklyn anchorage on the natural sand.

In the steel towers and the shore spans there was used 12,000 tons of steel. In making the steel cables there will be used 5,000 tons of steel wire and steel castings.

There will be about 12,000 tons of steel in the Manhattan approach, and about 6,000 tons of steel in the Brooklyn approach.

The towers were finished late in 1900, and the first wire in the process of constructing the cables was drawn across the river in March, 1901. At that time the engineers in charge of the work estimated that it would take them till 1904 to prepare the structure for traffic.

Failure of Bridges.—The subject of failures of bridges and of the causes of failure is one of great importance to a bridge engineer. Here it is only possible to briefly mention a few of those most important on account of the loss of life and of the lessons which they teach.

On Dec. 20, 1876, the Ashtabula bridge, in Ohio, on the Lake Shore R. R., fell while an express train was passing over it, and about eighty of the passengers and seven of the crew were killed out of a total of 158 persons on board. The bridge was a deck structure, 157 feet in span, of the Howe truss type, built all of iron. The report of a committee appointed by the Ohio Legislature to investigate the failure concluded that the bridge went down under an ordinary load by reason of defects in its original construction, and that these defects could have been discovered at any time after its erection by careful examination.

The Tariffville bridge, over the Farmington river, in Connecticut, went down on Jan. 15, 1878, while an excursion train was passing over it at slow speed, and thirteen persons were killed. It was a through Howe truss of the common pattern with two spans, each of 165 feet. The coroner's jury reported that the wrought-iron vertical rods were too small, and that the timber of the chords had become weakened by decay to such an extent as to render the bridge unfit for use.

The Tay bridge, in Scotland, was blown down on Dec. 28, 1879, while a train was passing over it in a violent storm of wind, and all on board—about seventy-five in number—perished. The bridge was the longest in the world, having eighty-five spans, with a total length of 10,321 feet, and thirteen spans and their piers were blown down. The piers were mostly made of cast-iron columns connected by horizontal braces. The board of inquiry reported that the failure was caused by the insufficiency of the cross-bracings and their fastenings to sustain the force of the wind, and that no understood rule and no requirements existed in Great Britain regarding computations for wind-pressures, although in France 55 lb. per square foot and in the U. S. 50 lb. was generally used. It is scarcely necessary to remark that careful computations of wind-stresses were made for the new Tay bridge.

On July 1, 1881, occurred at Morelos, Mexico, the most fatal bridge accident on record, whereby 247 soldiers were killed, 40 were injured, and only 20 escaped uninjured of all those on the train.

The necessity of careful inspection, as plainly emphasized by the disasters of Ashtabula and Tariffville, led to a thorough overhauling of old railroad bridges during the following years. Accidents, however, still occurred, but none involving great loss of life. In 1886 there were reported twenty-two failures of bridges in the U. S., by which thirty-five persons were killed. Of these twenty-one persons perished in the wreck of a bridge at Opelika, Ala., whose abutments are said to have been weakened by a freshet.

The Bussey bridge, at Roslindale, Mass., fell on Mar. 14, 1887, whereby 26 passengers were killed and 115 injured. The bridge was of 125 feet span, and of an unusual form of construction. The railroad commissioners reported that it was built practically without superintendence, and that the only inspection had been that made by a machinist who had regularly passed over vital parts of the bridge without realizing that they were important or defective. The lesson taught by this accident is that important constructions should be built and inspected by educated and trained engineers, if safety as well as economy is to be secured.

The accident at Chatsworth, Ill., on Aug. 10, 1887, may here be mentioned, although properly it was not caused by a bridge failure. A small wooden trestle, only 30 feet in length, had caught fire, and before an excursion train could be stopped it became wrecked, and 73 persons were killed and 374 injured.

In 1889 C. F. Stowell, bridge engineer of the New York State railroad commission, compiled a table showing the

bridge failures in the United States and Canada during the ten years 1879–88, which gives a total of 265 bridges. Of these, 27 were due to fire, 39 to freshet, 8 failed while undergoing repair, 60 were knocked down by derailed trains, and 34 fell with trains passing normally over them. This does not include trestles and culverts, or failures occurring without accident to a train. The most serious accident during 1889 was at St. George, Ontario, where a derailed train knocked down one span of a bridge, and 13 deaths and 29 injuries resulted. In 1890 a drawbridge was left open at Oakland, Cal., and a train plunged into the water, drowning thirteen persons; other serious disasters of this kind are also on record, but these are properly classed as due to negligence of operation.

On June 14, 1891, a small bridge of 134 feet span at Mönchenstein, Switzerland, failed while a passenger train was crossing it, by which 74 persons lost their lives and about 200 others were injured. The bridge had riveted lattice trusses, and had been in service for sixteen years. A commission of experts concluded that the bridge was faultily constructed and weak in some of its parts; that the iron was generally of poor quality; and that injury had occurred several years before by the sinking of one of the abutments during a freshet.

Statistics.—No statistics have ever been collected regarding the number of bridges of different kinds and lengths of spans. But figures obtained by Theodore Cooper in 1889 for 26,228 miles of railroad in the U. S. showed, excluding trestles and spans under 20 feet, 446,488 linear feet of bridges. Using this as a basis of estimate for the 160,000 miles of railroad in the U. S., he found the following distribution:

Spans from 20 to 50 feet	.121 miles	=	18,150	spans.
" " 50 " 100 "	.130 "	=	9,100	"
" " 100 " 150 "	.190 "	=	8,000	"
" " 150 " 200 "	.109 "	=	3,300	"
" over 200 feet	56 "	=	1,150	"
Total	.606 "	=	39,700	"

These include both wood and iron bridges, and for the iron bridges he gives the following estimates:

Spans under 20 feet	.17 miles	=	5,100	spans.
" from 20 to 50 feet	.86 "	=	12,900	"
" " 50 " 100 "	.66 "	=	4,600	"
" " 100 " 150 "	.93 "	=	3,600	"
" " 150 " 200 "	.69 "	=	2,100	"
" over 200 feet	.49 "	=	950	"
Total iron spans	.380 "	=	29,550	"

Literature.—The first book on bridge construction published in the U. S. was Thomas Pope's *Treatise on Bridge Architecture* (New York, 1811), which has already been alluded to as advocating the advantages of his "flying pendant lever bridge," but which devotes 196 pages to "an historical account and description of different bridges erected in various parts of the world." Mention has also been made of a pamphlet issued by Col. S. H. Long in 1836, but nothing further is known to have been published until 1847, when Squire Whipple issued at Utica, N. Y., a book entitled *A Work on Bridge-building*, consisting of two essays, the one elementary and general, the other giving original plans and practical details for iron and wooden bridges. This work gave methods for computing stresses in trusses, but its circulation was very small. In 1851 appeared *General Theory of Bridge Construction*, containing demonstrations of the principles of the art and their application to practice, by Herman Haupt, A. M., which gave an excellent discussion of the resistance of materials, the flexure of beams, and the theory of stresses, as well as examples of timber bridges for railroad service. Little literature appeared in this country between 1850 and 1870, but since 1870 a large number of books have been issued. The following are the titles of the several standard technical works, with the date of the first edition: Wood, *Treatise on the Theory of the Construction of Bridges and Roofs* (1873); Greene, *Trusses and Arches Analyzed by Graphic Methods* (1879); Burr, *Stresses in Bridge and Roof Trusses* (1880); Du Bois, *Strains in Framed Structures* (1883); Waddell, *Design of Highway Bridges* (1884); Bender, *Principles of Economy in Design of Metallic Bridges* (1885); Johnson and Bryan, *Modern Framed Structures* (1893). Monographs in book form have also appeared on the construction of the Niagara suspension bridge, the St. Louis and Illinois bridge, the Washington bridge in New York, and others, while the columns of engineering journals and of the *Transactions of the American Society of Civil Engineers* contain many valuable papers, both theoretical and descriptive. Almost the only books of an historical and descriptive nature published in the U. S. are Boller, *Iron Highway Bridges* (1876), and Cooper, *American Railroad Bridges* (1890).

Among foreign books the following may be noted as containing drawings and descriptions of bridge structures: Gauthey, *Traité de la construction des ponts* (Paris, 1809); Miller, *Die Brückenbaukunde* (Leipzig, 1860); Humber, *Cast and Wrought Iron Bridge Construction* (London, 1864); Maw and Dredge, *Road and Railway Bridges* (London, 1872); and Heinzerling, *Die Brücken in Eisen* (1874). Of the large number of foreign theoretical works, Fidler's *Practical Treatise on Bridge Construction* (London, 1887) may be mentioned as perhaps likely to be most serviceable to students.

Mansfield Merriman.

Bridges, Laws Governing the Erection of: In England at the common law no one can build a public bridge without a license. In the U. S. the building and maintaining of bridges upon the highways is a duty that is included in that usually imposed by statute upon the municipal corporations to maintain the highways in a condition reasonably safe and convenient for public travel. The right to erect a bridge over navigable waters may be conferred by State law, subject, however, to the exercise of the power conferred by the Constitution upon Congress to regulate navigation. In pursuance of this power Congress has passed a law (26 Stat. at large, 453) which provides that whenever the Secretary of War shall have good reason to believe that any bridge is an unreasonable obstruction to navigation he shall, after giving the parties opportunity to be heard, give notice to alter it, specifying the changes to be made. Failure to remove is a misdemeanor, and on conviction a fine not exceeding $5,000 may be imposed, each month of default being deemed a new offense. The custom is to obtain the consent both of Congress and of the State Legislature before bridging navigable waters.

F. Sturges Allen.

Bridges, Military: Wherever warfare has been so far reduced to a system and a science as to call into the field, for protracted campaigns, large and organized armies, the very necessities of the case call for some systematic method of passing streams, and, as belonging to it, special organizations of men (*personnel*) for making bridges, and a portable bridge *apparatus*.

The bridge of boats of Xerxes for passing the Hellespont, the timber-pile bridge of Cæsar (of which an account is given in the article Bridges), were not ordinary, but *extra*ordinary constructions necessitated by the magnitude of the obstacles; and they owe their record probably to that peculiarity. It is quite likely, however, that during ages when roads for wheeled vehicles scarcely existed, and, on the other hand, forest timber was abundant, the felled tree (elaborated into a rude bridge), or some such improvised expedient, could generally be resorted to, and that a regular "bridge equipage," in the modern sense of the term, did not exist. The Romans are known to have had a species of "ponton" (as we now call it) to carry with their armies. In fact the wooden boat has naturally offered the readiest means of support to portable bridges; but these, generally large and heavy, are with difficulty transported. Hence various expedients for creating a vessel of considerable flotation power, yet lighter and more portable than ordinary boats (such as framework, covered by skins, canvas, etc.) have been resorted to. The French, the systematizers of the modern art of war, were naturally the first to provide a regular organization and established type of construction for the military bridge, and to organize a *personnel* by which it should be operated.

Their first *ponton* was of copper. Their system has undergone successive modifications and improvements, and instead of metal, wood is used in their ponton. As fixed in 1853 the French ponton, as described by Gen. Cullum in his work on military bridges, is a flat-bottomed wooden boat, 31 feet long, the middle part or body of which, for a length of 16 feet, has a trapezoidal section of 5′ 7″ width at top and 4′ 4″ at bottom, and 2′ 7″ deep; the fore part, 8′ 9″ long, diminishes to 2′ 6″ in width at the bow, and has a sheer of 5½″; and the aft part, 6′ 3″ long, diminishes to 4′ 7″ in width at the stern, and has a sheer of 3″. Each bateau weighs 1,455 lb., is borne on the shoulders of 17 to 20 men, has a flotation of 18,600 lb., car-

ries 25 infantry soldiers, is convenient for disembarking troops, and can be easily navigated in a rapid current by five men.

The material for the French bateau bridge for an army consists of 8 abutments, 8 trestles, 32 bateaux, 4 mooring-boats, 339 balks (84 abutment, 24 claw, and 231 bateaux), 784 chesses, 32 anchors, and all the accessories for forming a bridge of 41 bays, 262 yards long, and 12′ 9½″ wide. This train may be divided into 4 divisions, each containing the material for a complete bridge.

The Russians have a somewhat lighter equipage; the ponton (of canvas) is a flat-bottomed bateau, having, except at the ends, a rectangular section. The length at top is 21 feet, and at bottom 18′ 4″; the width 5′ 4″; and the depth 2′ 4″. The skeleton consists of two side-frames, connected by movable transoms—all of 4-inch scantling. The canvas cover is 10′ 8″ wide, 30 feet long in the middle, and 23′ 3″ along the edges: both sides being tarred or painted black with a composition, applied hot, composed of hempseed oil, strong loam, india-rubber, soap, wax, and soot. The cover is brought over the ends of the frame, and lashed to the top transoms; it is secured, along the sides, to the top string-pieces of the side-frames by small nails passing through eyelet-holes along the edges of the cloth. A plank is laid on the bottom for the pontoniers to stand upon. The canvas ponton, frame and cover complete, weighs 718 lb., and has a flotation of 13,428 lb.

The complete bridge is composed of 32 canvas pontons, with bridge-flooring and accessories for 33 bays; and a section of the Birago equipage, consisting of 8 trestles and 15 wooden pontons (8 bow and 7 body pieces), with a bridge-flooring for 8 bays.

The Austrians, after satisfactory trials in the passage of the broad, deep, and rapid current of the Danube, adopted, in 1841, a system named from its inventor, Col. Birago, of the Austrian Imperial Engineers. This system was somewhat modified in 1859.

This equipage has fixed and floating bridge-supports, the former consisting of abutments and trestles, and the latter of pontons of two pieces assembled together according to the requirements of the bridge for the passage of infantry, cavalry, or artillery, and whether designed for one, two, or three distinct roadways.

The pontons are flat-bottomed bateaux of sheet iron, of one piece, or from two to six assembled together, end to end, by suitable bolts and fixtures. The Birago trestle is composed of a *cap* and two *legs*, to the lower ends of which *shoes* are attached to increase their bearing surface, and give greater stability to the trestle. The *cap* is *adjustable*, being partly supported at the proper height by *suspension* chains, at one end of which are large rings passed over the tops of the legs, the free ends being run through suspension rings on the upper side of the cap. After the chains are made taut, and the cap is at its proper height, the latter is held in place by the *toggles* inserted in the last link which has passed through the suspension rings.

Nothing like a "bridge equipage" had belonged to our military service until 1846. The Engineer Department had long foreseen the necessity of a corps of well-drilled pontoniers and a bridge equipage for our army, and year after year had urged their great importance upon the attention of Congress, but not until May 15, 1846, was its sanction given to the project of the department, and when too late to aid the passage of the Rio Grande by our forces then invading Mexico.

With the sanction of Congress finally obtained, a company of sappers, miners, and pontoniers was organized as part of the Corps of Engineers, and an india-rubber ponton bridge of 46 pontons was prepared by direction of the chief of engineers, but under the superintendence of the late Major-Gen. G. W. Cullum, then a captain in the Corps of Engineers. Another of 36 pontons was subsequently dispatched with the army under Gen. Scott. Owing to the lightness of these pontons only *thirty-five six-horse carriages* were necessary to transport, over the worst roads, a complete train for the formation of a bridge of 200 yards. For the French bateau bridge of nearly 240 meters *seventy-seven six-horse carriages* are used.

The rubber pontons in use for drill purposes at West Point having become unserviceable, and it having become evident that rubber was not adapted to their construction, experiments were undertaken by the then instructor of practical engineering, Capt. J. C. Duane, now brigadier-general and chief of engineers, U. S. army, retired.

The immense trains with which our armies are unavoidably encumbered, the long marches to be made, and the numerous wide and rapid rivers to be crossed, demand an equipage of the most substantial character. On the other hand, the extended expeditions of light columns, which necessarily attend our military operations, require a train light enough to keep pace with the most rapid cavalry movements.

Hence we require both a reserve and advance-guard train.

The experiments included the trial of the bridge equipages used by those European armies most experienced in the art of military bridge-building.

Pontons were constructed after the models of the French bateau, the Austrian sectional ponton, and the Russian canvas boat. Corrugated-iron boats were procured, corresponding as nearly in form and dimensions to the French and Austrian boats as the nature of the material would permit. A number of Birago trestles were also constructed. All of the above material, with the exception of the iron boats, was prepared by the enlisted men of the Engineer Company (A) then stationed at West Point.

The bridges formed of this material were exposed as much as possible to the action of heavy loads, storms, the tide, and floating ice. The material was also packed on carriages of various patterns in order to ascertain the best form, both of bridge material and of carriage, for transportation.

The selection of the French, Russian, and Austrian trains for these experiments was made after a careful study of the various equipages used by the armies of Europe. These three nations alone appeared to have definitely settled on their systems, and this after much experience and thorough research.

After experimenting for two years, the conclusion was arrived at that the French ponton should be adopted. Experiments followed to determine *the material* of which the ponton should be made. Life-boats having been successfully made of corrugated iron, it was presumed it might be, with equal advantage, applied to pontons. It was not only found that to get adequate strength the weight must be increased beyond that of the wooden ponton, but that iron failed in other respects. In fact, it would not bear land transportation, as, in traveling over a rough road, the joints open by the yielding of either the rivets or sheet iron. When in the bridge, if the boat grounds on an uneven or rocky bottom, a hole is frequently punched through it, and such injuries can not be repaired in the field. The wooden ponton is not only much less liable to such accidents, but can be readily repaired when they do occur.

See *Organization of the Bridge Equipage of the United States Army*.

Previous to the battle of Gettysburg a ponton bridge over the Potomac at Harper's Ferry was destroyed, the pontons being scuttled and set adrift above the rapids. About three weeks after, the water having fallen, the boats were recovered, repaired with pieces of hard-bread boxes obtained from the commissary, and used in constructing a bridge at Berlin, over which the entire army passed into Virginia.

With regard to the canvas boat, it soon became apparent that it was precisely what we required for our advance-guard train. It is light, simple, strong, easily repaired, and when packed can safely be transported with the superstructure of the bridge as rapidly as any column of troops can move. A strong argument in favor of its adoption was that it had been used successfully by the Russians for more than 100 years, under every variety of circumstances likely to occur in this country.

The French ponton wagon not being adapted to our rough roads, further experiments ensued to fix upon the selection of a proper carriage for transporting our bridge equipage.

Through the information gained by these experiments resulted the system of bridge equipage adopted at the commencement of the civil war.

"During the winter of 1861–62 five trains were constructed, each composed of 34 pontons and 8 trestles—the pontons being nearly of the same form and dimensions of the French bateau. The frame was somewhat different, the ribs being entire and strongly ironed, and the ironing stronger throughout. The stern was provided with a locker. There were also other alterations in the details of construction. The balks were stronger, and the Birago trestle was modified by substituting built beams, instead of solid timber, for the trestle caps and balks.

"At the same time several canvas trains were organized. In constructing the ponton frame the dimensions and form of the Russian boat were exactly retained. The scantling for the frame was considerably lighter, but, being strongly braced and ironed, the strength was about the same. One train was composed of canvas boats and trestles, being, in truth, a trestle train, with auxiliary pontons to be used only where the depth of water or muddy bottom prevented the use of trestles.

"In the month of Feb., 1862, a ponton bridge, composed of about sixty boats of the reserve train, was thrown across the Potomac at Harper's Ferry. The river was then a perfect torrent, the water being 15 feet above the summer level, and filled with driftwood and floating ice. The greatest difficulty was experienced in pulling the pontons into position, and it was necessary to make use of ship anchors and chain cables to hold them in place. Notwithstanding these unfavorable circumstances, the bridge was completed in about eight hours, and the corps commanded by Gen. Banks, with all its trains and artillery, passed over it without accident or delay.

"Several of these trains accompanied the army in the Peninsular campaign. The pontons were used in discharging quartermaster and commissary stores at Ship Point, in disembarking Gen. Franklin's command at West Point (York river), and in constructing bridges over Hampton creek, the streams in front of Yorktown, and the Upper Chickahominy. Finally a bridge was built over the Lower Chickahominy, about 2,000 feet long, over which nearly the whole Army of the Potomac, with its immense trains, artillery, and cavalry, passed with promptness and safety.

"After the army had passed, the bridge was dismantled and the balks, chesses, etc., packed into the pontons, which were formed into rafts and towed by steamers to Washington. The bridge trains were next transported to Harper's Ferry, where a bridge was constructed a second time, but under entirely different circumstances from that built during the previous winter. The water was now not deep enough; and, as it continued to subside shortly after the bridge was laid, many of the pontons grounded on a very uneven and rocky bottom. Some of them were completely out of water, yet the heavy trains continued to move over the bridge without seriously injuring them; and when the water rose, most of them floated as well as ever.

"Discovering in this way that the boats were much stronger than we had supposed, we were enabled to improve the method of bridging tidal streams.

"It had formerly been considered necessary to build out to low-water mark with trestles, so that the ponton should always be afloat. The bridge is now commenced at high-water mark, building with pontons alone. As the water subsides, the pontons nearest shore ground successively, forming a gentle ramp from the abutment to the floating portion of the bridge, instead of making the descent in 20 feet, as formerly. This method of course applies only to wooden pontons, and to cases where the bottom is favorable.

"During the Fredericksburg campaign it became necessary to force the passage of the Rappahannock. The enemy, having intrenched themselves on the bank, prevented for some time the construction of the bridge; until at length troops were embarked in the pontons and ferried across, where they stormed the rifle-pits, and held them until the bridge was completed.

"During the year 1863 the ponton trains accompanied the army in all its marches backward and forward through Virginia, frequently bridging the Potomac, Rapidan, and Rappahannock. In the latter stream the bridges remained in position all winter; and, notwithstanding the frequent floods and the quantity of ice formed, but few interruptions occurred on these thoroughfares.

"During the campaign of 1864 trains, composed of fourteen pontons and two trestles, accompanied each of the three army-corps of the Army of the Potomac. These trains attended their corps in the long march from Culpeper to the James river, and, although the roads were frequently very bad, in no instance did they delay the march of the troops or arrive late when a bridge was to be laid.

"The headquarters train was followed by a canvas train; which, when a crossing was to be made by surprise, was sent forward with the cavalry, who covered the construction of the bridge and held the position till the main body arrived.

"On reaching the James river, a bridge was laid opposite Charles City Court-house (at a point selected by the writer of this article), about 2,000 feet in length. The water was so deep and rapid that the pontons could not be held by their own anchors, and it was found necessary to attach their cables to schooners anchored above and below the bridge. . . . For the next 40 hours a continuous stream of wagons passed over the bridge, from 4,000 to 6,000 wagons, some said 50 miles of wagons, and nearly all the artillery of this army, and by far the larger portion of the infantry and all its cavalry present, and even to its heads of 3,000 or more of beef cattle—the most injurious of all—without an accident to man or beast." (*Report of Gen. Benham.*) The length of the bridge was made up of 200 feet in trestlework and 2,000 feet in pontons (101 in all); depth of the river, 85 feet.

"Thus the wooden ponton train through four years of war, during which the bridges constructed were without parallel in number and magnitude, amply fulfilled all the requisites of a good bridge equipage. The frequent crossing of the Potomac, Chickahominy and James rivers proved that, even under the most unfavorable circumstances it could furnish a bridge capable of passing a large army, with its heaviest trains over wide and rapid streams, with safety and dispatch.

"Its capabilities in ferrying troops were shown at Ship Point, West Point, and Fredericksburg; and of the mobility of the equipage there was abundant proof in the long marches during the last two years of the war.

"The canvas equipage, also, was perfectly successful as an advance-guard train. In the cavalry raids it was always able to keep pace with the columns; and, although they frequently marched hundreds of miles, it was invariably ready to furnish a prompt and secure means of crossing all the streams on their route. It also often furnished bridges for the heavy trains of the army over streams of moderate width and rapidity.

"The only part of the bridge equipage which did not realize all our expectations was the Birago trestle.

"As already stated, a train was organized early in the war on the Austrian principle, in which the trestle is the main dependence, the ponton being merely auxiliary. It was supposed that many streams would be encountered which would be bridged best with trestles alone, but none such were met with. In fact, when a stream is more than 2 feet deep, a ponton bridge may be laid; when less than that depth, if the bottom is hard, it may be forded, and no bridge is required; should the bottom be soft, the trestle legs will usually settle so as to render the bridge unsafe. As it was not deemed advisable to transport with the army a train which could only be used in exceptional cases, this description of equipage was abandoned. The trestle was, however, very useful as an auxiliary, especially with the canvas train; for, as these boats when in the bridge should never be allowed to touch the bottom, it is frequently necessary to build out several bays from the shore before sufficient depth of water can be obtained to float the ponton—and for this purpose nothing could be better than the Birago trestle, which is also equally useful for a similar purpose with the reserve train, when the river bottom is rough near the shore.

"The canvas train was extensively used by the Western army, and with such success that it was proposed to employ it exclusively. Experience, however, in the East has clearly proved that this train can not fulfill all that is required of the bridge equipage of a large army. The bridges of the Potomac and James rivers could not have been built with canvas boats, which will not resist ice and driftwood; neither are they suited to the disembarkation of troops or the passage of a river by force.

"Experience would therefore lead us to concur with Gen. Barnard in his remarks on this subject, viz.:

"'The numerous proposers of "flying" bridges forget that if a military bridge is intended to be *carried with* an army, it is also intended to *carry* an army. its columns of men, its cavalry, its countless heavy wagons, and its ponderous artillery. It must carry all these, and it must do it with certainty and safety, even though a demoralized corps should rush upon it in throngs. No makeshift expedient, no "ingenious" invention not tested by severe experiment, no light affair of which the chief merit alleged is that it is light, will be likely to do what is required, and what the French ponton has so often done.'"

The experienced engineer officers from whose *Introductory History* we quote constituted a board which, in 1870, established the present authorized organization. It was based upon the experience we have described in their language.

As now fixed the U. S. bridge equipage is composed of reserve and of advance-guard trains. The former are intended to accompany large bodies of troops in the field, and are provided with the material necessary for the construction of bridges of sufficient capacity to pass large armies with their heaviest trains over rivers of any size and rapidity.

The advance-guard equipage is intended for the use of light troops, such as advance guards, cavalry expeditions, etc. It is organized, both as regards material and carriages, with a view to rapidity of movement. At the same time it is capable of furnishing a bridge which will fulfill all the requirements of troops engaged on such service.

The basal elements of these distinct equipages—the French wooden bateau and the Russian canvas ponton—are of dimensions very nearly corresponding to those (already given) of their original prototypes; but with modifications in details of construction derived from our own experience.

The reserve equipage is divided into trains, each of which is composed of four ponton divisions and one supply division. Each division is accompanied by a tool wagon and traveling forge.

Each ponton division is complete in itself, containing all the material necessary for constructing a bridge of eleven bays, or 225 feet in length.

Each of these divisions is subdivided into four sections, two of which are ponton and two abutment sections; the former contains 3 ponton wagons and 1 chess wagon; the latter, 1 ponton, 1 chess, and 1 trestle wagon each.

The ponton section contains the material for three bays, and should never be subdivided. The division may be increased or diminished at pleasure by changing the number of its ponton sections.

The supply division is provided with articles necessary to replace material lost or worn out, such as balk, chess, spare parts of carriages, a few complete carriages, etc.

The carriages of this division consist of ponton, chess, and tool wagons, and of forges. Their number and proportion will be determined by the nature of the country in which the army is operating, and by the proximity of the main dépôt.

The trains of the advance-guard equipage are composed of 4 ponton divisions, each of which consists of 8 ponton, 2 chess, and 2 trestle wagons.

The ponton wagon carries all the material necessary for constructing a complete bay. The division may therefore be increased or diminished by one or more ponton wagons without disorganizing it. When a forced march is to be made, and it is desirable to lighten the loads, the chess may be removed from the ponton wagons, the rope from the trestle wagons, and the load of the chess wagons be reduced to 40 chess. The number of the latter wagons in this case must be increased to 5.

The ponton wagons of reserve train are drawn by 8 mules or 6 horses, those of the advance-guard train by 6 mules or 4 horses, the "loads" being about 3,000 and 2,000 lb. respectively. It would be out of place to enter more fully into this subject in this work; but these historical details concerning the development of the military-bridge system of the U. S.—a matter in which the country had no experience whatever—during the war can not fail to be interesting.

Railway Bridges.—Another interesting branch of the subject—the remarkable constructions applied to the improvisation of railroad bridges in place of destroyed ones, and the noteworthy system of repair and construction introduced into our military railway service, can only be alluded to. The military railroad construction and repair corps were a part of the quartermaster's department, which organized, hired, and paid all their members, and bought and paid for all the material, and possessed and operated the railroads at an expense which at one time amounted to about $2,000,000 per month. Under the chief of that department, and especially charged with this duty, the principal organizer and conductor of military railroad transportation and repairs was Brig.-Gen. D. C. McCallum (who has since made a valuable report on this subject), well known as an able civil engineer and inventor of the "inflexible arch truss"; but the credit of the military railroad operation, and repair and success, belong to no individual altogether, but to the quartermaster's department, and to the body of railroad engineers, superintendents, and operatives who came into its service to aid the country during the war.

In the occupation, for protracted periods, of the same ground (as in investments, sieges, etc.), military bridges assume frequently a semi-permanent character.

Thus while the Army of the Potomac occupied a position near Richmond (May and June, 1862) its wings were separated by the formidable barrier of the Chickahominy rivulet and swamp. One of the bridges is thus described in the report of the chief of engineers of the Army of the Potomac:

"The bridge was built over the stream upon frame trestles; through the swamp it was supported by cribs. The *approaches* to the bridge over the low bottom-lands were either raised corduroy or (on the north side) simply earth raised 2 or 3 feet (the soil being here sandy), with a layer of brush 1 foot below the upper surface, deep lateral ditches being made. The whole structure of the bridge and approaches was about 1,400 yards long. The trestlework and cribwork bridge was mostly done by troops of the engineer brigade under Gen. Woodbury; the approaches on the north by the 9th and 22d Massachusetts regiments (Cols. Cass and Gove, both of whom were killed in the battles following), and those on the south side by the 3d Vermont. The bridge was ready for the passage of teams on the 14th, covered with earth, and the approaches entirely completed on the 17th. The bridge proper was 1,080 feet long; roadway, 11 feet wide; number of cribs, 40; of framed trestles, 6." (Fig. 1.)

The combined armies under Gen. Grant occupied positions before Petersburg and Richmond from June, 1864, to Apr., 1865. The James river separated the Army of the James (in its final position) from the center and left. An assured communication was indispensable, and at the same time one which would not impede the navigation for Federal vessels, whether transports or armed.

Col. P. S. Michie, chief of engineers, Army of the James, designed and submitted for approval a timber-pile bridge with a floating draw (the floats being ordinary pontons), of which an elevation of a portion, including the "draw," of pontons is here given. (Fig. 2.)

FIG. 1.—Woodbury and Alexander's bridge.

The piles of trestles were guarded against ice (which in the winter forms freely in the upper James) by highly inclined guard-pieces, the feet of which were secured to piles in the bed of the river. Each trestle was made up of a cap-piece and six piles (in pairs) driven into the bed of the river.

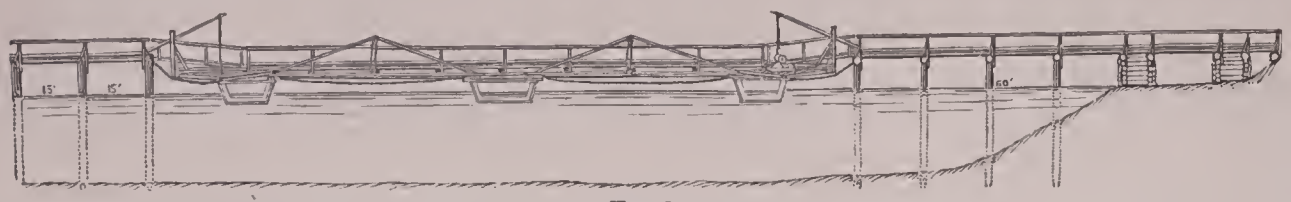


FIG. 2.

This bridge, which was constructed late in the year 1864, was in use down to the close of the civil war. During the period above indicated the gap in our lines made by the Rappahannock was occupied by one or more ordinary ponton bridges. See Haupt's *Military Bridges* (1867).

Revised by JAS. MERCUR.

Bridget (or **Brigit**), SAINT, or **Saint Bride**: one of the three patron saints of Ireland; b. at Fochart, now Faugher, 47 miles N. W. of Dublin, 453; early showed a character of great energy, courage, generosity, unselfishness, and holiness; became a devotee, and founded a monastery of the Columbian order at Kildare, 30 miles W. S. W. of Dublin; and there died Feb. 1, 523. The name Brigit means "the fiery arrow." Her day is Feb. 1.

Bridget, SAINT (of Sweden): See BIRGITTA, SAINT.

Bridgeton: city, railroad center, and port of entry, the capital of Cumberland co., N. J. (for location of county, see map of New Jersey, ref. 7–B); is situated on both sides of Cohansey river, a tide-water stream; 20 miles from Delaware Bay, 37 miles S. of Philadelphia, and 127 miles S. of New York. Its area is 15·39 sq. miles, or 9,849 acres. As a port of entry it is second in the State. The leading articles received are coal, pig iron and iron ore, lumber, lime and shells, fertilizers, and manufactured goods. The principal shipments are nails, gas and water pipe, canned fruits, woolen goods, window-glass, hollow-ware, and grain, potatoes, etc. It is the leading city of Southern New Jersey in the variety and value of its manufactured products. Educational facilities are fine. The South Jersey Institute for both sexes, opened in 1870 on a commanding site, has a handsome and well-appointed building which cost over $65,000. The West Jersey Academy occupies a fine building in a beautiful location. Ivy Hall, a select boarding-school for girls, has a high reputation. There are also public schools of a high order. It has a flourishing board of trade, building and loan associations, a large number of benevolent societies, and good county buildings. Pop. (1800) about 400; (1880) 8,722; (1890) 11,424; (1900) 13,913.

EDITOR OF "NEWS."

Bridgetown: the capital of the island of Barbados; on its west coast, and extends along the north side of Carlisle Bay, which forms its roadstead; lat. 13° 4′ N., lon. 59° 38′ W. (see map of West Indies, ref. 8–M). It is the residence of the Bishop of Barbados and the governor of the Windward islands, and has an arsenal and barracks in the vicinity. Pop. (1891) 21,000.

Bridgewater: a town and river-port of England; in Somersetshire; on both sides of the river Parret; 33 miles by rail S. W. of Bristol (see map of England, ref. 13–F). It is neatly built, and the houses are mostly of brick. Vessels of 200 tons can ascend the river to this town. Here is St. Mary's church, which has a remarkable and lofty spire. This is the native place of Admiral Blake. Bridgewater became a free borough in 1200. Pop. (1891) 12,429.

Bridgewater: a post-village of New Dublin township, Lunenburg County; 12 miles from Lunenburg, Nova Scotia (see map of Quebec and Nova Scotia, ref. 3–B); has manufactures of lumber, etc. Pop. 4,000.

Bridgewater: town; Plymouth co., Mass. (for location of county, see map of Massachusetts, ref. 4–I); on Old Col. R. R., 27 miles S. of Boston. It contains a State normal school, State almshouse, extensive iron-works, cotton-gin, and other manufacturing establishments, and is the seat of the county agricultural fair. Pop. of township (1880) 3,620; (1890) 4,249; (1900) 5,806. EDITOR OF "INDEPENDENT."

Bridgewater, FRANCIS HENRY EGERTON, eighth Earl of: b. in London, Nov. 11, 1756; son of John Egerton, Bishop of Durham. He inherited the earldom in 1823, and died unmarried in Paris, Feb. 11, 1829. By his last will he left £8,000 to be paid to the author of the best treatise *On the Power, Wisdom, and Goodness of God as Manifested in the Creation*. He was an Anglican priest, very eccentric. Thus he had his house in Paris filled with dogs and cats. Some, dressed up like human beings, were taken riding with him and fed at his table.

Bridgewater Treatises: a series of works named in honor of the Earl of Bridgewater. (See preceding article.) The trustees who had the control of his bequest of £8,000 placed it at the disposal of Gilbert Davies, president of the Royal Society, who appointed eight gentlemen to write separate treatises illustrative of the power, wisdom, and goodness of God. They are arranged as follows in the collected edition: Vol. i., by Sir Charles Bell, F. R. S., *The Hand as Evincing Design* (1832; 7th ed. 1860); ii., iii., by Rev. William Kirby, M. A., F. R. S., *Power, Wisdom, and Goodness of God in the Creation of Animals* (1835); iv., by John Kidd, M. D., F. R. S., *Adaptation of External Nature to the Physical Conditions of Man* (1833); v., by Rev. William Whewell, M. A., F. R. S., *Astronomy and General Physics with Reference to Natural Theology* (1833); vi., by Rev. Thomas Chalmers, D. D., *Adaptation of External Nature to the Moral and Intellectual Conditions of Man* (1833); vii., by William Prout, M. D., F. R. S., *Chemistry, Meteorology, and Digestion with Reference to Natural Theology* (1834; 4th ed. 1855); viii., ix., by Rev. William Buckland, D. D., F. R. S., *Geology and Mineralogy with Reference to Natural Theology* (1836); x., xi., by Peter Mark Roget, M. D., F. R. S., *Animal and Vegetable Physiology with Reference to Natural Theology* (4th ed. 1869).

Bridgman, FREDERICK ARTHUR: genre and portrait painter, principally of Oriental subjects; b. at Tuskegee, Ala., Nov. 10, 1847; pupil of Gérôme, Paris; National Academician 1881; member of the Society of American Artists 1880; medal at the Centennial Exhibition, Philadelphia, 1876; third-class medal, Salon, 1877; second-class medal and Legion of Honor, Paris Exposition, 1878; second class-medal, Paris Exposition, 1889; medal at Munich Exposition 1888. His picture *Procession of the Bull Apis* is in the Corcoran Art Gallery, Washington; his *Roumanian Lady*, in the Temple collection, Pennsylvania Academy, Philadelphia; and *Diligence in the Pyrenees*, in the Permanent Gallery, Liverpool, England. Many of his works are owned in the U. S. His pictures display very clever technique, and are generally brilliant in color. Studio in Paris.

WILLIAM A. COFFIN.

Bridgman, LAURA: a blind deaf-mute; afforded a remarkable instance of the development of intellectual and moral powers under the most adverse circumstances. She was born at Hanover, N. H., Dec. 21, 1829. When two years old she lost her sight, hearing, and smell through a severe illness, her sense of taste being at the same time greatly impaired. At the age of eight she was placed under the instruction of Dr. Howe, of Boston, principal of Perkins Institution. She soon learned to read and spell with a manual alphabet, and afterward learned to write and to sew, acquired very considerable information, and was an object of great interest to psychologists and to those interested in the education of persons of defective senses. She was a teacher in the Perkins Institute, and composed religious verse. D. May 24, 1889. See Mary S. Lamson's biography of her (Boston, 1878).

Bridgnorth (anc. *Bruges* or *Brugia*): a town of Shropshire, England; on both sides of the Severn; 19 miles S. E. of Shrewsbury, and 123 miles N. W. of London (see map of England, ref. 9–G). The upper part of the town is picturesquely built on a rock 60 feet higher than the river. It has an old castle, almshouses, a public library, a bluecoat or charity school, a handsome bridge, and manufactures of carpets, nails, tobacco-pipes, boats, and worsted stuffs. It has a heavy commerce upon the river, and is supposed to have been founded by a daughter of Alfred the Great. Pop. (1891) 5,723.

Bridgton: town; Cumberland co., Me. (for location of county, see map of Maine, ref. 10–B); on Bridgton and Saco

River R. R.; 38 miles from Portland. It has 5 churches, 5 graded schools, woolen mills, and other manufactories, and is accessible by steamboat from the foot of Sebago Lake. Pop. of township (1880) 2,863; (1890) 2,605; (1900) 2,868; village, 1,552. EDITOR OF "NEWS."

Bridlington, or **Burlington**: market-town in the East Riding of Yorkshire, England; on the North Sea; 54 miles by rail E. by N. of York (see map of England, ref. 6–J). Here are remains of a rich priory founded by a grand-nephew of William the Conqueror. Numerous ancient tumuli or barrows occur in this vicinity. Bridlington Quay, a seaport and bathing-place, is on the sea, 1 mile S. E. of the town. It has a chalybeate spring and several hotels; also an active trade in corn, which is exported from it. This place is noted for chalk-flint fossils. Pop. of Bridlington and Quay (1891) 6,611.

Bridport: a seaport-town of Dorsetshire, England; on the Brit or Bride river; 16 miles N. W. of Dorchester (see map of England, ref. 14–F). It is surrounded by hills, and consists chiefly of three spacious streets. It has a Gothic church, an almshouse, a town-hall; also manufactures of cordage, sail-cloth, shoe-thread, and fish-nets. The vicinity is celebrated for its butter and cheese. Pop. 7,500.

Brief [O. Fr. *bref*, *brief* < Lat. *breve*, a short list, note, dispatch, neut. of *brevis*, short]: in law, an abridged statement of the plaintiff's or defendant's case, prepared by his attorney for the use of the barrister or counsel. (See ATTORNEY.) It should contain a summary of the pleadings, a concise statement of the facts involved, the names of the witnesses, the substance of their testimony, and usually observations by the attorney in the nature of suggestions to counsel.

In the U. S., where the same person performs the functions of both attorney and counsel, the word "brief" is used to denote the sketch of the argument of counsel, with or without a statement of facts, which is either used by him or submitted to the court under its rules. "Brief" is also sometimes employed in the sense of *breve*, to denote one of the writs by which all suits in the higher courts were originally begun. Revised by F. STURGES ALLEN.

Brief, Papal: a letter addressed by the pope to temporal princes or communities on subjects of discipline or public affairs. It differs from the papal bull in several respects, giving decisions on matters of inferior importance, which do not require the deliberations and assent of a conclave of cardinals. It is not signed by the pope, but by the segretario de' brevi, an officer of the papal chancery. It is written on thin parchment, in current Latin characters, begins with the name of the pope, is dated after the modern and not, as in bulls, after the Roman fashion, and sealed in red wax with the pope's private seal, called the "Fisherman's Ring" (Annulus Piscatoris).

Brieg, breech: a town of Prussia; in Silesia; on the Oder, and on the railway from Breslau to Oppeln; 29 miles by rail N. of Neisse (see map of German Empire, ref. 5–I). It is well built, and has a gymnasium, a good library, and manufactures of hosiery, ribbons, linens, and woolens. Pop. (1890) 20,154.

Briel, or **The Brill**: a fortified seaport-town of Holland; province of South Holland; near the mouth of the river Meuse; 13 miles S. S. W. of The Hague; lat. of lighthouse 51° 54′ 11″ N., lon. 4° 9′ 51″ E. (see map of Holland and Belgium, ref. 6–D). It has a good harbor, is intersected by several canals, and contains several magazines. The capture of this town by William de la Marck in 1572 was the first important event in the long contest between the Dutch and Philip II. of Spain. Van Tromp and De Witt were born here. Pop. 4,600.

Brienne, or **Brienne-le-Château**, brē̆e′en′le-shă̆ă′tō′, called also **Brienne-Napoléon**, -nă̆ă′pō′lā′ōn′: a small town of France; department of Aube; on the river Aube; 23 miles E. N. E. of Troyes (see map of France, ref. 4–G). Here was a military school in which Napoleon I. was educated. The place derived its name from a château built by the last Count de Brienne. In Jan., 1814, a battle was fought here between Napoleon and the allies commanded by Blücher and Schwarzenberg, but was without important results. Pop. (1891) 1,732.

Brienz, bree′ens, **Lake of** (Germ. *Brienzer-See*): in Switzerland; is formed by the river Aar, at the foot of the Hasli valley. It is 8 miles long, 2 miles wide, and from 500 to 2,100 feet deep. The surface is 1,847 feet above the level of the sea. It is surrounded by high mountains, one of which, called the Rothhorn, commands a grand view of the Alps. The surplus water of this lake flows through the Aar into Lake Thun. A small steamer plies on the lake daily.

Brierre de Boismont, brē̆e′ār′de-bwă̆ă′mōn′, ALEXANDRE JACQUES FRANÇOIS: a French physician; b. in Rome, Oct. 18, 1797; published numerous treatises on medico-psychological subjects; among others, *De l'Ennui*; *Sur le Suicide et la Folie-suicide* (rev. ed. 1865); and *Des Maladies Mentales* (1866). D. in St.-Mandé, Dec. 25, 1881.

Brigade [Fr., from Ital. *brigata*, crew, company]: a group of regiments or battalions combined into one body. In the British army it denotes a body formed by the union of two or more regiments or battalions under one commander, called a brigadier. It is a temporary grouping which can be broken up whenever the commander of the army thinks proper. In the U. S. army two or more regiments of infantry or squadrons of cavalry may constitute a brigade. A brigade of cavalry is usually eight or ten squadrons. The term is often applied to uniformed bodies acting under authority in a semi-military way, as "fire brigade." The Royal Guard in Great Britain, consisting of three cavalry and three infantry regiments, is known as the Household Brigade.

Brigadier′, or **Brigadier-general**: the commander of a brigade; an officer who is one degree higher than a colonel, and one lower than a major-general. In the British army a brigadier is an officer (usually a colonel) who for a limited time and for a special service is appointed to the command of a brigade. When this is broken up he either falls back to his colonelcy or is raised to the rank of major-general.

Brig′andage: highway robbery by organized gangs, who make their home in secure places in the forests or among the mountains, from which they issue forth to seize and rob wayfarers or to hold them for ransom. In a period of barbarism, when might is the only right, brigandage has its rise. The heroes of Greece distinguished themselves by suppressing brigandage. Theseus, Perseus, and Hercules purged the country of these robbers who had taken refuge in caverns, and also of the princes who practiced the same trade. Cities pillaged each other. The Palatine Hill, the cradle of Rome, was originally a refuge for the brigands of the Campagna; during the whole period of the Roman republic the Italian peninsula was full of brigands. The fugitive slaves and the inhabitants of conquered cities who had escaped the Roman sword continually increased the number. The Ciminian forest was their headquarters, and this has remained until our time a most dangerous place for travelers from Florence to Rome. The civil wars increased the numbers of the brigands; Roman citizens were carried away almost under the eyes of the soldiers and held in prison until they paid a high ransom. Still the brigands, even at that period, were not without sentiment. Palæmon, the celebrated grammarian, having fallen into their hands, was sent away without harm as soon as they had heard his name. Fifteen centuries later Ariosto paid his ransom on almost the same spot by reading a few stanzas of his poem.

The vast forests that covered Gaul and Germany furnished a natural refuge for brigands; continual wars favored them, and the whole feudal system in many of its features was little better than respectable brigandage. In France the system survived longer than in Germany. The eighteenth century furnishes two famous names in the annals of brigandage in France, Cartouche and Mandrin. Napoleon having firmly established the security of the roads, since his day brigandage has practically been unknown in that country. Italy, always the classic home of brigands, and Spain, her rival in this respect, continued for many years to give a home to these romantic criminals. The outlaws were generally in league with the authorities, and were never betrayed except for vengeance; this was particularly the case in Southern Italy. The ordinary line of operations of the brigands extended from Vienna to Naples, covering the lofty mountains of Aquila and Aquino, E. of Rome. These are covered with dense forests, which support numerous goats, on which the brigands subsisted. Brigandage was entirely consistent with religion. A man took his gun and went upon the highway to collect money to pay his taxes or his church assessments. Napoleon waged a fierce war against this system in Italy, and during all his domination no assassination or theft was allowed to go unpunished. This was one great cause of the popular hatred against him. One of the most famous of the Italian brigands was Fra Diavolo, who played an important part in the revolution of Naples

in 1799, was received with great favor at the court, and given the title of colonel by Queen Caroline. Spain has had much the experience of Italy. No government has ever been strong enough to track the malefactors to their mountain fastnesses and exterminate them. Here, as in Italy, brigandage seemed rather chivalry. José Maria, the most celebrated of the Spanish contrabandists, is said never to have taken a ring from a lady's hand without saying "Madam, so fair a hand has no need of ornament." Other countries preserve tender recollections of these happy times. Schinderhannes is still popular along the Rhine; Chandor is as celebrated for his filibustering exploits as for his share in the revolution of 1848. In Albania this form of plunder still exists. A characteristic feature of brigandage everywhere is the holding of captives for a ransom. The brigand has furnished many heroes to literature and opera. Hernani, the hero of Victor Hugo's great drama, is one of the most celebrated. About's *Roi des Montagnes* is a well-known and delightful tale based upon brigandage in Greece. See Larousse, *Dictionnaire du XIX^e^ Siècle* (upon which this article is largely founded); Baedeker's *Guide to Southern Italy.* C. H. Thurber.

Brigan'tes: a powerful nation of ancient Britain, inhabited what is now the north of England, including the counties of Cumberland, Westmoreland, Durham, York, and Lancaster.

Briggs, Charles Augustus, D. D.: theologian and scholar; b. in New York city, Jan. 15, 1841; studied at the University of Virginia 1857–60, the Union Theological Seminary of New York 1861–63, and the University of Berlin 1866–69; was pastor of the Presbyterian church at Roselle, N. J., 1870–74; in 1875 was chosen Professor of Hebrew and the Cognate Languages in the Union Theological Seminary of New York; in 1891 was transferred to the newly endowed Edward Robinson chair of Biblical Theology. His inaugural address was the occasion of his trial for heresy by the Presbytery of New York, on the ground that it maintained the following errors: (1) that Reason is a fountain of divine authority which may and does savingly enlighten men; (2) that the Church is a fountain of divine authority which, apart from the Holy Scripture, may and does savingly enlighten men; (3) that errors may have existed in the original text of Holy Scripture, as it came from its authors; (4) that Moses is not the author of the Pentateuch; (5) that Isaiah is not the author of half the book that bears his name; (6) that Sanctification is not complete at death. The trial lasted for some six weeks (during November and December, 1892), and resulted in the acquittal of the accused on every count. It was shown to the satisfaction of the majority of the presbytery that he never maintained the error stated in the first two counts, and in regard to the others that it was allowable in a Presbyterian minister to hold the opinion sought to be condemned. He afterward left the Presbyterian Church and was ordained in the Episcopalian ministry. He was the editor of the *Presbyterian Review*, 1880–89, and author of *Biblical Study* (New York, 1883; 3d ed. 1888): *American Presbyterianism* (1885); *Messianic Prophecy* (1886); *Whither?* (1889); *The Bible, the Church, and the Reason* (1892). The University of Edinburgh gave him the degree of D. D. in 1884.

Briggs, Charles Frederick: journalist; b. at Nantucket, Mass., in 1804. He established the *Broadway Journal* in 1844, and was afterward associated editorially with *Putnam's Magazine*, the *Independent*, and the *New York Times*. He published, besides other works, *The Adventures of Harry Franco: a Tale of the Great Panic* (1839); *The Haunted Merchant* (1844); and *The Trippings of Tom Pepper* (1847). D. in Brooklyn, N. Y., June 20, 1877.

Briggs, George Nixon, LL. D.: lawyer and judge; b. in Adams, Mass., Apr. 13, 1796; became a lawyer in 1818 in Berkshire County; distinguished himself in defense of an Indian charged with murder in 1827; from 1831 was a member of Congress for twelve years, and Governor of Massachusetts from 1844 to 1851, during which time he refused to pardon Prof. Webster, the murderer of Dr. Parkman. He was a common pleas judge 1851–56; also a trustee of Williams College for sixteen years, and a distinguished philanthropist, and for many years president of the Baptist Missionary Union. D. in Pittsfield, Sept. 12, 1861. See his memoir under title *Great in Goodness* (Boston, 1866).

Briggs, Henry: mathematician; b. near Halifax, Yorkshire, in 1551; educated at St. John's College, Cambridge. He became in 1619 Savilian Professor of Astronomy at Oxford. He made important contributions to the theory of logarithms, in which the logarithm of ten was taken as unity, and published in 1624 a great work entitled *Arithmetica Logarithmica*, giving the logarithms of natural numbers from 1 to 20,000, and from 90,000 to 100,000, calculated to 14 places. His *Trigonometria Britannica* (London, 1633) contained *Tables* of natural sines, tangents, and secants with logarithms to the hundredth part of a degree. D. in Oxford, Jan. 26, 1630.

Brigham, Amariah, M. D.: b. near New Marlborough, Mass., Dec. 26, 1798; practiced medicine in Hartford, Conn., where his opposition to revivals on hygienic grounds brought him obloquy. He became superintendent of the lunatic asylum at Utica, N. Y., in 1842. Among his works is *The Anatomy, Physiology, and Pathology of the Brain* (1840). D. in Utica, Sept. 8, 1849.

Brigham, Charles Henry: b. in Boston, Mass., July 27, 1820; graduated at Harvard; became in 1844 pastor of the First Congregational church in Taunton, Mass., and in 1865 pastor of the Unitarian church at Ann Arbor, Mich. After 1866 he was Professor of Biblical Archæology and Ecclesiastical History in the Meadville (Pa.) Theological School. He was a prominent member of the American Oriental Society, of the Philological Society, and of the American Association for the Advancement of Science, and was the author of many contributions to periodical literature. D. in Brooklyn, N. Y., Feb. 19, 1879. See his *Memoir* by E. B. Willson, Boston, 1881.

Brigham: city; capital of Box Elder co., Utah (for location of county, see map of Utah, ref. 2–L); on Cent. Pac. and on branch of Union Pac. R. Rs.; 60 miles N. of Salt Lake City, near the northern shore of Salt Lake. There are here churches of three denominations, and 4 district and 3 sectarian schools; farming and fruit, cattle, and sheep raising are the chief occupations of the people. Pop. (1880) 1,877; (1890) 2,139; (1900) 2,859.

Editor of "Bugler."

Bright, John: orator and statesman; b. near Rochdale, Lancashire, England, Nov. 16, 1811. He was a member of the Society of Friends. About 1840 he became a personal and political friend of Richard Cobden, and gained distinction as an orator of the Anti-Corn-Law League, in advocacy of which he addressed many public meetings. He was elected a member of Parliament for the city of Durham in 1843, and was returned for Manchester in the general election of 1847. Cobden and Bright became the principal leaders of the Manchester school or party, which was not identified with either of the great political parties, but advocated a pacific foreign policy and electoral reform. He was defeated in the election of 1857, because he had opposed the Crimean war against Russia and the Chinese war, but was elected in the same year by the Liberal voters of Birmingham, whom he continued to represent for many years. During the great civil war in the U. S. he expressed his sympathy with the Union cause in several eloquent speeches. After the Reform bill of Russell and Gladstone had been rejected by the House of Commons in 1866, Mr. Bright advocated the cause of electoral reform by vehement speeches at immense public meetings in London, Manchester, Birmingham, and other places. In 1867 the friends of reform triumphed, and procured the passage of a bill granting the right of suffrage to every householder in a borough. He entered the cabinet formed by Mr. Gladstone in Dec., 1868, as president of the Board of Trade, and resigned office on account of ill health about Mar., 1871; again a member of Mr. Gladstone's cabinet of Apr. 28, 1880; he resigned July 14, 1882, announcing in the House of Commons that he retired because he differed from his colleagues of the cabinet on their Irish home-rule and their Egyptian policy. He was elected lord rector of the University of Glasgow Nov. 15, 1880. A collection of his speeches was published in two volumes in 1868. D. in London, Mar. 27, 1889.

Bright, Marshal H.: b. at Hudson, N. Y., Aug. 18, 1834; educated at Lawrence Scientific School, Cambridge, 1852–53; reported in New York Senate 1854; associate editor *Albany Argus* same year; served in the civil war; appointed on the staff of Gen. Robert Anderson, Oct., 1861; served successively on staffs of Gens. W. T. Sherman, D. C. Buell, W. S. Rosecrans, and George H. Thomas 1861–65; participated in several engagements; breveted major for valuable and meritorious services; resigned his commission at close of the war 1865; engaged in silver mining in Nevada; became managing editor of *Christian at Work*, New York, 1873, and

editor-in-chief 1880. He has contributed to numerous periodicals on theological, scientific, and philosophical subjects, and delivered various addresses.

Bright, William, D. D.: Canon of Christ Church and Regius Professor of Ecclesiastical History, Oxford; b. in Doncaster, England, Dec. 14, 1824. Educated at Rugby and at University College, Oxford; graduated B. A. 1846; fellow of his college 1847; ordained 1848 and 1850; Canon Christ Church and regius professor 1868. Author of *Ancient Collects* (1857; 2d ed. 1861); *History of the Church from the Edict of Milan to Council of Chalcedon* (1860; 5th ed. 1888); *Sermons of St. Leo the Great on the Incarnation*, trans. with his *Tome* and *Notes* (2d ed. 1885); *Faith and Life* (1864; 2d ed. 1866); *Hymns and other Verses* (1866; 2d ed. 1874); *Chapters of Early English Church History* (1878; 3d ed. 1889); *Notes on the Canons of the First Four General Councils* (1882); *Iona and other Poems* (1886); *Addresses on the Seven Sayings from the Cross* (1887); *Sermons on the Incarnation* (1889); *Lessons from the Lives of Three Great Fathers* (1890); *The Roman Claims Tested by Antiquity* (1877). Editor of Eusebius's *Ecclesiastical History* (1872; 2d ed. 1882); St. Athanasius's *Orations against the Arians* (1873; 2d ed. 1883); *Socrates's Ecclesiastical History* (1878); select *Anti-Pelagian Treatises of St. Athanasius*, in The Library of the Fathers.

Brighton, formerly **Brighthelmstone**: a town and fashionable watering-place of England, in Sussex; on the English Channel; 50 miles S. of London (see map of England, ref. 14–J). It is the southern terminus of the London and Brighton Railway. Lat. of lighthouse, 50° 50′ N., lon. 0° 8′ W. It extends 3 miles along the coast, and is sheltered on the N. and N. E. by the South Downs. To resist the inroads of the sea, which formerly undermined the chalk-cliffs at Brighton, a sea-wall of great strength has been constructed. It is 60 feet high and forms an admirable promenade. In the middle of the town, in an open space called the Steyne, is the pavilion or Marine Palace, a fantastic structure of Oriental style built by the Prince of Wales (George IV.). It was finished in 1827, and is now owned by the corporation of Brighton. The town is well built, and consists mostly of new and elegant streets and terraces. It is a favorite resort for the aristocracy and the opulent classes, has numerous magnificent hotels, two theaters, assembly-rooms, and many boarding-schools. Among its institutions are Brighton College, founded in 1847 for the education of the sons of noblemen, a hospital, and the Sussex Literary and Scientific Institution. Brighton returns two members to Parliament. Steamers ply between this place and Dieppe. A fine terrace, called the Marine Parade, extends about a mile between the Steyne and Kempton, an eastern suburb of Brighton. It has little or no maritime trade, and owes its rapid increase to the salubrity of the air and its attractions to persons in pursuit of health and pleasure. It entertains annually about 80,000 visitors. Pop. (1881) 107,528; (1891) 115,873; (1901) 123,478.

Bright's Disease, or **Nephritis** (named after the famous English physician, Dr. Richard Bright, who studied this disease in the early part of the nineteenth century): essentially a degeneration of the kidney structure. In consequence of this, the normal excretory processes are not accomplished, and various poisonous substances meant for excretion are retained, to the impairment of the general health. The causes of this disease, or more properly group of diseases, for under the term Bright's disease are included various degenerations of the kidneys, are extremely varied. Infectious diseases, particularly scarlet fever, wet and cold, gout, syphilis, excessive use of alcohol, and many other causes, may bring about disease of the kidneys. Bright's disease may be acute or chronic. The former is the form commonly observed after infectious disease or exposure, and in a fair proportion of cases terminates happily. The latter is the result of more slowly acting causes, and may be accompanied by a great variety of symptoms. The first effect of degeneration of the kidney substance is alteration in the character of the urine. The presence of albumin in the urine, though by no means always indicative of Bright's disease, rarely fails to be a symptom of the disease. At the same time there may be seen by the microscope certain small "casts" or molds of the urinary tubules of the kidneys. The latter are considered absolutely indicative of the disease, whereas Albuminuria (*q. v.*) may occur in other conditions. Of the other symptoms derangement of the digestive system, headache, progressive weakness and anæmia, dimness of vision, and finally dropsy are important. In exacerbations these symptoms may become intensified, causing vomiting, diarrhœa, entire loss of vision, widespread dropsy (anasarca), and finally convulsions or coma. It is important to remember that Bright's disease as a rule is a wholly painless disease. The pains in the back and side so frequently attributed to this disease are usually muscular or rheumatic, sometimes they are expressions of disturbance or irritation of the intestines, but very rarely can they be attributed to Bright's disease. Stone in the kidney does cause such pains, but these are more acute than the dull ache spoken of, and are apt to be so severe as to lead to an early recognition of their true cause. The outlook in chronic Bright's disease is always gloomy, though many persons reach an old age totally unaware of the fact that they had the disease during many years, and others live long periods in comparative comfort after having discovered the disease. The best treatment is the hygienic, consisting of carefully regulated diet, avoiding meat and other albuminous foods as far as possible, the restriction of alcoholic drink to the minimum, moderate exercise, and careful avoidance of cold and wet. During the acute attacks medicinal treatment may be needed to compensate the improper excretion of urine. If dropsy is pronounced, active purgation or sweating may be required; if weakness and anæmia are great, iron will be found efficacious, or it may be necessary to administer other tonics. See Albuminuria.

William Pepper.

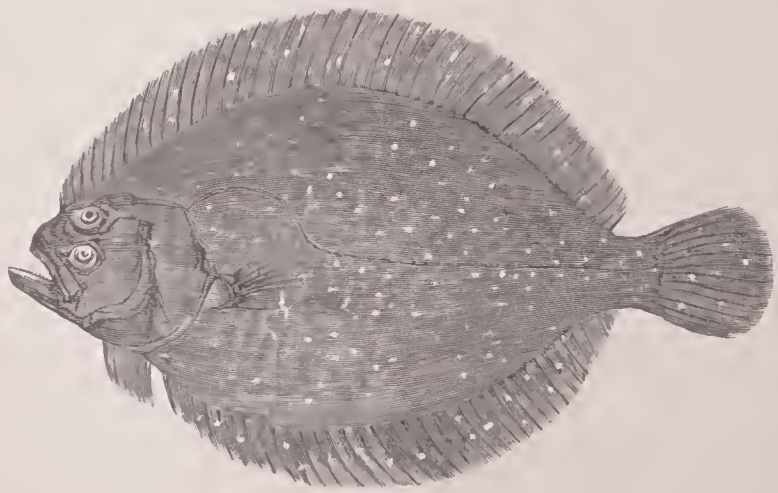
Brigitta: See Birgitta.

Brigittines, brij'it-inz, or **Order of the Saviour**: a monastic order affiliated with the Augustinians; founded by St. Bridget (or Birgitta) of Sweden in 1344. It originally included monks and nuns, who lived in the same house, but were forbidden to see each other. There are at present few if any Brigittine monks, and not many nuns. Sion House was the only English convent. Œcolampadius, the Reformer, was once a Brigittine monk.

Bri'gus: a port of entry and post-town; capital of Brigus district, Newfoundland; is about 35 miles N. W. of St. Johns. It has a small but good harbor, having over 820 cod-fishing boats and 30 trading vessels, and is visited by steamers from St. Johns. It has a convent of Sisters of Mercy and a jail. It has considerable agriculture. Pop. about 2,000.

Bril, Paul: landscape-painter; b. in Antwerp in 1556. He was a pupil of his brother Matthæus, and worked for many years in Rome, where he died Oct. 7, 1626.

Brill: a flounder (*Bothus rhombus*); found on the coasts of Europe, and esteemed as food, though inferior to the turbot which it much resembles, but from which it may be



The brill.

distinguished by its want of tubercles on the upper surface, and by the color, which is a reddish sandy brown on the upper side, varied with darker brown, and sprinkled with white pearly spots. It seldom weighs more than 8 lb.

Brimstone: a commercial and common name for Sulphur (*q. v.*).

Brindaban, brin-da-baan', or **Bindrabund** (anc. *Vrindavana*): a sacred town of British India; in Northwestern Provinces; on the river Jamna; about 40 miles N. N. W. of Agra and 7 miles from Muttra (see map of N. India, ref. 6–E). It has several temples of Krishna, one of which is a remarkably massive structure. This town is visited by multitudes of pilgrims from distant parts of India, and

their munificence is the chief support of the place. Pop. (1890) 21,467.

Brin'disi: a fortified seaport of Italy; province of Lecce; situated at the head of a bay of the Adriatic; 38 miles by rail N. N. W of Lecce; lat. of fort, 40° 39′ N., lon. 18° 1′ E. (see map of Italy, ref. 6–II). The ancient *Brundisium* was taken from the Sallentines by the Romans in 267 B. C., and was afterward the principal naval station of the Romans on the Adriatic. It had an excellent landlocked harbor, and was long one of the most important maritime cities of Italy. It was the port from which the Romans embarked on the voyage to Greece. Vergil died here in 19 B. C. The crusaders used it as their chief port of embarkation to the Holy Land. The harbor having become choked with sand, its importance greatly declined. Here is a mediæval cathedral and an ancient castle. The large steamers of the Peninsular and Oriental Company now enter this port, which has recently been improved. Since 1860 the government has dredged the harbor, so that a depth of nearly 6 fathoms has been obtained, and has constructed two breakwaters and about 3,000 feet of quay. The position of Brindisi has been rendered very advantageous for commerce by the opening of the Suez Canal. A railway extends from this town along the coast to Ancona, Milan, etc. Pop. 16,719.

Brine Shrimp. a small entomostracous crustacean of the order *Phyllopoda*; found in salt pools and salt lakes. The American species, *Artemia gracilis*, is common in many places and especially abundant in the Great Salt Lake, Lake Mono, and other salt or alkaline lakes of the Great Basin. The European species, *Artemia salina*, is of especial interest, from the fact that it is known to produce several broods parthenogenetically, and also that it has been known to vary very much in form with the degree of concentration of the brine in which it lives. DAVID S. JORDAN.

Brink, BERNHARD AEGIDIUS KONRAD TEN: philologist; b. at Amsterdam, Jan. 12, 1841. He was educated in Germany, and was Professor of Modern Languages in the University at Marburg 1870–73. In 1873 he was called to the University at Strassburg, then just reorganized, as Professor of English Philology, and he held that position till his death, Jan. 29, 1892. Ten Brink was not only a broad and accurate scholar, but a man of distinguished literary taste, and master of an attractive and elegant style. His principal work, *Geschichte der englischen Literatur* (pt. i., 1877, English translation, 1883; pt. ii., 1889–93, English translation, first half, 1893), comes down to the Reformation. Other important works are *Chaucer: Studien zur Geschichte seiner Entwicklung und zur Chronologie seiner Schriften* (1870); *Chaucers Sprache und Verkunst* (1884); *Béowulf* (1888), being No. 62 of *Quellen und Forschungen zur Sprach- und Culturgeschichte der germanischen Völker*, an important series of monographs begun in 1874, of which ten Brink was one of the founders and editors. G. L. KITTREDGE.

Brinkley: town (founded in 1874); Monroe co., Ark. (for location of county, see map of Arkansas, ref. 3–E); on Ark. Midland, Little Rock and Mem., St. Louis S. W., and Wh. and Bl. Riv. Val. R. Rs.; 68 miles from Memphis. Brinkley is situated in the fertile southern timber belt, and is the chief railroad center and manufacturing town of Eastern Arkansas; it has car-works, railroad machine and repair shops, oil-mill, two stave-factories and cooperage works, ice-factory, very large lumber-mill, water-works, electric lights, and two banks. There are seven churches and good public schools. The recent rapid growth of the town is due to the completion of the railroads centering here. Pop. (1880) 325; (1890) 1,510; (1900) 1,648. EDITOR OF "ARGUS."

Brinton, DANIEL GARRISON, M. D.: archæologist and ethnologist; b. at Thornbury, Chester co., Pa., May 13, 1837; A. B., Yale College, 1858; M. D., Jefferson Medical College, Philadelphia, 1860; studied in Paris and Heidelberg; entered the army as a surgeon, serving as medical director of the Eleventh Army-corps, and later as superintendent of hospitals at Quincy and Springfield, Ill.; edited the *Medical and Surgical Reporter* 1867–87; appointed Professor of Ethnology at the Academy of Natural Sciences in Philadelphia 1884; Professor of American Linguistics and Archæology in the University of Pennsylvania 1886; author of *The Floridian Peninsula* (1859); *The Myths of the New World* (1868); *American Hero Myths* (1882); *Essays of an Americanist* (1870); *Races and Peoples* (1890); *The American Race* (1892). *The Library of Aboriginal American Literature* (8 vols.), of which he was editor, is a reproduction of aboriginal legends, thought, and customs, as authentic material for linguistic study. He contributed largely to the study of American archæology, ethnology, and linguistics. D. in Atlantic City, N. J., July 31, 1899.

Brion, brē̆ē′ōṅ′, GUSTAVE: genre-painter, principally of Alsatian life; b. at Rothau, Alsace, Oct. 24, 1824; d. in Paris, Nov. 4, 1877. His *Pilgrims of St. Odile*, painted in 1863, is in the Louvre. He received the Legion of Honor and a first-class medal at the Salon of 1863, and the medal of honor in 1868. Knight of the Order of Leopold of Belgium. A good many of his works are in American collections. WILLIAM A. COFFIN.

Brisbane: city and seaport, and the capital of Queensland, Australia; on Brisbane river; about 20 miles from its entrance into Moreton Bay, and about 600 miles N. by E. of Sydney (see map of Australia, ref. 5–J). Wool and other products are exported from this place. It is connected by rail with Sydney, Melbourne, and Adelaide, and is in direct steamship communication with London and Liverpool. The Houses of Parliament meet in an expensive and handsome structure, and the public buildings are for the most part impressive. It is the seat of an Anglican and a Roman Catholic bishop. Settlement began here with a penal colony in 1825, which was broken up in 1839; was incorporated as a city in 1859 and made the capital of the Moreton Bay district, and subsequently of Queensland; was inundated and severely injured by a flood in the river early in Feb., 1893. Pop. (1881) 31,109; (1891) 55,959, including suburbs.

Brisbane, Sir THOMAS MACDOUGALL, G. C. B.: astronomer and general; b. in Largs, Ayrshire, Scotland, July 23, 1773; commanded a brigade in the Peninsula 1812–13; governor of New South Wales 1821–25, who improved the penal colonies and promoted the commerce of the colony. The river and town of Brisbane perpetuate his name. He catalogued 7,385 stars while in Australia, and on his return built an observatory on the Tweed; was made a baronet in 1836; succeeded Sir Walter Scott as president of the Royal Society of Edinburgh. D. in Largs, Jan. 27, 1860.

Brissot de Warville, brē̆ēs′sō′de-vaăr′vē̆ēl′, FÉLIX SATURNIN: painter of landscape and sheep (contemporary French school); b. at Sens, Yonne; d. in Paris, July, 1892. He was a pupil of Léon Cogniet, and obtained a second-class medal at the Salon of 1882. His work is notable for vigorous execution and excellent drawing of animals, especially sheep, which he particularly loved to paint.
WILLIAM A. COFFIN.

Brissot de Warville, JEAN PIERRE: French Girondist and political writer; b. near Chartres, Jan. 14, 1754. He published in 1780 a *Theory of Criminal Laws*. In 1785 he was unjustly imprisoned in the Bastile for about four months. With the aid of his friends he founded about 1788 the Society of the Friends of the Negroes, and visited the U. S. to promote the abolition of the slave-trade. After his return to France he founded and edited the *Patriote Français*, an able republican journal. In 1791 he was elected to the National Assembly by the voters of Paris. He was so prominent a leader of the Girondists that they were often called the Brissotins. Having been elected to the convention, he opposed the execution of the king. He was guillotined in Paris, Oct. 31, 1793. See Brissot's *Mémoires pour servir à l'Histoire de la Révolution*, published by his son (4 vols., 1830), and his own memoirs entitled *Legs à mes enfants* (1885).

Bris'ted, CHARLES ASTOR: son of the John mentioned below; b. in New York, Oct. 6, 1820; educated at Yale College, New Haven, and Trinity College, Cambridge; author of an edition of Catullus (1849); *Five Years in an English University* (1851; revised 1872); *The Upper Ten Thousand* (1852); *Pieces of a Broken-down Critic* (1858); *The Interference Theory of Government* (1867); *Anacreontics* (1872); and was a frequent contributor to leading periodicals. D. at Washington, D. C., Jan. 15, 1874.

Bristed, JOHN: an Episcopal clergyman; b. in Dorsetshire, England, in 1778; educated at Winchester School; removed to the U. S. in 1806; practiced law in New York; married a daughter of John Jacob Astor; studied divinity and was ordained in the Episcopal Church. He was author of *Critical and Philosophical Essays* (1804); *Resources of the United States* (1818), reprinted in London with the title *America and her Resources*, the same year; and *Anglo-American Churches* (1823). D. at Bristol, R. I., Feb. 23, 1855. Revised by W. S. PERRY.

Bristle-tail: an insect of the sub-order *Cinura*; an agile creature of low structure and without wings, found in damp rooms, and often feeding on tapestry or clothing. The long bristles at the tail suggest the name. A common species is *Lepisma saccharina*.

Bris'tol: maritime city of England; situated on the Avon at its confluence with the Frome; 8 miles from the sea; 11½ miles by rail N. W. of Bath, and 118 miles by rail W. of London: lat. 51° 27′ N., lon. 2° 35′ W. (see map of England, ref. 12–F). It is chiefly in the county of Gloucester, and partly in Somersetshire, and occupies several hills and valleys. It is the terminus of the Great Western, the Bristol and Exeter, and the Midland Railways. Bristol returns four members to Parliament. Among its remarkable buildings are the cathedral, which was founded about 1150; the fine church of St. Mary Redcliffe, which was completed in 1376; the Temple church, which has a leaning tower; the guildhall; the exchange, used as a corn-market; and the new general hospital. The modern portions of Bristol, including Clifton and other suburbs, consist of handsome residences in squares, terraces, crescents, and detached villas. This city has a public library, a bishop's college, a medical school, an infirmary, an asylum for the blind, an asylum for deaf-mutes, and other benevolent institutions. The Avon here, though narrow, is deep enough for large vessels. About £650,000 have been expended in turning this river into a new course, and its old channel now forms a harbor furnished with locks and quays 6,000 feet long. Bristol was the first British port between which and the U. S. a regular communication by steam was established. It has an extensive trade with Canada, the U. S., the West Indies, France, Russia, the shores of the Mediterranean, etc. The chief articles of export are copper, iron, brass, coal, salt, and manufactured goods. The manufactures of this city are chiefly cotton goods, refined sugar, glass, woolen goods, chemical products, machinery, and earthenware. Here are extensive ship-yards, which turn out excellent vessels. This place was called *Caer-oder* by the Britons, and *Bricstowe* or *Briestow* by the Anglo-Saxons. A fortified town existed here as early as 500 A. D. It was formerly the second commercial city in England. During the civil war it was taken alternately by Royalists and Roundheads. Pop. (1881) 206,503; (1891) 289,280; (1901) 328,836.

Bristol: town (incorporated 1785): Hartford co., Conn.; on N. E. R. R., 18 miles S. W. of Hartford (for location, see map of Connecticut, ref. 9–G); has 9 churches and 13 schools, including a high school, a free public library, a national and a savings bank, 2 stockinet factories, foundries, manufactories of brass goods, clocks, bells, hardware, steel fishing-rods, etc. The borough of Bristol (1893) has an estimated population (Jan. 1, 1896) of 6,127. It is connected with New Britain and Plainville by an electric tramway. Sewage is disposed of by irrigation system. Pop. of town (1890) 7,382; (1900) 9,643.

Bristol: town (incorporated in 1819); Grafton co., N. H. (for location of county, see map of New Hampshire, ref. 7–E); is terminus of Bristol branch of Concord Division of B. and M. R. R.; 32 miles from Concord, and is situated at the junction of Pemigewasset and Newfound rivers. Bristol has 6 schools, 3 churches, a public library, and manufactories of flannels, paper, wood-pulp, and wooden-wares. It is a place of summer resort. Pop. (1880) 1,352; (1890) 1,524; (1900) 1,600. EDITOR OF "ENTERPRISE."

Bristol: borough; Bucks co., Pa. (for location of county, see map of Pennsylvania, ref. 5–J); on railroad and on the Delaware river; 19 miles above Philadelphia, and nearly opposite Burlington, N. J. Its industries are iron-founding and manufactures of flour, machinery, worsted, and furniture. Here is a valuable mineral spring. Pop. (1880) 5,273; (1890) 6,553; (1900) 7,104.

Bristol: port of entry; capital of Bristol co., R. I. (for location of county, see map of Rhode Island, ref. 9–O); on P., W. and Bristol R. R., and on Narragansett Bay; 15 miles S. S. E. of Providence, and 7 miles S. W. of Fall River. It has a good harbor, which is easy of access, and will admit large vessels. It has two yacht-building establishments, and manufactures of cotton goods, rubber goods, worsted, etc. Bristol has 17 public schools, including a high school, 8 churches, a free library of about 12,000 volumes with brown-stone library building. The town's charter was granted in 1680. Pop. of township (1880) 6,028; (1890) 5,478; (1900) 6,901. EDITOR OF "PHŒNIX."

Bristol: city; Sullivan co., Tenn., and Washington co., Va. (for location of county, see map of Tennessee, ref. 5–K). The State division-line between Tennessee and Virginia runs E. and W. along the main street, and Bristol, Va., was formerly called Goodson. Bristol has King College for young men, Sullins College and Southwest Virginia Institute for young ladies, good public schools, 2 tobacco-factories and warehouses, 2 flouring-mills, an iron furnace, veneer-factory, cotton-factory, planing-mills, ice-factory, car-works, etc. Pop. (1880) 3,209; (1890) 3,324; (1900) 5,271. EDITOR OF "COURIER."

Bristol: town (founded in 1789); Addison co., Vt. (for location of county, see map of Vermont, ref. 5–B); is E. terminus of Bristol R. R., and 31 miles S. of Burlington; has a graded school and 7 district schools, and churches of 4 denominations. Its industries are principally farming (in which one-third of the population are engaged), and the manufacture of burial-caskets, beekeepers' supplies, and wooden mailing-boxes. Pop. (1880) 1,579; (1890) 1,828; (1900) 2,061. EDITOR OF "HERALD."

Bristol, GEORGE PRENTICE: scholar; b. at Clinton, N. Y., June 21, 1856; graduated at Hamilton College 1876; assistant Professor of Greek in Hamilton 1882–88; appointed associate Professor of Greek in Cornell University in 1888. Editor of *Selected Orations of Lysias* (1892). B. I. W.

Bristol, JOHN BUNYAN: landscape-painter; b. at Hillsdale, N. Y., Mar. 14, 1826. Studied at Hudson, N. Y., under Henry Ary, and first came into notice by the exhibition of landscapes which he had painted in Florida about 1860. National Academician 1875; honorable mention, Paris Exposition, 1889; medal of honor, Centennial Exhibition, Philadelphia, 1876, for his picture entitled *Mount Oxford*. Studio in New York. WILLIAM A. COFFIN.

Bristol, MARQUESSES OF (1826, in the United Kingdom), Earls of Bristol (1714, in Great Britain), Earls Jermyn (1826, in the United Kingdom), and Barons Hervey (1703, in England), a noble family of Great Britain.—FREDERICK WILLIAM JOHN HERVEY, the third marquess: b. June 28, 1834; succeeded his father in 1864. He was member of Parliament for West Suffolk 1859–64.

Bristol Brick, or **Bath Brick**: a variety of brick used for scouring steel table-cutlery and other polished steel surfaces. It is made at various places in England and the U. S., a peculiar fine sand being used in the manufacture.

Bristol Channel: an inlet of the Atlantic Ocean; in the southwest part of England; bounded on the N. by Wales and on the S. by Somerset and Devonshire. At the E. end it communicates with the estuary of the Severn. It is the largest inlet of Great Britain, and has a coast-line of 220 miles. The tides rise to an extraordinary height—at Bristol about 40 and at Chepstow sometimes 70 feet. The principal bays are Swansea Bay, Caermarthen Bay, Cardiff Roads, the Severn Estuary, and Barnstable Bay.

Bris'tow, BENJAMIN HELM: b. at Elkton, Todd co., Ky., in 1833; studied law, and practiced his profession successfully in Kentucky till 1861, when, on the outbreak of war, being of strong Union sentiments, he volunteered his services, and as major of the Twenty-fifth Kentucky Volunteers was engaged at Fort Donelson and as lieutenant-colonel at Shiloh, in command of the regiment, being wounded in the last-named battle. Afterward, as colonel of the Eighth Kentucky Cavalry, he served throughout the war with distinction. About the close of the war he received the appointment of U. S. district attorney for the Louisville district. The ability here exhibited led to his appointment as solicitor-general on the organization of the department of justice in 1870. After two years' service he resigned and became attorney of the Texas Pacific R. R., which position he held but a short time when he returned to the practice of his profession at Louisville, Ky.; was appointed attorney-general in 1873; and was Secretary of the Treasury in 1874–76. D. in New York, June 22, 1896.

Bristow, GEORGE FREDERICK: musician; b. in Brooklyn, N. Y., Dec. 19, 1825; studied principally under his father, an English musician and composer; became one of the earliest members of the New York Philharmonic Society; composed for this society his concert overture in E flat, op. 3, in 1846; his *Jullien* symphony, op. 24, in 1855; symphony in F sharp minor, op. 26, in 1858; overture *Columbus*, op. 34, in 1866; symphony *Arcadian*, op. 50, in 1873. His oratorio *Praise to God*, op. 32, was produced by the New York Harmonic Society in 1866. His opera *Rip Van Winkle*

was produced by the Pyne-Harrison company at Niblo's Garden, New York, in 1853, and had a long and successful run. This was rewritten to a new libretto in 1880. He was conductor of the Harmonic Society, the Mendelssohn Union, and the Centennial Choral Union; was for many years director of the music in the New York public schools. In addition to the works mentioned, he has composed an opera, *Columbus*, 1878; an oratorio, *Daniel*, 1867; a cantata, *The Great Republic*, 1862, besides much church music and many songs and piano pieces. He lives in New York city.

D. E. Hervey.

Bristow Station, now **Bristoe**: Prince William co., Va. (for location of county, see map of Virginia, ref. 4–H); on the Richmond and Danville R. R.; 4 miles W. S. W. of Manassas Junction. A severe engagement took place here the afternoon of Aug. 27, 1862, between the U. S. forces under Gen. Hooker and the Confederates under Gen. Ewell, darkness closing the conflict, with severe loss on both sides. On Oct. 14, 1863, the Confederate general A. P. Hill attacked the force under command of Gen. G. K. Warren, U. S. army, at this place; the attack was repulsed by Warren, who captured several pieces of artillery and many prisoners.

Brit: a name applied to young herrings.

Britan'nia: the ancient name of the island of Great Britain. It was inhabited by rude, uncivilized tribes of Britons (Lat. *Britanni*), who were perhaps, but not probably, the aborigines when Julius Cæsar invaded the island in 55 B. C. Their religion was a sanguinary Druidism. Many of the Britons were Cymric Celts, while those of the northern part were probably largely Gaelic. (See Briton.) They obstinately resisted the Roman invaders, but without success, and the southern half of the island was conquered by the armies of Vespasian. In the reign of Domitian, Agricola extended Roman power to Scotland, and erected a chain of forts between the friths of Clyde and Forth about 84 A. D. The northern part of the island was inhabited by the Caledonians and Picts, whom the Romans failed to subdue. These warlike barbarians made frequent inroads into the southern province, to obviate which the Romans built the wall of Antoninus about 140 A. D. Another rampart, called the Wall of Hadrian, extending from Solway Frith to the mouth of the Tyne, was completed by Severus about 210 A. D. The part of the island S. of this wall was for several centuries under the dominion of the Romans, who founded many towns (*municipia*), and diffused Roman culture, arts, and civilization in the country. They made numerous roads from London to the provinces, the remains of which are still visible. Many parts of England abound in Roman antiquities, including remains of camps, baths, mosaic pavements, weapons, ornaments, utensils, pottery, sculptures, and coins. It appears that the Romans intended to keep Britain as a permanent conquest, but in consequence of the internal disorders and external dangers that menaced the stability of the Roman empire the legions were withdrawn from the island about 420 A. D., soon after which it was invaded and conquered by the Saxons. It is said that Cæsar was the first who gave the name *Britannia* to this island, which before his time was called *Albion*. The name *Britannicæ Insulæ*, however, was applied to the British islands collectively before Cæsar invaded Albion. Britannia is usually personified in the fine arts as a woman seated on an insulated rock, leaning on a shield and holding in her hand a spear or trident. See Camden's *Britannia*.

Britannia Metal: an alloy of tin with a little antimony, zinc, and copper; largely used in the manufacture of coffee-pots, tea-pots, and other vessels. It is harder than pewter, and not so easily indented or bent. The proportions of the metals combined to make this alloy are various. The average composition in 100 parts is—tin, 85½; antimony, 10½; zinc, 3; and copper, 1. The present composition of the alloy used at Birmingham, England, is stated to be 90 of tin, 8 of antimony, 2 of copper.

Britannicus: a surname which, on account of some alleged victories in Britain, the Roman senate bestowed in 42 A. D. on the Emperor Claudius and his newly born son by Messalina, Claudius Tiberius Germanicus, and which afterward became the distinguishing appellation of the latter. In 48 Messalina was executed, and Agrippina, the second wife of Claudius, induced him to exclude Britannicus from the throne and appoint Nero, her son by her former husband, successor. After the accession of Nero, however, Agrippina used Britannicus as a means of intimidating him, and to get rid of his rival Nero poisoned him Dec. 15, 55.

British America: a name which in its widest sense comprises all British possessions in the western hemisphere. It is usually applied, however, to the territory embraced since 1873 in the Dominion of Canada and to Labrador and Newfoundland. See these headings respectively.

British Association for the Advancement of Science: a society for promoting the mutual acquaintance of scientific men, the interchange of scientific ideas, and the solidarity of the great body of scientific workers, founded in 1831 at a memorable meeting held in the city of York. With admirable prescience it was given so comprehensive an organization that only minor changes have been found necessary in subsequent years. Its annual meeting, held in the summer season, occupies a week. Each year a new meeting-place is chosen, and towns vie with one another for the privilege of entertaining the society. The proceedings consist chiefly of the announcement and discussion of results of scientific work, and for this purpose the association is divided into eight sections, meeting in separate halls. The field of Section A is mathematical and physical science; of B, chemical science; of C, geology; of D, biology; of E, geography; of F, economic science and statistics; of G, mechanical science; and of H, anthropology. The membership is about 4,600, the usual attendance about 2,000. A large income from dues yields a surplus which is devoted to the aid of special researches conducted by committees of the association. The grants for such purposes amount annually to about £1,000.

The example of Great Britain in founding this institution has been followed in Germany, France, and the U. S. See American Association for the Advancement of Science.

G. K. Gilbert.

British Columbia: a province of the Dominion of Canada; bounded S. by the U. S. (Washington, Idaho, and Montana), N. by Northwest Territory, E. by Athabasca and Alberta, and W. by the Pacific Ocean and Alaska. The northern boundary is the parallel of 60° N. It includes the important islands of Queen Charlotte (*q. v.*) and Vancouver (which last was, in 1849, made a crown colony, and in 1866 united to the present province, *q. v.*). British Columbia was united to Canada in 1871. The soil of portions of the province near the sea is good, and the climate mild, though rainy; but in the interior the surface is extremely rugged, and the climate is severe. The coast-line is characterized by remarkable fiords, called "canals," which are often walled in by mountains of moderate elevation known as the Cascade Range. The same feature is seen to an unusual degree in the lakes of the province. These are generally very long and narrow, lying between parallel ranges of mountains. The highest peaks in the Rocky Mountains of this province are Mt. Brown (about 16,000 feet) and Mt. Hooker (about 15,700 feet). Furs are largely exported. There is much valuable timber, and the fisheries have become important. Cod, haddock, herring, halibut, trout, sturgeon, anchovies, and especially salmon, abound. There is much fine grazing-land. Large amounts of gold have been obtained here, and silver, copper, zinc, mercury, coal, iron, and marble are found. Manufactures in 1891 embraced 755 establishments, $14,342,149 invested capital, 11,473 employees, and a production valued at $11,916,928. Education is compulsory. Religiously, the inhabitants in 1891 were divided into Anglicans 23,600, Roman Catholics 20,367, Presbyterians 15,281, Methodists 14,298, pagans (chiefly Indians and Chinese) 12,691, and of all other denominations 11,376. Area, 382,300 sq. miles. Capital, Victoria. The principal towns are Victoria and Nanaimo, on Vancouver Island, and Vancouver and New Westminster, on the mainland at the terminus of the C. P. R. R. Total pop. (1891) 97,612, of whom 42·4 per cent. were of foreign birth, though chiefly from Great Britain and the U. S., including about 25,000 Indians and 6,000 Chinese. The best harbor is at Esquimault. British Columbia has an Anglican bishop, whose seat is at New Westminster.

Certain islands in the Strait of Juan de Fuca, having been claimed by both the U. S. and Great Britain, were held under joint military occupation until Oct., 1872, when, by a decision of the Emperor William I. of Germany, to whom the dispute was referred, they became U. S. territory. These islands, of which San Juan is the most important,

are ten in number. Their entire population, now embraced in the county of San Juan, in 1880 was 948; (1890) 2,072; (1900) 2,928. Revised by M. W. Harrington.

British East Africa: See Ibea.

British Empire: See Great Britain and Ireland.

British Guiana: See Guiana.

British Gum: See Dextrin.

British Honduras: See Honduras, British.

British India: See India.

British Museum: in London; was established in 1753 by act of Parliament in pursuance of a bequest of Sir Hans Sloane to the nation of his cabinets of natural history and his library, numbering 50,000 volumes, in return for a sum of £20,000 to be paid to his heirs, and was opened in 1759. The palace of the Duke of Montague on Great Russell Street was purchased for the reception of the collection. In 1801 the Elgin marbles, in 1823 the library of George III., containing 80,000 volumes, were added to the museum, and it has been subsequently enriched by the Granville library, the Sir William Temple coin cabinets, the Layard and Loftus collection of Assyrian, and the Lady Webster collection of Mexican, antiquities, and other extensive accessions. The building in 1823–47 was enlarged and renovated at a cost of £150,000, and an additional wing was built in 1883 with the funds left by Mr. William White. The library numbers 1,600,000 volumes, besides many thousands of MSS., documents, and state papers. The collections of antiquities are altogether the completest in Europe. The museum contains also the finest collection of vases, among them the famous Portland vase, and the largest collections of Greek and Roman sculpture in the world, and the cabinets of natural objects embrace every province of science. A catalogue is now being printed, but will not be finished until 1900.

British New Guinea: See New Guinea.

British North Borneo: See Borneo.

Briton: a native or citizen of ancient Britain or Britannia (*q. v.*). When Cæsar invaded Albion in 55 B. C., he found in it two different peoples. The interior was occupied by the primitive or indigenous Celtic inhabitants, who had been driven back from the coasts by a people of probable Gothic descent. The latter had colonized the southeast part of the island, and were less numerous than the Celtic Britons. The language of the Southern Celtic Britons was very similar to the present Welsh. "The Gaels and Britons," says R. G. Latham, "are the fundamental populations of the British isles. The Picts were either aboriginal or intrusive. If aboriginal, they were like the Gaels and Britons, Keltic." (See Picts.) When Cæsar invaded the island, the Britons were divided into a number of petty kingdoms or states. Some of these were called *Silures*, *Brigantes*, *Ordovices*, *Trinobantes*, and *Cantii*. Their religion was Druidism. (See Druids.) The primitive Britons were brave and warlike, but, in consequence of their divisions, they were conquered by the Romans without much difficulty. They were rude barbarians, who painted their bodies blue. The term Briton is often applied to a modern inhabitant of Great Britain.

Brittany: See Bretagne.

Brittle-star: a starfish of the order *Ophiuroidea*, called also serpent-star. The brittle-stars possess a distinctly outlined central disk, in which is the stomach. The arms, usually five in number, spring abruptly from the disk. The ambulacral groove is covered by a series of plates, causing the ambulacral feet to extend from the sides of the arms. The arms are cylindrical and flexible, and do not contain any appendages of the stomach, as do those of true starfishes. The arms are unbranched in all but the family *Astrophytidæ*, to which the basket-fish and Gorgon's-head belong. There are about 500 species of brittle-stars, certain ones being very common on most coasts.

David S. Jordan.

Britton, Nathaniel Lord, E. M., Ph. D.: botanist; b. on Staten Island, N. Y., Jan. 15, 1859; graduated from Columbia College, in which he is now Professor of Botany. As botanist of the State geological survey he published a *Catalogue of the Plants Found in New Jersey* (1889). He is editor of the *Bulletin of the Torrey Botanical Club*. He has published technical papers on certain genera of sedges, *Cyperus*, *Scleria*, and *Eleocharis*, South American plants, Arizona plants, etc. Charles E. Bessey.

Brive, or **Brives-la-Gaillarde**, breev'laă-gă'yaard': a town of France; department of Corrèze; situated in a rich plain on the river Corrèze; 44 miles by rail E. of Périgueux (see map of France, ref. 7–E). It has manufactures of muslins, woolen stuffs, silk handkerchiefs, etc.; also a college and public library. Pop. (1896) 18,111.

Brix: See Brüx.

Broach (sometimes written *Baroa'ch*): a district and city in the North Division of Bombay, British India. The district is on the east side of the Gulf of Cambay, and S. of the river Mahi. Area, 1,453 sq. miles, consisting chiefly of the alluvial plain at the mouth of the river Nerbudda. The land is rich and highly cultivated, and though without forests is not destitute of trees. Agriculture is the almost exclusive industry. Pop. 327,000, about three-fourths Hindus. The chief town is Broach, situated on an elevated mound, supposed to be artificial, on the right-hand bank of the Nerbudda, 30 miles from its mouth. It has a considerable trade, and exports annually large quantities of raw cotton. It is probably the *Barygaza* of Ptolemy and Arrian. It first came into British possession in 1772. Pop. 38,000. It has two steam cotton-gins. It has also a Brahminical hospital for sick and disabled animals; even insects are received. On an island near Broach is the largest banyan-tree in India. It is said to have once sheltered an army of 7,000 men. M. W. Harrington.

Broad Arrow: a government mark used as a means of identification upon British Government stores of every description, and so called as being likened to the head of a broad arrow. It is a felony to obliterate or deface this mark; and the unlawful placing of it upon goods involves a penalty of £200 and the forfeiture of the goods. The mark is supposed to be of Celtic origin, and by some identified with a Druidical letter typical of superiority in rank, authority, or holiness, and also believed to have stood for king or prince. It was used as the cognizanee of Henry Viscount Sydney, Earl of Romney, Master-General of Ordnance from 1693 to 1702, and was first used as a government mark in his time.

Broad Mountain: a high ridge in the anthraeite-coal region of Pennsylvania, in Carbon and Schuylkill Counties. It has an altitude of about 2,000 feet above the sea, and is nearly 50 miles long. Its direction is nearly N. E. and S. W. The Mine Hill R. R. crosses this mountain.

Broad River: a river of the U. S., rising at the foot of the Blue Ridge, in the western part of North Carolina. Having entered South Carolina, it flows in a S. S. E. direction through fertile uplands, and unites with the Saluda at Columbia to form the Congaree river. Total length estimated at 150 miles.

Broad Top Mountain: a mountain of Pennsylvania; in the northeast part of Bedford County, and the south part of Huntingdon County. It rises about 2,500 feet above the level of the sea. Here are extensive beds of bituminous coal, for the transportation of which a railroad has been opened from this mountain to Huntingdon.

Broad'us, John Albert, D. D., LL. D.: Baptist educator and author; b. in Culpeper co., Va., Jan. 24, 1827; educated at the University of Virginia; assistant instructor at the University of Virginia; chaplain of the University of Virginia; pastor of churches in Charlottesville, South Carolina, and Kentucky. In 1859 he became professor in the Southern Baptist Theological Seminary, and upon the death of Dr. Boyce was chosen to be president of that institution. D. in Louisville, Ky., Mar. 16, 1895. He published *Preparation and Delivery of Sermons* (Philadelphia, 1870; 23d ed. 1898); *Lectures on Preaching* (New York, 1876); *Commentary on Matthew* (Philadelphia, 1886); *Sermons and Addresses* (1886); and *Jesus of Nazareth* (New York, 1890).

Broca, brō'kaa', Paul: French surgeon and anthropologist; b. at St. Foy-la-Grande, Gironde, June 28, 1824; Professor of Surgical Pathology at Paris; founded the Paris Anthropological Society; Legion of Honor 1868; president International Congress of Anthropology at Paris. 1878; since 1872 published the *Revue d'Anthropologie*. Among his voluminous works are *Sur l'Anesthésie Chirurgicale Hypnotique* (1859); *Études sur les Animaux Ressuscitants* (1860); *Traité des Tumeurs* (1865–69); *Mémoires sur les Caractères physiques de l'Homme Préhistorique* (1869); *L'Anatomie comparée de l'Homme et des Primates* (1869); *Mémoires d'Anthropologie* (1871–88); and *Correspondance* (1886). D. in Paris, July 9, 1880.

Brocade [Span. *brocado*: Ital. *broccata*, embossed material; deriv. of Ital. *brocca*, boss, stud; cf. Eng. *brooch*]: a silk fabric variegated with gold and silver threads, or a silk fabric on which figures of flowers, foliage, or other objects are formed by the threads of the warp and woof being raised by the Jacquard loom or other means. Brocade bears nearly the same relation to silk textures as damask to linen fabrics.

Broca's Convolution: See SPEECH.

Brock, Sir ISAAC: British soldier; b. in the island of Guernsey, Oct. 6, 1769; entered the army and rose by services in the West Indies, Holland, and Denmark to the command of a regiment, which was ordered to Canada in 1802. Here in 1803 he suppressed a threatening mutiny; in 1810 was made Lieutenant-Governor of Upper Canada; and in 1812 captured Detroit from Gen. Hull. He was killed in the battle of Queenstown, Oct. 13, 1812. He was then a major-general. Parliament pensioned his family, and monuments were erected to him in St. Paul's, London, and on Queenstown Heights, which are still standing. His name is perpetuated in that of Brockville, Ontario.

Brocken, The, or **Blocksberg** (anc. *Mons Bructerus*): a mountain of Prussia; province of Saxony; 20 miles W. S. W. of Halberstadt; the highest summit of the Hartz Mountains, and 3,740 feet above the level of the sea. It is cultivated nearly to the top, which commands a fine view in clear weather. The Brocken is the cradle of many popular superstitions. It is, according to an ancient belief, the scene of the annual dance of the witches on Walpurgis night (May 1). This superstition in all probability owes its origin to the phenomenon known as "The Specter of the Brocken," seen here and elsewhere, which is simply the shadow of a man or other object on the fog, best seen at sunrise. The apparent enlargement of the figure is an illusion, and the shadow can be seen only by the one who makes it or some one very close to him.

Brockes, brok'es, BARTHOLD HEINRICH: German poet; b. in Hamburg, Sept. 22, 1680. He was the first poet who turned away from the conventional classicism and dry learning of German poetry during the latter part of the seventeenth century, and who urged, especially in his *Irdisches Vergnügen in Gott* (Hamburg, 1721), a more thorough study and contemplation of nature. D. in Hamburg, Jan. 16, 1747. See Alois Brandl, *B. H. Brockes* (Innsbruck, 1878).

JULIUS GOEBEL.

Brock'ett, LINUS PIERPONT: historical and miscellaneous writer; b. at Canton, Conn., Oct. 16, 1820. He published among other works, a *History of Education* (1859); *History of the Civil War* (1866); *Men of Our Day* (1868); *The Year of Battles* (1871); and *Epidemic and Contagious Diseases* (1873). D. in Brooklyn, Jan. 13, 1893.

Brock'haus, FRIEDRICH ARNOLD: German publisher; b. at Dortmund, May 4, 1772. He was the founder of the firm of Brockhaus in Leipzig, and published six editions of the *Conversations-Lexikon*. He was distinguished for his literary culture, enterprise, and patriotism. He became a citizen of Leipzig in 1817. D. Aug. 20, 1823.—HEINRICH: son of the preceding; b. in Amsterdam, Feb. 4, 1804. He succeeded his father as proprietor of the publishing-house, and published new editions of the *Conversations-Lexikon*. D. in Leipzig, Nov. 15, 1874.—HERMANN: the brother of Heinrich; b. in Amsterdam, Jan. 28, 1806; was educated at Leipzig, Göttingen, and Bonn. He lived for a time in France and England; became professor at Jena in 1839, and at Leipzig in 1841, where in 1848 he was made Professor of Sanskrit Speech and Language, and there he died, Jan. 5, 1877. Among his publications are editions of the *Zendavesta* and the *Vendidâd Sâde*, in Latin (Leipzig, 1850); of the *Kathâ-Sarit-Sâgara*, or collection of fables of Somadeva Bhatta (2d ed. Leipzig, 1866); of the Persian compilation, *The Books of the Seven Wise Masters* (1845); and of a critical edition of the *Songs of Hafis* (1854–60).—HEINRICH EDUARD: b. in Leipzig, Aug. 7, 1829; son of Heinrich; educated at Leipzig, Heidelberg, and Berlin; a member of the Reichstag 1871–78; succeeded his father in 1874 at the head of the publishing-house.—His brother HEINRICH RUDOLF: b. in Leipzig, July 16, 1838; brought up to his father's business; became Eduard's partner. This firm has had in hand since its commencement in 1818 the publication of the enormous *German Encyclopædia of Learning and Art*, of Ersch and Gruber, which in 1888 had reached 168 volumes and was still incomplete.

Brockport: village; Monroe co., N. Y. (for location of county, see map of New York, ref. 4–D); on the N. Y. Cent. R. R., and on the Erie Canal; 17 miles W. of Rochester; is in the heart of a wealthy and populous farming country. Brockport has electric lights, water-works, eight churches, a State normal school, mower and reaper works, flour-mills, shoe-factory, and other manufactories. The manufacture of reapers began here in 1846, and subsequently the first reapers with circular platform and sweep-rake were constructed here. Pop. (1870) 2,817; (1880) 1,971; (1890) 3,742; (1900) 3,398.

EDITOR OF "REPUBLIC."

Brockton: city (formerly North Bridgewater, incorporated in 1874); Plymouth co., Mass.; on the N. Y., N. H. and Hart. Railroad; 20 miles S. of Boston (for location, see map of Massachusetts, ref. 4–J). It is one of the first cities in the county for wealth and population, and is an important trading-center. The manufacture of boots and shoes is the principal industry, there being invested in the various branches of this industry a capital of over $6,500,000, according to the U. S. census report for 1890; furniture, carriages, needles and shoe-tools, paper boxes, candy, etc., are also manufactured. It has a public library. Pop. (1880) 13,608; (1890), 27,294; (1900) 40,063.

EDITOR OF "ENTERPRISE."

Brock'ville: a port of entry of Ontario, Canada; capital of the county of Leeds; on the St. Lawrence river and the Grand Trunk Railway; 125 miles by railway S. W. of Montreal, and 75 miles by railway S. of Ottawa (see map of Ontario, ref. 3–H). Hardware, chemicals, white lead, gloves, farming tools, steam-engines, and machinery are manufactured here. It is the southern terminus of the Brockville and Ottawa Railway. Pop. of district, 13,000.

Brockway, HOWARD: See the Appendix.

Brockway, ZEBULON REED: penologist; b. in Lyme, New London co., Conn., Apr. 28, 1827; clerk Connecticut State-prison 1849–50; assistant superintendent, Albany, 1854–61, under Pillsbury; opened Detroit House of Correction and conducted it 1861–73; organized and since 1876 controlled Elmira penitentiary, New York; founder in the U. S. of indeterminate sentence and penal-reform methods; has written much for the magazines on penological questions, and is author of numerous papers in the *Proceedings* of the National Prison Association of the U. S.

Broderick, DAVID COLBRETH: U. S. Senator from California; b. in Washington, D. C., Feb. 4, 1820; educated in New York city; apprenticed to a stone-cutter; defeated as candidate for Congress in 1846; removed to California in 1849; served as U. S. Senator from California from 1857 to his death; fought a duel with Judge D. S. Terry, of the State Supreme Court, and was killed, near Lake Merced, Sept. 16, 1859.

Brod'head: Green co., Wis. (for location of county, see map of Wisconsin, ref. 7–D); beautifully situated on railroad and on Sugar river; 90 miles W. of Milwaukee; has a large graded school, a foundry, machine-shops, wagon and carriage factories, large flouring-mills, etc., and an extensive trade. The surrounding country is exceedingly fertile. Pop (1880) 1,254; (1890) 1,461; (1900) 1,584.

Brodhead, JOHN ROMEYN, LL. D.: historian; son of Rev. Dr. Jacob Brodhead; b. in Philadelphia, Jan. 2, 1814; graduated at Rutgers College in 1831, and was admitted to the bar in New York city in 1835. After two years he began to devote himself to the study of American history. In 1839 he went to Holland as secretary of the U. S. legation at The Hague. In 1841 he was appointed by Gov. Seward to search out and copy documents relating to the early history of New York. When he returned in 1844 he brought with him more than 5,000 separate documents, which led Mr. Bancroft to say that "the ship in which he returned was more richly freighted with new materials for American history than any that had ever crossed the Atlantic." These documents were afterward published in eleven quarto volumes. From 1846 to 1849 he was secretary of legation under Mr. Bancroft in London. From 1853 to 1857 he was naval officer of the port of New York. Years of patient labor were bestowed upon his *History of the State of New York*, the first volume of which appeared in 1853, and the second in 1871. D. in New York city, May 6, 1873.

Bro'die, Sir BENJAMIN COLLINS, D. C. L., F. R. S.: surgeon; b. in Wiltshire, England, June 9, 1783; became in 1832 surgeon to William IV.; was created a baronet in 1834. Among his works are *Lectures on Local Nervous Affections* (1837) and *Psychological Inquiries as to the Mental Faculties* (1854). He received the Copley medal of the Royal So-

ciety in 1811 for his contributions to physiology. D. near London, Oct. 21, 1862. See his *Autobiography* (1865).

Brod'rick, Hon. George Charles, D. C. L.: edncator; b. in Norfolk, England, May 5, 1831; educated at Eton, at Oxford, and at University of London; called to the bar 1859; member of school board for London 1877; member of governing body of Eton College; warden of Merton College 1881; has published *Political Studies* (1880); *English Land and English Landlords* (1881); *Memorials of Merton College*; and a *History of the University of Oxford*.

Brodsky, Adolph: See the Appendix.

Bro'dy (formerly called **Lubicz**): a trading-town of Austria, in Galicia; near the Russian frontier; 50 miles E. N. E. of Lemberg (see map of Austria-Hungary, ref. 3–L). It has an imperial chamber, a theater, and a castle; also manufactures of linen and leather. The majority of its inhabitants are Jews. Pop. (1890) 17,475.

Broglie, brō'yee', Achille Léonce Victor Charles, Duc de: statesman; b. in Paris, Nov. 28, 1785. He married in 1816 the daughter of Madame de Staël. He was a friend of Guizot, and co-operated with him as a leader of the party called Doctrinaires. He was Minister of Foreign Affairs from Oct., 1832, to Apr., 1834. In 1849 he was a conservative member of the Legislative Assembly. He was elected to the Academy in 1856. D. in Paris, Jan. 25, 1870.

Broglie, Jacques Victor Albert, Duc de: statesman and author; b. in Paris, June 13, 1821. Having kept aloof from public life during the second empire, he was appointed minister to London by M. Thiers in Feb., 1871; became Minister of Foreign Affairs in the MacMahon administration in 1873–74; Minister of Justice in 1877, but his exertions in behalf of the constitutional monarchy ended with the downfall of MacMahon. His principal works are *l'Église et l'Empire romain au quatrième Siècle* (1856, 6 vols.); *La Souveraineté Pontificale et la Liberté* (1861); *Frédéric II. et Marie Thérèse* (1882); *Frédéric II. et Louis XV.* (1885); *Marie Thérèse impératrice* (1887); *Maurice de Saxe et le Marquis d'Argenson* (2 vols., 1891).

Broiling: the process of cooking meat or fish by the direct action of heat over or in front of a clear fire. The food to be cooked is placed upon a gridiron. By this method the albumen on the outside of the food becomes coagulated at the outset, and forms a crust which prevents the juices flowing out.

Broken Bones: See Fracture.

Broken Bow: city; capital of Custer co., Neb. (for location of county, see map of Nebraska, ref. 10–F); is situated in a stock-raising and agricultural region. Pop. (1885) 212; (1890) 1,647; (1900) 1,375.

Broken Breast: a condition occurring in abscess of the breast. See Breast, Abscess of.

Broken Wind: a disease of the horse, the nature of which is not well understood, though it is characterized by difficulty in the act of expiration, the horse making a spasmodic effort to expel the air from the lungs. The symptoms are best observed when the horse is exercised, the breathing becoming labored, the nostrils dilated, the eyes bloodshot, showing imperfect purification of blood in the lungs. A broken-winded horse has a bad hollow cough. When the animal is oppressed by work, the pulse is exeessively rapid and the heart beats energetically. From this circumstance it is regarded by some as a disease of the heart. Low-bred horses are especially liable to broken wind if fed on innutritious and bulky food, and at the same time kept at hard work. The treatment is unsatisfactory, and we can only hope for palliation by keeping the alimentary canal in order, administering occasional purgatives, and feeding on a proper quantity of the best oats, which should always be bruised; also allowing the best hay in spare quantities—10 to 12 lb. daily. The hay should be cut and wet. Fresh grass in its season is the proper food. Dusty hay and dry meal as food should especially be avoided.

Broker [from O. Fr. *brokeor*, *brocheor*, tapster, wine-retailer; deriv. of vb. *brochier*, tap, Eng. *broach*]: in general, a species of agent employed to act as a middleman or negotiator between distinct parties, such as buyer or seller, though this statement would not include a pawnbroker. He differs from a factor, since he does not have possession of the property with which he deals. He is in a certain sense the agent for both parties, though primarily of the party by whom he is employed. Accordingly, until he closes the negotiation he is the agent of the party who employs him. If he were employed to buy, he could not sell his own goods, but must buy of a third person, even though his engagement be gratuitous. Regularly, a broker discloses his agency on the face of the transaction; should he fail to do so, he would, by the general principles of the law of agency, make himself personally liable. When he has closed the negotiation, he usually gives to either party a memorandum of the transaction, and in the case of the sale of goods gives a "bought-and-sold note." For the purpose of complying with the rule of law requiring in certain sales a written memorandum, he is the agent of both parties. A broker is to be distinguished from an auctioneer; a broker may both sell and buy—an auctioneer only sells. A broker buys and sells at private sale—an auctioneer only sells at public sale. His compensation is usually derived from commissions upon the transaction, termed "brokerage." The commission is earned when the negotiation is completed. The real inquiry in such a case is, Did the broker's services result in bringing the buyer and seller together? If that be the case, he will be entitled to his commissions, though the contract, from subsequent causes, was not in fact carried out. On the other hand, if the negotiation failed at the time, and the parties were subsequently brought together by other means, his commissions would not be payable.

In the large cities brokers form a distinct class of persons, devoting themselves to special departments of agency, such as insurance-brokers, stock-brokers, real-estate brokers, produce-brokers, and the like. A person may, however, act as a broker in a single transaction without following the business, and will be governed in the main by the rules already stated. See Agent. T. W. Dwight.

Bro'mal: $C_2HBr_3O = C_2Br_3O.H$; a compound analogous to chloral, produced by the action of bromide on alcohol.

Bromberg, brom'bārch (Polish *Bydgoszcz*): a town of Prussia; province of Posen; on the river Brahe; about 6 miles from its junction with the Vistula, and 65 miles N. E. of Posen (see map of German Empire, ref. 3–I). It is on the railway from Berlin to Dantzig, and on the Bromberg Canal, which connects the Vistula with the Oder. It has a normal school and a gymnasium; also manufactures of linen and woolen fabrics, tobacco, Prussian blue, etc. Here are several distilleries, potteries, and breweries. Pop. (1885) 36,269; (1890) 41,451.

Brome, Richard: English dramatist; at first a servant of Ben Jonson; wrote twenty-four popular plays, fifteen being comedies. The best are *The Northern Lass* and *The Jovial Crew*. His dramatic works were reprinted in 1873. D. about 1652.

Brome-grass: a grass of the genus *Bromus*, which comprises numerous species, natives of both hemispheres. The *Bromus mollis* grows well on poor soils, and is readily eaten by cattle, but is not much esteemed by farmers. The tall brome grass (*Bromus giganteus*), a native of Europe, grows nearly 5 feet high, and affords a large bulk of foliage, not much relished by cattle. The *Bromus secalinus*, commonly called chess or cheat, is a troublesome weed which infests grain-fields both in Europe and the U. S. In the latter it is a naturalized exotic. It resembles rye (*secale*) when it is young, hence the specific name *secalinus*. The seeds retain their power of germinating for years. This weed is so common in wheat-fields that many farmers believe that wheat will turn into chess. *Bromus brizæformis* is grown in gardens for use in dry bouquets.

Brome'lia: a genus of plants of the family *Bromeliaceæ*; named after the Swedish botanist Bromel; natives of tropical America, though many have naturalized themselves in Asia and Africa. The fruit is succulent, and the leaves have spiny serratures on the margins. The genus comprises a number of species, the fibers of which are used for cordage, ropes, nets, etc. Among them are *Bromelia pigna*, which abounds in the Philippine islands, and is cultivated for its fiber by the Chinese; and the *Bromelia pinguis* of the West Indies, from the fruit of which a vinous liquor is prepared.

Bromelia Family (*Bromeliaceæ*): monocotyledonous plants, natives of tropical climates. They have six stamens and a single style, with a three-celled ovary. The leaves are hard, rigid, channeled, and often spiny. Some of the species have beautiful flowers. The order comprises more than 350 species, among which are the pineapple (*Ananas sativus*) and the *Tillandsia usneoides*, which is called Spanish moss

or old man's beard. It grows in the Southern U. S. on forest trees, from the branches of which it hangs down in long gray threads. The fiber of this is used to stuff mattresses. Many of the species are epiphytic, growing on trees, and are capable of vegetating for a long time without contact with the earth, and will flower if suspended in the air after being severed from their roots. The leaves of some are so formed as to retain near their base a quantity of water, and thus supply travelers with refreshment. Many plants of this order afford valuable fibers, which are used in making cordage, cloth, etc. The fiber of the leaves of *Ananas sativus* has been made into a fabric resembling white muslin.

Bromidrosis: See Skin Diseases.

Bro'mine, or **Bro'mium** [from Gr. *βρῶμος*, foul odor]: a chemical element discovered in 1826 by Balard. Its chemical symbol is Br, and atomic weight 80. It resembles chlorine in chemical habitudes, and exists in minute quantity in sea-water and the ashes of marine plants. It is also found in many mineral springs, especially those of Kissingen, Kreuznach, and Arnstadt (13·6 grains per imperial gallon), in Germany, Tenbury in Worcestershire (12½ grains), Saratoga and Ballston, N. Y., and in many brines, especially those of Pennsylvania and West Virginia, and in the waters of the Dead Sea (121 grains). Bromine also occurs as a bromide of silver in the mines of Chili and other countries. It is usually extracted from the mother-liquors or bitterns of brines, or from the purification of rock salt and chloride of potassium by the agency of chlorine or of binoxide of manganese and sulphuric acid. Formerly, most of the bromine was obtained at Schönebeck, Prussia; since the discovery of the Stassfurt deposits larger quantities (260 tons per annum) have been made there. In the U. S. much bromine is made at Tarentum, Sligo, and Natrona, Pa., at Pomeroy, O., Pittsburg, Pa., Syracuse, N. Y., and Kanawha, West Va.; also in Michigan. The total product of the U. S. was estimated at 388,000 lb. for 1890. To obviate the danger attending the transportation of bromine, much of the bromine of Stassfurt is shipped as ethyl bromide, from which it is easily set free.

Bromine is a dark reddish-brown liquid, having a powerful suffocating odor and emitting heavy red fumes. Its specific gravity is 2·976; it boils at 145·4° F., and freezes at 19·4°. It is very poisonous; is soluble in alcohol and ether, slightly so in water. It combines readily with metals; forms hydrobromic acid (HBr) with hydrogen, and with oxygen bromic acid ($HBrO_3$) and hypobromous acid (HBrO), all of which are analogous in their properties to the corresponding compounds of chlorine. Bromine possesses bleaching and disinfecting properties. It is used to a limited extent as a disinfectant, but its most important application is for the manufacture of bromide of potassium (KBr), which is used in medicine and in photography. Bromide of ammonium, cadmium, etc., are also prepared for the latter purpose. Bromine is also used extensively in the manufacture of aniline dyes.

Revised by Ira Remsen.

Bro'moform (or *tribrom-methane*, $CHBr_3$): a compound analogous to chloroform and iodoform. It is a heavy, volatile liquid.

Bromsgrove: a market-town of Worcestershire, England; 16 miles by rail S. W. of Birmingham; in a richly wooded valley; on the Birmingham and Bristol Railway (see map of England, ref. 10–G). It has a fine old church, and a grammar school founded by Edward VI.; also manufactures of buttons and nails. Pop. (1891) 7,934.

Bronchi, brong'kī [pl. of Lat. *bronchus*, from Gr. *βρόγχος*, windpipe]: the divisions of the trachea or windpipe through which the air is conveyed into the lungs. The trachea divides into a right and left bronchus similar in structure to itself. The right is the shorter of the two and is rather larger in caliber than the other. Within the lung the bronchi divide and subdivide, forming minute tubes. These are lined with epithelium of ciliated type, and their walls are composed of fibro-muscular tissue strengthened with rings or plates of cartilage. The terminal bronchi divide into bronchioles, which again open into the alveoli or respiratory part of the lungs.

W. P.

Bronchi'tis [from Gr. *βρόγχος*, trachea + suffix *-itis* (Gr. *-ῖτις*)]: a diseased condition characterized by inflammation or hyperæmia (congestion) of the mucous membrane lining the air-passages, and usually accompanied by a more or less excessive secretion of mucus from that membrane. Young children, old people, and those who are feeble or ill-nourished are especially liable to it. More or less bronchitis is usually associated with pulmonary consumption, with obstructive heart disease, and with asthma. It is often seen in patients with intermittent fever, typhoid, measles, and smallpox. Perhaps the most fruitful cause is exposure to sudden and extreme changes of the weather, leading primarily to that form of acute bronchitis which is known as a "cold on the lungs." Influenza is an epidemic bronchitis, the cause of which is undecided, but is probably some unknown influence existing in the air.

The symptoms of bronchitis are of various character, varying according as the disease is seated in the larger or the smaller bronchi; the disease is also much more formidable in young children and in aged persons than in others. There is especial danger in the case of infants that collapse of small portions of the lung may ensue. Bronchitis may be either chronic or acute. Uncomplicated chronic bronchitis may require the use of sedatives or tonics, with systematic exercise and careful attention to the other hygienic conditions, but the treatment of individual cases will vary with the circumstances and special condition of the patient. The inhalation of medicated vapors and atomized liquids is especially recommended in some cases. Acute bronchitis is in general to be treated by expectorants or emetics, to remove the secretion, and by diaphoretics and counter-irritants, such as mustard, on the extremities and the chest, to relieve the congested blood-vessels of the bronchi. When the case is extreme and suffocation threatened, an infant may be often relieved by a warm bath. There are other special remedial measures which may be resorted to under the advice of the physician.

The diagnosis of bronchitis may be somewhat obscure, but to the practitioner the stethoscope reveals the extent and character of the disease by signs which to the untrained observer might appear insignificant. It may be observed that, except in children and old persons, the great proportion of cases of acute bronchitis recover spontaneously.

Bronchocele, brong'kō-sēēl: See Goitre.

Bröndsted, brön'sted, Peter Oluf: b. at Fruering, Nov. 17, 1780; studied at the University of Copenhagen, then in Paris 1806–08; undertook extensive explorations in Greece and Asia Minor from 1810 to 1813. In the latter year he was made Professor of Philology in Copenhagen, but went in 1819 to Rome, and resided there till 1823, visiting Southern Italy, Sicily, the Ionian islands, and Malta. He spent some time in England and in Paris, 1828–32. Returning to Copenhagen in 1832 as director of the royal numismatical collections and Professor of Archæology, he died there June 26, 1842. His principal work is *Voyages dans la Grèce, accompagnés de recherches archéologiques et suivis d'un aperçu sur toutes les entreprises scientifiques qui ont eu lieu en Grèce depuis Pausanias jusqu'à nos jours* (Paris, 1826–30, 2 parts). He also wrote *Bidrag til den danske Historie af udenlandske Manuscriptsamlinger* (1817–18); *Description of Thirty-two Ancient Greek Painted Vases* (1832); *The Bronzes of Siris* (1836); and finally published a very fine Danish translation of Æschylus's *Agamemnon* (1842), leaving in MS. a version (published 1844) of the rest of the trilogy.

Revised by G. L. Kittredge.

Brongniart, brōñ'ñi-aar', Alexandre: savant: b. in Paris, Feb. 5, 1770. He became in 1800 director of the porcelain manufactory at Sèvres. In 1815 he was admitted into the Institute. He wrote, besides other works, an *Elementary Treatise on Mineralogy* (1807) and a *Treatise on the Art of Pottery* (1845). He classified reptiles, to the divisions of which he gave the names of Saurians, Batrachians, Chelonians, and Ophidians, and laid the foundations of a systematic study of Trilobites. D. in Paris, Oct. 7, 1847.

Bron'te: a town of Sicily; in the province of Catania; near the west base of Mt. Etna; 28 miles N. N. W. of Catania (see map of Italy, ref. 9–F). It has manufactures of paper and woolen goods. Pop. 17,395.

Bron'të, Anne: sister of Charlotte Brontë; b. at Haworth, Yorkshire, England, Mar. 25, 1820; wrote, under the pen-name *Acton Bell*, two novels, *Agnes Grey* (1847) and *The Tenant of Wildfell Hall* (1848), besides a number of poems. D. in Scarborough, May 28, 1849.

Henry A. Beers.

Brontë, Charlotte (*Currer Bell*): novelist; b. at Thornton, in Yorkshire, Apr. 21, 1816. Her eccentric father, Patrick Brontë, originally *Prunty*, became curate of Haworth,

Yorkshire, in 1820. She lost her mother in 1821, and was sent to a boarding-school, where her health was impaired by impure air and unwholesome food; and then taught until in 1842 she and her sister Emily went to Brussels to learn French. In 1846, Charlotte and her sisters, Emily and Anne, published a volume entitled *Poems by Currer, Ellis, and Acton Bell*. Her first successful work was *Jane Eyre, an Autobiography, edited by Currer Bell* (1847), which was very popular. Her other chief works are *Shirley* (1849) and *Villette* (1852). She was married in 1854 to the Rev. A. B. Nichols, her father's curate, and d. Mar. 31, 1855. See E. C. Gaskell's *Life of Charlotte Brontë* (2 vols., 1857), and another life of her by T. W. Reid, 1877.

Brontë, Emily Jane: sister of Charlotte; b. at Thornton, Yorkshire, England, Aug. 20, 1818. Her life was spent at her father's parsonage at Haworth, where she wrote, under the pen-name *Ellis Bell*, her strong but painful novel *Wuthering Heights* (1847), and a number of poems. She is the original of Shirley in Charlotte Brontë's novel of that name. D. in Haworth, Dec. 19, 1848. Henry A. Beers.

Brontotherium: See Titanotherium.

Bronze: an alloy of copper and tin in variable proportions; harder and more fusible than copper, but less malleable. Bell-metal is a variety of bronze, and the cannon commonly called brass are made of this alloy. Bronze was used by the ancients for weapons and utensils before the art of working iron had been invented. The metal which the Romans called *æs* was probably bronze. The brass mentioned in the Bible is supposed to have been either pure copper or an alloy of copper and tin. Bronze is extensively used in statues, machinery, and ordnance. The French and English have issued bronze coins for currency. Tempering produces on bronze an effect directly opposite to that on steel. To render bronze malleable it must be heated to redness and quenched in water. A mixture of 90 parts of copper with 10 of aluminium produces "aluminium bronze," a valuable alloy which is used as a substitute for bronze. "Manganese bronze" contains manganese in substitution for tin, up to 10 and even 20 per cent. Phosphor bronze is any standard bronze fluxed with phosphorus, and usually retains a small proportion of that element. All these alloys are usually stronger and sounder than the pure bronze. The varieties of bronze are composed of the following proportions: Bronze cannon, copper 9, tin 1; Chinese gongs, copper 5, tin 1; musical bells, copper 6, tin 1; house bells, copper 4, tin 1; large bells, copper 3, tin 1; bronze for wheels, copper 10, tin 1; telescope or speculum metal, copper 2, tin 1; mathematical instruments, copper 12, tin 1.

Bronze-brass alloys (*kalchoids*, as the writer has called them) are ternary alloys of copper, tin, and zinc. Their properties were investigated by the writer for the U. S. board appointed to test iron, steel, and other metals, 1875, by special processes devised for the purpose. (See *Report of United States Board*, R. H. Thurston, ed., Washington, 1878–80.) To represent with satisfactory precision, completeness, and intelligibility a series of researches on the character of triple alloys of all desired proportions appeared, at first, a most difficult, if not insolvable, problem. A very satisfactory method was, however, finally devised.

In any triangle, as at A, Fig. 1, let fall perpendiculars upon the three equal sides. The area of the whole triangle B, C, D, is measured by the product of the altitude, C E, by one-half the base, B D. Draw lines A B, A C, A D, to the vertices of the triangle, thus forming three smaller triangles, the sum of which equals, in area, the original triangle. We now have: C E × 1–2 B D = A F × 1–2 B D + A G × 1–2 B C + A H × 1–2 C D; or, the sides of the triangle being equal, C E × 1–2 B D = (A F + A G + A H) 1–2 B D. Hence A F + A G + A H = C E.

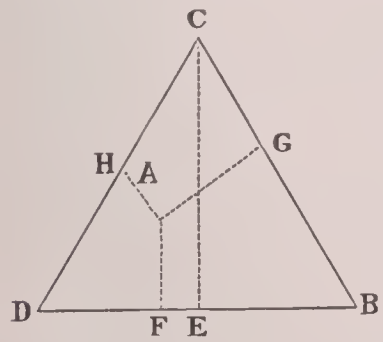


Fig. 1.

But the area of the whole triangle may be conceived to represent a ternary alloy composed of the three components in proportions represented by the areas of the three several small triangles which together make up its total area. But these smaller triangles have areas proportional, as has just been seen, to their altitudes, A F, A G, A H; the proportions in which the three metals are combined to form the given alloy may therefore be measured by the ratio of their representative triangles to the whole triangle in area and in altitude. Then, dividing the height of the large triangle into one hundred equal parts, the altitudes of the small triangles, measured in the same units, will represent the percentages of the three elements in the given alloy.

Every point in the triangle thus represents some certain triple alloy; there is no possible ternary alloy which has not its representative point in the triangle. We now have before us a field which exactly defines our research, and we may attempt its exploration with a clear understanding of what is to be done.

The result of an investigation such as has just been described may be very beautifully exhibited to the eye by making a *model* (Fig. 2) of the surface thus determined. In carrying out these researches the writer found the following plan perfectly satisfactory:

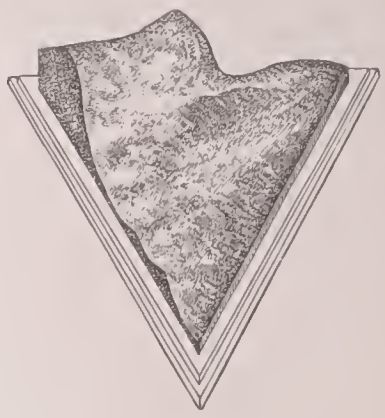


Fig. 2.

Lay out a triangle, as above described, upon a surface of sheet brass. At the points at which determinations have been made erect wires of which the lengths have been made carefully proportional to the ordinates of the representative surface at those points, screwing them firmly, or otherwise fixing them, in their places. When all the wires are in place and are found to be of the exact length required, place bits of board along the outside to form the boundaries of the triangle, and pour in plaster-of-Paris until the wires are all covered. When the plaster has set, remove the boards and carefully cut away the upper part of the plaster, working carefully down to the tops of the wires, just exposing their points. The surface thus produced is a model of the strength, or other quality represented, of all the alloys.

Similarly a model may be made to represent any other quality, as elasticity, ductility, malleability, resilience, or the total. (*New Plan of Representing Researches*, etc., R. H. Thurston, Proc. Am. Assoc. for Advancement of Science, 1887, vol. xxvi.)

The result of this investigation was the determination of the tenacities and other properties of all possible alloys of copper and zinc, copper and tin, and copper, zinc, and tin, and of the discovery of the existence and the location of a "maximum alloy," represented by the highest point on the model, of the highest tenacity attainable in this system of alloys; which alloy contains about 55 parts copper, 43 zinc, and 2 of tin, and has a tenacity of from 70,000 to 85,000 lb. per square inch (4,850 to 5,500 kilog. per square centimeter), according as it is well or badly fluxed. If t and z are the percentages of zinc and of tin, the alloys should have not less than the following tenacities in pounds on the square inch. (*Materials of Engineering*, R. H. Thurston, vol. iii., art. 255.)

For bronze, in British and metric measures, respectively:

$$T = 30{,}000 + 1{,}000\ t.$$
$$T_m = 2{,}100 + 70\ t, \text{ nearly.}$$

For brass:

$$T = 30{,}000 + 500\ z.$$
$$T_m = 2{,}100 + 35\ z, \text{ nearly.}$$

The best alloys in this respect have a composition—

$$Z + 3t = 55, \text{ nearly,}$$

and their tenacity is not far from

$$T = 40{,}000 + 500\ z.$$
$$T_m = 2{,}800 + 35\ z, \text{ nearly,}$$

when the proportion of tin exceeds about 1 per cent. The strongest alloys are deficient in ductility, however, as a rule, and lie on the margin of a field of *gray* alloys, in which all are too brittle for common use in the arts. With phosphorus used as a flux, the writer found it possible to secure tenacities, for alloys from copper 100, to $4t + z = 50$,

$$T = 60{,}000 + 1{,}000\ t + 500\ z.$$
$$T_m = 4{,}200 + 70\ t + 35\ z, \text{ nearly.}$$

Many exceptionally strong alloys are now known to fall into this class, or nearly so: as Farquharson's, copper 37, tin 1; British naval bronze, copper 87·65, tin 8·32, zinc 4·03; Tobin's alloys, used by the U. S. Navy Department, copper 58·22, tin 2·30, zinc 39·48, the atomic proportions of these elements. These alloys have tenacities ranging up to 70,000 lb. per

square inch, will work well either hot or cold, can be forged and rolled and make good castings. Cold-rolling increases tenacity greatly, while reducing their ductility and resilience, and this process was employed by Dean in the production of bronze ordnance, and also later by Uchatius for the Austrian army. R. H. Thurston.

Bronze, Age of: It is held by some archæologists that, when primeval man began to become civilized, the first weapons of war and utensils for industry were made of stone; that in the next stage of progress (in most nations before the beginning of history) there succeeded a time when copper and its alloys were used in the place of stone for many purposes, as is known to have been true among the Peruvians, and also among some of the ancient races of North America; and that in the third stage men learned how to smelt and work iron. Hence these three hypothetical stages are respectively termed the Age of Stone, the Age of Bronze, and the Age of Iron. These terms are convenient, though it is certain that the so-called ages interpenetrated and overlapped each other. In Denmark and Scandinavia especially there have been interesting and extensive collections made of the relics of the Age of Bronze, and it appears certain that a large part of these curious weapons and tools (which are in many cases finely wrought) were made in prehistoric times; nevertheless there are many able men who deny that the facts, so far as known, sustain the above-mentioned theory of the origin of civilization.

Bronzed Skin: See Addison's Disease.

Bronze-wing, or **Bronze-pigeon**: one of several species of pigeons; natives of Australia; mostly belonging to the genus *Phaps*. They have the wing coverts marked with lustrous bronze-colored spots. The common bronze-wing (*Phaps chalcoptera*) is distributed over all the Australian colonies. It weighs about 1 lb., and is esteemed as food.

Bronzing: the covering of articles made of clay, metal, wood, or other material with a substance which gives them the appearance of being made of bronze. Sometimes bronze or some other alloy of copper is actually spread upon the articles to be bronzed, which may be done by the electrotype process, or by applying the powdered alloy by means of *gold size*, which is a mixture of linseed-oil and gum animé. There are also certain chemical reagents which when applied to various metals will give them a bronzed appearance.

Brooke, Gustavus Vaughan: tragedian; b. in Dublin, Ireland, Apr. 25, 1818; was educated for the law; went upon the stage in 1833; attained eminence as a tragedian, playing with success in the principal cities of Great Britain and the U. S. He was lost on the steamer London while on a voyage to Australia, Jan. 11, 1866.

Brooke, Henry: dramatist and novelist; b. in the County of Cavan, Ireland, in 1703; educated at Trinity College, Dublin; was a friend of Pope. He wrote, besides other works, *Universal Beauty*, a poem; tragedies entitled the *Earl of Essex*; *Gustavus Vasa* (1739), which was produced in Ireland as *The Patriot*; and a novel called *The Fool of Quality*, of which an edition appeared in 1859, with encomiums from Charles Kingsley for its permanence of pure and elevating thought. D. in Dublin, Oct. 10, 1783.

Brooke, Sir James: Rajah of Sarawak; b. of English parents in Benares, India, Apr. 29, 1803; educated in Norwich. He served in the Burmese war of 1825, and was badly wounded; inherited from his father in 1835 an estate of $150,000; formed a project to suppress piracy in the Malay archipelago; went to Borneo in 1838. He rendered some service to the Sultan of Borneo, who in 1841 appointed him governor of Sarawak. He framed a code of laws for the natives of Sarawak, and displayed great energy in the extirpation of pirates. His coadjutors received £20,000 as head-money for the pirates whom they killed, but on parliamentary investigation he was exonerated from profiting by the bloody business. From 1848 to 1857 he was British governor and consul-general in the island of Labuan. In the latter year he repulsed a desperate attack of Chinese on his estates, and drove them from Borneo, and he lived to achieve the independence of Sarawak. In 1847 he was created a knight by Queen Victoria. D. at Burrator, Devonshire, England, June 11, 1868. See St. John's *Life of Sir James Brooke* (1879).

Brooke, John R.: See the Appendix.

Brooke, Stopford Augustus: clergyman and author; b. at Letterkenny, Ireland, Nov. 14, 1832; was educated at Trinity College, Dublin; held various London livings in the Church of England, becoming in 1872 a queen's chaplain; in 1880 he became a Unitarian because he had ceased to believe in a miraculous incarnation; officiates in Bedford chapel, Bloomsbury, London. He is the author of many volumes of sermons, mostly promulgating advanced Broad Church views, besides *Poems* (1888); *Theology in the English Poets* (1847); a very popular primer, *History of English Literature* (1876); *The Early Life of Jesus*; and the best edition yet extant of *The Life and Letters of Frederick W. Robertson* (1865). Henry A. Beers.

Brook Farm: a community established in West Roxbury, Mass., in 1841, as an experiment in "plain living and high thinking." The articles of association provided that the name and style of the community should be the "Brook Farm Institute of Agriculture and Education," and defined its object to be the establishment of an "agricultural, literary, and scientific school or college." The head of the community was George Ripley, formerly a Unitarian minister in Boston, who had been in 1836 one of the founders of the Transcendental Club, with Emerson, Hedge, Alcott, and others; and in 1840 had established the transcendentalist organ, *The Dial*, in connection with Emerson and Margaret Fuller. Associated with Ripley in the Brook Farm enterprise were Nathaniel Hawthorne, Charles A. Dana, John S. Dwight, and other well-known men. They bought a farm comprising some 200 acres, about 9 miles from the city of Boston. Several trades besides agriculture were carried on, and a number of children were received as pupils, instruction being furnished in ancient and modern languages, history, mathematics, moral philosophy, music, drawing, etc. It was designed to substitute co-operation for selfish competition, and to dignify bodily labor by uniting it with the intellectual and spiritual life. The community was at first organized as a joint-stock company, each subscriber being guaranteed 5 per cent. per annum on his shares. In 1844, mainly owing to the influence of Albert Brisbane, it was reorganized on a Fourieristic plan, as a "phalanstery," and incorporated in 1845 under the title of the "Brook Farm Phalanx." In the latter year the phalanstery building, an uncompleted wooden structure designed to lodge the entire community, was burned; and in 1847 the experiment, having proved a failure financially, was given up.

Life at Brook Farm, especially during the first years of enthusiasm, had idyllic and romantic aspects, of which Hawthorne availed himself in his *Blithedale Romance*. In its palmiest state the community, including school children and boarders, numbered about 150 souls. Kitchen and table were in common; very little help was hired, but philosophers, clergymen, and poets worked at the humblest tasks, milking cows, pitching manure, cleaning stables, etc., while cultivated women cooked, washed, ironed, and waited at table. All work, manual or intellectual, was credited to members at a uniform rate of ten cents an hour. Among many persons of note who took an interest in Brook Farm, and were frequent visitors though not residents there, were Emerson, Theodore Parker, Margaret Fuller, Bronson Alcott, Orestes A. Brownson, Rev. W. H. Channing, and Christopher P. Cranch. The *Harbinger*, a weekly journal devoted to the principle of association, was issued from Brook Farm from 1845 to 1847, and, after the break up of the community, transferred to New York. It numbered among its contributors, exclusive of Brook Farmers, writers like Lowell, Whittier, Greeley, Higginson, Story, and Curtis. See Hawthorne's *American Note-books*; O. B. Frothingham's *Life of George Ripley*; T. W. Higginson's *Life of Margaret Fuller*; the *Atlantic Monthly* for Oct., 1878; and *Old and New* for Feb., Apr., and Sept., 1871, and May, 1872.

Henry A. Beers.

Brookfield: town; on railroad; Linn co., Mo. (for location of county, see map of Missouri, ref. 2–F); is the central station and division headquarters of the Hannibal and St. Joseph R. R. Several of its offices, its round-house, and extensive shops are located here. There is a coal mine near the town. Pop. (1880) 2,264; (1890) 4,547; (1900) 5,484.

Brookhaven: city; capital of Lincoln co., Miss. (for location of county, see map of Mississippi, ref. 8–F); situated at junction of Ill. Cent. and Mer., Brookhaven and Natchez R. Rs., 54 miles S. by W. of Jackson. The city has 9 churches, a fine public school, and is the seat of Whitworth Female College, one of the most flourishing institutions of learning in the South; it has a foundry, machine-shops, and 2 planing-mills. The principal industries of the surround-

ing country are lumbering and agriculture, and Brookhaven is an important trading-center for the products, about 13,000 bales of cotton being marketed annually. Pop. (1880) 1,615; (1890) 2,142; (1893) with suburbs, about 3,000.

Brookings: city; capital of Brookings co., S. D. (for location of county, see map of South Dakota, ref. 6–G); on Chicago and N. W. R. R.; in the fertile Sioux valley. Here are South Dakota Agricultural College and U. S. Agricultural Experiment Station, large flouring-mill, large tow-mill, five churches, commodious school building, electric lights, and water-works. Pop. (1890) 1,518; (1900) 2,346.

Brookite: a mineral named in honor of Brooke, the crystallographer; pure native titanic anhydride. It occurs in reddish, yellowish, or hair-brown crystals, which are more or less translucent, and have a brilliant luster, inclining to metallic. It is found in Perthshire, Scotland, at Tavistock, in Savoy, and other places, A variety found in the Ozark Mountains, Arkansas, is called *arkansite*.

Brooklime (*Veronica beccabunga*): a perennial plant; native of Europe; grows in ditches and wet places. It has a procumbent stem and elliptical serrate leaves, which are succulent, and are used in England as an ingredient in spring salads. In the U. S. is found a similar plant, the *Veronica americana*, or American brooklime.

Brookline: a township in Norfolk co., Mass. (for location of county, see map of Massachusetts, ref. 5–I); on the Charles river, which separates it from Boston and Cambridge. It is connected with Boston by steam and street railways, and is almost wholly a place of residence. It has many fine villas and country seats, and, with its meandering and well-kept streets winding among lawns and terraced grounds, under fine old trees and amid ornamental shrubbery, presents the appearance of a park. A small part of this township has been annexed to Boston since the census of 1870. Brookline has a public library building costing $50,000, and a granite town-house costing $150,000. Pop. (1880) 8,057; (1890) 12,103; (1900) 19,935.

Brooklyn: city (formally laid out in 1855); Poweshiek co., Ia. (for location of county, see map of Iowa, ref. 5–I); on Ch., Rk. I. and Pac. R. R.; 72 miles E. of Des Moines, 104 miles W. of Davenport. It has graded schools, six churches, several grain elevators, and a flour-mill, and is a division station of the Ch., Rk. I. and Pac. R. R. The surrounding country is rich farming land. Pop. (1890) 1,202; (1900) 1,188.

Brooklyn: formerly a city, now a borough of New York city and the county-seat of Kings county; on the west end of Long Island; bounded by the East river (an estuary separating Long Island from Manhattan Island and connecting Long Island Sound with New York Bay), New York Bay, Buttermilk Channel, the Atlantic Ocean, Jamaica Bay, and the borough of Queens; lat. (at Navy-yard) 40° 51′ 30″ N., lon. 73° 59′ 30″ W. of Greenwich. Toward the East river and the ocean the ground is flat, but from New York Bay it rises with a steep grade to a ridge that extends eastward through the island. The highest altitude (202 feet) is reached at Prospect reservoir. The borough of Brooklyn, by surveys taken in 1899 and 1900, has an area of 77.62 sq. miles, which include the swamp lands in and about Jamaica Bay. In political divisions it has 32 wards, 21 assembly districts, 7 senatorial districts, and 6 congressional districts. It has 33 miles of water frontage, 713 miles of streets, of which 553 miles are paved. Brooklyn is an aggregation of villages that have gradually coalesced and therefore, as a whole, lack unity of design. The streets and avenues are broad and cross each other at right angles, except along the boundaries of the original villages. Fulton Street, the main business thoroughfare, was the old country road by which Long Island farmers made their way to the ferries of the East river to market their produce. The street was built up along the lines of the old road, which accounts for its many curves and turns. Miles of retail establishments, many unsurpassed in size and appointments by any in the country, line Fulton Street, Broadway, and Myrtle and Fifth Avenues.

The borough is supplied with water from ponds, streams, and driven wells on Long Island, the principal system covering a drainage area of 60¼ sq. miles. In the main system the water is pumped into the reservoir at Ridgewood, and thence distributed through mains, which, Jan. 1, 1901, aggregated 597 miles. In addition to the Ridgewood plant there are four other water plants: the Flatbush water works, owned by a private company, supplying the Twenty-ninth ward, and the New Lots, Gravesend, and New Utrecht plants, formerly private companies, but now owned by New York city. The average daily consumption of water in Brooklyn in 1900 was more than 104,400,000 gallons. The cost of the Ridgewood system was $18,386,662.

Parks.—The park system of Brooklyn consists of 36 parks, with a combined area of 1,566½ acres, and 22 parkways, 42½ miles in length. In addition there are 2 bicycle paths, each 5½ miles long, exclusively devoted to bicycle riders. The principal park is Prospect; area, 516½ acres; original cost of land (1866), $3,919,370; present value (1901), $27,735,000. It is on the highest ground in the city, and includes 110 acres of woodland, 77 acres of lakes and watercourses, 70 acres of meadows, 259⅙ acres of plantations, 8¾ miles of drives, 3 1/10 miles of bridle-roads, and 10¾ miles of walks. More than 25,000,000 visitors, it is estimated, visited the park in 1900. Fort Greene Park, 30 acres of beautiful grounds, is less than half a mile from the Borough Hall. Here 11,000 victims of the Revolutionary War prison ships are entombed. The last burial took place June 16, 1900, when the bones of the prison ship martyrs were removed from the Navy-yard to a specially constructed vault in Fort Greene. The largest park is Brooklyn Forest Park, a woodland at the boundary of Brooklyn and Queens boroughs; area, 536 acres; cost, $1,150,000. It is as yet undeveloped, with the exception of roadways. Public golf links are located at Sunset Park, Fifth Avenue and Forty-second Street. The administration of the park systems of Brooklyn and Queens is under a park commissioner appointed by the mayor of New York city.

Monuments.—The Soldiers and Sailors' Memorial Arch on Prospect Park Plaza, dedicated in 1892, is of white marble; the bas reliefs are by Maurice J. Power. In 1898 it was further adorned by a bronze group, called the Quadriga, designed by Frederick Macmonnies, and in 1900 by two more groups, one representing the Army and the other the Navy. In Prospect Park are the following bronze figures: J. S. T. Stranahan, busts of John Howard Payne, Thomas Moore, Washington Irving, Beethoven, and Mozart. A bronze statue of Major-Gen. Gouverneur Kemble Warren, in Prospect Park Plaza, was unveiled July 4, 1896. The bronze statue of Abraham Lincoln, dedicated Oct. 21, 1869, was removed from the Park Plaza in 1895, and placed in the flower garden overlooking Prospect Park lake. A statue of Gen. Grant is on Bedford Avenue near Dean Street, and one of Henry Ward Beecher stands in front of the Borough Hall.

Cemeteries.—Six cemeteries lie wholly or partly in Brooklyn, and others are just beyond the borough boundary in Queens. Greenwood, southwest of Prospect Park, has an area of 474 acres, and is widely known for the beauty of its ground and monuments. The burials, up to Oct. 1, 1900, numbered 309,000, and the yearly average is 4,784. Evergreens, in the northeast corner of the city, covers 375 acres, and on Oct. 1, 1900, contained the remains of 167,300 dead. Other cemeteries within Brooklyn's boundaries are Holy Cross, Twentieth ward, 60 acres with (Oct. 1, 1900) 246,190 interments; Kings County Farm (Potter's Field), 14 acres, contains the remains of 22,818 poor and unknown dead; Maimonides Cemetery, 7½ acres; Mount Hope, 12 acres; Washington Cemetery, on Ocean Parkway, contains 32,000 dead.

Transportation.—The borough is intersected with surface and elevated railroads. The first horse-car began to run July 4, 1854. The entire system is now controlled by two companies, and is operated by electricity. The total length of transportation lines, Feb. 1, 1901, was 549.7 miles, and the total number of passengers carried in the year ending June 30, 1900, was 324,898,232.

The first ferry between Manhattan and Long Island was established in 1642, about where Fulton Ferry now is. The first steam ferry was opened May 10, 1814. There are now (1901) fifteen ferries from different points in Brooklyn to Manhattan and Jersey City, and they are controlled by seven companies.

The New York and Brooklyn Bridge.—A suspension bridge over the East river, connecting Brooklyn and Manhattan boroughs. The plans and estimates were made by John A. Roebling, who was its chief engineer till his death in 1869. Washington A. Roebling, his son, succeeded him and completed the structure. Work was commenced Jan. 2, 1870. The first wire was run out May 29, 1877, and the bridge was opened to the public May 24, 1883. The bridge railroad was opened Sept. 24, 1883. Total length,

with extensions, is 6,537 feet. It has two granite towers, 278 feet high, one on either shore. The horizontal section of these towers at high water mark is 140 by 59 feet; at the top, 136 by 53 feet. The depth of the tower foundations below high water is, on the Manhattan side, 78 feet, and on the Brooklyn side 45 feet. The length of the river span is 1,595½ feet. The bridge is supported by four great cables, and by many stays extending from the towers. Each of the cables contains 5,296 parallel galvanized steel, oil-coated wires, closely bound up into a solid cable, 15¾ inches in diameter. Each wire is 3,578 feet long. The clear height of the bridge above high water is 135 feet in the middle of the river span, and at the towers 119¼ feet. The bridge is 85 feet wide, and contains 5 parallel avenues. The central avenue, 15½ feet wide, is for foot passengers, those on either side of the footway are for passenger cars; the motive power was formerly supplied by a cable 11,600 feet long, but the third-rail electric system has been placed on the bridge, and is now used almost exclusive of the cables. The outermost avenues, each 19 feet wide, are for vehicles. The permanent weight suspended from the cables is 14,680 tons. The original cost of construction was $15,000,000. In 1897 the Legislature empowered the trustees to enter into contracts with Brooklyn railroads to operate their lines over the bridge, and the first trolley car crossed it Dec. 31, 1897. The bridge railway was leased to the Elevated Railroads on July 1, 1898. The total number of passengers carried on the bridge railway up to July 1, 1898, was 500,147,723. Since the leasing of the railroad and the operation of trolley cars across the bridge, no record has been kept of the number of passengers crossing. The total receipts of the bridge, from May 23, 1883, to Dec. 1, 1900, were $18,532,169.50, and the expenditures for the same period were $18,688,639.68. For the new EAST RIVER BRIDGE, see BRIDGE.

Buildings.—Among the principal buildings are the Borough Hall, Court-house, Municipal Building, Hall of Records, Federal Building, Academy of Music, Academy of Design, Brooklyn Library, Eagle Building, Long Island Historical Library, Brooklyn and Dime Savings Bank, Mechanisc Bank, Temple Bar Building, Polytechnic, Packer, Pratt, and Berkeley Institutes, and many large commercial buildings.

Churches.—On Jan. 1, 1901, Brooklyn had 382 Protestant and Jewish churches, with a membership of 131,178, and 145,473 Sunday-school children. In 1900 these churches raised for all purposes $2,362,210. They have a total indebtedness of $1,863,700, and own property valued at $169,923,681. The total number of sittings in Protestant churches and chapels is 294,648. There are 84 Roman Catholic churches, with 307,975 parishioners, 47,426 Sunday-school children, and 31,087 parochial-school children. This denomination owns property to the value of $10,086,000, indebted to the extent of $1,342,859. The total seating capacity in Catholic churches is 37,284. There are 75 religious societies and Young Men's Christian Associations, besides church societies, 100 city missionaries, 31 missions, 10 Chinese missions, 41 church sewing and industrial schools, 19 church kindergartens, and 19 free church reading-rooms.

Education.—The public schools consist of 6 high schools, a training-school for teachers, 122 day and 16 evening schools, 10 industrial and asylum schools, and a truant school. There are 5 private institutions of high order, viz., the Polytechnic, Packer, Pratt, and Berkeley Institutes, and the Adelphi Academy and College. There are also 2 Roman Catholic colleges, a college of pharmacy, 2 medical colleges, 7 business colleges, and 48 private schools and academies. There are 23 libraries, having an aggregate of more than 480,000 volumes, of which 208,445 volumes are also in free circulation. There is a Museum of Natural History, Antiquities, and Mechanical Arts; a Museum of Arts and Sciences, 10 local and 2 post-graduate Chautauqua societies, and 14 art associations and societies.

Clubs and Societies.—There are 82 social clubs, maintaining club-houses or club-rooms: 306 miscellaneous societies, and 145 political clubs, besides hundreds of lodges, posts, etc., of the various fraternal societies.

Newspapers.—Brooklyn has 5 dailies, 1 semi-weekly, 2 semi-monthlies, 13 monthlies, and 3 quarterlies.

Charitable Institutions.—Brooklyn has 4 hospitals, supported entirely by the State and city, and a U. S. Naval Hospital, supported by the Government. There are also 27 hospitals, supported mainly by private subscription, 23 dispensaries, 5 training-schools for nurses, 9 societies organized to aid in hospital work, 2 private hospitals, 13 homes for the aged, 36 homes and societies for the relief of children, 5 truant homes, 32 homes and societies for special relief, and 18 organizations for extending temporary relief. The Bureau of Charities maintains 16 industrial agencies throughout the borough. In addition, there are 18 societies offering miscellaneous relief. About $1,000,000 was appropriated by the city in 1900 toward defraying expenses of charitable organizations in Brooklyn.

Finances, Banks, etc.—The amount of the debt of Brooklyn, as contracted before consolidation with New York and outstanding on December 1, 1900, was $63,126,274.10; and the county debt amounted to $13,767,392.83. The assessed valuation of real estate in 1900 was $651,408,500, of personal property $43,937,440. The assessment of Brooklyn banks in 1900 was $3,657,191. In addition to the amount for general administration of New York city government, there was appropriated for running Brooklyn departments in 1900, $2,613,663.46, and for county and State purposes $2,665,936.72. The tax rate in Brooklyn was $2.32 per $100 in 1900. There are 15 State, 5 national, and 16 savings banks, 10 trust companies, 5 title guarantee, 8 safe deposit, 5 fire insurance, and 7 illuminating companies, also 36 building and loan associations, with assets amounting to $8,844,768, and loans on bonds and mortgages amounting to $7,565,928.

Courts.—U. S. circuit and district courts, and circuit court of appeals; special, trial, and appellate division of Supreme Court of New York State; county and surrogate courts; court of special sessions of the second division of the city of New York; 5 municipal courts, and 8 city magistrate courts, fulfill the duties of the police courts that prevailed before consolidation.

Manufactures.—According to the 14th annual report of the State Factory Inspector, for the year ending Nov. 30, 1899, 1,070 firms were engaged in the manufacture of clothing and garments, and 2,112 in the manufacture of other products. Nearly every industry is represented.

Commerce.—Though pre-eminently a city of homes for men doing business in New York, Brooklyn has developed an extensive commerce. The wharves and docks of the city have a water frontage of more than 25 miles, lined with great storehouses and elevators, and represent an investment of hundreds of millions of dollars. Ninety per cent of the coffee and sugar imported into the U. S. is received there. Thirty-three regular lines of steamships, and a great number of "tramp" steamers and sailing vessels, dock in Brooklyn. Along the water front are also extensive basins, one covering 40 acres and accommodating 500 vessels at one time, shipyards, dry docks, and marine railways. Here also is the Brooklyn Navy-yard, the most important station in the U. S., where four-fifths of the stores for the entire navy are handled, and war-ships repaired and fitted for sea service.

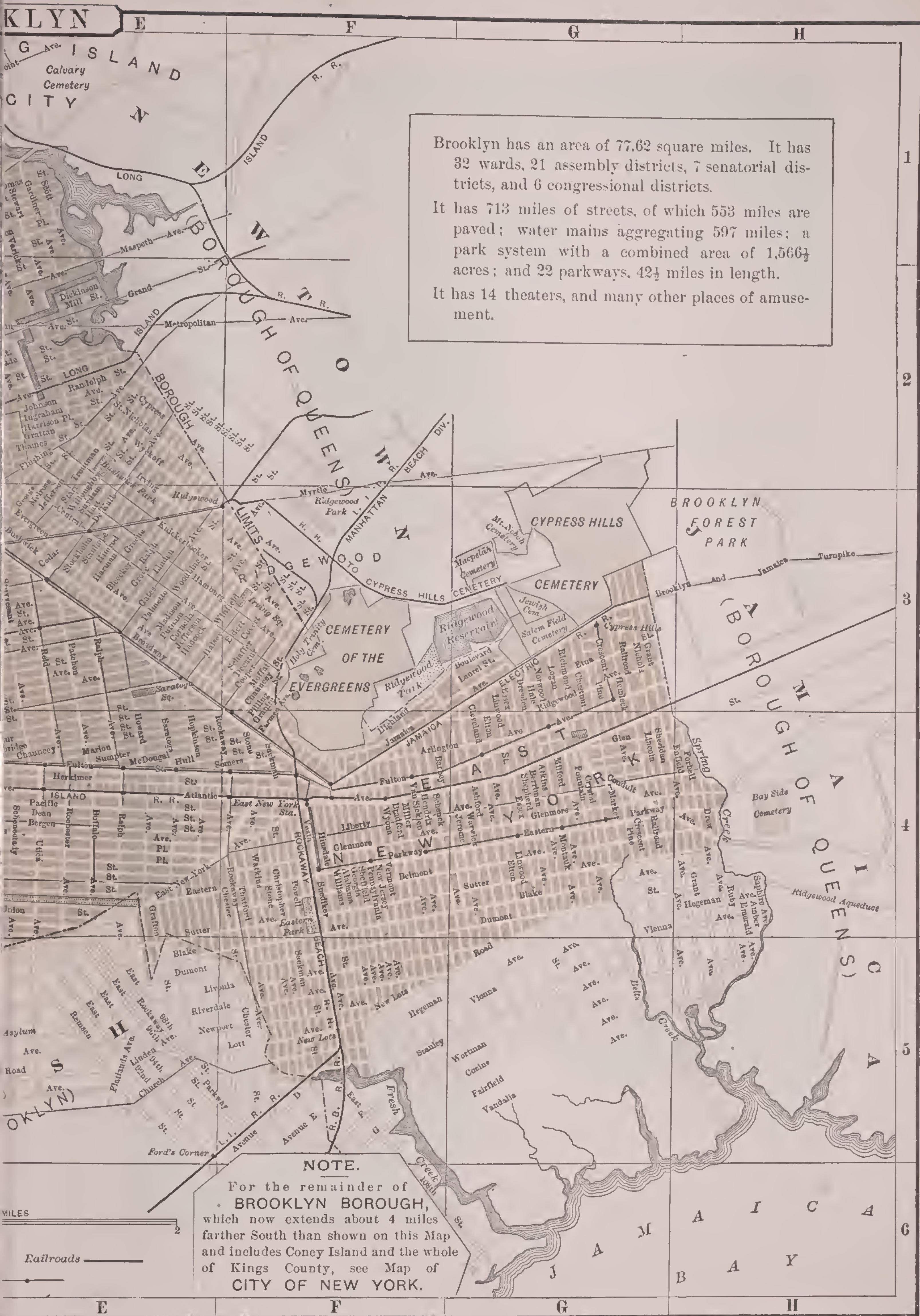
The United States census taken in 1900 shows the population of Brooklyn to be 1,166,582. The annexation of Gravesend brought into Brooklyn's limits all the beach hotels and the shore resorts on Coney Island, and the race-courses of the Coney Island and the Brooklyn Jockey Clubs and of the Brighton Beach Racing Association. The government of the city was vested in a board of aldermen, called the common council, the majority of whose members were elected in aldermanic districts and the remainder from the city at large; terms of all members were two years. The administrative power was vested in the mayor and heads of departments, all of whom (except those of the department of finance, audit, and public instruction) were appointed by the mayor. For the new borough government, see NEW YORK, in the Appendix. Over the ground now occupied by the borough of Brooklyn, on Aug. 7, 1776, was fought the first great battle of the Revolution after the Declaration of Independence, the battle of Long Island.

Revised by BENJAMIN T. BUTTERWORTH, JR.

Brooks, CHARLES WILLIAM SHIRLEY: journalist, lecturer, dramatist, and novelist; b. in London, England, Apr. 29, 1816; became a newspaper reporter and writer; was sent by the *Morning Chronicle* to the East to report on the condition of labor, and produced the *Russians of the South* (1856). He produced the dramas *The Creole*, *Our New Governess*, etc. Among his novels are *Aspen Court* (1857); *Gordian Knot* (1860); *The Silver Cord* (1861); and *Sooner or Later* (1868). He became connected with *Punch* in 1851, and on the death of Mark Lemon in 1870 succeeded him as editor. D. in London, Feb. 23, 1874.

East River Bridge, between New York and Brooklyn.

BROO
MANHATTAN BOROUGH
HUDSON RIVER
EAST RIVER
NEW YORK BAY
GOVERNOR'S I.
Buttermilk Channel
GREENPOINT
WILLIAMSBURGH
NAVY YARD
Wallabout Bay
U.S. Navy Hospital
Fort Greene Park
City Hall
Post Office
Brooklyn Bridge
Red Hook
Atlantic Basin
Erie Basin
GOWANUS BAY
Gowanus Bay Channel
PROSPECT PARK
Parade Ground
GREENWOOD CEMETERY
WINDSOR TERRACE
BAY RIDGE
West Brooklyn
Tompkins Park
Bedford Park
Penitentiary
Alms House
FLATBUSH
(PART OF BOROUGH OF B
Staten I. Ferry
Fulton Ferry
Wall St. Ferry
South Ferry
Hamilton Ferry
39th St. Ferry
Bay Ridge Ferry
Roosevelt St. Ferry
Catherine St. Ferry
Twenty Third St. Ferry
Tenth St. Ferry
Houston St. Ferry
Grand St. Ferry
Brooklyn Annex
Flatbush Ave. Depot
P. P. & C. I. R. R. Depot
BROOKLYN BATH & WEST END R. R.
PROSPECT PARK & CONEY I. R. R.
BRIGHTON BEACH
Principal Street Car Lines
Elevated Railroad
SCALE
0 ¼ ½ ¾


KLYN
Brooklyn has an area of 77.62 square miles. It has 32 wards, 21 assembly districts, 7 senatorial districts, and 6 congressional districts.
It has 713 miles of streets, of which 553 miles are paved; water mains aggregating 597 miles; a park system with a combined area of 1,566½ acres; and 22 parkways, 42½ miles in length.
It has 14 theaters, and many other places of amusement.
NEWTOWN
(BOROUGH OF QUEENS)
CYPRESS HILLS CEMETERY
CEMETERY OF THE EVERGREENS
BROOKLYN FOREST PARK
JAMAICA
(BOROUGH OF QUEENS)
EAST NEW YORK
JAMAICA BAY
NOTE.
For the remainder of BROOKLYN BOROUGH, which now extends about 4 miles farther South than shown on this Map and includes Coney Island and the whole of Kings County, see Map of CITY OF NEW YORK.
MILES
Railroads

The Approach to the East River Bridge—(New York side).

Brooks, Charles Timothy: Unitarian minister and poet; b. at Salem, Mass., June 20, 1813; graduated at Harvard in 1832, and was pastor at Newport, R. I., from 1837 to 1873. He translated *Faust*, *Hesperus*, *Titan*, and many small poems from the German. His *Poems*, *Original and Translated*, were published with a memoir by Charles W. Wendte (Boston, 1885). D. in Newport, R. I., June 14, 1883.

Brooks, Elbridge Gerry, D. D.: b. at Dover, N. H., July 29, 1816; studied law (1833–35) with Chief Justice Tenney of Maine; began preaching in 1836; became Universalist pastor in West Amesbury, Mass., 1837, East Cambridge 1838, Lowell 1845, and Lynn, Mass., 1850, New York city 1859, resigned 1867. Philadelphia, Pa., 1868. He was general secretary of the Universalist general convention 1867–68. D. in Philadelphia, Pa., April 8, 1878. See his *Life* by E. S. Brooks (Boston, 1888).

Brooks, Erastus: journalist; b. at Portland, Me., Jan. 31, 1815; educated at Brown University; was the coadjutor and partner of his brother James (*q. v.*) on the *New York Express*, and its proprietor until 1877; State Senator 1853–57, becoming involved in a controversy with Archbishop Hughes on account of his efforts to divest Roman Catholic bishops of the power to hold real estate in trust for the Church; Assemblyman and Democratic leader 1878–79 and 1881. D. Nov. 25, 1886.

Brooks, James: editor and politician; b. in Portland, Me., Nov. 10, 1810; graduated at Waterville in 1831. He was educated by his own industry. He studied law with John Neal the novelist; taught school, and at the same time engaged in political journalism. When twenty-one years of age he was elected to the State Legislature, and in the following year became a newspaper correspondent at Washington. He afterward traveled in the South and in Europe. In 1836 he established the *New York Express*. He was a member of Congress 1849–53, 1865–67, his seat being at last successfully contested by Hon. W. E. Dodge, and 1869–73. He was one of the leaders of the Knownothing party, and during the war a peace Democrat; was censured in Congress for participation in the Crédit Mobilier corrupt practices. D. in Washington, Apr. 30, 1873.

Brooks, John, M. D., LL. D.: b. in Medford, Mass., May 31, 1752; practiced medicine at Reading; fought with the greatest honor as an officer at Lexington, White Plains, Saratoga, Monmouth, etc., becoming a colonel and adjutant-general. He practiced medicine at Medford, Mass., after the war, and was a member of the State convention which adopted the Federal Constitution. He was Governor of Massachusetts (1816–23), and president of the Massachusetts Medical Society (1817–25). D. Mar. 1, 1825.

Brooks, Kendall, D. D.: b. in Roxbury, Mass., Sept. 3, 1821; graduated at Brown University 1841; Newton Theological Institute 1845; tutor in Columbian College 1841–43; pastor of the Baptist church at Eastport, Me., 1845–52; Professor of Mathematics and Natural Philosophy in Waterville College 1852–55; pastor at Fitchburg, Mass., 1855–65; editor of the *National Baptist*, Philadelphia, 1865–68; and president of Kalamazoo College, Michigan, 1868–87.

Brooks, Maria Gowen: poet; b. in Medford, Mass., about 1795. She was married young to a Mr. Brooks, a merchant of Boston. Her chief work is *Zophiel, or the Bride of Seven*, the first canto of which was published in 1825, and the complete poem in London in 1833, under the supervision of Robert Southey, who gave the author the sobriquet Maria del Occidente (Maria of the West). D. at Matanzas, Cuba, Nov. 11, 1845.

Brooks, Noah: journalist and author; b. at Castine, Me., Oct. 30, 1830. He has been engaged in newspaper work since 1850, first in Boston, afterward in California, Washington, and New York, where he was one of the editorial staff of the *Tribune* and the *Times*. In 1884–1893 he edited the *Daily Advertiser* of Newark, N. J. He has published a *Life of Abraham Lincoln* (1888) and a number of books for boys, such as *The Boy Emigrants* (1876) and *The Fairport Nine* (1881).

Henry A. Beers.

Brooks, Phillips, D. D., Oxon.: author, preacher, and Bishop of Massachusetts; b. in Boston, Dec. 13, 1835; graduated at Harvard in 1855. He studied in the Episcopal Theological Seminary at Alexandria, Va.; was ordained in 1859; became the same year rector of the Church of the Advent in Philadelphia, and in 1862 of the Church of the Holy Trinity, where he remained until 1869, when he accepted the rectorship of Trinity church in Boston. In 1886 he was elected in Philadelphia assistant bishop in Pennsylvania, but declined the office. Elected Bishop of Massachusetts on Apr. 30, 1891, he accepted the appointment, and was consecrated in his own church Oct. 14 of the same year. He published five volumes of sermons; *Lectures on Preaching*, delivered before the Divinity School of Yale College; several orations, short poems, carols, etc., all of which have been issued in repeated editions. He was a Broad Churchman, and was regarded in England and the U. S. as the greatest preacher of his Church. He was a man of noble stature, rapid in utterance, averse to polemics, but a great spiritual leader. D. in Boston, Mass., Jan. 23, 1893. A statue of Bishop Brooks is to be erected in Copley Square, Boston, overlooking the scenes of his rectorate at Trinity church. Three of Bishop Brooks's brothers entered the Episcopal Church ministry.—Frederick: b. in Boston, Mass., Aug. 5, 1842; graduated at Harvard 1863; studied theology at the Episcopal Divinity School, Philadelphia; ordained in 1866; was rector of churches in Des Moines, Ia., and Cleveland, O.; drowned by stepping through an open draw at night in the bridge over Charles river, Boston, Sept. 15, 1874. Posthumous volume of sermons (1875), with introduction by Phillips Brooks.—Arthur: b. in Boston, June 11, 1845; graduated at Harvard 1867; studied theology in Andover and Philadelphia; took orders in 1870; rector in Williamsport, Pa., of St. James's church, Chicago, and of the Church of the Incarnation, New York, 1875. D. at sea July 10, 1895. He published *Sermons* (1886; English ed. *Christ for To-day*).—John Cotton: b. in Boston, Aug. 29, 1849; graduated at Harvard 1872; studied theology at Andover and Philadelphia; ordained 1875; rector in Bristol, Pa., 1876; Providence, R. I., and of Christ church, Springfield, Mass., 1878.

Brooks, William Keith, Ph. D.: b. in Cleveland, O., Mar. 25, 1848; graduated from Williams College 1870; took the degree Ph. D. at Harvard University 1874; was assistant in the Boston Society of Natural History 1874–75; became associate of Johns Hopkins University 1876; and in 1883 Professor of Morphology there. Dr. Brooks is a member of the National Academy of Sciences and of several foreign scientific societies. In 1878 he organized the Johns Hopkins summer marine laboratory, which has won a reputation for itself by the class of students who study there, and the publications which are the result of their work. His most important works are *Handbook of Invertebrate Zoölogy* (1881. 400 pp., 300 cuts); *Heredity* (1883, 300 pp.); and *The Development and Protection of the Oyster in Maryland* (192 pp. quarto, 13 plates, 3 charts, 1884). Besides these, he has published *Leucifer, a Study in Morphology* (1881), and a monograph on *Stomatopoda* (1886) in *Transactions* of the London Royal Society, and other papers on marine forms.

Brooks, William Thomas Harbaugh: soldier; b. in New Lisbon, O., Jan. 28, 1821; graduated at West Point in 1841; major Eighteenth Infantry Mar. 12, 1862; and Sept. 28, 1861, brigadier-general U. S. volunteers. He served in the Florida war 1841–42; on frontier duty 1843–45; in the military occupation of Texas 1845–46; in the war with Mexico 1846–48; was engaged at Palo Alto, Resaca de la Palma, Monterey (brevet captain), Vera Cruz, Cerro Gordo, Contreras, Churubusco (brevet major), and the city of Mexico, as aide-de-camp to Brevet Maj.-Gen. Twiggs 1848–51; in active operations in New Mexico in 1868, and engaged in several skirmishes against the Navajos. In the civil war he served in the Virginia Peninsula campaign 1862; engaged at Yorktown, Golden's Farm, Savage Station (wounded), and Glendale; in the Maryland campaign, 1862, engaged at Crampton Pass and Antietam (wounded); commanded division in the Rappahannock campaign 1862–63; in command of the department of the Monongahela 1863–64, when Pittsburg was threatened by a raid: in command of the Tenth Corps before Richmond 1864; engaged at Swift's Creek, Drury's Bluff, Bermuda Hundred, Cold Harbor, and the siege of Petersburg. Failing health from exposure and wounds caused him to resign from the army, July 14, 1864, and in 1866 he retired to a farm in Huntsville, Ala., where he resided till his death, July 19, 1870.

Brookville: town; on railroad; capital of Franklin co., Ind. (for location of county, see map of Indiana, ref. 8–G). It has great water-power, paper-mills, flouring-mills, etc., and contains Brookville College. Pop. (1880) 1,813; (1890) 2,028; (1900) 2,037.

Brookville: borough and capital of Jefferson co., Pa.; on railroad and on Red Bank creek (for location of county, see

map of Pennsylvania, ref. 3–C). Pop. (1880) 2,136; (1890) 2,478; (1900) 2,472.

Broom: any one of several shrubs of the family *Leguminosæ*. They belong to the allied genera of *Spartium*, *Genista*, and *Cytisus*. The common broom of Europe (*Cytisus scoparius*) grows on dry and sandy soils and heaths, and bears handsome yellow flowers. The branches, which are very tough and angular, are used for making brooms. The young tops and seeds, being strongly diuretic, are used in medicine, and are beneficial in dropsy. All kinds of broom have long, slender branches. The Spanish broom (*Spartium junceum*) grows wild in the south of Europe, and possesses medical properties like the common broom. The fiber of its branchlets is used in Italy and Spain for making cloths and ropes. The *Cytisus albus*, or white broom, also a native of Europe, is cultivated in England as an ornamental shrub, and bears white flowers which are much admired. It sometimes attains a height of 15 feet or more. The broom (Fr. *genêt*) gave name to the royal family of Plantagenet, one of its ancestors having the broom for his crest.

Broom-corn: a plant of the order *Graminæ*; native of the East Indies; cultivated in the U. S. It is a variety of the same species which produces sugar-cane, durra-corn, and other plants (*Sor'ghum sacchara'tum* or *Sacchar'um officinar'um*). It has a jointed stem, which grows to the height of 8 or 10 feet, and bears spikelets, two and three together, on the ramifications of an open panicle. Only the middle or terminal one of these is fertile; stamens three. The panicle is extensively used in the manufacture of brooms. It is stated that this plant was first introduced into the U. S. by Dr. Franklin, who, finding a seed on a whisk that had been imported, planted it and propagated it. It succeeds best in alluvial soils, but will generally produce a fair crop on any land that is adapted to maize. Broom-corn is largely cultivated in the Mohawk Valley of New York, in Nebraska and Kansas, and other regions. It is planted in rows about 3 feet apart, and in hills about 18 inches apart. The average produce of an acre is about 500 lb. of the brush or material for brooms. The brush, or stems of the panicle, grow straighter if the panicle stands in a horizontal or drooping position. The stalks are therefore broken over when the panicle is nearly full grown, at a point a foot or a foot and a half below the head. Two rows are ordinarily broken toward each other. This operation is called "tabling." The seed of broom-corn is often fed to chickens, but it has comparatively little value. The brush is not harvested until the seed is nearly ripe, and by this time the herbage is so hard that it has little value for fodder. Revised by L. H. Bailey.

Broome, Sir Frederick Napier, K. C. M. G.: British colonial statesman and author; b. in Canada, 1842; educated at Whitchurch Grammar School, Shropshire, England; emigrated to New Zealand 1857; returning to England, was on the staff of *The Times* 1869–73; colonial secretary of Natal 1875; of Mauritius 1877; lieutenant-governor of Mauritius 1880. As governor of Western Australia, 1882–90, he did much to promote the interests of the colony. Besides contributions to magazines, he was author of *Poems from New Zealand* (1868) and *The Stranger of Seriphos* (1869). D. in England, Nov. 26, 1896.

Broome, John L.: b. Mar. 8, 1824, in New York city; appointed 2d lieutenant in the marine corps Jan. 12, 1848; 1st lieutenant, 1857; captain, 1861. He served in the Mexican war; was in command of the marine guard of the Hartford (1862–63). Brevetted major 1864, lieutenant-colonel 1879. Retired Mar. 8, 1888.

Brosböll, bros'böl, Johan Carl Christian: Danish novelist; b. in Fridericia, Aug. 7, 1820. Under the pseudonym *Carit Etlar* he published many novels and tales, and some poems and dramas. His best stories are scenes from Danish history and peasant-life in Jutland. His works were collected in twenty-four volumes (*Skrifter*, 1859–68); an additional collection (*Ny Samling*) appeared 1873–79 (five volumes), and a new edition was published in 1887, ff.

Brotherhood of Andrew and Philip: See the Appendix.

Brotherhood of the Kingdom: See the Appendix.

Brotherhood of St. Andrew: See the Appendix.

Brother Jonathan: See Trumbull, Jonathan.

Brothers of the Christian Schools: an order in the Roman Catholic Church; founded in 1679 at Rheims by the Abbé La Salle, and confirmed in 1725 by Benedict XIII. Its members are not allowed to enter the priesthood. They devote themselves to teaching, and especially to the instruction of the poor, mostly in rudimentary branches, but sometimes in more advanced studies. They are numerous in France, Ireland, Italy, the U. S., and most other countries.

Brough, John: b. in Marietta, O., Sept. 17, 1811; was a printer in his youth; studied at Ohio University. He edited several political journals; became a powerful Democratic orator; held important public offices. In 1846 he became a lawyer. In 1848 he left political life for a time to preside over a railroad. In 1864 he became Governor of Ohio, receiving the joint vote of all parties who were in favor of prosecuting the war against the insurgent States. D. in Cleveland, Aug. 29, 1865.

Brougham, brōō'am, Henry, Lord: orator, lawyer, and writer; b. in Edinburgh, Scotland, Sept. 19, 1779. His mother was a niece of Dr. Robertson, the historian. He graduated in the University of Edinburgh, studied law, and was admitted to the Scottish bar in 1800. He was intimate with Francis Jeffrey and Sydney Smith, whom he aided in founding the *Edinburgh Review* in 1802, and he continued to contribute to that review for many years. In 1808 he removed to London, and was called to the English bar. He became a Whig member of Parliament in 1810, and soon acquired a high reputation as a debater as well as a forensic pleader. As a parliamentary orator he was distinguished for vehemence and energy, and the rather free use of sarcasm and invective. He represented Winchelsea from 1816 to 1830. Among his famous performances as an advocate was his defense of Queen Caroline (1821), by which he gained great popularity. He distinguished himself as a promoter of popular education, as a reformer of laws, and a friend of political reform and progress. In 1825 he published *Practical Observations on the Education of the People*. He took a prominent part in founding the Society for the Diffusion of Useful Knowledge, of which he became in 1827 the first chairman. He made a powerful speech against slavery in 1830, soon after which he was returned to Parliament by the great popular constituency of Yorkshire. In the same year he was appointed Lord Chancellor in the new Whig ministry, and was raised to the peerage as Baron Brougham and Vaux. He retired from office with his colleagues in Nov., 1834, after which he ceased to act with the Whigs, without joining any other party, but pursued an independent political course.

Among his writings are a *Treatise on the Objects, Advantages, and Pleasures of Science*; *Sketches of Statesmen of the Time of George III.* (3 vols., 1839–43); *Political Philosophy* (3 vols., 1840–44). He died at Cannes, in France, May 9, 1868. He had published an edition of his collected works in 10 vols., 1857. See Lord Campbell's *Life of Lord Brougham*.

Brougham, John: actor and playwright; b. in Dublin, Ireland, May 9, 1810; educated to be a surgeon, but reverses led to a change of plan, and he entered the stage at the Tottenham theater, London, in 1830. Afterward he was engaged by Madame Vestris to act in her stock company at the London Olympic theater. His first dramatic composition was a burlesque, written for William E. Burton. It succeeded, and he wrote many similar pieces of a light description. It was at this period that he wrote, in conjunction with Dion Boucicault, the comedy of *London Assurance*. A little later he undertook the management of the London Lyceum, and for this stage he wrote several plays.

In 1842 Brougham removed to the U. S.; acted at the Park theater, and made a professional tour of the theatrical cities of the U. S. He then settled down as a member of the stock company of Burton's theater, New York. Here he wrote *Vanity Fair*; *The Irish Yankee*; *Benjamin Franklin*; *The Irish Emigrant*; a dramatization of *Dombey and Son*; and other dramas. He then undertook the management of Niblo's Garden. On Dec. 23, 1850, he opened Brougham's Lyceum, which afterward became Wallack's theater. Brougham did not keep it long, but while there he wrote, among other pieces, a dramatization of *David Copperfield*, and a new version of *The Actress of Padua*. His next venture was made at the Old Bowery theater (1856–57), where he produced *The Pirates of the Mississippi*; *The Red Mask*; *Tom and Jerry in America*; *The Miller of New Jersey*, all dramas of a common sort, but profitable. Then he accepted an engagement at Wallack's theater, and while there he wrote a version of *Bleak House*; *Pocahontas*; *The Ruling Passion*; and *Playing with Fire*. A little later he left Wallack's and rejoined Burton at the Metro-

politan theater, and here he produced his burlesque of *Columbus*.

In 1861–62 Brougham went to London, where he remained upward of four years. During this time he wrote *The Duke's Motto* and *Bel Demonio*, and dramatic versions of two novels by Miss M. E. Braddon called *Lady Audley's Secret* and *Only a Clod*.

In 1869 he opened Brougham's theater, in Twenty-fourth Street, New York. His management in this house was of short duration. His last appearance on the stage occurred on Oct. 25, 1879, at Booth's theater, New York. He was one of the founders of the Lotos Club, of New York, and for some time its president.

Brougham started in New York a comic paper called *The Lantern*, and he was author of two volumes of miscellaneous writings entitled *A Basket of Chips* and *The Bunsby Papers*. He was separated from his first wife in 1845. His second wife, Miss Nelson, whom he wedded in 1847, died in 1870. D. at New York, June 7, 1880.

Revised by B. B. Vallentine.

Broughton, Rhoda: novelist; b. at Segrwyd Hall, Denbighshire, Wales, Nov. 29, 1840. Among her novels are *Not Wisely, but Too Well* (1867); *Cometh up as a Flower* (1867); *Red as a Rose is She* (1870); *Good-bye, Sweetheart* (1872). Miss Broughton has lived much at Oxford, the scene of her novels *Belinda* (1883) and *Doctor Cupid* (1886).

Brounoff, Platon: See the Appendix.

Brous'sa, or **Brussa** (anc. *Prusa ad Olympum*): a city of Asia Minor; in Anatolia; pleasantly situated at the north base of Mt. Olympus; about 60 miles S. by E. from Constantinople (see map of Turkey, ref. 4–E). It is on a beautiful and fertile plain, and presents a magnificent external appearance, having more than 200 mosques and minarets, some of which are very handsome. The streets are narrow, but are kept clean by running water. Here are many colleges and schools, several Armenian churches, and large bazaars supplied with European goods. Broussa is one of the most commercial cities in Asiatic Turkey, and raw silk is the chief article of export. It has manufactures of silk, satin, gauze, cotton cloths, and tapestry. The silks of Broussa are highly esteemed in the European markets. A superior article of China was formerly manufactured here, but the art is now lost. Here are warm mineral springs which were celebrated in ancient times. *Prusa* was the capital of ancient Bithynia. It was taken by the Turkish Sultan Orkhân in 1326, after which it was the capital of the Turkish empire until 1453. Feb. 28, 1855, the town was nearly destroyed by an earthquake. Pop. reported 37,500 in 1885, but since the Russo-Turkish war it has grown rapidly, and was (1891) estimated at 100,000.

Broussais, broo'say', François Joseph Victor: physician; b. in Saint-Malo, department of Ille-et-Vilaine, France, Dec. 17, 1772; educated in the public school of Dinan and under the supervision of his father, who was a country physician. On the outbreak of the Revolution he joined the army as a volunteer, but was discharged on account of sickness; studied medicine; obtained a commission as surgeon, first on a ship of war, afterward at Brest, and went in 1799 to Paris to pursue a regular course of medicine. In 1804 he was appointed military surgeon to the camp of Boulogne, and accompanied this division of the French army till 1808. After the publication in that year of his *Histoire des Phlegmasies chroniques*, he was made chief physician to one of the divisions of the French army in Spain, and remained there till 1814. After the end of the war he was made assistant professor at the military hospital of the Val de Grâce in Paris; published in 1816 *Examen de doctrine médicale généralement adoptée*; in 1824 *Traité de la physiologie appliquée à la pathologie*; in 1829 *Commentaires des propositions de pathologie consignés dans l'examen*; in 1832 *Le cholera morbus épidémique*, and was in the same year appointed Professor of General Pathology in the Academy of Medicine, which office he held till his death, Nov. 17, 1838. He was the founder of the physiological system of medicine.

Brousson, broo'sõn', Claude: b. in Nîmes, France, in 1647; studied law, and was a celebrated advocate in Toulouse when the persecutions began against the Huguenots, to whose sect he belonged. After the Revocation of the Edict of Nantes in 1685, when the churches of the Huguenots were interdicted, their ministers exiled, and their books burnt, Brousson assembled from time to time his co-religionists in his house, and endeavored to uphold their courage and strengthen their power of resistance. These reunions caused finally a popular outbreak in Toulouse, and Brousson was compelled to flee to Switzerland. Here he was consecrated to the ministry, and although the governor of the province of Languedoc put a price of 10,000 livres on his head, he returned to France, and lived up to 1693 as an itinerant priest in the Cévennes, where he preached in the caves and crags to those who gathered around him, forming the famous *assemblées du désert*. After a short residence in the Netherlands, he re-entered France by the way of the Jura Mountains, and began once more to preach in the Cévennes, but was caught, brought to Montpellier, tried on a charge of co-operating with Count Schomberg in a scheme of invading France, and broken on the wheel Nov. 4, 1698. His influence, both as a preacher and a writer, was very great, and he is considered one of the martyrs of the French Reformed Church. He wrote *L'état des réformés de France* (3 vols., The Hague, 1684); *Lettres au clergé de France* (1685); *Lettres des Protestants de France à toutes les autres Protestants de l'Europe* (Berlin, 1688); *Lettres aux Catholiques romains* (1689); *Relation sommaire des merveilles que Dieu fait en France dans les Cévennes* (1694); *La manne mystique du désert* (published in 1695 by the synod of Haarlem), etc.

Broussone'tia: a genus of trees allied to the mulberry. It comprises the paper mulberry (*Broussonetia papyrifera*), the fibrous bark of which is used by the Chinese and Japanese in the manufacture of paper. It is a small tree with deciduous leaves of variable shape. It is planted as a shade tree in some American cities.

Brown (in Fr. *brun*): in painting, a dark dusky color, inclined to red, of various degrees of depth. It belongs to the tertiary colors known as russets and olives, in which the hue is modified by an admixture of black or a dark pigment. Among the brown pigments are bister, umber, raw and burnt sienna, and brown madder.

Brown, Aaron Venable: statesman; b. in Brunswick co., Va., Aug. 15, 1795; graduated at Chapel Hill in 1814; removed to Tennessee in 1815; partner of James K. Polk; member of Congress 1839–45; and was elected Governor of the State in 1845. He became Postmaster-General of the U. S. in 1857 under Buchanan. D. in Washington, D. C., Mar. 8, 1859.

Brown, Benjamin Gratz: b. in Lexington, Ky., May 28, 1826; graduated at Yale in 1847. He began the practice of law at St. Louis, Mo.; was a member of the State Legislature (1852–58); edited the Missouri *Democrat* (1854–59). On the breaking out of the war in 1861 he raised a regiment and fought on the side of the Union; afterward commanded a brigade of militia. He was among the most active and influential in procuring the adoption of the ordinance of freedom in 1864 by the State of Missouri. He was U. S. Senator in 1863–67, and was made Governor of Missouri in 1871. He was nominated at the Cincinnati convention, May, 1872, for the office of Vice-President of the U. S., Horace Greeley being the nominee for President. D. in St. Louis, Dec. 13, 1885.

Brown, Charles Brockden: novelist, and the first professional man of letters in the U. S.; b. in Philadelphia, Jan. 17, 1771. His life was spent in New York and Philadelphia, where he edited *The Literary Magazine and American Register* (1803–08). His romances, *Wieland* (1798), *Ormund* (1799), *Edgar Huntley* (1799), *Arthur Mervyn* (1800), *Jane Talbot* (1801), and *Clara Howard* (1801), are weird and mysterious, dealing with the phenomena of sleep-walking, ventriloquism, etc. D. Feb. 22, 1810. See Prescott's *Life of C. B. Brown*, in Sparks's *American Biography*, vol. i.; W. Dunlap's *Life of Charles B. Brown*, prefixed to an edition of his works (1827); E. I. Stevenson's *Life*, announced (1897).

Brown, Ford Madox: decorative and genre painter; b. of English parents at Calais, France, Apr. 16, 1821; pupil of the academies of Bruges and Antwerp. Notable among his works is a series of frescoes in the town-hall of Manchester, illustrating the history of the city. He generally held aloof from public exhibitions. D. in London, Oct. 6, 1893.

William A. Coffin.

Brown, Francis, D. D.: b. in Chester, N. H., Jan. 11, 1784; graduated at Dartmouth College in 1805; tutor from 1806 to 1809; settled over the Congregational church in North Yarmouth, Me., in 1810; chosen president of his alma mater in 1815. It was during his presidency that the famous Dartmouth College case was carried up to the U. S.

Supreme Court. Jeremiah Mason and Daniel Webster admired the ability with which he served them in their management of the case, which was won for him, and he was reinstated as college president in 1819. D. July 17, 1820.

Brown, Francis, Ph. D., D. D.: grandson of Francis Brown; b. in Hanover, N. H., Dec. 26, 1849; graduated at Dartmouth College in 1870; tutor there 1872 to 1874; graduated at the Union Theological Seminary in 1877; spent two years in Germany; in 1879 was appointed instructor, in 1881 Associate Professor, in Biblical Philology in the Union Theological Seminary, New York; in 1890 was transferred to the chair of Hebrew and the Cognate Languages. He edited Lenormant's *The Beginnings of History* and (with Dr. R. D. Hitchcock) the *Teaching of the Twelve Apostles*. He wrote *Assyriology, its Use and Abuse in Old Testament Study* (1885). Revised by George P. Fisher.

Brown, George: naval officer; b. in Indiana, June 19, 1835; entered the navy as a midshipman Feb. 5, 1849. He was in command of Admiral Porter's flag-ship, the Octorora, at the attack on Vicksburg, June 28, 1862. On the night of Feb. 24, 1863, Brown, in the steamer Indianola, defended his vessel for an hour and twenty-seven minutes against the rams Queen of the West and William H. Webb, and two large "cotton-clads," surrendering the Indianola only when she was fast filling with water. He commanded the steamer Itasca at the battle of Mobile Bay, Aug. 5, 1864, and during the subsequent operations against the defenses of Mobile. On Jan. 25, 1890, he was assigned to the command of the Pacific station; became a rear-admiral Sept. 27, 1893; retired in 1898.

Brown, George: Canadian statesman; b. in Edinburgh, Scotland, Nov. 29, 1818. He was educated in his native city, and in early manhood removed with his parents to New York. In 1843 he proceeded to Toronto, and in 1844 established the *Globe* newspaper, which has been ever since the leading Liberal paper of Canada. He entered Parliament in 1852; formed the Brown-Dorian administration Aug. 2, 1858, but resigned with his colleagues after holding office for a few days in consequence of adverse vote passed by the Assembly. He was leader of the Reform section of the coalition government from 1864 till 1865, when he resigned owing to the policy of the Government relative to a reciprocity treaty with the U. S. He was a delegate to the Charlottetown conference in 1864; to that at Quebec the same year; went to London on public business in 1865; and to Washington in 1874 as joint plenipotentiary with Sir Edward Thornton to negotiate a commercial treaty with the U. S. On Mar. 25, 1880, he was shot in the leg by a discharged employee, and died in consequence May 9 following. See Hon. Alexander Mackenzie's *Life and Speeches of the Hon. George Brown* (Toronto, 1882).

Neil Macdonald.

Brown, George Loring: landscape-painter; b. in Boston, Mass., Feb. 2, 1814; pupil of Washington Allston, and Isabey, Paris. Most of his works are owned in Boston and vicinity. His *Crown of New England* was purchased by the Prince of Wales when he visited the U. S. in 1860, and his *Bay of New York* was presented to the Prince of Wales in the same year by a number of New York merchants. D. in Malden, Mass., June 12, 1889. W. A. C.

Brown, George William: jurist; b. in Baltimore, Md., Oct. 13, 1812; graduated at Rutgers College in 1831. In 1867 he was a member of the Maryland constitutional convention, and from 1873 until 1888 was chief justice of that State. He was one of three compilers of the first *Digest of the Decisions of the Maryland Court of Appeals*. He was mayor of Baltimore at the time the mob of that city attacked the Sixth Massachusetts Regiment on its way to the defense of Washington, Apr. 19, 1861. D. at Lake Mohonk, N. Y., Sept. 6, 1890. Henry Wade Rogers.

Brown, Goold: grammarian and teacher: b. in Providence, R. I., Mar. 7, 1791; taught an academy in New York for twenty years. He published *Institutes of English Grammar* (1823) and *Grammar of English Grammars* (1850). D. in Lynn, Mass., Mar. 31, 1857.

Brown, Harvey: soldier; b. in Rahway, N. J., in 1795; graduated at West Point in 1818; colonel Fifth Artillery May 5, 1861. He served chiefly at seaboard posts 1818–61; as aide-de-camp to Maj.-Gen. Brown 1824–25; on quartermaster duty 1826–29; in the Black Hawk expedition 1832; in the Florida war 1836–38; engaged at Wahoo Swamp; suppressing Canada border disturbances 1839–41; in the war with Mexico 1846–48; engaged at Monterey, Vera Cruz, Cerro Gordo, Contreras (brevet lieutenant-colonel), Molino del Rey, and the city of Mexico (brevet colonel); on recruiting service 1848–52; superintendent 1851–52; in Florida hostilities 1852–53; in command of the artillery school for practice 1857–58; inspector of artillery 1859–60. In the civil war he was engaged in the defense of Fort Pickens, Fla., 1861–62 (brevet brigadier-general); and as military commander of the city of New York, Jan. 15–July 16, 1863, suppressed the draft riots (brevet major-general). Retired from active service Aug. 1, 1863. D. at Clifton, Staten Island, N. Y., Mar. 31, 1874.

Brown, Henry Billings, LL. D.: jurist; b. in Lee, Mass., Mar. 2, 1836; graduated at Yale in 1856; studied law; removed to Michigan; became U. S. district judge in 1875; appointed associate justice of the Supreme Court of the U. S. in 1890, succeeding Samuel F. Miller.

Henry Wade Rogers.

Brown, Henry Kirke: sculptor and painter; b. in Leyden, Mass., Feb. 24, 1814. Among his best works are the equestrian statue of Washington in Union Square, New York; a colossal bronze statue of Gov. Clinton at Greenwood Cemetery; the *Angel of the Resurrection*, also at Greenwood; and a colossal equestrian statue of Gen. Winfield Scott. His statue of Gov. Clinton at Washington is perhaps the finest. He was the first American to use bronze in sculpture, made much portrait statuary, and was also a painter of no mean ability. D. in Newburg, N. Y., July 10, 1886.

Brown, Jacob: b. in Bucks co., Pa., May 9, 1775; removed to New York in 1798. He joined the army in 1812, and defended Sackett's Harbor in 1813. Having been raised to the rank of major-general, he invaded Canada in the spring of 1814, and commanded with success at Chippewa and Niagara Falls in July of that year. He became commander-in-chief of the U. S. army in 1821. D. in Washington, D. C., Feb. 24, 1828.

Brown, James: merchant; b. in Providence, R. I., Mar. 22, 1698. He was in the third generation of descent from Chad Brown, who immigrated to New England in 1638; became pastor in succession to Roger Williams of the First Baptist church in Providence; was known as the "Peacemaker" of the colony, and died about 1665. James was the father of four sons who were benefactors of Brown University (*q. v.*), founders of the prosperity of Providence, and of a very wealthy family in Rhode Island. D. Apr. 27, 1739.—His son Nicholas; b. in Providence, July 28, 1729; d. there May 29, 1791. He was a zealous Baptist, and greatly increased his fortune by commerce.—The second son, Joseph; b. in Providence, Dec. 3, 1733; on acquiring a fortune, gave much time to mechanics and astronomy. He made observations of the transit of Venus in 1769, and published his observations; was Professor of Natural Philosophy in Rhode Island College from 1784; alone of the brothers became a communicant in the Baptist church; d. Dec. 3, 1785.—John; b. in Providence, Jan. 23, 1736; was the more enterprising of the house; opened trade with China and the East Indies; led the raid upon the British sloop of war Gaspee, 1772; imported and supplied ammunition to the army under Washington while at Cambridge; representative in the Sixth Congress; laid the corner-stone of Rhode Island College when it was removed to Providence; was its benefactor and treasurer from 1783; d. in Providence, Sept. 20, 1803.—Moses, youngest of the brothers; b. in Providence, Apr. 4, 1738; had mercantile experience in the family business; withdrew in 1773; became a Quaker, a patron of Friends' schools, and an abolitionist; d. in Providence, Sept. 6, 1836.—Nicholas, who bore his father's name (as above); b. in Providence, Apr. 4, 1769; is the member of the family for whom Rhode Island College in 1804 changed its name to Brown University. Inheriting wealth and a trading business, he took his brother-in-law into partnership, and thus formed the powerful house of Brown & Ives, now engaged in textile manufactures. He took some representative part in Whig politics, gave about $100,000 to the college, endowed the Providence Athenæum and an insane asylum; d. in Providence, Sept. 27, 1841.—His son was John Carter Brown; bibliophile; b. in Providence, Aug. 28, 1797; graduated at Brown University 1816; partner in his father's business; gathered a library of Americana prior to 1800, rich in Canadian, New England, Spanish, and Portuguese documents and books; celebrated among scholars for its completeness; catalogued by J. R. Bartlett (4 vols., 1871). Mr.

Brown gave $160,000 to Brown University, chiefly for library equipment. D. in Providence, June 10, 1874.

Brown, James Allen, D. D., LL. D.: Lutheran divine; b. of Quaker parentage, in Lancaster co., Pa., Feb. 19, 1821; graduated at Pennsylvania College, Gettysburg, 1842; pastor in Baltimore, Md., and Reading, Pa.; Professor of Systematic Theology, Newberry, S. C., 1859–61, and at Gettysburg, Pa., 1864–79; author of *The New Theology* (1857), and editor of *Quarterly Review of Lutheran Church* (1870–79). D. in Lancaster, Pa., June 19, 1883.

Henry E. Jacobs.

Brown, J. Appleton: landscape-painter: b. at Newburyport, Mass., July 24, 1844; pupil of Benjamin C. Porter, Boston, and of Lambinet in France; member of the Society of American Artists 1892. His pictures of springtime are sympathetically treated, and his landscape work in general is noteworthy on account of its delicate and tender color. Most of his artistic career has been passed in Boston, but he removed to New York in 1891. W. A. C.

Brown, James Baldwin: Congregationalist; b. in London, England, Aug. 19, 1820; d. in London, June 23, 1884. He graduated at University College, London, 1839. He first studied law and afterward theology. He became a minister at Derby (1843), and then was pastor in London, in the Clapham Road (1846). From there he removed with his congregation to Brixton (1870). He had great influence in the Christian communion to which he belonged. He was a prolific author on a variety of theological and ecclesiastical topics. One of his principal works is *The Doctrine of Annihilation in the Light of the Gospel of Love* (London, 1875; 2d ed. 1878). George P. Fisher.

Brown, John: a religious writer; b. at Carpow, in Perthshire, Scotland, in 1722. He studied theology under Ebenezer Erskine, of Stirling, in connection with the Associate Burgher Synod, and in 1751 became pastor of the Associate congregation at Haddington, and so remained till his death. He had a high reputation for piety and learning. It is stated that he knew nine languages. Among his works are a *Dictionary of the Bible* (Edinburgh, 1769) and a *Self-interpreting Bible* (1778, 2 vols.). D. in Haddington, June 19, 1787.

Brown, John, M. D.: a physician; author of the Brunonian system of medicine; was born in Bunkle parish, Berwickshire, Scotland, in 1735. He published in 1780 *Elementa Medicinæ*, in which he propounded his new system, in which diseases were classified as the consequence of an excess or deficiency of excitement, or as sthenic and asthenic. This was received with favor by many physicians. His favorite medicines were alcohol and opium. D. in London, Oct. 17, 1788.

Brown, John: patriot; b. in Sandisfield, Mass., Oct. 19, 1744; graduated at Yale in 1761; became king's attorney in the New York colony; afterward practiced law at Pittsfield, Mass. In 1774 and 1775 he operated for the cause of freedom in Canada; aided in the capture of Ticonderoga; took Fort Chambly; fought at Quebec; became a lieutenant-colonel; and in 1777 surprised the outposts at Ticonderoga, and made important captures. He was killed by the Indians in the Mohawk Valley campaign, Oct. 19, 1780.

Brown, John, M. D.: physician; a son of Rev. Dr. John Brown, of Haddington (1784–1858); b. in Biggar, Scotland, Sept. 22, 1810. He practiced in Edinburgh, and published *Horæ Subsecivæ* (1858), containing the well-known *Our Dogs, Rab and his Friends*, and *John Leech and Other Papers* (1882). He wrote but little, and only of animals and things he loved. Pathos and humor are his characteristics. He suffered much from periods of depression. D. in Edinburgh, May 11, 1882.

Brown, John, **of Ossawatomie**: a zealous opponent of slavery; b. in Torrington, Conn., May 9, 1800. He removed to Ohio in early youth, married, and worked at the trade of a tanner. His life was always unsettled and adventurous, but as upright and resolute as an old Covenanter's. He was twice married and had twenty children, and the whole family made sacrifices to sustain his enterprises. In 1855 he emigrated to Kansas, where he fought against the pro-slavery party, and lived at Ossawatomie. His house was burned and a son killed in the border wars of Kansas, and he made bloody reprisals. He was the master-spirit of the convention which met at Chatham, Canada, in May, 1859, and organized an invasion of Virginia in order to liberate the slaves. In July of that year he rented a farmhouse about 6 miles from Harper's Ferry. On Oct. 16, aided by twenty-two associates, of whom six were Negroes, he surprised Harper's Ferry, and captured the arsenal and armory. He and his party were overcome the next day by a detachment of U. S. troops, and Brown and his surviving followers were given up to the State authorities for trial. He was hanged at Charlestown, Va., Dec. 2, 1859, exhibiting great serenity and elevation of mind. His adventure was influential in disclosing and intensifying the feeling between the North and the South, and a popular song concerning him was an inspiring tune in all the Union camps during the civil war. See Redpath, *Life of Captain John Brown* (1860), and the fuller work of F. B. Sanborn, *Life and Letters of John Brown* (1885).

Brown, John G.: genre-painter; b. at Durham, England, Nov. 11, 1831; pupil of the Academy at Edinburgh, Scotland, and afterward, when he removed to the U. S., studied in the schools of the National Academy, New York, in 1853; National Academician 1863; honorable mention, Paris Exposition, 1889. The subjects of his works are scenes of country life and single figures. His portrayals of the New York bootblacks and street urchins are widely known and very popular. He is president of the American Water-color Society, and paints skillfully in oil and in water-color. Studio in New York. William A. Coffin.

Brown, John Henry Hobart, D. D.: first Protestant Episcopal bishop in Fond du Lac, Wis.; b. in New York city, Dec. 1, 1831; graduated at the General Theological Seminary 1854; took orders 1855; served parishes in New York State; consecrated bishop Dec. 15, 1875; d. at his see May 2, 1888.

Brown, John Lewis: French painter of genre and outdoor life, principally hunting scenes; b. at Bordeaux, Aug. 16, 1829. He became identified with the impressionists, and his pictures give evidence of careful and artistic observation and talent in the representation of atmospheric effects. Pupil of Roqueplan and of Belloc; first-class medal, Paris Exposition, 1889; Legion of Honor 1870. Studio in Paris. D. in 1892. W. A. C.

Brown, Joseph Emerson, LL. D.: statesman; b. in Pickens co., S. C., Apr. 15, 1821; educated at Calhoun Academy, S. C., and in law at Yale College 1846; settled in Canton, Ga.; engaged in politics and served in the Legislature; superior court judge of Blue Ridge circuit 1855; elected Governor in 1857 and for three succeeding terms; as war Governor of Georgia seized the Savannah forts before his State seceded; disputed with Mr. Davis the Confederate conscription laws; opposed Sherman's march through Georgia with 10,000 recruits gathered from exempt classes, but refused to send them out of the State; prisoner of war in 1864; acquiesced in reconstruction laws, and supported Grant for the presidency at the cost of popularity at home; chief justice of Georgia 1868; president of Western and Atlantic R. R. from 1870; U. S. Senator in 1880 to fill vacancy caused by resignation of Gen. Gordon; retained in the Senate by the Legislature until 1890, when he declined a re-election; gave $50,000 to Southern Baptist Theological Seminary, and as much more to the Georgia State University. D. in Atlanta, Ga., Nov. 30, 1894. See his *Life and Times*, by H. Fielder (Springfield, Mass., 1883).

Brown, Robert: founder of the Brownist sect, or Independents (*q. v.*); b. in Tolethorpe, Rutlandshire, England, about 1550; probably graduated at Corpus Christi College, Cambridge, 1574; taught school in Southwark, and preached in the fields; went to Norwich and organized a Congregational church in 1581, publishing his views of church polity; took refuge in Holland and distributed tracts in England, for which two men were hanged; tried for heresy in Scotland 1583; preached in Northampton; got into jail for it; was excommunicated by the Bishop of Peterborough, having never separated entirely from the establishment; conformed in 1591, and for forty years was rector of Achurch-cum-Thorpe, diocese of Peterborough; left treatises, of which three are extant, teaching Congregationalism as practiced in the U. S.; said he had been "in thirty-two dungeons"; d. in 1633, and, it is reported, in Northampton jail.

Brown, Robert, M. A., Ph. D.: traveler and scientist; b. in Campster, Caithness, Scotland, Mar. 23, 1842; studied at Edinburgh, Leyden, Copenhagen, and Rostock; visited Jan Mayen, Spitzbergen, Greenland, and western shore of Baffin's Bay (1861); the Pacific islands, Alaska, Venezuela, and Bering seacoast and Vancouver (1863–66); Greenland

a second time and North Africa since 1867; removed to London, 1876 in order to devote himself to literary work; member of numerous learned societies; author of twenty-six volumes, including *Peoples of the World* (6 vols.); *Countries of the World* (6 vols.); *Manual of Botany; Our Earth* (3 vols.); and *Science for All* (5 vols.); a large number of scientific memoirs, and some 3,000 articles and reviews in various languages. D. Oct. 26, 1895.

Brown, Robert, F. R. S., D. C. L.: botanist; b. at Montrose, Scotland, Dec. 21, 1773. He studied medicine in the University of Edinburgh, and was naturalist to the expedition which Capt. Flinders conducted to Australia in 1801. In 1805 he returned with a collection of 4,000 species of Australian plants, and in 1810 he published a *Prodromus Floræ Novæ Hollandiæ*. He also wrote *General Remarks, Geographical and Systematical, on the Botany of Terra Australis* (1814). His discovery of the gymnospermy of the conifers was published in 1825. In 1827 he became keeper of the botanical department of the British Museum. D. in London, June 10, 1858.

Brown, Sir Samuel: naval officer and civil engineer; b. in London, England, in 1776. He served on the sea in the Napoleonic wars; invented a method of manufacturing chain cables which led to their introduction into the navy; in 1819 built the first suspension bridge in England. Made a Hanoverian knight in 1838. D. in Blackheath, Mar. 15, 1852.

Brown, Samuel Gilman, D. D., LL. D.: son of President Francis Brown; b. in North Yarmouth, Me., Jan. 4, 1813; graduated at Dartmouth College in 1831, and at Andover Theological Seminary in 1837; traveled in Europe from 1838 to 1840; was professor in Dartmouth College, first of oratory and belles-lettres, from 1840 to 1863, then of intellectual philosophy from 1863 to 1867, and was president of Hamilton College from 1867 to 1881. Besides numerous addresses and articles in reviews, he published a *Biography of Self-taught Men* (1847) and *The Life of Hon. Rufus Choate* (1862). He also lectured on *British Orators*. D. in Utica, N. Y., Nov. 4, 1885.

Brown, Thomas, M. D.: metaphysician; b. in Kirkcudbrightshire, Scotland, Jan. 9, 1778. He was a pupil of Dugald Stewart in Edinburgh. In 1798 he published a refutation of Darwin's *Zoönomia*. Having studied medicine, he graduated in 1803, and practiced medicine about seven years. In 1810 he was appointed colleague of Dugald Stewart as Professor of Moral Philosophy in the University of Edinburgh. He was very popular as a lecturer, and published *Lectures on the Philosophy of the Human Mind* (4 vols., 1820). His other chief work is *Observations on the Relation of Cause and Effect* (1805; 3d ed. enlarged, 1818). His chief contribution to psychology is an explication of the sixth or *muscular* sense. Died while on a visit in London, Apr. 2, 1820. See Dr. Welsh, *Account of the Life and Writings of Thomas Brown* (1825).

Brown, Thomas: English humorist; b. at Shifnal, in Shropshire, in 1663; educated at Christ Church, Oxford. His writings consist largely of satires, epigrams, lampoons, farces, and sketches of low life in London, such as *Amusements, Serious and Comical* (1700); *A Wall Round London and Westminster*. D. June 16, 1704. Henry A. Beers.

Brown, Thomas Edward: See the Appendix.

Browne, Charles Farrar (known as *Artemus Ward*): humorous writer; b. at Waterford, Me., Apr. 26, 1834. He learned the business of a printer; removed to Ohio, and about 1858 began contributing to the *Cleveland Plaindealer* a series of humorous *Letters from Artemus Ward, Showman*. In 1860 he went to New York and joined the editorial staff of *Vanity Fair*. He became a popular lecturer; visited California in 1863 and London in 1866. D. at Southampton, England, Mar. 6, 1867. He published *Artemus Ward, his Book* (1862), and other works. See his *Complete Writings*, with biography, by M. D. Landon (New York, 1875).

Browne, Edward Harold, D. D., D. C. L.: Bishop of Winchester, England; b. at Aylesbury, Buckinghamshire, Mar. 6, 1811; educated at Emmanuel College, Cambridge, 1832; took orders in 1836; consecrated Bishop of Ely 1864; translated to Winchester 1873; resigned 1891. Bishop Browne took a great interest in the Old Catholic movement, and attended the Old Catholic congress at Cologne in 1872. He was a member of the O. T. Company of Revision of King James's Version. He was the author of *An Exposition of the XXXIX. Articles* (2 vols., 1850–53; 13th ed. in 1 vol., 1887); *Sermons on the Atonement and other Subjects* (1859); *Messiah Foretold and Expected* (1862); *The Pentateuch and the Elohistic Psalms in reply to Bishop Colenso* (1863); *The Strife, the Victory, the Kingdom* (1872); *Position and Parties of the English Church* (1875); *Commentary on Genesis* in the *Speaker's Commentary*, together with numerous charges, addresses, etc. D. Dec. 19, 1891.

William Stevens Perry.

Browne, Sir J. C.: See Crichton-Browne.

Browne, John Ross: Irish-American writer and traveler; b. in Ireland in 1817. Among his works are *Etchings of a Whaling Cruise* (1846) and *Yusef, or the Journey of the Fragi* (1853). He was minister to China in 1868–70. D. in Oakland, Cal., Dec. 9, 1875.

Browne, Samuel J.: b. in England, Mar. 19, 1788; became in 1798 a resident of Cincinnati, O., where he grew rich by investments in land. He was long a minister of the United Brethren, and afterward of the Presbyterians. D. in Harrison Junction, O., Sept. 10, 1872, leaving a large amount of money to found a church, a university, and a free school.

Browne, Sir Thomas, M. D.: English philosopher and writer; b. in London, Nov. 19, 1605. He practiced medicine at Norwich for many years; published, besides other works, *Religio Medici* (1642); *Inquiries into Vulgar and Common Errors* (1646); and *Urn Burial* (1658), all written in a quaint, highly latinized style, and displaying a most peculiar imagination. He was knighted by Charles II. in 1671. D. Nov. 19, 1682.

Browne, William: pastoral poet; b. at Tavistock, Devonshire, England, in 1591. He was educated at Exeter College, Oxford; afterward entered himself at the Inner Temple. His best-known works are *Britannia's Pastorals* (1613–16) and *The Shepherd's Pipe* (1614). D. about 1643.

Henry A. Beers.

Brownell, Henry Howard: b. in Providence, R. I., Feb. 6, 1820; graduated at Trinity College, Hartford, Conn., in 1841; wrote a number of popular histories; a volume of *Poems* (1847); *Lyrics of a Day* (1864); *War Lyrics* (1866). In the civil war he was a volunteer naval officer, serving on Farragut's staff. He lived mainly at East Hartford, where he died Oct. 31, 1872.

Brownell, Thomas Church, D. D., LL. D.: Bishop of Connecticut; b. at Westport, Mass., Oct. 19, 1779; graduated at Union College in 1804. He held various professorships in the college until 1816, when he took orders in the Protestant Episcopal Church. In 1819 he was consecrated Bishop of Connecticut, and was the first president of Trinity College, Hartford (1824–31). He was largely instrumental in providing liberal endowments for its professorships, and in securing important additions to its general fund. In 1852 he became presiding Bishop of the Protestant Episcopal Church in the U. S. He published an *Expositor* of the New Testament; a *Commentary on the Book of Common Prayer*; *Religion of the Heart and Life* (5 vols., 1839–40); *Consolation for the Afflicted*; *Christian's Walk and Consolation*; and several other works. D. in Hartford, Conn., Jan. 13, 1865. A bronze statue of the bishop stands on the campus of Trinity College, Hartford, the gift of his son-in-law, Gordon W. Burnham, of New York.

Brownian Movements (*Pedesis*): those movements seen with the microscope among minute particles (not living) in a liquid. Robert Brown, the botanist, first described them in 1827. These movements have often been mistaken for *vital* motions. When bacteria or other minute organisms in a solution are observed through a microscope they are found to be in motion. After the liquid has been sterilized by heat or otherwise, motion still goes on, but in a manner obviously different from that due to living organisms. The same phenomena can be exhibited by rubbing fine powder of gamboge, carmine, lampblack, or pumice-stone in water. Indeed, as Jevons has shown, all solid matter when very finely divided, and in suitable liquid, shows this motion. Beale considers of the same nature the motions of very minute bubbles ($\frac{1}{20000}$ of an inch in diameter) within certain crystals. These movements have not been satisfactorily explained. Beale suggests their possible connection with heat. See Jevons, *Quarterly Journal of Microscopy*, viii. (1878), p. 172; also Carpenter, *The Microscope*, 7th ed., p. 373.

E. L. Nichols.

Brownie: a spirit of the fairy order in the old superstitions of Scotland. The tradition is that he was a good-humored goblin, who attached himself to farmhouses, and occupied himself when the family were in bed in performing any work, such as churning, threshing, etc.—a spirit not seen or spoken to, and only known by the performance of voluntary labors. In Cornwall a goblin known as Browny is called to assist at the swarming of bees.

Browning, Elizabeth Barrett: the greatest English poetess; b. in Carlton Hall, Durham, Mar. 6, 1806. Her father, Edward Moulton, took the name Barrett on the inheritance of some estates in Jamaica. She was liberally educated, and studied the Greek and Latin languages with success. She published in 1826 a volume entitled an *Essay on Mind, and other Poems*, and in 1833 translated from the Greek of Æschylus *Prometheus Bound*. Her health having been impaired by the rupture of a blood-vessel in 1837, she passed several years in seclusion. In 1846 she was married clandestinely to the poet Robert Browning, and went with him to reside in Italy. Among her poems are *The Seraphim and other Poems* (1838); *The Romaunt of the Page* (1839); *A Drama of Exile* (1844); *Aurora Leigh* (1856); *Poems before Congress* (1860); and *Last Poems* (1861). Many of Mrs. Browning's poems, such as *Casa Guidi Windows* (1851), relate to Italy and the Italian aspirations for liberty and unity. *Aurora Leigh* (1856), in which she embodies her philosophy of life and art, is a novel in verse, dealing with contemporary thought in 12,000 lines of blank verse. *Sonnets from the Portuguese* (1850) contains some of the finest love poetry in the language, and is not, in fact, a translation, as the title implies, but original with Mrs. Browning. She died in Florence, June 30, 1861.

Revised by Henry A. Beers.

Browning, Orville Hickman: statesman; b. in Harrison co., Ky., 1810; educated at Augusta College; studied law; called to the bar in 1831; removed to Quincy, Ill. He served in the Black Hawk war; became a prominent State politician; was U. S. Senator (1861–63); Secretary of the Interior (1866–68); acting Attorney-General of the U. S. under President Johnson (1868–69). D. in Quincy, Aug. 10, 1881.

Browning, Robert: the foremost of psychological poets; b. at Camberwell, a suburb of London, May 7, 1812. His early education, up to the age of fourteen, was got in private schools and at home; subsequently a private tutor was employed for some years. His father, a clerk in the Bank of England and a scholar of the old-fashioned classical type, was an enthusiastic collector of scarce and curious books, and his house was filled with them. These the young Browning voraciously devoured, and from them, and the inspiration of his book-loving father and of a mother of whom Carlyle spoke as "the true type of a Scottish gentlewoman," and the poet himself as "a divine woman," he derived an education of a kind which, no doubt, better fitted him for his future work than any he could have derived from either of the great universities at the time. In a private letter he says: "I could never have done much by either process," meaning that of public school or university.

In his eighteenth year he attended for only a term or two the London University, now University College, where he studied Greek chiefly, an ardent love of which he had imbibed from his father. The winter of 1833–34 he spent in Russia, and was much impressed with Russian life and Russian winter scenery. It does not seem that, up to this time, he had pursued any strictly scientific studies, though his knowledge of various sciences appears, from his poetry, to have become later quite extensive. Throughout his works there are many evidences of a deep insight into the phenomena of nature. But the human soul was ever his ultimate interest; in his own words, "little else is worth study" than what bears upon its development. His early work, *Paracelsus* (1835), showed the transcendental character of his genius, and struck the key-note of his subsequent poetry—namely, that "truth is within ourselves," meaning spiritual and absolute truth, the greatest agency for the awakening of which being great personalities.

He married in 1846 the poet Elizabeth Barrett. Their married life of fifteen years (she died in 1861) was spent in Italy, and chiefly in Florence, golden records of which are his *One Word More* and *O Lyric Love, Half Angel and Half Bird*. A son, Robert Wiedemann Barrett Browning, who has attained to considerable distinction as an artist, was born Mar. 9, 1849.

Italy was ever Browning's "land of lands," and his poetry is informed throughout with its spirit, and exhibits a subtle knowledge of the Italian character in all its phases. "Open my heart and you will see graved inside of it 'Italy.'" After the death of Mrs. Browning he took up his abode in London, making annual summer visits to the Continent till the end of his life, especially to his beloved Venice.

Of his voluminous poetry space allows mention of only the more important works, or collections published under general titles: *Strafford: an Historical Tragedy* (1837); *Sordello* (1840); *Bells and Pomegranates*, in 8 nos. (1841–46), containing many of his most popular compositions; *Christmas Eve and Easter Day* (1850) give the poet's attitude toward Christianity; *Men and Women* (1855); *Dramatis Personæ* (1864); the last two collections will continue perhaps to be most read; *The Ring and the Book* (1868–69), his masterpiece, and the greatest poetical achievement of the century; *Balaustion's Adventure, including a Transcript* from *Euripides* (1871); the *Transcript* is a paraphrase of the *Alkestis*, informed with the idea of the regenerating power of personality; *Fifine at the Fair* (1872); *Red Cotton Nightcap Country* (1873); *Aristophanes's Apology* (1875); *La Saisiaz* (1878), "the poet's musings on death, God, the soul, and the future state"; *Dramatic Idylls* (1879; 2d series 1880), etc. His last volume, *Asolando*, was published in London on the day of his death, which took place in Venice, in the Palazzo Rezzonico, Dec. 12, 1889. His body rests in Poets' Corner, in Westminster Abbey.

By far the largest portion of his voluminous poetry is dramatic monologue—a difficult art-form which he made peculiarly his own, in bringing it into the service of that "worthier stage, the soul itself, its shifting fancies and celestial lights."

After nearly fifty years of noble poetic productiveness, which was unattended by any conspicuous recognition, the poet at last received a portion of the payment in the public estimation which had been so long due him. The Browning Society of London was founded in 1881 by Dr. F. J. Furnivall for the study and discussion of his works, the publication of papers on them, etc. A large body of valuable criticism has been since published by the society, and an interest has been awakened which has resulted in the publication of many works of various kinds on his poetry, and in the establishment of Browning clubs all over the English-speaking world—an interest which, by reason of its solid basis, will be perpetuated and increased.

Hiram Corson.

Brownists: See Baptists.

Brownlow, William Gannaway: Methodist divine and politician; b. in Wythe co., Va., Aug. 29, 1805; removed to Tennessee, where he edited the *Knoxville Whig*, in which his caustic writing earned him the sobriquet of "the fighting parson." In 1856 he published *The Iron Wheel Examined and its False Spokes Extracted*, in reply to an assault on Methodism. After the breaking out of the war in 1861 he was a firm adherent of the Union party, in consequence of which he suffered arrest and imprisonment, when the Confederate government in 1862 sent him within the Union lines. He then lectured in Northern cities to large audiences, but in 1864 returned to Knoxville, and in 1865 was elected Governor of Tennessee by the Republicans; re-elected in 1867. He was a member of the U. S. Senate from 1869 to 1875. D. in Knoxville, Tenn., Apr. 29, 1877.

Brownlow: Earls, and Viscounts Alford (1815, in the United Kingdom), Barons Brownlow (1776, in Great Britain), and Baronets (1677), a prominent family of Great Britain.—Adelbert Wellington Brownlow, the third earl, born Aug. 19, 1844, succeeded his brother in 1867. He was member of Parliament for North Shropshire 1866–67.

Brown-Séquard, brown'se-kaar', C. Édouard, M. D.: physiologist and neurologist; b. in the island of Mauritius in 1818. He was the son of Edward Brown, a Philadelphian, and a French lady *née* Séquard. He studied in Paris, where he graduated as M. D. in 1840. He gained distinction by experiments on blood, animal heat, and the spinal cord. These highly important researches are believed to have thrown as much light as those of any other observer upon the physiology and diseases of the nervous system. In 1869 he was appointed professor in the School of Medicine in Paris. His researches have done much to elucidate the relations of the sensor to the motor nerves and the gray matter of the brain. He was a lecturer in Harvard University 1864–68; a practitioner in New York 1873–78; the founder of several medical journals in Paris; Professor, from

1878, of Experimental Medicine in the Collège de France. Late in life he announced the discovery of an *elixir vitæ* prepared from the genitals of sheep for inoculation, but to the detriment of his reputation. He resided chiefly in Paris. His principal works are *Physiology and Pathology of the Nervous System* (1860); *Paralysis of the Lower Extremities* (1860); *Lectures on Nervous Affections* (1873); articles in medical journals. D. in Paris, Apr. 1, 1894.

Brownson, Nathan: a physician and statesman of Georgia; graduated at Yale in 1761; member of the Provincial Congress (1775); surgeon of the Revolutionary army; member of the Continental Congress (1776 and 1778); Governor of Georgia in 1781. D. in Liberty co., Ga., in 1796.

Brownson, Orestes Augustus, LL. D.: journalist and theologian; b. in Stockbridge, Vt., Sept. 16, 1803. He founded in 1838 *The Boston Quarterly Review*, known later as *Brownson's Quarterly Review* (New York), and nearly all written by him; discontinued in 1873; was a frequent contributor to the *Democratic Review*. He became a Roman Catholic in 1844, having previously been a Presbyterian, Universalist, and Unitarian. He published a novel, *Charles Elwood, or the Infidel Converted* (Boston, 1840), and other works. D. in Detroit, Mich., Apr. 17, 1876. See his *Works* (New York, 1883–85, 19 vols.).

Brown's Valley: village; Traverse co., Minn. (for location of county, see map of Minnesota, ref. 8–A); is terminus of Brown's Valley branch of Great Northern R. R.; has four churches, a good school, a grain elevator, and a flouring-mill. Its water-supply is mostly derived from an artesian well. It is situated in a fine agricultural district between the sources of Big Stone and Traverse Lakes, which form the boundary between Minnesota and South Dakota for over 70 miles. Pop. (1880) 64; (1890) 498; (1900) 721.

Editor of "Interlake Tribune."

Brownsville: Lonoke co., Ark. (for location of county, see map of Arkansas, ref. 3–D); 27 miles E. of Little Rock. Here an engagement took place, Aug. 25, 1863, between a division of U. S. cavalry and the Confederates, who were quickly driven from the town.

Brownsville: borough; Fayette co., Pa.: on railroad and the Monongahela river; 35 miles S. of Pittsburg (for location of county, see map of Pennsylvania, ref. 6–B); has large glass-factories, coal mines, iron-foundries, machine-shops, planing-mills, etc. Pop. (1880) 1,489; (1890) 1,417; (1900) 1,552.

Editor of "Clipper."

Brownsville: city; capital of Haywood co., Tenn. (for location of county, see map of Tennessee, ref. 7–B). The city is in the midst of a rich cotton-growing district, and its principal industries are connected with the shipping and manufacture of cotton. Pop. (1890) 2,516; (1900) 2,645.

Brownsville: a river-port and city; on railroad; capital of Cameron co., Tex. (for location of county, see map of Texas, ref. 8–H); on the left bank of the Rio Grande, opposite Matamoras, Mexico. It has steam-navigation on the Rio Grande and an extensive trade with Mexico. Here are a custom-house, 6 churches, 9 schools, and a Roman Catholic college. Brownsville was taken from the Confederates by Gen. Banks in Nov., 1863. Pop. (1880) 4,938; (1890) 6,134; (1900) 6,305.

Editor of "Cosmopolitan."

Brown University: an institution of learning founded in 1764 at Warren, R. I., and removed to Providence, its present seat, in 1770. Its first name was Rhode Island College, but in 1804 it received its present name, in honor of Nicholas Brown, one of its chief benefactors. Its presidents have been James Manning, 1765–90; Jonathan Maxey, 1792–1802; Asa Messer, 1802–27; Francis Wayland, 1827–55; Barnes Sears, 1855–67; Alexis Caswell, 1868–72; Ezekiel G. Robinson, 1872–89; E. Benjamin Andrews, 1889–98; William Herbert Perry Faunce since May, 1899. The corporation consists of 12 fellows and 36 trustees, of whom a slight majority, including the president, must be Baptists, while the rest *can not* be, except that 4 fellows may be members of any denomination, though these places have never been filled by Baptists. The administration is most liberal and catholic. The statistics for 1900 show 75 members of the faculty and 886 students, of whom 88 are graduate students. The library has 100,000 volumes. The 13 university buildings are all substantial and in good order, and several of them new and of superior architecture. The gymnasium is exceptionally beautiful and well equipped. The observatory contains one of the finest telescopes in America. The university's invested funds amount to about $1,300,000. The buildings and grounds have an assessed valuation of half a million more. Courses of study are provided for the degrees of A. B., B. P., B. S., C. E., and M. E. The studies for the first year are usually prescribed, the rest nearly all elective. Of the graduate students ten are candidates for the degree of Ph. D. About half the students are from Rhode Island, about a fourth from Massachusetts and Connecticut. In the remainder nearly all the States are represented, as well as Canada. Revised by E. B. Andrews.

Brownwood: city; capital of Brown co., Tex. (for location of county, see map of Texas, ref. 3–G); on Gulf, Col. and Santa Fé and Fort Worth and Rio Gr. R. Rs.; 370 miles from Galveston and 140 miles from Austin; has 6 churches, 2 public schools, Daniel Baker College (Presbyterian), and Howard Payne College (Baptist). Its principal industrial establishments are a cottonseed-oil mill, roller flouring-mills, ice-factory, wire-fence, iron-cornice, and saddle and harness manufactories, and coal mines. The city has a thriving trade in wheat, cotton, hay, pecans, cattle, and hides. Pop. (1880) 725; (1890) 2,176; (1900) 3,965.

Proprietor of "Banner."

Brozik, Vaczlav: painter of historical subjects and genre; b. at Tzemoschna, near Pilsen, Bohemia, in 1852; pupil of Piloty and of Munkacsy; second-class medal, Salon, 1878; officer Legion of Honor 1890. His best work is the *The Imperial Counselors Martinitz and Slawata thrown out of the windows of the Château of Hradschine at Prague by Count Thurn, in 1618*, which is dramatically composed, and fairly good in color and drawing. The large picture of *Columbus before Ferdinand and Isabella*, in the Metropolitan Museum, New York, is much inferior to it. Studio in Paris.

William A. Coffin.

Bruce: the name of a noble family of Scotland; descended from Robert de Bruis (or de Brus), a Norman knight who followed William the Conqueror to England in 1066. He derived his lineage from Brusi, a Northman, a son of the famous Sigurd. His younger son, Adam, who acquired a large estate in Yorkshire, left a son, Robert, who received from David I. of Scotland a grant of the lordship of Annandale, held by the tenure of military service. He died in 1141, and left a son Robert, who was the second Lord of Annandale. This second lord had a grandson, Robert, who was the fourth Lord of Annandale. He married Isabel, a daughter of David, Earl of Huntingdon, younger brother of King William the Lion, and thus laid the foundation for the royal house of Bruce. He died in 1245. Robert de Bruce, a son of the preceding, and the fifth Lord of Annandale, was born in 1210. When the Scottish throne became vacant by the death of Queen Margaret in 1290, this Robert de Bruce and Baliol claimed the throne. The dispute was referred to Edward I. of England, who decided in favor of Baliol. Robert died in 1295, leaving a son, Robert, who by his marriage with the Countess of Carrick obtained the title of Earl of Carrick (1271). He fought in the English army against Baliol at the battle of Dunbar. D. in 1304, and left a son, Robert, who became King of Scotland.

Bruce, Alexander Balmain, D. D.: theologian; b. in the parish of Aberdalgie, Perthshire, Scotland, Jan. 30, 1831; studied in Edinburgh; was settled in Cardross, Dumbartonshire, in 1859; was translated to Broughty Ferry, Forfarshire, in 1868; and in 1875 was made Professor of Apologetics and New Testament Exegesis in Free Church College of Glasgow. Has published *The Training of the Twelve Apostles* (Edinburgh, 1871; 3d ed. 1883); *The Humiliation of Christ* (1876; 2d ed. 1881); *The Chief End of Revelation* (London, 1881); *The Parabolic Teaching of Christ* (1882; 3d ed. 1887); *The Galilean Gospel* (Edinburgh, 1882); *The Miraculous Element in the Gospels* (London, 1887); *The Kingdom of God* (Edinburgh, 1889); *Apologetics* (1892); and some minor works.

S. M. Jackson.

Bruce, David: See David II.

Bruce, Edward: King of Ireland; younger brother of Robert, King of Scotland; fought for Scottish independence; landing in Ireland with 6,000 men in 1315, wrested Ulster from the English, and was crowned King of Ireland 1316; defeated and slain in battle of Dundalk, Oct. 5, 1318.

Bruce, Sir Frederick William Adolphus: a British diplomatist; b. in Broomhall, Fifeshire, Scotland, Apr. 14, 1814; brother of Lord Elgin; graduated at Oxford 1834. He was consul-general in Egypt in 1849; minister to China 1861; and in 1865 succeeded Lord Lyons as ambassador at Washington. D. in Boston, Mass., Sept. 19, 1867.

Bruce, George: b. in Edinburgh, Scotland, June 26, 1781; removed in 1795 to the U. S., and learned to be a printer in Philadelphia. In 1803 he became publisher and printer of the New York *Daily Advertiser*; in 1806, with his brother David, he began printing books; in 1812 they introduced stereotyping into the U. S., and soon after established an extensive type and stereotype founding business. George, with his nephew David, invented a successful type-casting machine. D. in New York, July 6, 1866.

Bruce, Sir George Barclay: b. in Newcastle-on-Tyne in 1821. He was trained for the profession of a civil engineer as a pupil of Robert Stephenson, on whose recommendation he obtained appointments on the Newcastle and Darlington, the Northampton and Peterborough, and the York, Newcastle and Berwick Railways, and became resident engineer of the Royal Border bridge, a work nearly half a mile long, carrying the last-named railway over the Tweed at Berwick. This bridge was opened by the Queen with considerable state in 1850. Shortly afterward Mr. Bruce went to India, and in 1853 became chief engineer of the Madras Railway. He laid out and constructed the original line, 500 miles long, on the departmental system, i. e. dispensing with a contractor, a proceeding which was reckoned a bold experiment in those days. He became consulting engineer to what is now the South Indian Railway, of 600 miles, which was carried out on the same system as the Madras line. In addition, he was engineer also to some East Prussian railways, and to the Government of New Zealand for its lines, as well as to those constructed in Spain and the Spanish-speaking republics, among the most notable being the Rio Tinto and the East Argentine lines. On June 6, 1887, he was elected president of the Institution of Civil Engineers, and again on May 29, 1888. Shortly afterward he received the honor of knighthood, as having been president at the time of the jubilee of the Queen. Sir George has been moderator of the English Presbyterian Synod. Wm. R. Hutton.

Bruce, James: traveler; b. in the county of Stirling, Dec. 14, 1730. He was appointed consul-general at Algiers in 1763, after which he studied several Oriental languages, and explored the antiquities of Barbary. In 1768 he departed from Cairo on a journey to Abyssinia, in order to discover the source of the Nile. Passing through Syene, Cosseir, and Jidda, he reached Gondar in Feb., 1770. He discovered the source of the Blue Nile in November of that year, and remained about two years in Abyssinia, the king of which treated him kindly. He passed through great dangers and hardships in his return, and arrived in England in 1774. In 1790 he published *Travels to Discover the Source of the Nile* (5 vols.). His veracity was at first doubted by many, but his statements have been confirmed by Salt, Belzoni, and others. D. at Kinnard, Apr. 27, 1794. See A. Murray, *Life of Bruce*.

Bruce, Michael: Scottish poet, whose productions (mostly hymns) are characterized by singular pathos and beauty; b. at Kinneswood, in the county of Kinross, Mar. 27, 1746. He died of consumption July 5, 1767. In 1770 his "friend," the Rev. John Logan (1748–88), published what purported to be his literary remains. In 1781 this same Logan published another volume of poems, which he called his own. The best of these, it is now almost absolutely certain, came from the pen of Michael Bruce. A baser act of literary piracy was never perpetrated. See *The Works of Michael Bruce*, edited by Rev. Alexander B. Grosart, Edinburgh, 1865.

Bruce, Robert: an heroic King of Scotland; b. Mar. 21, 1274; son of Robert de Bruce, Earl of Carrick. In 1296, as Earl of Carrick, he swore fealty to Edward I. of England, but he soon joined the Scottish leaders who were fighting for the independence of Scotland. Having made peace with Edward I., he became in 1299 one of the four regents who ruled the kingdom. In 1305 he was involved in a quarrel with the Red Comyn, who was a nephew of Baliol, and was a claimant of the throne. Bruce killed Comyn, and then assembled his vassals, and was crowned at Scone in the spring of 1306. His small army was soon defeated by the English, and he was compelled to take refuge in the island of Rathlin, on the coast of Ireland, where he remained all winter. Renewing the contest in the spring, he defeated the English at Loudon Hill in May, 1307. In less than two years he made himself master of nearly all Scotland, and in 1309 he drove back an invading army of Edward II. The latter invaded Scotland again in 1314 with an army of about 100,000 men. Bruce, who had less than half as many, gained a complete victory at Bannockburn, June 24, 1314. In 1318 the Scots invaded England, and after several other campaigns the war was suspended in 1323 by a truce. By a treaty of peace concluded at Northampton in 1328 the English king recognized the independence of Scotland. Bruce died June 7, 1329, and was succeeded by his son David.

Bru'cea: a genus of shrubs of the family *Rutaceæ*. One species of this genus, a native of Abyssinia, is called *Brucea anti-dysenterica* because its leaves have astringent properties of great value in diarrhœa and dysentery. In Sumatra and China another species, the *Brucea sumatrana*, is used for the same purpose as the species just named. H. A. H.

Bruce Mines: a port of entry of the Algoma district, Ontario, Canada; near the north end of Lake Huron; 35 miles below Sault Ste. Marie (see map of Canada, ref. 10–K). It has productive copper mines, and exports large quantities of fish. Pop. 1,500.

Bruch, brookh, Max: musician; b. in Cologne, on the Rhine, Jan. 6, 1838; early showed musical talent, in which he was directed by his mother. By the time he was fourteen years old he had already written nearly seventy compositions, among them being a symphony, which was performed in Cologne in 1852. He then studied, first under Ferdinand Hiller, and later at Leipzig. In 1859 he returned to his native city, and began his professional career. Among his early compositions is his *Jubilate, Amen*, which has been sung with great success by choral societies. His first great work was the opera *Loreley*, composed to the text which Geibel wrote for Mendelssohn. This was produced in Mannheim in 1863, and is a standard work in the German operatic repertory. In 1864 he produced his cantata for male voices, *Frithjof*, at Aix-la-Chapelle. In 1873 his opera *Hermione*, based on Shakspeare's *Winter's Tale*, was produced at Berlin and Dresden. Other important compositions are *Salamis*; *Norman Expedition*; *Roman Song of Triumph* (a particularly fine work); *Fair Ellen*, on the story of the siege of Lucknow: *Odysseus*; *Lay of the Bell*; *Achilleus* and *Arminius*. This last is a special favorite in the U. S., having been sung twice at the Worcester festivals, and also in Philadelphia. Bruch also composed symphonies and overtures, and a few violin concertos, but is better known by his vocal music. D. E. Hervey.

Bruch'sal: a town of Germany; in Baden; on the river Salzbach; and on the railway from Heidelberg to Carlsruhe; 14 miles by rail N. E. of the latter (see map of German Empire, ref. 6–D). It is the northwestern terminus of a railway which extends to Friedrichshafen on Lake Constance. It has an old castle of the twelfth century, a fine palace, a gymnasium, and a paper-mill. Pop. (1885) 11,657; (1890) 11,902.

Bru'cia, or **Brucine**: a bitter and poisonous vegetable alkaloid found in *Strychnos nux vomica*. It is characterized by giving a blood-red color with concentrated nitric acid. It was discovered in bark incorrectly supposed to be that of *Brucea antidysenterica*, whence its name. Its toxicological effects are like those of strychnia, but it is far less active.

Brucite: the native magnesic hydrate, MgH_2O_2. It is found in serpentine at Hoboken, N. J. The finest specimens occur in the chrome mines of Texas, Pa.

Brück'e, Ernst Wilhelm: physiologist; b. at Berlin, Germany, June 6, 1819; became in 1846 teacher of anatomy at the Berlin Art Academy; in 1849 Professor of Physiology in Vienna. He is the author of *Anatomische Beschreibung des Augapfels* (1847); *Grundzüge der Physiologie und Systematik der Sprachlaute* (1856; 2d ed. 1876); *Neue Methode der phonetischen Transcription* (1863); *Physiologie der Farben für die Zwecke der Kunstgewerbe* (1866); *Die physiologischen Grundlagen der neuhochdeutschen Verskunst* (1871); and *Vorlesungen über Physiologie* (1885). D. in Vienna, Jan. 7, 1892.

Brucker, broo'ker, Johann Jakob: a German historian and Protestant minister; b. in Augsburg, Jan. 22, 1696; studied at Jena; became pastor in Augsburg 1744. Among his works is a *Critical History of Philosophy* (in Latin, 5 vols., Leipzig, 1741–44), which has a high reputation. It contains valuable biographical materials, but is deficient in critical analysis. D. in Augsburg, Nov. 26, 1770.

Bruck-Lajos, Louis: genre-painter; b. at Papa, Hungary, Nov. 3, 1846; pupil of the Vienna Academy and of Munkacsy; formerly a frequent exhibitor in the Paris

Salons, but has resided of late years in London, and his work is more often seen there. Well known to American collectors. W. A. C.

Bruckner, brook'ner, ANTON: musician; b. at Ausfelden, Austria, Sept. 4, 1824; was a chorister and subsequently organist of the Institute of St. Florian; in 1855 became organist of Linz cathedral; continued his studies under Sechter and Kitzler; succeeded Sechter as organist of the Hof Kapelle, Vienna, at the death of the latter in 1867. He was a famous organist, and in late life became a composer, and produced three grand masses, seven symphonies, and many other works, all of which are marked by profound learning. His romantic symphony in E flat (No. 4) was performed in New York by the Philharmonic Society, Mar. 16, 1888; his symphony in D minor by the Symphony Society in 1885; and his symphony in E major (No. 7) by the Philharmonic Society in 1886. D. Oct. 11, 1896. D. E. HERVEY.

Bruges, broo'jez (Dutch *Brugge*, or *Bruggen*, i. e. bridges, Lat. *Brugæ*): a fortified city of Belgium; capital of the province of West Flanders; situated on a fertile plain about 8 miles from the ocean, and 64 miles by rail N. W. of Brussels; lat. 51° 12′ N., lon. 3° 14′ E. (see map of Holland and Belgium, ref. 9–B). The railway from Ostend to Brussels passes through Bruges, which is connected with the ocean by several canals. It derives its name from the numerous bridges (about fifty-four) which here cross the canals. It contains many fine Gothic edifices, some of which were built in the fourteenth century, and are richly adorned with works of art. Among these are the Church of Notre Dame, which has a spire 450 feet high, and contains a splendid monument of Charles the Bold; the town-hall, with a lofty tower and a celebrated chime of forty-eight bells; and the Cathedral of St.-Sauveur, furnished with paintings of eminent artists. Memling's *Shrine of St. Ursula* and his other works at Bruges are of great importance in the history of mediæval painting. Bruges has an academy of painting, a public library, a museum, an episcopal college, a hospital, a school of surgery, and an institution for the blind. Here are manufactures of cotton, linen, and woolen fabrics, lace, leather, cordage, tobacco, and soap. Several thousand women are employed in the manufacture of lace of fine quality. Bruges was an important commercial town before the Norman conquest (1066), after which it continued to increase in riches and population. In the thirteenth century it was the great central mart of the Hanseatic League. Its manufactures were also very extensive. The tapestry and cloths of Bruges were celebrated for their excellence. The population once exceeded 200,000. Its prosperity was injured by a popular revolt in 1488, and by persecutions and vexations under Philip II. of Spain. Pop. (1896) 50,338.

Brugmann, brookh'măn, FRIEDRICH KARL: philologist; b. at Wiesbaden, Germany, Mar. 16, 1849; studied at Halle and Leipzig 1867–71; taught in the gymnasium at Wiesbaden 1872–73, at Leipzig 1873–77. In 1877 he became a privat-docent in the University of Leipzig; in 1882 assistant professor; in 1884 was called to the professorship of Comparative Philology at Freiburg; in 1887, after the death of Georg Curtius, was called as his successor to Leipzig. Brugmann is distinguished not only for his scientific attainments, but for his skill as a teacher, and his clearness and force as a lecturer and writer. His investigations in the field of Indo-European vocalism have done much to bring about the great changes of theory and method which characterize the history of the science in the last fifteen years. Especially rich in its results was his article on *Nasalis sonans*, published in vol. ix. of *Curtius's Studien*, of which Brugmann was at the time joint-editor. Though the position taken in this article was so radical as to call forth a disclaimer and rebuke (see note at end of *Studien*, ix.) from his co-editor, Prof. Curtius, and led ultimately to a personal rupture between the two men, it proved itself to be nothing less than a turning-point in the history of the science. Its essential results are to-day universally accepted. The association of Brugmann with Hermann Osthoff in the publication of the *Morphologische Untersuchungen* (vols. i.–iv., 1878–81, vol. v., 1890) was especially significant, these writings characterizing the period of transition. The chief work of Brugmann is that in which he brings together and classifies with a masterly control of the difficult material involved the whole body of results in the field of Indo-European grammar from the sides of phonology and inflection, *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* (3 parts appeared, 1886–90; English translation). Among his other works are: *Ein Problem der homerischen Textkritik* (1876); *Litauische Volkslieder und Märchen*, with A. Leskien (1882); *Griechische Grammatik*, in vol. ii. of *Müller's Handbuch der Albertinus Wissenschaft* (2d ed. 1890); *Zum heutigen Stand der Sprachwissenschaft* (1885). He is also, in company with W. Streitberg, editor of the *Indogermanische Forschungen*. BENJ. IDE WHEELER.

Brugsch, brookhsh, HEINRICH KARL: Egyptologist; b. at Berlin, Feb. 18, 1827; studied at Berlin; made his first scientific journey to Egypt in 1853; became privat-docent in Egyptology in Berlin 1854; accompanied the Prussian embassy into Persia 1860; returned 1861; he was appointed Prussian consul to Cairo in 1864; in 1868 the khedive made him director of the museum of Boulak; became Professor of Egyptology at Göttingen 1869. In 1885 and 1886 he was again in Persia for a stay, but from 1886 he lived in Berlin, where he lectured in the university. In 1891 he took 3,000 papyrus rolls with him from Egypt. Among his numerous writings, all of which are of the first rank, may be mentioned: *Grammaire démotique* (Berlin, 1855); *Hieroglyphisch-demotische Wörterbuch* (Leipzig, 1867–82, 7 vols.); *Geschichte Ægyptens unter den Pharaonen* (1877; Eng. trans. *History of Egypt under the Pharaohs*, 1879; 2d ed. by Mary Brodrick, 1891); *Religion und Mythologie der alten Ægypter* (1884); *Thesaurus inscriptionum ægypticarum* (1883–91, 6 parts); *Steininschrift u. Bibelwort* (Berlin, 1st and 2d ed. 1891). D. in Berlin, Sept. 10, 1894.

Brühl, HEINRICH, Count von: German statesman; b. in Weissenfels, Aug. 13, 1700; prime minister to Augustus III. of Saxony and Poland 1746; impoverished the country in slavishly supplying his master's and his own extravagance; gained wealth and titles. The Royal Library in Dresden contains his collection of 62,000 volumes. D. in Dresden, Oct. 28, 1763.

Brule Indians: See SIOUAN INDIANS.

Brumaire, brü'mãr': second month in the calendar of the French republic; derived from *brume*, a mist, a fog, Lat. *bruma*, winter. It comprised the time from Oct. 23 to Nov. 21. See CALENDAR.

Brum'mell, GEORGE BRYAN: "Beau Brummell," a famous fop; b. in London, June 7, 1778; schooled at Eton and for a while at Oxford. He had elegant taste in dress, became intimate with the Prince of Wales, lived in sumptuous style, and associated with the nobility on equal terms; was recognized as an oracle in questions of etiquette and dress; squandered a fortune; went into exile in 1815; and died at Caen in a pauper lunatic asylum, Mar. 29, 1840. See his *Life* by Jesse (new ed. 1886).

Brunck, RICHARD FRANÇOIS PHILIPPE: classical scholar; b. at Strassburg, Alsace, Dec. 30, 1729. He was liberally educated in Paris, and became an ingenious critic and bold emendator of the classics. He edited Anacreon, Aristophanes, Sophocles, and Terence, and published *Analecta Veterum Poetarum Græcorum* (1772–76). In the French Revolution he warmly supported the popular cause. D. June 12, 1803.

Brundisium: See BRINDISI.

Brunehaut, brün'hō, or **Brunehilde**, brün'hĕld': a famous queen; daughter of Athanagildus, King of the Visigoths. She was married in 568 A. D. to Sigebert, King of Austrasia. She was beautiful, ambitious, and high-spirited. Her husband was assassinated in 575 by the order of Fredegonda, Queen of Neustria. She afterward governed the kingdom with ability, and obtained an ascendency over her son Childebert, who was the nominal king. Having been defeated in battle and captured by Clotaire II., she was murdered in 613 A. D.

Brunei, or **Borneo**: a seaport-town on the northwest coast of Borneo; capital of the sultanate of Brunei (see map of East Indies, ref. 5–F), a territory of 3,000 sq. miles and 50,000 inhabitants which came under British protection in 1888. The houses are built on posts, and canals pass through all the streets. Pop. about 25,000.

Brunel', ISAMBARD KINGDOM, D. C. L., F. R. S.: engineer; b. in Portsmouth, England, Apr. 9, 1806. He was employed under his father as assistant engineer of the Thames tunnel, in the construction of which he displayed great energy and ability. In 1833 he was appointed chief engineer of the Great Western Railway. He was the designer and engineer of the Great Western steamship and of the Great Eastern, said to be the largest vessel ever built,

and of the Royal Albert bridge, Saltash. (See BRIDGE.) D. Sept. 14, 1859. See *Life* (1870) by his son.

Brunel, Sir MARK ISAMBARD, F. R. S.: engineer; b. near Rouen, in France, Apr. 25, 1769; father of the preceding. Driven from France by the Reign of Terror, he removed to New York in 1793, and designed the Bowery theater of that city. In 1799 he went to England, and married a Miss Kingdom. He was distinguished for his mechanical ingenuity, and invented a machine for making block pulleys, for which the Government gave him $85,000, and other useful machines. His most important work is the Thames tunnel, which was commenced in 1825 and opened in 1843. D. Dec. 12, 1849. See R. Beamish, *Life of M. I. Brunel.*

Brunelleschi, broo-nel-les'kĕe, FILIPPO: architect and sculptor; b. in Florence in 1377. He promoted the restoration of the ancient style of architecture as a substitute for the Gothic, which in his youth prevailed in Italy. The first church built in Europe in the revived classical style was the Church of San Lorenzo in Florence, designed by him. About 1418 he was appointed architect of the Cathedral of Florence (Santa Maria del Fiore), which had been commenced about 1296, and was unfinished. He raised over it a grand and beautiful dome, which is one of the largest in the world. Among his other works is the Pitti Palace of Florence. D. in Florence, Apr. 16, 1446. See Baldinucci, *Vita di F. di Ser Brunellesco* (1812).

Brunet, brü'nay', JACQUES CHARLES: bibliographer; b. in Paris, Nov. 2, 1780; d. there, Nov. 14, 1867. He was the son of a bookseller, and was brought up among books. He prepared numerous catalogues, and contributed largely to the science of bibliography. His great work was the *Manuel du Libraire et de l'Amateur de Livres* (first published in 1810; 5th ed., Paris, 1860–65, 6 vols., 3 supplements, 1870–80).

Brunetière, brü'ne'ti-ār', FERDINAND: French critic; b. in Toulon, July 19, 1849; became in 1886 Lecturer on the French Language and Literature in the École Normale Supérieure at Paris, and a member of the Academy June 8, 1893. As a contributor to the *Revue des Deux Mondes* he has distinguished himself for his defense of the classic French tradition in literature, and for his sharp criticism of realism, naturalism, determinism, and similar literary and ethical doctrines in great vogue. Among his works are *Études critiques sur l'histoire de la littérature française* (3 series, 1880–82–87); *Le Roman naturaliste* (1883); *Histoire et Littérature* (1884–86); *l'Évolution des Genres dans l'Histoire de la Littérature* (vol. i., 1890). A. R. MARSH.

Brunhilda, or **Brunehild** of Norse mythology: See BRYNHILD.

Bruni: See ARETINUS.

Brunlees, Sir JAMES, F. R. S.: past president of the Institution of Civil Engineers; b. at Kelso, Roxburghshire, Scotland, in 1816; educated there and at the University of Edinburgh. He practiced as a surveyor, and in 1838 became assistant engineer on the Bolton and Preston Railway, one of the first lines constructed in England. From 1844 to 1850 he carried out the extensive works of the Lancashire and Yorkshire Railway system, with Sir John Hawkshaw as chief engineer. In 1850 he constructed the Londonderry and Coleraine Railway, in 1852 undertook the difficult Ulverston and Lancaster Railway across Morecambe Bay; was engaged in other engineering work in England and abroad, and as arbitrator in the settlement of disputed contracts. Among his works are the Solway Junction Railway, Clifton Extension Railway, Mersey Tunnel Railway, the Avonmouth, King's Lynn, and Whitehaven docks. He was associated with Sir John Hawkshaw as engineer of the proposed Channel tunnel. He constructed in Brazil the São Paulo, the Minas and Rio, and the Porto Alegre railways, and received the decoration of the Brazilian order of the Rose. He also built the Central Uruguay and the Bolivar railways. He was knighted by the Queen at Windsor in 1886. He became a member of the Institution of Civil Engineers in 1853, and its president in 1883. He wrote upon piles, railways, sea embankments, land reclamation, iron viaducts, etc. D. June 2, 1892.
WM. R. HUTTON.

Brünn (Slavic *Brno*, the ford): a fortified city of Austria; the capital of Moravia; beautifully situated at the confluence of the Schwarza and the Zwittawa; 94 miles by rail N. N. E. of Vienna, and 159 miles by rail S. E. of Prague; lat. 49° 11′ 39″ N., lon. 16° 36′ 39″ E. (see map of Austria-Hungary, ref. 4–F). Here is the castle of Spielberg, used as a state prison. Among the remarkable public buildings are the cathedral, the Gothic Church of St. James, the *Landhaus*, formerly a rich Augustine convent, several palaces of the nobility, and a theater. Brünn also contains a museum, a public library, and a botanic garden. It has important manufactures of woolen, cotton, and silk fabrics, ribbons, glass, soap, and tobacco. It is the seat of the highest civil and military authorities of Moravia and Austrian Silesia, and of a Roman Catholic bishop. Its manufactures of woolens are said to be the most extensive in the Austrian empire. Over 15,000 persons are employed in the factories. Napoleon used Brünn as his headquarters before the battle of Austerlitz. Pop. (1880) 82,660; (1891) 95,342.

Brunn, HEINRICH, von: archæologist; b. in Wörlitz, Jan. 23, 1822; pupil of Welcker and Ritschl; Professor of Archæology in the University of Munich; author, among other works, of *Geschichte der griech. Künstler* (2 vols., Stuttgart, 1853–59; 2d ed. 1888–89). D. July 23, 1894.

Bru'no (in Lat. *Brunus*), GIORDANO: philosopher; b. at Nola, in the kingdom of Naples, in 1548, and entered the Dominican order in 1563. He was a man of independent and speculative spirit, and rejected the orthodox doctrines of the Church. On account of his opinions he was obliged to leave his monastery in 1576, and afterward led a wandering life. He fled first to Geneva; a few years after he removed to Paris; passed some time in England. His principal works are *Spaccio della Bestia trionfante* (1584); *Della Causa Principio e Uno*; *Del Infinito Universo e Mondi.* About 1592 he returned to Italy and became a resident of Venice. Having been accused of heresy, he was imprisoned at Rome for seven years, and was burned there as a heretic Feb. 17, 1600. On June 9, 1889, a monument to him was unveiled on the same spot where he died. He was an advocate of the Copernican system on speculative and not scientific grounds. He declared the universe to be everlasting, complete, and to be God. Nature is the self-evolution of God. Fr. H. Jacobi and Schelling first called the attention of the modern world to his views. His Italian works were edited by P. Lagarde (Göttingen, 1888, 2 vols.) and his Latin works by Tocco (Florence, 1889, 1891). His *Della Causa Principio e Uno* was translated into German in J. H. Kirchmann's *Philosophische Bibliothek* (Leipzig, part 184, 1873), and his *Reformation des Himmels* (1889).
Revised by S. M. JACKSON.

Bruno, SAINT: founder of the Carthusians; b. in Cologne about 1030. His parents were prominent persons, and his education was the best the times afforded. In 1057 he became master of the cathedral school in Rheims. In 1082 he retired from the world, and with a few friends began to live in solitude at Saisse-Fontaines; in 1084 he withdrew to La Grande Chartreuse, and founded there the order of Carthusians, who adopted the rule of St. Benedict. The monastery of La Grande Chartreuse was afterward built at the same place. In 1090 he obeyed the papal summons and went to Rome as papal adviser, but finding court life distasteful he sought and obtained means to build another monastery at Della Torre (1094); subsequently another was built (1097). D. at Della Torre, Italy, Oct. 6, 1101. He was canonized 1628. (See CARTHUSIANS.) See his *Life* by D. M. Tappert (Luxemburg, 1872).

Bruno the Great: Archbishop of Cologne; b. 925; a younger brother of the Emperor Otho I. He was a man of great talents, virtue, and learning, and had a powerful influence in the Church and state. He became lord high chancellor of the empire 940; Archbishop of Cologne 953. D. in Rheims, Oct. 11, 965.

Bruns, PAUL VICTOR, von: b. in Brunswick, Aug. 9, 1812; studied at Brunswick, Tübingen, and Berlin. He was the author of several surgical treatises and handbooks, and made a special study of diseases of the larynx, for the treatment of which he invented a new and effective throat-mirror. He was one of the highest surgical authorities in Germany. His work on laryngoscopic surgery gained for him the grand prize of 20,000 marks, offered by the Academy of Turin. D. in Tübingen, Mar. 19, 1883.

Brunswick: a duchy of the German empire; consists of three larger parts and several enclaves. Area, 1,424 sq. miles. The larger part, containing the capital, is entirely surrounded by Prussia. The chief mountain-range is a part of the Hartz Mountains in the S., the highest point of which in the duchy is the Wormberg, 3,245 feet high. It is traversed by the Ocker in the N., and the Leine, Aller, and

Bode. The chief products are grain, flax, and hops. Among the mineral products are silver, lead, iron, copper, coal, alabaster, alum, salt, etc. It has extensive manufactures of linen, wooden wares, glass, sugar, tobacco, paper, cloths, etc., also large beer-breweries. It has 5 gymnasia, 1 polytechnic school, a theological seminary, 2 normal, and numerous other schools. The government is a constitutional monarchy, and the supreme power is vested in a duke and a legislative body of 46 members. The receipts and expenses for 1891–92 were each estimated at 12,400,000 marks. The public debt in 1891 amounted to 28,371,588 marks. Brunswick is represented by 2 members in the Bundesrath of the empire, and 3 deputies in the imperial Reichstag. Its contingent to the German army forms part of the Tenth Army-corps. Pop. in 1890, 403,029.

History.—Brunswick formed originally a part of the duchy of Saxony, and was given in 1194 to Henry the Lion. His grandson Otto became first Duke of Brunswick in 1235. After having been divided and reunited by the descendants of Otto, they were again united under Ernest the Confessor (d. 1546). His two sons, Henry and William, again divided the country, and formed the two branches Brunswick-Oels and Brunswick-Lüneburg, the latter of which reigned as electors of Hanover, and in the person of George I. succeeded to the British throne. Brunswick was annexed to the kingdom of Westphalia in consequence of the treaty of Tilsit, but in 1813 it again became an independent state under Frederick William, who was killed in the battle of Quatre Bras in 1815. He was succeeded by his son Karl, who was expelled from the country in 1830, and was succeeded by his brother Wilhelm, who died Oct. 18, 1884. Brunswick joined the German customs-union in 1844, assisted Prussia in the war of 1866, joined the North German Confederation in the same year, and became a member of the German empire upon its revival in 1870. With the death of Duke Wilhelm the ducal line of Brunswick became extinct, Duke Charles having died in Aug., 1873, without issue. Prince Albrecht, b. May 8, 1837, son of the late Prince Albrecht of Prussia, was unanimously elected regent of the duchy by the Diet, Oct. 21, 1885; accession Nov. 2, 1885. The heir to Brunswick is the Duke of Cumberland, excluded owing to his refusal to give up his claim to the throne of Hanover.

Revised by C. K. Adams.

Brunswick (Germ. *Braunschweig*; anc. *Brunonis Vicus*): a city of Germany; capital of the duchy of the same name; on the river Oker; and in a level district; 47 miles by rail E. S. E. of Hanover; lat. 52° 16′ 11″ N., lon. 10° 32′ 09″ E. (see map of German Empire, ref. 4–E). The old fortifications have been demolished and converted into pleasant promenades. It contains a magnificent ducal palace, an ancient cathedral, the Church of St. Andrew with a steeple 316 feet high, a mint, an opera-house, a town-hall, and a museum which contains paintings by Albert Dürer, Rembrandt, Holbein, and other great masters. Railways extend from this town to Hanover, Magdeburg, and other places. Here are manufactures of linen and woolen goods, lacquered wares, papier-maché, tobacco, hardware, etc. A great annual fair is held here. Among its institutions are a college, a gymnasium, a Realschule, and an asylum for deaf-mutes. This is a very old town. It was enlarged and beautified by Henry the Lion in the twelfth century. It formerly belonged to the Hanse League. Pop. (1885) 85,174; (1890) 101,047.

Brunswick: city; railroad junction, and port of entry; capital of Glynn co., Ga. (for location of county, see map of Georgia, ref. 7–K): on St. Simon's Sound; 8 miles from the Atlantic Ocean, and 80 miles S. S. W. of Savannah. It has a first-class system of public schools. There are here a safe and spacious harbor, a large manufacture and export of yellow-pine lumber, and a large export trade in cotton. At the south end of St. Simon's island, and on the north side of the entrance to the sound, is St. Simon's lighthouse. It is of brick, and is 108 feet high. Pop. (1880) 2,891; (1890) 8,459; (1900) 9,081.

Editor of "Times."

Brunswick: town; Cumberland co., Me. (for location of county, see map of Maine, ref. 10–B); on railroads connecting it with Portland, Augusta, and Bath; on Androscoggin river at head of navigation; 29 miles N. E. of Portland; connected by bridge with Topsham. Falls in the river furnish ample water-power. The town is the seat of Bowdoin College (*q. v.*); its industries are flour, cotton and paper mills, tannery, shipping, etc. Pop. (1880) 5,384; (1890) 6,012; (1900) 6,806.

Brunswick: town; Chariton co., Mo. (for location of county, see map of Missouri, ref. 3–F); on Wabash R. R., and on the north bank of the Missouri river; 90 miles E. by N. by railroad from Kansas City; has excellent public school, saw and planing mill, cigar-factory; is good wheat and corn shipping-point. Pop. (1880) 1,801; (1890) 1,748; (1900) 1,403.

Editor of "Brunswicker."

Brunswick-Bevern, August Wilhelm, Duke of: a Prussian general; b. Oct. 15, 1715; took part in the wars of Frederick the Great against Austria. He distinguished himself in the battles of Lowasitz, Reichenberg, Prague, and Kollin. He was defeated and taken prisoner at Breslau in 1757, and was released in 1758. D. Aug. 1, 1781. He was the tallest soldier of his time in the Prussian army.

Brunswick Black: a varnish used for the purpose of giving a bright polished appearance to coarse iron-work, such as grates and fenders. It is chiefly composed of bitumen, lampblack, and turpentine, and is applied with a brush.

Brunswick Green: an oxychloride of copper, used as a pigment in the arts. It is obtained by exposing metallic copper to the action of ammonium chloride, or by mixing sulphate of copper and common salt into a paste with water. It is also generated by the action of sea-water on copper, and occurs native in Atacama in the form of green sand, hence called atacamite.

Bruns'wick-Lü'neburg, Karl Wilhelm Ferdinand, Duke of: a German general; b. Oct. 9, 1735; nephew of Frederick the Great; eldest son of Duke Karl. He fought for his uncle in the Seven Years war, and succeeded to the dukedom in 1780. He became in 1792 commander-in-chief of the allied armies of Austria and Prussia, which invaded France and were repulsed by Dumouriez. In 1793 he resigned the command. He took command of the Prussian army in 1806, and was defeated by the French at Jena in October of that year. In this battle he was mortally wounded. D. Nov. 10, 1806.

Bruschius, broo'shi-ŭs, or **Brusch**, broosh, Gaspard: German historian; b. at Schlakenwald, Bohemia, Aug. 19, 1518; in 1552 made a count palatine and poet laureate by Ferdinand, King of the Romans. He favored Luther and Melanchthon, and in 1559 was murdered in a forest by some gentlemen who thought themselves satirized by him. His chief historical works are *De Germaniæ episcopatibus epitome* (1549) and *Monasteriorum Germaniæ præcipuorum Chronologia* (1551).

Brush: name of instruments for removing dirt from various surfaces by friction, for adjusting the hair, for polishing, for applying paints, whitewashes, and the like. Hog's bristles furnish a large part of the material for the friction surface of the best brushes; but for delicate work camel's, badger's, sable's, and rabbit's hair is used. Wire brushes are used in various departments of manufacturing industry. Split whalebone is sometimes employed as a substitute for bristles. Broom-corn and twigs of trees are often employed for stiff brushes, and the coarse instruments used in cleaning streets are partly made from bass or piassaba and other imported palm fibers. Most brushes are made by joining some of the above materials to a stock of wood, leather, bone, or metal, by various methods—a business which gives employment to many thousands in Europe and the U. S. Ingenious machines have been invented for the performance of various parts of the work of making brushes; and these machines have greatly reduced the labor and expense of manufacture.

Brush (in dynamo-electricity): a device for making electric contact with the moving parts of a generator or motor. Brushes consist of strips of copper or brass, or of bundles of wire held with suitable pressure by means of a spring in contact with the commutator or other moving part with which connection is sought. Carbon plates or pencils are largely used instead of metallic brushes. In static electricity a brush is the name given to certain forms of silent discharge through the air, the illumination from which is so faint as to be clearly visible only in a darkened room. See Dynamo Electric Machines and Electric Discharge.

Brush, Charles Francis: best known as the inventor of the Brush dynamo for arc lighting, and of a lamp that worked uniformly on a large circuit supplying many lights; b. in Euclid, O., Mar. 17, 1849, and graduated at the University of Michigan in 1869. He is also the inventor of a great number of devices which have been of practical value in the development of the electric light. In 1881 he was

made chevalier of the Legion of Honor in France. Resides in Cleveland.

Brush, George De Forest: painter of figure-subjects; b. at Shelbyville, Tenn., in 1855; pupil of Gérôme, Paris; member of the Society of American Artists 1880; associate National Academy of Design; first Hallgarten prize, National Academy, 1888. His pictures of Indian life in the West attracted notice in the New York exhibitions about 1883, and some of his most successful works are among those of that class of subjects. Latterly he has spent some years in Paris again, and at the Society of American Artists in 1892 exhibited two remarkable works, *The Portrait* and *Ossian the Bard*. His work is especially good in drawing, and presents some points of similarity in technical method to that of Gérôme, but is entirely individual in character. *Mourning her Brave* and *An Aztec Sculptor*, two of his best pictures, are in the collection of Thomas B. Clarke, New York. Studio in New York. William A. Coffin.

Brush, George Jarvis: mineralogist; b. in Brooklyn, N. Y., Dec. 15, 1831; educated at Yale College, at the University of Munich, the Mining Academy of Freiberg, Saxony, and the School of Mines in London. He became in 1855 Professor of Metallurgy in Yale, to which the professorship of mineralogy was added in 1864. He is executive officer of the Sheffield Scientific School, has published numerous papers in the *American Journal of Science*, and is author of parts of the fifth edition of Dana's *Mineralogy*. See *Popular Science Monthly* for Nov., 1881.

Brush-turkey, sometimes called **New Holland Vulture**: a bird (*Talegalla lathami*) of Australia, remarkable for the peculiar manner in which its eggs are hatched. Several pairs of these birds, having united to build a nest, collect leaves, grass, etc., into a heap, sometimes to the amount of several cart-loads. In this mass the several females deposit their eggs, where they remain till hatched by

Brush-turkey.

the artificial heat of the mound. The bird is about the size of the common turkey, and has wattles on its head and neck. When pursued, it endeavors to makes its escape by running through the tangled brush or by flying into the low branches of a neighboring tree.

Besides the above, there are several other species and genera, all Australian, and nearly all closely resembling the above bird in its peculiar habits. These now constitute the family *Megapodidæ* (*q. v.*). The birds are edible, and are much sought as game.

Bruso'ni, Girolamo: Italian historian and poet; b. in Legnano, Dec. 10, 1610. He wrote many Latin and Italian poems; was for a time confined in prison at Venice for assuming improperly the dress of a Carthusian monk. He wrote many historical and other works, of which the best known is *Istoria d'Italia* (1656–80). D. after 1679.

Brussa: a city of Asia Minor. See Broussa.

Brus'sels (in Dutch, *Brussel*; Fr. *Bruxelles*): capital of Belgium; in the province of Brabant; on the river Senne; 27 miles by rail S. of Antwerp, and 227 miles by rail N. N. E. of Paris; lat. 50° 51′ 10″ N., lon. 4° 22′ 13″ E. (see map of Holland and Belgium, ref. 10–D). It is built partly on the slope of a hill which rises 220 feet above the level of the sea, and partly on a fertile plain. The upper town on the hill is the most modern and fashionable, and contains the royal palace, public offices, and the finest hotels. Brussels is the most important and populous city of Belgium, is remarkable for the number and richness of its antique buildings, and ranks among the finest cities of Europe. The walls which formerly surrounded this city have been converted into broad promenades lined with double rows of shade trees. The Allée Verte is a fashionable promenade along the Scheldt Canal, and extends to the royal palace of Laeken, about 3 miles N. of the city. The principal public squares are the Place Royale, the Grande Place, in which stands the hôtel de ville, and the Place de la Monnaie, which contains the mint, the theater, and the exchange. Among the remarkable edifices of the city are the hôtel de ville, a fine Gothic structure with a spire 364 feet high, in the grand hall of which the Emperor Charles V. abdicated in 1555; the Gothic Cathedral of St. Gudule, which was built about 1270 and is celebrated for its painted windows, numerous statues, and carved pulpit; the Church of Notre Dame de la Chapelle commenced in 1134; the royal palace; the modern Church of Notre Dame de Bon Secours; the former palace of the Prince of Orange; and the Palace of the Fine Arts, which contains a large collection of paintings of the Flemish school; the Palais de Justice, built in 1866–83 at a cost of nearly $10,000,000, situated in the upper part of the city on a commanding eminence, and one of the most strikingly handsome buildings in Europe. Brussels has a public library (Royal) of 350,000 volumes; a botanic garden; an astronomical observatory, one of the finest in Europe; a magnetic observatory; a free university, founded in 1834, with four faculties—viz., law, medicine, mathematical, and physical sciences, and belles-lettres; a normal school, a polytechnic school, and institutions for the blind and for deaf-mutes. The only mint of the kingdom is situated here. In 1888 a world's exhibition was held in this city. Brussels is one of the great centers of Belgian industry, and is celebrated for the manufacture of lace which is considered the finest in the world. The other chief products of its manufactories are fine linens, damasks, ribbons, gold and silver embroidery, glass mirrors, jewelry, paper, porcelain, hats, mathematical and musical instruments, carriages, and chemical products. Its trade is facilitated by a canal which connects it with Antwerp, and by railways which radiate in many directions. About one-third of the people of this city speak French, and the others Flemish or Dutch. Brussels was the seat of the International Monetary Conference, called by the U. S. to discuss the position of silver, which met in Dec., 1892. Pop. (with suburbs) (1880) 394,940; (1885) 438,843; (1891) 482,268: of the city proper (1891) 182,305; (with suburbs) (1896) 531,011.

Brussels Conference: a conference of delegates from the principal military powers, called by the Emperor of Russia in 1874, to prepare the way for an agreement upon a code of rules to govern civilized warfare. It met in Brussels July 27 of that year. Delegates from Russia, Germany, France, Austria, Great Britain, the Netherlands, Belgium, Italy, Spain, Denmark, Norway and Sweden, the Swiss Confederation, and Greece were present. The single English delegate attended under express stipulations that the rules of naval warfare should not be discussed. The U. S. were not represented, alleging the lateness of the invitation.

The draft of a code had been submitted before this to the governments invited, and many of its rules, embodying the best modern usage, were acceptable to all the delegates. Thus there was a substantial agreement on the subjects of lawful weapons, care of the wounded, pillage, sieges, armistices, prisoners of war, spies, treatment of public and private property, capitulations, duties of neutral states in case troops are driven across their frontiers, and flags of truce.

The chief points of difference related to the topics of "occupation of territory" and the "*levée en masse*." Here the interests of the great and of the smaller military powers proved irreconcilable. On the one side it was argued that a portion of the enemy's territory once occupied by an invader, its defenders having been arrested or driven out, remains lawfully in the hands of that invader as occupied territory, even though his forces may have advanced and left it vacant. In the opinion of the smaller states, occupation was held a question of fact, not of construction; it must be substantiated by the constant presence of an invading force strong enough to keep its people from rising.

In like manner the *levée en masse*, or popular rising against an invader in unoccupied territory, was held by one set of delegates to be lawful only when these irregular forces were properly officered, bore arms openly, and wore such a badge or uniform as to be recognizable at a distance. Such conditions were believed by the other set to be inconsistent with a popular rising for defense, a measure upon which states with no compulsory military service must rely in case

of invasion. The subject of what could be lawfully exacted from conquered territory under the head of requisitions and contributions was also in dispute.

Although thus failing of adoption, the Brussels conference was not without value. It brought out clearly the points at issue, and the necessity for compromise in regard to them. It was a promising step in a right direction. A later attempt to codify the laws of war was made in 1880 by a committee of the Institute of International Law, with the Brussels code as a basis. It legalizes the *levée en masse* on the sole condition that the rules of war be adhered to, and defines occupied territory as a region where the former sovereign has ceased to exercise authority and the invading power alone finds itself able to maintain order. This Oxford code is reasonable, and worthy of a recognition which it has not yet received from any government.

THEODORE S. WOOLSEY.

Brussels Sprouts: like the CABBAGE (*q. v.*), a form of *Brassica oleracea*. It takes its name from Brussels, Belgium, and from the term "sprouts," which is used for kale-like plants. It differs from the cabbage in forming little heads (or buds) in the axils of the leaves nearly the whole length of the stem. As these buds develop the leaves are cut away until only a crown is left at the top of the stem. These little heads attain a diameter of an inch or two. Brussels sprouts is grown for a fall crop, the seeds being started out of doors. L. H. BAILEY.

Bru'tus, LUCIUS JUNIUS: Roman patriot; son of Tarquinia and nephew of Tarquin the Proud. According to tradition, that tyrant was about to put him to death, but he saved his life by feigning idiocy, which was the origin of his surname *Brutus*. When the tragic fate of Lucretia had prepared the people to revolt, Brutus led them, expelled the Tarquins from Rome, and founded a republic (509 B. C.). He was then elected one of the consuls. He ordered the execution of his own sons, Titus and Tiberius, who were convicted of treason. About 507 he was killed in a battle against the Tarquins.

Brutus, MARCUS JUNIUS: a Roman republican: descendant of the preceding; b. in 85 B. C. He married Portia, the daughter of Cato Uticensis, who was his maternal uncle. In the civil war he fought under Pompey against Cæsar, but after the battle of Pharsalia he was kindly treated by the dictator with whom he entered into friendly relations; he was appointed Governor of Cisalpine Gaul. His zeal for republican liberty and the influence of his friend Cassius induced him to join the conspiracy against Cæsar; both took part in his murder; became prominent leaders of the republican party; led an army against that of Antony and Octavius at Philippi (42 B. C.), and after the reverse of Cassius Brutus killed himself on the field.

Bry'an: village and capital of Williams co., O. (see map of Ohio, ref. 1–C); on Lake Shore and M. S. R. R.; 53 miles W. S. W. of Toledo. Has machine-shop, graded schools, and churches. Pop. (1880) 2,952; (1890) 3,068; (1900) 3,131.

Bryan: village and capital of Brazos co., Tex. (for location of county, see map of Texas, ref. 4–I); on Houston and Texas Cent. R. R.; 100 miles N. W. of Houston. Industries are saw and grist mill, carriage and wagon shop, chair-factory, etc. Near by is the Agricultural and Mechanical College of Texas. Pop. (1890) 2,979; (1900) 3,589.

Bryan, WILLIAM JENNINGS: lawyer, politician, and journalist; b. at Salem, Ill., Mar. 19, 1860; educated at Whipple Academy and Illinois College, Jacksonville, Ill., where he graduated with honor in 1881; studied law at Chicago for two years; returned to Jacksonville, where he began practice; married a year later, and in 1887 removed to Lincoln, Neb.; was a delegate to the Democratic State convention at Omaha 1888; declined the nomination for lieutenant-governor 1889; in 1890 elected as a Democrat to Congress; became a member of the ways and means committee; advocated "tariff for revenue only" and attracted attention as a speaker, being frequently spoken of as the "boy orator of the Platte"; re-elected to Congress in 1892 and became a champion of "free silver." At the end of his second term he returned to Nebraska and became editor of the Omaha *World-Herald*. In 1896 he received the Democratic and People's Party nomination for President on a free-silver platform, but was not elected. In 1898 he became colonel of a Nebraska volunteer regiment, and resigned in December. He was nominated again, in 1900, by the Democratic and People's (Fusion) Parties, and indorsed by the Silver Republicans and the Anti-Imperialist League, and again defeated. In Jan., 1901, he established *The Commoner*, a newspaper devoted to the interests of the laboring man and to the advocacy of "free silver."

Bryanites: followers of William O'Bryan, who separated from the Wesleyans in 1815. See BIBLE CHRISTIANS.

Bryant, WILLIAM CULLEN: poet and journalist; b. in Cummington, Hampshire co., Mass., Nov. 3, 1794; educated at Williams College, which he entered in 1810. He studied law, and in 1815 was admitted to the bar, but after practicing successfully for ten years, first at Plainfield and then at Great Barrington, removed in 1825 to New York, and became an editor. In 1826 he became connected with the *Evening Post*, of which he was the editor-in-chief from 1828 till his death. Mr. Bryant visited Europe several times and presented the literary fruit of his travel in a series of *Letters of a Traveler* (1852 and 1859), *Letters from Spain and other Countries*, and *Letters from the East* (1869), which rank high in literature of their class. Bryant's career as a poet began very early. He contributed verses to the county gazette before he was ten years old; in his fourteenth year he published a political satire, *The Embargo*, together with another long poem, *The Spanish Revolution*, which in a twelvemonth reached a second edition. *Thanatopsis*, perhaps the most impressive and most widely known of his pieces, was produced in his nineteenth year. He published the first volume of poems, *The Ages*, in 1821 at Cambridge, and the first complete collection in 1832 at New York. His translations of the *Iliad* and *Odyssey* into blank verse were published in 1870 and 1871. He responded to frequent invitations to make ceremonial addresses—a duty that he discharged with rare felicity. His efforts in this kind have been collected in a volume of *Orations and Addresses* (1873). An edition of his works complete in four volumes was published in 1883–84, edited by his son-in-law, Parke Godwin. D. at New York city, June 12, 1878. See his *Life* by Parke Godwin (New York, 1883, 2 vols.).

Revised by HENRY A. BEERS.

Bryce, GEORGE, LL. D.: Canadian clergyman; b. at Mt. Pleasant, Brant co., Ont., April 22, 1844. He graduated at Toronto University in 1869, at Knox College in 1871, and the latter year was elected as assistant and successor in Chalmers's church, Quebec. The same year he was authorized by the Presbyterian General Assembly to establish a college among Selkirk settlers on Red river, and also to organize a Presbyterian church in Winnipeg, Manitoba, all of which he successfully accomplished. The college was incorporated in 1883, and in 1884 was removed to Winnipeg. He was one of the principal founders of Manitoba University in 1871; appointed inspector of Winnipeg schools in 1877; examiner in natural science in Manitoba University in 1878; and moderator of first Presbyterian synod of Manitoba and Northwest Territories in 1884. Among his works are *Manitoba, its Infancy, Growth and Present Condition* (London, 1882); *Canada and the Northwest* (1887); and *A Short History of the Canadian People* (1886).

NEIL MACDONALD.

Bryce, JAMES, M. P.: statesman and author; b. in Belfast, Ireland, May 10, 1838; educated at the High School and University of Glasgow, and at Trinity College, Oxford, graduating at the latter in 1862 with a double first; appointed Regius Professor of Civil Law in Oxford University 1870; elected to Parliament in 1880; Under Secretary of State for Foreign Affairs in Mr. Gladstone's government in 1885. Author of *The Holy Roman Empire* (9th ed. 1888); *Transcaucasia and Ararat* (1877; new ed. 1897); and edited *Two Centuries of Irish History* (1888). *The American Commonwealth* (1888) is the best known of his works in the U. S., and is regarded by some as the best description of the political and social institutions of the U. S. ever written. In 1892 he was appointed Chancellor of the Duchy of Lancaster, with a seat in the cabinet of Mr. Gladstone.

C. K. ADAMS.

Brydges, Sir SAMUEL EGERTON: English writer and bibliographer; b. in Kent, Nov. 30, 1762; published, besides many novels, letters, poems, etc., *Censura Literaria, Containing Titles and Opinions of Old English Books* (10 vols., 1805–09); *The British Bibliographer* (4 vols. 8vo, 1810–14); and *Res Literariæ* (3 vols., 1821). He claimed that he was the lawful heir to the barony of Chandos, but his title was not recognized. D. at Geneva, Sept. 8, 1837. See his *Autobiography* (2 vols., 1834).

Bryen'nios, Philotheos: Greek Catholic bishop; b. in Constantinople, Mar. 26, 1833; educated at Chalce and in Germany; became Professor of Theology at Chalce 1861; metropolitan of Serrae, in Macedonia, 1875; of Nicomedia 1877. In 1873 he discovered the famous *Teaching of the Twelve Apostles* in the Jerusalem monastery in Constantinople, and published it first in 1883. See Dr. Schaff's edition (3d ed. 1888).

Bryen'nius, Nicephorus: Byzantine historian and general; a minister of Alexis Comnenus, whose daughter, Anna Comnena, he married. D. about 1137. His *History of Constantinople* was edited by Meineke (1836).

Bryn'hild, or **Brynhil'da**: a beautiful maiden, celebrated in the Norse mythology. Though called a valkyria, she is evidently the same person as the Princess Brunhild of the *Nibelungen Lied*. See Thorp's *Northern Mythology*, vol. i.; also Nibelungen Lied, in this work.

Bryn Mawr College (at Bryn Mawr, on the Pennsylvania R. R., 10 miles W. of Philadelphia): founded by Joseph W. Taylor, M. D., a member of the Society of Friends, who died in 1880, having bought the land, about 42 acres, and begun the erection of the college buildings during his lifetime. The college is intended to give to women of intelligence and refinement the best opportunities for culture, combined with Christian influences and social amenities. Its distinctive features are a high standard of preparation for admission; a system of studies which combines required courses for general culture with varied elective groups of two chief studies in fixed combinations and other free electives; graduate courses in all subjects offered to undergraduates; fellowships of $525 each, nine in number, open to graduates who have already distinguished themselves in particular branches of study, namely, Greek, Latin, English, German, Romance languages, history, mathematics, biology, and chemistry. A fellowship is also offered yearly to a graduate of the college to enable her to pursue studies at some European university. M. Carey Thomas, LL. D., is president (1900).

Bry'ony: a tendril-bearing, climbing, herbaceous plant of the genus *Bryonia*, of the *Cucurbitaceæ* or Gourd Family (*q. v.*). The genus contains about twenty species. They are natives of temperate and tropical regions. Two species (*B. dioica* and *B. alba*) occur in Europe, and from the roots of these is obtained the drug "Bryonia," a drastic hydragogue cathartic, now much less used than formerly. Some of the species are quite ornamental, and are desirable climbers since their tuberous roots are perennial, the stems and leaves only dying at the end of the year. The cut-leaved bryony of Ceylon is now assigned to the genus *Bryonopsis*.

Bryony, Black: a pretty, twining, tuberous-rooted plant (*Tamus communis*) belonging to the Yam family, and native of Europe, North Africa, and temperate Asia. It is somewhat cultivated for its beautiful foliage of heart-shaped, bright green leaves and bright red (but inedible) berries. A second species occurs in the Canary islands.

Bry'ophytes [from Gr. *βρύον*, moss + *φυτόν*, plant]: the mossworts (*Bryophyta*); one of the branches of the vegetable kingdom, characterized by the production of antherids and *archegones*, the latter after fertilization developing a more or less stalked, leafless *spore-fruit*. They are readily separated into two classes, viz.: (1) the liverworts (*Hepaticæ*), which are mostly thalloid plants, with splitting spore-fruits, containing elaters; (2) the mosses (*Musci*), leafy-stemmed plants, with spore-fruits mostly opening by a lid, and containing no elaters. See Plants (Fossil). C. E. Bessey.

Bryozo'a [from Gr. *βρύον*, moss + *ζῷον*, animal]: group of animals of doubtful affinities, being placed by some zoölogists as one of the classes of the *Molluscoidea*, the *Brachiopoda* being the other class; by others as one of the orders of the class *Prosopygia*, of the branch *Vermes*. (See Worms.) They are very small, and moss-like or polyp-like in appearance, usually united together in colonies, mostly marine, but some species live in fresh water. They are also known as Polyzoa (*q. v.*). J. S. K.

Bry'son, Andrew: rear-admiral U. S. navy: b. in New York, July 25, 1823; entered the navy 1837; commanded the ironclad Lehigh in 1863 and 1864 at the reduction of Fort Macon, and was in all the important fights with the defenses of Charleston harbor; became commander 1873; rear-admiral 1880; retired 1881. D. in Washington, D. C., Feb. 7, 1892.

Bu'balus [Gr. *βούβαλος*, a species of antelope]: a genus of *Bovidæ*, the species of which constitute the buffaloes of India and Africa. See Buffalo.

Bubas'tis (the *Pi-beseth* of Scripture and modern *Telbasia*): a ruined city of Lower Egypt; in the delta of the Nile; about 75 miles a little E. of N. from Cairo; lat 30° 36′ N., lon. 31° 33′ E. The site is now occupied by extensive mounds containing the remains of brick houses and broken pottery. See *Herodotus* ii., 137, 156.

Bubastis: a goddess of ancient Egypt; a deification of the moon corresponding to the Greek Artemis; said to signify literally "she who multiplies her aspects"; so called in allusion to the changes of the moon. According to other authorities, Bubastis was the deification of the cat, which animal, as is well known, was an object of worship in ancient Egypt. Her name, according to modern Egyptologists, was *Pecht* or *Pasht*.

Bubble: a globular film or vesicle of water or other liquid inflated with air, vapor, or gas. The study of bubbles has added much to our knowledge of capillarity and of molecular action in liquids. The thickness of the soap-bubble film, determined by means of the interference of light, to which the bubble owes its transcendent coloring, has furnished physicists with a means of estimating the probable size of the molecule. Soap films have been observed the thickness of which was certainly less than $\frac{1}{2000000}$ of an inch. It is certain that a molecule of water can not exceed such a film in thickness, and there are reasons, on the other hand, for thinking that its diameter can not be less than $\frac{1}{50000000}$ of an inch. E. L. N.

Bubou'ic Plague: See Plague.

Bucaramau'ga: the capital of the department of Santander, republic of Colombia; lon. 73° 10′ W., lat. 7° N.; on the east side of the main mountain-range (see map of South America, ref. 2–C). There are extensive gold, copper, and iron mines in the vicinity. Pop. 16,000.

Buccaneer' [from Fr. *boucanier*, deriv. of *boucaner*, to smoke meat on a *boucan*, a native So. Amer. name for a wooden grate or framework used in drying meat]: a name originally applied to French hunters in Hayti who brought their meat to market cured; then to the famous adventurers or filibusters who in the sixteenth and seventeenth centuries infested the West Indies and the Spanish colonies of South America. They were mostly English and French, and were united by a common hostility to the Spaniards, to plunder whom was their principal object and business. For mutual protection against the cruelty of the Spaniards, they organized themselves into an association or community bound by a simple code of laws. The island of Tortuga was at one time occupied by them, and was their chief base of operations. They took immense booty from the Spanish galleons which conveyed precious metals to Spain, and often attacked towns on the coasts. Among the famous and able leaders of the buccaneers were the French Montbar, surnamed The Exterminator, and Henry Morgan, a Welshman, who was born about 1637. The latter organized fleets and armaments, took fortresses, and displayed remarkable military talents. He was knighted by Charles II., and made governor of Jamaica, already in possession of his confederates. The navigator Dampier also took part with the buccaneers in some expeditions against the Spaniards. The wars of William III. with France dissolved the confederation, and in 1701, treaty of Ryswick, the buccaneers lost their political character, and were replaced by a set of marine thieves or vulgar pirates. See James Burney, *History of the Buccaneers* (1816); Thornbury, *Monarchs of the Main* (1855); and *Les Flibustiers au XVII^e Siècle* (1884).

Buccina'tor [Lat. deriv. of *buccina're*, to blow the trumpet, Lat. *bu'cina*]: a muscle situated in the substance of the cheeks; so called because, when the cheeks are distended with air, the contraction of the buccinator muscle forces it out. Its principal use is to hold the food between the teeth during mastication.

Buc'cinum [Lat., trumpet]: a genus of gasteropod mollusks known as the whelks; characterized by a shell with a smooth nonplicated columella, and with a fissure or short respiratory canal inflected toward the left. The shape of some species of this genus resembles that of a trumpet. *Buccinum undatum* is one of the most common of the species, and is a typical representative of the genus. Most of the living species are found in the cold zones; many are fossil.

Buc'cleuch, Dukes of (1663): Dukes of Queensberry, Marquesses of Dumfriesshire, Earls of Drumlanrig and Sanquhar (1684), Earls of Buccleuch (1619), Earls of Dalkeith (1663), Viscounts of Nith, Torthorwold, and Ross, and Barons Douglass (1684), Barons Scott of Buccleuch (1606), Barons Scott of Eskdale (1619), Lords Scott of Winchester (1663, in Scotland), Earls of Doncaster, and Barons Tynedale (1662, in England): a noble family of Scotland, descended from Sir Walter Scott of Branxholm and Buccleuch, a brave and powerful chieftain who lived in the reign of James V. He fought at the battle of Pinkie in 1547, and died in 1552. Some incidents of his life formed the subject of Scott's poem, the *Lay of the Last Minstrel*. His great-grandson, also named Sir Walter, was raised to the peerage as Lord Scott of Buccleuch in 1606. The first duke was beheaded in 1685, but the duchess retained the title and estates. Henry, the third duke, born in 1746, was a pupil and friend of Adam Smith. He distinguished himself by his efforts to improve his extensive estates by planting trees, enriching the soil, making roads, and improving the breed of sheep. D. in 1812. —His grandson, Walter Francis, b. Nov. 25, 1806, the fifth Duke of Buccleuch and the seventh of Queensberry, is said to have spent £320,000 in improving the harbor of Granton, about 2 miles from Edinburgh, the greatest public work ever executed in Scotland by an individual at his own expense. He succeeded his father in 1819; was Lord Privy Seal 1842–46; and president of the council in 1846. D. in 1884. —The sixth duke, William Henry Walter, b. in 1831, was M. P. for Midlothian 1853–68 and 1874–80.

Bucen'taur (It. *Bucentoro*): name of a celebrated Venetian galley which was gilded and sumptuously furnished, and was used only once a year in a splendid aquatic procession, when the doge performed the ceremony of espousing the Adriatic on Ascension Day by dropping a ring into the water. It was about 100 feet long, and in the annual procession was followed by many gondolas and feluccas. It was burned in 1797, having been kept for this service since 1177.

Buceph'alus [Gr. *βουκέφαλος*, ox-head, probably applied to a horse branded with the mark of an ox-head]: the favorite horse of Alexander the Great, who rode on him in all his campaigns. He was purchased in Thessaly by King Philip, and cost, according to Pliny, 16 talents, equal to nearly $20,000 of our money. The royal grooms were unable to manage him, but Alexander, then very young, tried and succeeded; and Bucephalus would never permit any one but Alexander to ride him. Bucephalus died in India from the effects of wounds received in battle about 326 B. C., and Alexander built in his honor the city Bucephala on the Hydaspes.

Bu'cer [from Gr. *βούς*, cow + *κέρας*, horn; being a literal translation of his German name, *Kuhhorn*], Martin: German Reformer; b. in Schlettstadt, near Strassburg, in 1491; was for a time a Dominican friar; became a Protestant in 1521; a friend of Luther; studied Greek and Hebrew at Heidelberg. He introduced the Reformed doctrines at Strassburg 1523, and was for many years Professor of Theology at that city. When dissensions arose between Luther and Zwingli, Bucer acted the part of mediator. At first he openly repudiated Luther's doctrine. He composed the Tetrapolitan Confession, which was offered at Augsburg alongside of that of the Lutherans. In 1536 he went to Wittenberg to effect a reconciliation. The result was *The Wittenberg Concord*, in which he indorsed Luther's doctrine of the Real Presence, but denied that unbelieving communicants received Christ's body. This appears to have remained his position to the end. In 1543 he co-operated with Melanchthon in the preparation of the Formula for the Reformation of Cologne by Archbishop Hermann, a document whose chief significance is the important part which it bore in the preparation of the English *Book of Common Prayer*. At the invitation of Archbishop Cranmer he went to England in 1549, and became Professor of Theology at Cambridge, prominently participating in the reforms made by Cranmer, especially in the liturgical sphere. Of this activity his *Censura* on the *Prayer-book* (1550), and the other writings contained in his *Scripta Anglicana* (Basel, 1577) are memorials. D. in Cambridge, England, Feb. 28, 1551. See his biography by J. W. Baum (Elberfeld, 1860) and in Stephen's *Dictionary of National Biography*.

Henry E. Jacobs.

Bucerot'idæ [from Gr. *βούκερως*, ox-horned], or **Hornbills**: a family of the *Picariæ*, remarkable for the excessive size of the mandibles, of which the upper usually supports a large horn-like protuberance. The feet are strong and short, the wings short; size large.

Buch, bookh, Leopold, von: geologist; b. at Stolpe-on-the-Oder, Prussia, Apr. 25, 1774; studied mineralogy under Werner at Freiberg; explored the geology of many countries of Europe, generally traveling on foot. In 1805 he witnessed an eruption of Mt. Vesuvius, which converted him to the Plutonic theory. Among his principal works are *Geognostic Observations during Travels in Germany and Italy* (2 vols., 1802–09); *Travels in Norway and Lapland* (1810); and *On the Mountain Systems of Russia* (1840). He published an excellent geological map of Germany (1824); was author of the doctrine of the slow upheaval of continents. D. in Berlin, Mar. 4, 1853. See the English translation of Flourens's *Eulogy on L. von Buch*, in the Smithsonian Report for 1862, p. 358.

Buchan, bŭkh'an: a district of Scotland; in the northeastern part of Aberdeenshire; consists of about one-fourth of the county lying between the Doveran and the Ytham.

Buchan'an: village (incorporated in 1858): Berrien co., Mich. (for location of county, see map of Michigan, ref. 8–G); on the St. Joseph river, and on railroad; 87 miles E. of Chicago and 197 miles W. of Detroit. Buchanan has a graded school and six churches; it is situated in the midst of a rich agricultural and fruit region, has a large trade, and a variety of manufactures. Pop. (1880) 1,894; (1890) 1,994; (1900) 1,708.

Editor of "Record."

Buchanan, byŭ-kan'an, Claudius, D. D.: clergyman of the Church of England; b. at Cambuslang, near Glasgow, Scotland, Mar. 12, 1766; educated at Queen's College, Cambridge, England. He was professor in the College of Fort William in Bengal (1799–1807); returned to England 1808; wrote *Christian Researches in Asia* (1811), a work that contributed largely to awaken the missionary spirit of the present time. D. in Broxbourne, Hertfordshire, Feb. 9, 1815. See *Memoirs*, by Dr. Hugh Pearson (London, 1819; 5th ed. 1846).

Buchanan, Franklin: b. in Baltimore, Md., Sept. 18, 1800; became a midshipman of the U. S. navy in 1815; passed through the various grades of the service, becoming a captain in 1855. In 1861 he resigned, intending to enter the Confederate service, but subsequently he asked to be restored. His request was refused, and he then joined the Southern navy. He commanded the Merrimack frigate after she was fitted up as an ironclad, and with her engaged and sunk the wooden frigates Congress and Cumberland. Being wounded in this affair, the command of the Merrimack in the encounter with the Monitor devolved upon Lieut. Catesby Jones. For this service Buchanan was made a Confederate admiral; was defeated and made prisoner by Farragut in Mobile Bay Aug. 5, 1864, having fought on board the ironclad Tennessee, and lost a leg. President of the Maryland Agricultural College after the war. D. in Talbot co., Md., May 11, 1874.

Buchanan, George: Scottish poet and historian; b. at Killearn, Stirlingshire, Feb., 1506. He was well educated in Paris, and became a professor in a college of that city. Having adopted the Reformed doctrines, he returned to Scotland in 1537, and wrote *Somnium*, a satire against the monks, for which he was persecuted. He took refuge in England, and passed over to France about 1540. He was employed as a teacher in Bordeaux and Paris for several years, during which he wrote some Latin tragedies; also taught three years in the Portuguese university in Coimbra, where he was driven by persecutions for suspected heresy. After several changes of residence and adventures, he returned to Scotland in 1560. In 1562 he was appointed classical tutor to Mary Queen of Scots. His religious and political principles rendered him in the civil war that ensued a supporter of Regent Murray, who made him principal of St. Leonard's College, St. Andrews. Lennox made him preceptor to the young king, James VI., in 1570, and Keeper of the Privy Seal in the same year. D. in Edinburgh, Sept. 28, 1582. As a scholar he was almost unrivaled by any of his contemporaries. He wrote Latin verse with great purity, and was humorous, sarcastic, and profound. His chief works are a *History of Scotland* (Rerum Scoticarum Historia, 1582); a metrical Latin version of the Psalms (1570); *Franciscanus*, a poetical satire; and a posthumous tract, *De Jure Regni*, affirming that kings exist by will of the people, which had great influence in the politics of the next century. See his *Autobiography*, 1608; David Irving, *Memoirs of the Life of George Buchanan* (1817).

Buchanan, Isaac: Canadian politician; b. in Glasgow, Scotland, July 21, 1810; became a leading merchant and president of the board of trade in Hamilton, Ontario. He was active in putting down the rebellion of 1837, and was for many years prominently engaged in public affairs. He published *The Relations of the Industry of Canada with the Mother Country and the United States.* Elected to the Canadian Parliament in 1841 for the city of Toronto, he helped to secure responsible government for the people and to procure the reduction of the duty on Canadian wheat. In 1843 he supported Lord Metcalf's administration at the head of the Constitutional or order party. For many years he held a seat in the executive council of the province. D. Oct. 1, 1883.

Buchanan, James: fifteenth President of the U. S.; b. near Mercersburg, Franklin co., Pa., Apr. 23, 1791; graduated at Dickinson College, Carlisle, in 1809; admitted to the bar in 1812. He was a Federalist in his youth, but supported the war of 1812–15, which he thought glorious to the people but disgraceful in the extreme to the administration. The death of his betrothed led him into politics as a distraction from his grief, and in 1820 he went to Congress, where he served ten years, turning Democrat on questions of internal improvement. Here he was especially conspicuous on bills reorganizing the judiciary and fixing its appellate jurisdiction. In 1828 he supported Gen. Jackson for the presidency, who sent him in 1831 as minister to Russia, where he concluded a favorable commercial treaty; was U. S. Senator 1834–45, when he took an influential position, defending the executive prerogatives of veto and of removing civil-service officials at will, urging spoliation claims against France, and also the expunging from the record of the senatorial censure of Jackson. While defending the right of petition, he declared against the power of the Government to interfere with slavery in the States. At this time his separation from Whig doctrines became complete, and he refused to be a candidate for the presidency, after having been a conspicuous supporter of Van Buren, that the nomination might go to James K. Polk, who appointed him his Secretary of State. The questions he confronted then were the northwest boundary-line of Oregon, the Mexican war, and the application of the Monroe doctrine to California and Central America, with a view to prevent British acquisitions there. Mr. Buchanan formulated the policy of the administration on these points. During the Taylor-Fillmore government he established himself at Wheatlands, near Lancaster, and received his niece, Harriet Lane, and a nephew in their orphanage into his family. Here he opposed the Wilmot proviso, and supported the compromises of 1850. After four years of private life he was sent by President Pierce, with whom he had contested the nomination for presidency, as minister to England in 1853. He then joined in the Ostend manifesto, proposing the acquisition of Cuba by treaty or otherwise. It was his bid for the Democratic nomination, and it won. He was nominated by the Democrats, and elected President of the U. S. in 1856. The other candidates were John C. Fremont, Republican, and Millard Fillmore, "American." Mr. Buchanan received 174 electoral votes. His cabinet contained Howell Cobb, J. B. Floyd, Jacob Thompson, and Isaac Toucey, who proved to be secessionists and labored to weaken the Government, but Mr. Buchanan perceived this reluctantly and tardily. He blamed the North for its abolitionism as a cause of sectional hatred, supported the Lecompton Constitution for Kansas, and directed a government controlled by the Southern Democracy, even to the extent of using his influence against the nomination of Douglas. The problem of his administration was to prevent the division of the Democratic party, and in this he utterly failed, becoming a partisan of the Southern wing. When secession came on he was tortured between his subserviency to the conspirators in his cabinet and among his counselors and his desire to postpone the collapse of the Union under his administration. His final position was announced in a feeble message of Dec., 1860, in which he blamed the Northern people for the disruption of the Union, and affirmed that the executive had no power or right to prevent the secession of a State. He published in 1866 *Mr. Buchanan's Administration*, a work in defense of his policy as President. Events forced the disunionists to leave the cabinet, and they were replaced by loyal men who passed the possession of the Government over to Mr. Lincoln with only seven States in secession. In his retirement Mr. Buchanan supported the war for the Union. D. near Lancaster, Pa., June 1, 1868. See his *Life* by G. T. Curtis (New York, 1883).

Buchanan, Robert Christie: soldier; b. in Maryland about 1811; graduated at West Point in 1830; Feb. 8, 1864, colonel Tenth Infantry. He served in Black Hawk war 1832; in command of gunboats in the battle of Bad Axe river; as adjutant Fourth Infantry 1835–38; in Florida war 1836–38—1841–42; in the military occupation of Texas 1845–46; in the war with Mexico 1846–48 under both Taylor and Scott; in command of district of Oregon and Northern California 1856; against Rogue river Indians; superintendent of Western recruiting 1857–59. In the civil war he served in the Virginia Peninsula 1862; Gaines's Mill (brevet colonel), Malvern Hill (brevet brigadier-general); in Northern Virginia campaign 1862; engaged at Antietam and at Fredericksburg (brevet major-general); assistant provost-marshal, etc., for New York 1864, and member of commissions 1865–68. Retired from active service Dec. 31, 1870. D. in Washington, D. C., Nov. 29, 1878.

Buchanan, Robert Williams: poet and romancer; b. at Glasgow, Aug. 18, 1841; educated at Glasgow University; went to London in 1860. He published some forty volumes in prose and verse, consisting of novels, plays, poems, and critical essays. Among these are *Idyls and Legends of Inverburn* (1865); *David Gray and Other Essays* (1868); *The Drama of Kings* (1871); *The New Abelard, a Romance* (1884). He attacked Rossetti, Swinburne, and others in an article in the *Contemporary Review* entitled *The Fleshly School of Poetry* (1872). He visited the U. S. in 1884–85. D. June 10, 1901. Henry A. Beers.

Buchanan, Thomas McKean: lieutenant-commander U. S. navy; b. at Bellefonte, Pa., Sept. 10, 1837; graduated at the Naval Academy in 1855. He was in many engagements on the lower Mississippi in co-operation with the Union army, and on Jan. 15, 1862, fell, shot through the head, while "encouraging in his own person his officers and men to fight courageously" in the sharp action at Bayou Tèche.

Buchanites, bŭk'an-īts: a Scotch fanatical sect, now extinct; derived its existence (in 1783) and its name from a Mrs. Buchan, whose maiden name was Elspeth Simpson; b. at Fatmacken, between Banff and Portsoy, in 1738; married Robert Buchan, but separated from him; in 1781 removed to Glasgow, and in 1783 to Irvine, where she, with Rev. Hugh White, founded the sect, which ultimately numbered forty-six. White claimed that Mrs. Buchan was the woman mentioned in Rev. xii., and she that he was the manchild. The sect was expelled for immoral practices in 1784, and established the farm of New Cample, in the parish of Closeburn, Dumfriesshire. Mrs. Buchan professed to give the Holy Ghost by breathing. She died May, 1791—a disproof of their claim that they would be living on the earth when Christ came. The last of the sect died in 1848. See Train, *The Buchanites from First to Last*, Edinburgh, 1846.

Bucharest' (i. e. City of Joy): the capital of Roumania; situated in a fertile plain on the river Dimbovetza, about 140 miles N. W. of Varna; lat. 44° 25′ 30″ N., lon. 26° 5′ 24″ E. (see map of Austria-Hungary, ref. 9–M). The houses are mostly mean, and the streets dirty and not well paved. It contain over 100 churches, a college, a public library, several hospitals, and an excessive number of gaming-houses. This city has the reputation of being the most dissolute capital in Europe. It is the entrepôt for the trade between Austria and Turkey, the chief articles of which are grain, wool, salt, building-timber, cattle, and wax. The treaty of peace by which the sultan ceded Bessarabia and part of Moldavia to Russia was concluded here in May, 1812. Pop. (1876) 221,000; (1892) probably 250,000.

Büch'eler, Franz: classical philologist, eminent authority in the domain of early Latin; b. in Rheinberg, June 3, 1837; professor in Bonn since 1870. Among his works are *Grundriss der lateinischen Declination* (1879); *Frontinus, de aquis urbis*; *Pervigilium Veneris*; *Petronius* (ed. mai. 1862; together with *Liber Priapeorum*, Varro's *Saturæ Menippeæ*, and the *Apocolocyntesis* of Seneca, 1882); *Quinti Ciceronis reliquiæ* (1869); *Herodas* (1892); and numerous articles on early Latin in the Rheinische Museum and elsewhere. A. Gudeman.

Buchez, bü'shay', Philippe Joseph Benjamin: philosophical writer and republican; b. in Mortagne, Ardennes, France, Mar. 31, 1796. He studied medicine, and took part in several plots against the Bourbons. He wrote, besides

other works, *The Science of the Development of Humanity* (1833), and a *Complete Treatise on Philosophy from the Catholic and Progressive Point of View* (3 vols., 1840). Buchez and Roux Lavergne published *The Parliamentary History of the French Revolution* (40 vols., 1833–38). He was president of the National Assembly in May, 1848. D. in Rhodes, France, Aug. 12, 1865.

Büch'ner, Friedrich Karl Christian Ludwig: b. in Darmstadt, Germany, Mar. 29, 1824; a leading advocate of "humanitarian," materialistic, and atheistic opinions. His best-known work is entitled *Kraft und Stoff* (Force and Matter, 1854). He wrote also two volumes with the title *Physiological Pictures* (1861): one on *Natural Philosophy*; *Six Lectures on Darwin* (1868); and a work on *Man in the Past, Present, and Future* (1869–70). The last has been translated (1872) into English by W. S. Dallas, F. L. S. With considerable acquaintance with recent science, an easy style, and some ingenuity of argument, the principal attraction of Büchner's works to most readers is, probably, his audacity. In 1872–73 Büchner made a lecturing tour in the U. S., under the auspices of the German Turnverein. D. in Darmstadt, May 1, 1899.

Buchtel College (Akron, O.): Its corner-stone was laid July 4, 1871, and it was opened for the reception of students Sept. 11, 1872. It was founded by the Ohio Convention of Universalists, and named Buchtel College in honor of John R. Buchtel (1820–1892), whose benefactions to the college are estimated at $500,000. It is open to men and women on equal terms, and offers three courses of study—the classical, the philosophical, and the scientific—leading respectively to the degrees of A. B., Ph. B., and B. S. Besides the main college building it has an astronomical observatory and a gymnasium.

Buchu, byu'kyu [a South African word]: the leaves of *Barosma crenata*, *crenulata*, and *serratifolia*, and of other strong-smelling South African plants used in medicine for their diuretic properties. They belong to the family *Rutaceæ*, and are used by the Hottentots for many diseases. The natives also prize them for their fragrance, and use them in perfuming their bodies. In commerce the various kinds of buchu are known as "round" and "long" buchu, etc. They all contain a volatile oil.

Buck: the male of the fallow deer and of other species of deer; also the male of sheep, goats, antelopes, and rabbits. The term is not properly applied to the male of red-deer or American deer, which is called a stag. The term doe is applied to the females of those species of deer the males of which are called bucks.

Buck, Dudley: organist and composer; b. in Hartford, Conn., Mar. 10, 1839; studied first at home and later in Leipzig. On his return was appointed organist of Park church, Hartford, and a few years later went to St. James's church, Chicago. The great fire of 1871 having destroyed his home there, he returned East, and was for a short time organist of the great organ in Music Hall, Boston; soon went to New York, and acted as substitute conductor of Thomas's Central Park Garden concerts; was appointed organist of St. Ann's church, Brooklyn, and later of the Church of the Holy Trinity, Brooklyn, where he still remains. Buck is one of the finest organists in the U. S., and as a composer is also very eminent. In 1876 he was selected to compose the cantata for the opening of the Centennial Exhibition in Philadelphia. His cantata *Scenes from Longfellow's Golden Legend* took the $1,000 prize at the Cincinnati festival of 1880. He has also composed the following cantatas: *Forty-sixth Psalm*; *The Legend of Don Munio*; *Voyage of Columbus* (for male voices); *The Light of Asia* (text by Edwin Arnold); *Hymn to Music*; *The Nun of Nidaros* (for male voices); *King Olaf's Christmas* (for male voices); *Chorus of Spirits and Hours*, from Shelley's *Prometheus*, besides an opera, *Deserel*, and another in manuscript and unproduced, together with numerous songs and part songs, for both male and mixed voices, and very many pieces for the organ, and almost numberless pieces of church music. He is the conductor of the Apollo Club of Brooklyn, a society of male voices, and has frequently officiated as judge in musical competitions. His music is very popular, being full of beautiful melody. He has also composed several works for full orchestra, including several symphonies, a concert overture, *Marmion*, and some smaller works. His cantata *The Story of the Cross* was published in 1891. D. E. Hervey.

Buck Bean, or **Marsh Trefoil** (*Menyanthes trifoliata*): a plant of the family *Gentianaceæ*. It is indigenous in Europe and the U. S., and is widely distributed in the colder parts of the northern hemisphere. It grows in bogs and marshes, hence also called *bog-bean*. The leaves are ternate, the corolla funnel-shaped and five-parted, and the fruit is a pod or two-valved capsule. A bitter extract obtained from the leaves is a valuable remedy for dyspepsia and disorders of the bowels. The whole plant is tonic, and is used in Germany as a substitute for hops.

Buckeye: the popular name of certain American exogenous trees and shrubs of the genus *Æsculus* and the family *Sapindaceæ*. The Ohio buckeye (*Æsculus glabra*), growing in the valley of the Mississippi, is a large tree with a strong-smelling bark, small obscure flowers, and prickly fruit containing the seed, a large nut resembling that of the horse-chestnut tree, which is a near relative of this buckeye. The sweet buckeye (*Æ. octandra*), a tree, sometimes a shrub, of a range rather more to the south than that of the preceding, has yellow or sometimes dull purple flowers. The red buckeye (*Æ. pavia*) has a still more southern habitat. It is generally small, and has bright-red flowers. The California buckeye (*Æ. californica*) is a tree 30 to 40 feet in height, growing on the Coast Range Mountains and the western slopes of the Sierra Nevada. There are various other species in Asia. Revised by Charles E. Bessey.

Buckhan'non: town; capital of Upshur co., West Va. (for location of county, see map of West Virginia, ref. 7–H); on W. Va. and Pitts. R. R., and on Buckhannon river; 41 miles from Clarksburg. Here are flouring, saw, and woolen mills, tannery, a furniture-factory, and two colleges. Pop. (1880) 761; (1890) 1,403; (1900) 1,589.

Buckingham, George Villiers, Duke of: favorite of James I. of England; b. in Leicestershire, Aug. 20, 1592. He became in 1617 a gentleman of the bedchamber, and obtained in the space of two years the titles of baron, viscount, and earl. In 1616 he was appointed lord admiral of England. He accompanied Charles, Prince of Wales, when he went to Madrid in 1623 to obtain in marriage the infanta of Spain. The failure of this suit was ascribed to the arrogance of Villiers, who in his absence was created Duke of Buckingham. He negotiated the marriage of the prince with Henrietta of France; contrived a disastrous expedition against Cadiz and an impotent one against Rochelle, from which he returned in disgrace. After the death of James I. he became the favorite and prime minister of Charles I., but he made himself odious to the nation. He was assassinated in Portsmouth while embarking for a second raid on Rochelle by John Felton, Aug. 23, 1628.

Buckingham, George Villiers, Duke of: b. in Westminster, Jan. 30, 1627. He was an adroit courtier, but profligate and unprincipled. On the defeat of the royalist party in 1651 he went into exile. At the Restoration (1660) he became a member of the privy council and an enemy of Lord Clarendon, after whose fall (1667) he was a confidential minister of Charles II. He was the president of the ministry called the "Cabal." He wrote the *Rehearsal*, a burlesque on the heroic plays of Dryden and other Restoration dramatists, produced at the King's theater in 1671, with immense success, and other plays. D. in Kirby Moorside, Yorkshire, Apr. 16, 1688.

Buckingham, Joseph Tinker: writer; b. at Windham, Conn., Dec. 21, 1779; published *Specimens of Newspaper Literature* (1850) and *Personal Memoirs* (1852); became successively editor of the *New England Galaxy*, the *Boston Courier*, and the *New England Magazine*. D. in Cambridge, Mass., Apr. 11, 1861.

Buckingham, William Alfred: war Governor of Connecticut: b. in Lebanon, Conn., May 28, 1804; brought up on a farm; became a manufacturer in Norwich, of which city he was mayor for four terms; was nine times successively elected Governor of his native State (1858–66); sent 55,000 troops to the Union army without drafting, an excess of the quota of the State by 6,000; U. S. senator 1869 to his death; eminent in temperance and missionary projects, and in Congregational councils; gave $25,000 to Yale Theological Seminary; d. in Norwich, Conn., Feb. 3, 1875. A statue of him is in the State-house at Hartford.

Buckinghamshire (England): See Bucks.

Buckingham and Chandos, Dukes of: Marquesses of Chandos and Earls Temple of Stowe (1822, in the United Kingdom), Marquesses of Buckingham (1784), Earls Tem-

ple (1749), Viscounts and Barons Cobham (1718, in Great Britain), Earls Nugent (1776, in Ireland), Barons Kinloss (1601, in Scotland), a noble family of Great Britain.—Richard Plantagenet Campbell Temple Nugent-Brydges Chandos Grenville, the third duke of this family, b. in 1823, sueeeeded his father in 1861. He was lord president of the council 1866–67, Secretary of State for the Colonies 1867–68, and beeame Lord-Lieutenant of Bucks; governor of Madras 1875–80; chairman of committees of House of Lords. D. Mar. 27, 1889, and the dukedom was extinguished with him.

Buckinghamshire, Earls of (1746, in England): Barons Hobart (1728, in Great Britain), and baronets (1611, in England), a noble family of Great Britain.—Augustus Edward Hobart, the sixth earl, b. Nov. 1, 1793, suceeeded his brother in 1849, and d. in 1885. Present earl is Sidney Carr Hobart-Hampden, b. in 1860.

Buckland, Cyrus: inventor; b. in Manchester, Conn., Aug. 10, 1799; beeame a machinist, and found employment in the Springfield armory. He invented a machine for turning gun-stocks finished from the rough block; also perfeeted the interehangeability of the parts of a musket, reducing the eost one-half. Received $70,000 from Congress for his inventions; retired in broken health in 1859; d. Feb. 26, 1891.

Buckland, William, D. D., F. R. S.: geologist; b. in Tiverton, England, in 1784; edueated at Corpus Christi College, Oxford; reader on geology on royal foundation at Oxford in 1819; author of a distinguished work in geology, *Reliquiæ Diluvianæ* (1 vol., 1823). His principal work is the Bridgewater Treatise entitled *Geology and Mineralogy, Considered with Reference to Natural Theology* (2 vols., 1836). In 1825 he beeame a eanon of Christ ehureh, Oxford; Dean of Westminster in 1845. D. Aug. 14, 1856.—Francis Trevelyan, his son: b. in Oxford, Dee. 17, 1826; a pisciculturist: beeame inspector of British salmon and herring fisheries; wrote treatises on his favorite pursuits; d. Dee. 19, 1880. See his *Life* by J. C. Bompas (London, 1885).

Bucklan'dia: a large and beautiful evergreen tree of the family *Hamamelaceæ*: native of the Himalaya Mountains. The trunk is sometimes 7 feet in diameter at 5 feet from the ground, and grows to the height of 40 feet before it braneh es. The foliage is thick and glossy, but the timber is not very valuable.

Buckle, George Earle: English journalist; b. June 10, 1854; edueated at Oxford; was called to the bar at Lineoln's Inn, 1880; entered the offiee of *The Times* in 1880, and beeame its editor in 1884. Married in 1885 a daughter of James Payn.

Buckle, Henry Thomas: philosophieal historian; b. at Lee, in Kent, Nov. 24, 1822. His father was a merehant, at whose death he eame into the possession of an ample fortune, and was enabled to gratify his fondness for books, forming, it is said, one of the finest private libraries to be found in all Europe. He published in 1857 the first volume of the *History of Civilization in England*, a work displaying great boldness as well as affluence of thought, and eharaeterized by an easy and vigorous style. It proposed to introduee a new method of studying and writing history which should raise history to the rank of a real science. The second volume appeared in 1861. He taught that skepticism was the souree of progress and eredulity retarded it, working out his conclusions often in a one-sided way and with boldness offensive to conservative minds. Mr. Buekle set out on an Eastern tour in 1861, and died at Damaseus, May 29, 1862. The three volumes of *Miscellaneous and Posthumous Writings* were edited by Miss Taylor (1872). See his *Life* by A. H. Huth (1880).

Buckley, James Monroe, D. D., LL. D.: editor and minister of the Methodist Episeopal Church; b. at Rahway, N. J., Dee. 16, 1836; educated at Pennington Seminary and Wesleyan University; entered the ministry 1858: editor of *The Christian Advocate* (New York sinee 1880); author of *Two Weeks in the Yosemite and Vicinity* (New York, 1873); *Christians and the Theater* (1875); *Supposed Miracles* (Boston, 1875); *Midnight Sun, the Czar and the Nihilists* (Boston, 1886); *Oats or Wild Oats* (New York, 1885); *Faith Healing* (New York, 1892).

Buckley, Samuel Botsford, Ph. D.: b. in Torrey, Yates co., N. Y., May 9, 1809; graduated at Wesleyan University in 1836; traveled extensively, chiefly in the Southern States, as a student of botany, malaeology, geology, geodesy, etc.; was assistant naturalist and geologist in the State survey of Texas 1860–61; was connected with the U. S. sanitary commission 1862–65; State geologist of Texas 1866–67; was 1871–72 editorially connected with the *State Gazette*, Austin, Tex.; was author of many scientific and other papers, and prepared a work on the trees and shrubs of the U. S. He discovered the flowers and fruit of the shrub or small tree *Buckleya distichophylla*, named in his honor by Dr. Torrey. D. in Austin, Tex., Feb. 18, 1884.

Buck'minster, Joseph, D. D.: an orthodox divine; b. at Rutland, Mass., Oct. 14, 1751; graduated at Yale in 1770; beeame pastor of a ehureh at Portsmouth, N. H., in 1779; and was an eloquent and popular preaeher. D. in Readsboro, Vt., June 10, 1812. See his *Memoirs* (Boston, 1851), by his daughter, Eliza B. Lee.

Buckminster, Joseph Stevens, D. D.: b. at Portsmouth, N. H., May 26, 1784; son of Joseph mentioned above; graduated at Harvard in 1800, and in 1804 beeame pastor of the Brattle Street ehureh in Boston. He had great oratorical ability, and as a member of the Anthology Club and contributor to the *Monthly Anthology* he was one of the founders of Boston's literary reputation, and especially one of those who first gave the preaching of his time a literary form where it had been merely expository and hortatory, strewn thiek with Scripture texts with which chapter and verse were given. He was of the Liberal Christian party of his day, whieh beeame distinetly Unitarian shortly after his death. In the pulpit he was Channing's rival, and no less on this account his valued friend. His literary tastes were likely to draw him from the pulpit to seeular scholarship, when his brilliant career was eut short by epilepsy. D. June 9, 1812. See his *Memoirs* (Boston, 1851), by his sister.

John W. Chadwick.

Buckner, Simon Bolivar: Confederate general; b. 1823 in Kentucky: graduated at West Point in 1844; in infantry 1844–52; subsequently commissary of subsistenee: served at frontier posts 1844–52; assistant professor at the Military Aeademy 1846; in the war with Mexieo 1846–48 under both Taylor and Seott; quartermaster Sixth Infantry; assistant instructor at the Military Aeademy 1848–50; on eommissary duty at New York eity 1852–55; resigned Mar. 26, 1855. He was superintendent of eonstruetion of Chieago custom-house 1855; adjutant-general, rank of colonel, of Illinois 1857; farmer near Louisville, and inspeetor-general commanding Kentucky home guards 1860–61; joined the Southern army in the eivil war; was in eommand of Bowling Green, which he evaeuated on the eapture of Fort Henry, falling back on Fort Donelson (surrendered Feb. 16, 1862, to Gen. Grant, with 16,000 troops and vast stores); prisoner of war at Fort Warren till Aug., 1862; in command of a division of Hardee's eorps in Bragg's army in Tennessee; as major-general assigned to third division; ineluded, May 26, 1865, in Kirby Smith's surrender to Gen. Canby. He was eleeted Governor of Kentucky Aug. 1, 1887. Nominated for Viee-President by the Sound-money Demoerats Sept. 3, 1896.

Buckuill, Sir John Charles: See the Appendix.

Bucks, or **Buckinghamshire**: an inland eounty of England; bounded N. by Northampton, E. by Bedford and Hertford, S. by Berks, and W. by Berks and Oxford. It has an area of 746 sq. miles. The surface is diversified by valleys and hills of moderate height. The Chiltern range of chalk-hills, about 900 feet high, extends across the county in a N. E. and S. W. direction. Near the middle of the county is the fertile Vale of Aylesbury, whieh is farther N. than the Chiltern Hills; the soil is generally fertile, and eontains a large portion of elay. It is drained by the Ouse, the Thames, and other smaller rivers. The staple products are wheat, beans, butter, eattle, and mutton. The sheep of the Vale of Aylesbury are noted for their fine and heavy fleeces. Bucks County is intersected by the Great Western and Northwestern Railways. The chief towns are Aylesbury, Buckingham, and Marlow. Pop. (1891) 186,680; (1901) 196,843.

Bucksport: township; terminus of Bucksport braneh of Maine Central R. R.; Haneoek eo., Me. (for loeation of county, see map of Maine, ref. 8–E); on left (east) bank of Penobseot river; 18 miles S. of Bangor. It derives its support prineipally from ship-building, fisheries, tanneries, sawmills, and ice business. Just out of the village are U. S. salmon-breeding houses and pond. It has daily stage eonnection with outlying towns. Bueksport has three ehurehes, and is the seat of the East Maine Conferenee Seminary.

Pop. of township (1880) 3,047 : (1890) 2,921 ; (1900) 2,339.
EDITOR OF "CLIPPER."

Buckthorn : a shrub or small tree of the genus *Rhamnus* and family *Rhamnaceæ* ; distinguished by a bell-shaped calyx which is four or five cleft, and petals which are small and sometimes wanting. The fruit is a berry-like drupe, containing two to four separate seed-like nutlets. The species are numerous, and natives of many temperate and tropical regions. The common buckthorn (*Rhamnus catharticus*) is a deciduous shrub, a native of Europe, and naturalized in the U. S. It has spiny branches, ovate leaves, and small black berries (or drupes) which are nauseous and purgative, and which yield the pigment called sap-green (or bladder-green). This shrub is planted for hedges in the U. S. The Atlantic States have two native species. The alder buckthorn (*Rhamnus frangula*) is a European shrub which is not armed with spines, and has ovate, entire leaves. The berries are violently cathartic. The bark has been employed in medicine, and is used for dyeing yellow. The unripe fruit of dyer's buckthorn (*Rhamnus infectorius*), a shrub which grows in Southern Europe, yields a bright yellow dye. The so-called French or Avignon berries used by dyers are the fruit of the last and other species.

Buckwheat [*buck-* has same root as *beech* : Germ. *Buche*, without umlaut ; cf. Germ. *Buchweize*] : an annual plant (*Fagopy'rum esculentum*, or *Polygo'num fagopyrum*) ; of the order *Polygonaceæ* ; said to be a native of Central Asia and Manchuria. It is cultivated for food in Europe and the U. S. It grows to the height of 2 feet or more. It has triangular, heart-shaped or halberd-shaped leaves. The seeds are triangular, and resemble a beech-nut in form. Cakes of buckwheat eaten warm are a favorite article of food, and very nutritious. Buckwheat meal contains about 10 per cent. of gluten and 50 per cent. of starch. Bees are partial to the flowers of this plant, which secrete a large portion of honey, not of the first quality. Buckwheat comes to maturity in a shorter time than most other grains, and may be sown late. In the U. S. the seeds are usually sown broadcast. The quantity of seed required for one acre is a bushel or one bushel and a half. It requires little nitrogenous or coarse, heavy manure. A good crop of this grain yields about 30 bush. on an acre, and a bushel of it weighs from 45 to 48 lb. Formerly buckwheat was grown mostly as a late-season and "catch" crop, but it now receives more systematic treatment in many parts of the country. Another species, called Tartarian buckwheat (*Fagopyrum tartar'icum*), is a hardy native of Siberia, and is adapted to cold climates. It is distinguished from the common buckwheat by the toothed edges of its seeds, and is inferior in quality.
Revised by L. H. BAILEY.

Buckwheat Family (*Polygonaceæ*) : apetalous, dicotyledonous herbs, shrubs, or even trees ; with a superior one-celled ovary, containing an erect, straight ovule. They are related to the amaranths, chenopods, and pinkworts. There are about 600 species, widely distributed throughout the world. The most important genera are : *Eriogonum*, containing about 100 species, all American ; *Polygonum*, with 150 species ; *Rumex*, with 130 species ; and *Coccoloba*, with 80 species. *Fagopyrum esculentum* of Asia is the well-known buckwheat ; *Rheum rhaponticum*, *R. undulatum*, and *R. officinale* are known as rhubarb, and supply the drug bearing that name, while the petioles of the first and second are used for pies, tarts, sauces, etc. CHARLES E. BESSEY.

Buckwheat-tree : a small tree or shrub of Georgia and the Gulf States (the *Cliftonia ligustrina*) ; a smooth, elegant evergreen of the family *Cyrillaceæ*. It has clusters of white, fragrant blossoms in March, April, and May. It grows around swamps, ponds, and streams, and is often called *titi*. Its pendulous-winged fruit is sometimes shaped like a kernel of buckwheat ; whence the name.

Bucol'ic [from Gr. βουκολικός, deriv. of βουκόλος, herdsman] : pastoral or pertaining to herdsmen. This term is applied to a kind of pastoral poetry written in hexameter verse. The poems of Theocritus and the *Eclogues* of Vergil are the most perfect models of bucolic poetry.

Bucy'rus : city ; capital of Crawford co., O. (for location of county, see map of Ohio, ref. 3–F) ; on Pa. and Ohio Central R. Rs., and on Sandusky river ; 62 miles N. of Columbus. It is the seat of a large farming and manufacturing community ; has large union school-house, gas and electric lights, good sewerage system, and pavements of vitrified brick in many of its streets. There are mineral springs in the town and neighborhood. The skeleton of a mastodon was found in the vicinity in 1838. Pop. (1880) 3,835 ; (1890) 5,974 ; (1900) 6,560. EDITOR OF "FORUM."

Bud (in plants) : In the growth of a shoot it frequently happens that the elongation of the stem is checked for a time, while the leaves continue their growth for a while longer. The result is a collection of leaves, mostly closely packed together into a pretty solid mass, and this we call a *bud*. Usually the leaves are considerably modified, the outer ones soon becoming hard and scale-like, constituting the so-called "bud scales." When the elongation of the stem is resumed the leaves are separated, and the bud disappears. A bud is thus a quiescent state of a shoot. In popular botany buds are distinguished as "leaf-buds" and "flower-buds," the former developing leafy shoots and the latter one or more flowers. Inasmuch as flowers are themselves transformed shoots, all buds are, strictly speaking, essentially alike.

Sometimes the word *bud* is applied to particular outgrowths in the lower plants, especially when these have to do with the production of new plants. Thus we speak of the buds on the yeast plant, the buds of liverworts, etc. This use of the word should be abandoned, as it tends to confusion. CHARLES E. BESSEY.

Buda, boo'da : city of the Austrian empire ; formerly a capital of Hungary. From its hot springs Buda derives its German name of *Ofen*—i. e. oven. Buda is on the right bank of the Danube opposite to Pest, with which it is now incorporated as one city, styled BUDAPEST (*q. v.*). Pop. (1880) of Buda alone, about 60,000.

Budæus (*Budé*), GUILLAUME : philologian ; b. in Paris, 1467 ; d. there Aug. 23, 1540 ; employed by Louis XII. and Francis I. in Roman embassies and other public business ; instigated the founding of the Collège de France ; obtained license for printing in opposition to the Sorbonne ; was royal librarian when he died. His best-known works were *Annotationes in xxiv. libros Pandectorum* (1508) ; *De Asse et partibus ejus* (1514) ; and *Commentarii Linguæ Græcæ* (1519) ; suspected of secret predilections for Lutheranism. See his *Life* by E. de Budé (Paris, 1884), and his *Lettres inédites* (Paris, 1887). D. in Paris, Aug. 22, 1540.

Buda, Old (in Ger. *Alt Ofen* ; Hun. *O' Buda*) : a municipal town of Hungary, in the county of Pest, on the Danube, almost adjoining the suburbs of Buda (see map of Austria-Hungary, ref. 6–H). It is supposed to be the ancient *Sicambria*. Pop. 16,000.

Budapest, boo'da-pest : capital of the kingdom of Hungary ; is composed of Buda, on the right bank of the Danube, and Pest, on the left bank, the two being connected by several handsome bridges, one a suspension bridge 1,200 feet in length (see map of Austria-Hungary, ref. 6–H). Buda and Pest were independent of each other up to 1873. The population of the two cities in 1848 was scarcely 100,000. Their growth was not marked until the formation of the new constitution of the Austro-Hungarian empire in 1868. Hungary then became practically an independent kingdom, and Budapest, as co-ordinate capital with Vienna of the empire, and the center of the growing national life, entered upon a new and magnificent era. Its growth in the two decades from 1870 to 1890 rivals, and in some respects surpasses, that of the great Western cities of the U. S. Buda, formerly the more important, has been outstripped by Pest in this advance. Buda is strikingly picturesque. A rock, springing abruptly from the river, and rising to a height of nearly 1,000 feet, is crowned by the now useless citadel ; a neighboring but lower eminence affords a striking site for the imposing royal palace ; and the city forms itself in an amphitheater about the base. Pest is situated on a sandy plain, but its location gives it marked commercial advantages. Budapest is the greatest grain-market of the empire. Vast fleets of grain-boats ply upon the Danube, and the milling industry is of great extent. Many of the improvements in flour-milling, including the roller-process, originated here. The city council numbers 400, doubtless the largest body of the kind in the world ; but the government is efficiently carried on by a small number of municipal officials. Sanitary improvements have reduced the death-rate from 50 per 1,000 to 29. The old streets have been straightened so far as possible. Andrássy Strasse is the finest street of the city, and by reason of its length (2 miles), its width, paving, and the uniformly handsome buildings that line it, has a claim

to be considered among the great streets of the world. The quays that confine the Danube for a distance of 3 miles, lined with fine buildings, are a striking part of the city. Radiating thoroughfares, intersected by the so-called *Ringstrassen*, have been introduced. Near the Blocksberg on the Buda side, on which is the observatory, are three celebrated sulphur springs, much resorted to for certain diseases, and contributing not a little to the natural advantages of the city. Budapest has a flourishing university, an academy of sciences, a polytechnic school, and is well provided with other educational institutions. Besides the buildings already mentioned, the cathedral, city-hall, national theater, and university church are among the most important. The Margaretta island in the Danube has been transformed into a park. Wine of a superior quality is produced in the vicinity (the Ofner). The Imperial Parliament meets in alternate years at Budapest and Vienna, and the emperor and court spend much time in the Hungarian capital. The history of the city is most interesting; it was once the site of a Roman colony; was long regarded as the citadel of Christendom against the Turks; belonged to the Turks, 1529–1686; in 300 years the citadel was besieged twenty times. The election of the Hungarian kings formerly took place on the Rakós, a neighboring plain, and here as many as 100,000 men often encamped for months. The new Budapest is the center of the political, commercial, literary, and artistic life of a progressive and ambitious people numbering 17,000,000, and as such is reasonably sure of maintaining and improving its position among the great cities of the world. Pop. (1890) 506,384. See *Budapest, the Rise of a New Metropolis*, by Albert Shaw, *The Century*, June, 1892. C. H. Thurber.

Budd, Joseph Lancaster: Professor of Horticulture and Forestry in the Iowa Agricultural College; b. in Peekskill, N. Y., July 5, 1835; known for his efforts to secure hardy fruits for the Northwest, particularly through his travels in Russia with Charles Gibb (*q. v.*), and the introduction of many Russian fruits and ornamental trees. The papers and library of the late Charles Downing were bequeathed to him.

Budde'us, Johann Franz: Lutheran theologian and philosopher; b. in Anclam, in Pomerania, June 25, 1667. He was elected in 1692 Professor of the Greek Language at Coburg; in 1693 was invited to take the chair of Moral Philosophy at Halle; in 1705 became Professor of Theology at Jena. His position was one which harmonized orthodoxy and pietism. His erudition was enormous (he was the most universal scholar among the theologians of his time), yet accurate, and his judgment was of the most solid kind. He wrote more than a hundred books, most of which are still sought by scholars, and several of which are acknowledged standards. His more important books were: *Institutiones Theologiæ Moralis* (Leipzig, 1171); *Institutiones Theologiæ Dogmaticæ* (Leipzig, 1728); *Historia Theologiæ Dogmaticæ et Moralis* (Frankfort, 1725). In philosophy he was an eclectic. D. in Gotha, Nov. 19, 1729.

Revised by Henry E. Jacobs.

Buddha or **Booddha**: a Sanskrit word meaning "awakened, enlightened, illuminated." It is applied to a man who has attained to perfect knowledge of the truth; who by good works through countless existences has at length become released from the bonds of existence; and who, before entering into Nirvana (*q. v.*) preaches the truth to mankind for its redemption. Innumerable Buddhas have already appeared. The Buddha of the present dispensation—the historical Buddha—was born of the Kshatriya tribe of Çākyas (Sakyas), and called in his youth Siddhattha. After attaining enlightenment, he was called Gotama (or Gautama) Buddha; also Samana Gotama, "the Gotamid ascetic." Çākya-muni (Sakyamuni), "Çākya-sage," and Çākya-singha, "Lion of the tribe of Çākyas," are mere epithets, like "Prophet of Nazareth." See Gautama. C. R. Lanman.

Buddhism: a complex, many-sided religious system which originated in India, probably about 500 B. C., and flourished there for sixteen centuries alongside of Brahmanism (*q. v.*), from which it may be said to have been evolved, and with which it had many things in common. By the thirteenth century of our era it had practically disappeared there, losing itself in that development of Brahmanism which is known as Hinduism, and to which it had itself contributed. From India the system was carried southward to Ceylon about 250 B. C.; thence to Burma in the fifth century of our era, and to Siam in the seventh. As it now exists in these countries it adheres more closely to the primitive system than does that which prevails elsewhere, and is known among scholars as southern Buddhism. About 245 B. C. it was carried northward by missionaries to Kashmir, whence it spread to Nepál, Tibet, China, Korea, and Japan. In these countries it received so many new developments that in some important respects it bears little resemblance to the original. Northern Bûddhism adheres in the main to the expanded form of doctrine promulgated by Nagarjuna, the fourteenth Indian patriarch, called the *Mahāyāna*, or "Great Vehicle or Conveyance," as distinguished from the more primitive doctrines of the southern school, called *Hīnāyana*, the "Little (or Inferior) Vehicle or Conveyance." The form of Buddhism which prevails in Tibet and Mongolia is called Lamaism. See all these titles and the countries named.

Its Founder.—Buddhism originated in the ethical and philosophical teachings of an ascetic and reformer known among southern Buddhists as Gautama, or Gotama (the sacerdotal name of the family to which he belonged), among northern Buddhists as Sakyamuni (the "Sakya Sage"), and generally among Europeans as the Buddha, or simply Buddha, the "enlightened" one, referring to the perfect insight which came to him as he sat under the Bo-tree (*q. v.*) pondering in rapt meditation on the problem of life and its attendant miseries. Son of a wealthy Sakya chieftain (whose seat was at Kapilavastu, near the foot of the Himalayas), reared in luxury and surrounded with all the pleasures and seductions of an Eastern court, he seems to have reached the age of twenty-nine before making acquaintance with human suffering, or realizing its universality, depth, and intensity. The story is that on four different occasions, while driving through the city, this was presented to him in four "visions." One of the devas appeared to his gaze first as a decrepit and wrinkled old man, tottering along with the help of a staff; next as a loathsome leper, writhing by the wayside in the agonies of disease; on the third occasion as a putrid corpse being carried to the grave. Profoundly saddened and impressed by these sights, and by the knowledge which inquiry brought him, that these were no uncommon occurrences but the lot of all without reference to sex, caste, or condition, he was prepared for the fourth vision, a Brahmanical recluse, who had abandoned the world and its fleeting pleasures in order that by meditation and mendicancy he might find a way of escape from the ills of life. This seemed to Gautama to point to a way of deliverance, so forsaking his home, his wife, and the boy born to him that very day, he assumed the garb of a mendicant, and set out to find salvation for himself and all mankind. Disappointed with the Brahmanical teaching which he first tried, he plunged into the forest, and for six years unavailingly sought by increasingly vigorous austerities and self-mortification to find the peace and deliverance he desired. At last almost in despair he flung himself down beneath a bo-tree, and there, after forty days and nights of fixed contemplation, enlightenment came to him, and the problem was solved.

Doctrinal Basis.—His solution of the problem is expressed in the Four Verities or Noble Truths, regarded as fundamental by all Buddhists of whatever school. They are: 1. Suffering exists wherever sentient being exists. 2. The cause of suffering is desire, a craving for pleasure or for existence. This leads to rebirth, and rebirth is suffering. 3. Deliverance from suffering can be effected only by the extinction or "blowing out" of desire. This is Nirvana (*q. v.*). 4. This cessation of suffering and entrance into Nirvana can be attained only by walking in the Path of Buddha, or the Noble Eightfold Path. This comprises right views (as to the nature and cause of suffering); right thoughts; right words; right actions; right means of livelihood—that is, as a mendicant monk, living in celibacy and on offered alms; right application of the spirit to the study of the law; right memory, or freedom from error in recollecting the law; and right meditation. The last four of these apply particularly to the community of monks which he founded; the first four to both monks and laymen.

In this Eightfold Path there are four distinct stages. He who has arrived at a just perception of the four verities and enters upon "the stream of holy conduct," successively becomes free from the first three of the ten fetters which bind us to life with its sorrows, viz., from delusion in regard to self, from doubt as to Buddha and his law, and from dependence on works, or a belief in the efficacy of rites and ceremonies. By perseverance throughout the second stage lust, hatred, and delusion are reduced to a minimum, and the disciple attains to the degree of saintship, which in-

volves only one more return to this world. By perseverance in the third stage sensuality and ill-will are entirely destroyed, and he is freed from all necessity of ever returning to this world. When the fourth stage is completed he is set free from all error; he has burst the remaining five fetters, viz., love of life on the earth, desire of life in heaven, pride, self-righteousness, and ignorance—the first link in the twelve-linked chain of cause and effect. See NIDANA.

Upon the Four Noble Truths and this Eightfold Path has been reared the whole elaborate superstructure of Buddhist doctrine and practice, with its TRANSMIGRATION; its six GÂTI, or conditions of sentient existence; its twelve NIDANAS, or links in the chain of causation; its five Skandhas, or bundles of material and abstract qualities, by the union of which personality is produced; its PARAMITAS, or cardinal virtues, by means of which one may pass across the great sea of life and death to the shores of NIRVANA; its DHYÂNA, or fixed contemplation; its Brahmalokas and its Devalokas; its heavens of TUSHITA and SWARGA; its SUKHĀVATĪ, or PARADISE OF THE WEST; its hot and cold hells (see NARAKA); its SANGHA, or order of monks; its VIHARAS, or monasteries; and its numerous sects and developments, some account of all of which is necessary to any adequate presentation of Buddhism, but which can not be dwelt on within the limits of a single page. See all the above titles in the order here given. See also TSING-TU (or JODO) and SHINSHIU.

In its primitive form Buddhism was essentially atheistic. The gods, equally with men and animals and all the other forms of sentient existence, were subject to change—to decay, death, and rebirth. Hence sacrifice and all forms of worship were useless, and a priesthood unnecessary. Later, however, the worship of various deities was introduced, and Buddha himself, as well as MAITREYA (*q. v.*), the coming Buddha; Adibuddha, the origin of all things; the DHYANI-BUDDHAS, or impersonations of abstract thought; Amitabha, the Buddha of "Boundless Light" who presides over the Paradise of the West; Avalokiteshvara, the god (or goddess) of mercy (see KWAN-YIN); and many others, are objects of worship throughout some section of the northern school. It also denied the existence of the soul, and, indeed, of everything except body, mind, and sensation, of heaven, earth, and hell, all of which, however, are described as characterized by impermanency, and subject to continual disintegration and reintegration. Man is conceived of as a combination of five skandhas, or bundles of material qualities, sensations, abstract ideas, tendencies of mind, and mental powers. The breaking up of these is death. A force, however, is left behind, and under the influence of this there is a tendency in these five elements to recombine and form a new personality or individual. This force is called Karma, the consequence of the acts, words, and thoughts of the individual during the continuance of the combination of qualities which has come to an end. It is this accumulation of merit or demerit which determines the nature and condition of the new personality, but it can not be said to be a soul. See KARMA.

The Brotherhood or Sangha.—A very important feature of the system of Buddha was the community or brotherhood of converts which grew up around him. At first it consisted of himself and his first five converts, the ascetics, with whom he had lived in the forests before he discovered that austerities were useless in bringing deliverance from the ills of life. As converts increased they joined this band of disciples called Bikshus and Bikshunis (male and female mendicants), and bound themselves to chastity and a life of self-denial. Conduct was regulated by a simple code of ten prohibitions. Not to kill (or even injure *any* living thing, no matter how lowly); not to steal, or commit adultery, or lie (and this included abstention from all manner of improper speech); not to use strong drink, or take repasts at improper times; not to look at dances and plays, or have costly raiment, perfumes, or ornaments; not to have a large bed or quilt; and not to receive gold or silver. In addition to these, twelve observances were enjoined on recluses, who were required to use clothes made of rags picked up in burying-grounds or on the road; to have only three such coats, all made by the wearer's own hands; to have a cloak of yellow wool to cover all, and made in the same way; to live exclusively on food given in charity and without asking; never to eat or drink after midday; to live in the forests or jungles; to have no roof but the foliage of the trees; to sit with the back supported by the trunk of a tree; to sleep sitting and not lying; never to change the position of the mat or quilt when once it had been spread; and lastly to go once a month to the cremation or burying grounds to meditate on the vanity of life. As his doctrines spread, and it was found impracticable for all to join this brotherhood, the first five injunctions (as the first four of the eight noble paths) were made obligatory on the masses. The one great redeeming and commendable feature of Buddhism is its charity, its kindliness toward and its care for the welfare of all living things, and its sympathy with sorrowing humanity; and its spread is perhaps more due to this than to any other feature. As it now exists its many votaries in its temples and monasteries are perhaps the only real *Buddhists*, but its moral teachings exercise considerable influence over a very large proportion of the inhabitants of Asia, from Ceylon to Japan. For Esoteric Buddhism, see THEOSOPHY; for Buddhist Cosmogony, see JAMBUDVIPA and SUMERU; and for an account of its scriptures (which are voluminous), see TRIPITAKA.

The following works on Buddhism may be consulted with profit: *Introduction à l'histoire du Bouddhisme Indien*, by Eugene Burnouf (1844–76); *Le Lotus de la Bonne loi*, by the same author (1852); *A Manual of Buddhism*, by R. Spence Hardy (2d ed. 1880); *Eastern Monachism* (1860) and *Legends and Theories of the Buddhists* (1866), both by the same author; *Religion des Buddha*, by Koeppen (vol. i. deals with *Southern Buddhism* (1857) and vol. ii. with *Lamaism*, 1859); *Buddhism in Tibet*, by Schlagintweit (1863); *The Wheel of the Law*, by Alabaster (1871); *Legend of the Burmese Buddha*, by Bishop Bigandet (1858); *Buddagosha's Parables* (from the Burmese), by Capt. Rogers, with Introduction by Max Müller (1870); *Der Buddhismus, seine Dogmen und Literatur*, by Wassilief (1869); *A Catena of Buddhist Scriptures*, by Beal (1871); *Texts from the Buddhist Canon, commonly known as Dhammapada*, translated from the Chinese by the same author; *Chinese Buddhism*, by Edkins (1880); *Buddhism* (1880), and the *Hibbert Lectures* (1881), by T. W. Rhys Davids; *Buddhism in its Connection with Hinduism*, by Monier-Williams (1889); and *Buddhism, Primitive and Present, in Magadha and Ceylon*, by Bishop Copleston (1892). R. LILLEY.

Budding, or **Inoculation**, is a mode of propagating improved and choice varieties of fruit which can not be reproduced by seeds. It is the best mode of propagating peaches, and is convenient in the case of plums, cherries, apples, pears, roses, etc. The best time for budding is the last half of summer. The operation is performed by opening the bark of the stock with a vertical and transverse cut, nearly like a letter T, and inserting into it a leaf-bud of another variety. The length of the bark and wood cut off with the bud is about an inch. These buds are taken from a branch formed in the present or preceding year. They should be cut squarely at the top, so as to fit the transverse section of the bark of the stock. The leaf growing close to the bud should be cut off. The process is finished by tying the bud with bass matting, soft cotton twine, or woolen yarn. The operation just described is called "shield-budding," and is more rapidly performed than grafting.

Bude-light: a brilliant light invented by a Mr. Gurney, of Bude, in Cornwall, England. He introduced a stream of oxygen into a flaming jet of oil or gas. The expense of this system has prevented its general use. The same name is sometimes inappropriately given in Great Britain to other similar inventions.

Budissin: See BAUTZEN.

Buel, SAMUEL, D. D.: theological writer and professor; b. in Troy, N. Y., June 11, 1815; graduated at Williams College 1833; rector of parishes in Michigan, Pennsylvania, Maryland, and New York; Professor of Ecclesiastical History and subsequently of Divinity in the Seabury Divinity School, Faribault, Minn., 1886; of Systematic Divinity and Dogmatic Theology in the General Seminary, New York city, 1871. He translated the *Report of the Union Conferences held August 10–16, 1875, at Bonn* (New York, 1876). He wrote *The Apostolical System of the Church Defended* (Philadelphia, 1844); *Eucharistic Presence, Sacrifice, and Adoration* (New York, 1874); and *A Treatise of Dogmatic Theology* (1890, 2 vols.). Died in New York city, Dec. 30, 1892.

Buell, DON CARLOS: soldier; b. near Marietta, O., Mar. 23, 1818; graduated at West Point in 1841; after serving in the infantry till 1848, became, July 17, 1862, assistant adjutant-general U. S. A., rank of colonel, and Mar. 21, 1862, major-general U. S. volunteers. He served in the

Florida war 1841–42; on frontier duty 1843–45; in the military occupation of Texas 1845–46; in the war with Mexico 1846–48, and was wounded at Churubusco; adjutant of the Third Infantry 1847–48; assistant adjutant-general at Washington, D. C., 1848–49; at headquarters of various departments 1849–61. In the civil war he was in command of the department and army of the Ohio 1862; engaged at the battle of Shiloh, siege of Corinth, operations in Northern Alabama, and the retreat to Louisville to cut off the army of Bragg, which he drove from Kentucky; was before a commission to investigate his operations 1862–63. He resigned from the army June 1, 1864, and in 1865 became president of the Green River (Kentucky) Iron-works. D. in Louisville, Ky., Nov. 19, 1898.

Buena Vista (Sp. pron. bwā'nāă-vees'tāă): a hamlet in Mexico; about 90 miles S. W. of Monterey and 7 miles S. of Saltillo; famous for the battle fought in its vicinity between the U. S. forces under Gen. Zachary Taylor and the Mexican army under Santa Anna, Feb. 22–23, 1847. Gen. Taylor, having become assured, from reconnoissances on Feb. 20, that the enemy was in heavy force at Encarnación, 30 miles in front of Agua Nueva, with the evident intention of attacking his position, withdrew his army on the 21st from the camp at Agua Nueva, which could be turned on either flank, and took up a strong line a little in front of Buena Vista. A cavalry force left at Agua Nueva to cover the removal of supplies was driven in during the night, and on the morning of the 22d the Mexican army appeared immediately in front of Buena Vista, and at 11 A. M. (Feb. 23) a flag was sent from Santa Anna with a summons of unconditional surrender, to which Gen. Taylor laconically replied that he "declined to accede to the request."

The line occupied by the U. S. troops was one of remarkable strength. The road at this point becomes a narrow defile, the valley on its right being rendered impracticable for artillery by a system of deep and impassable gullies, while on the left a succession of rugged ridges and precipitous ravines extends back toward the mountain which bounds the valley. The features of the ground were such as nearly to paralyze the artillery and cavalry of the enemy, while his infantry could not derive all the advantage of his numerical superiority. The action was commenced about three o'clock in the afternoon of the 22d, between the light troops on the left, and skirmishing continued till dark, but no serious attack was made until the morning of the 23d. During the night of the 22d the Mexicans had occupied the mountain-side by light troops, with the intention of forcing the left flank of the U. S. army, and it was here that the action commenced on the 23d, and an obstinate and sanguinary conflict was maintained, with short intervals and varying success, throughout the day, resulting in the repulse of the enemy from Taylor's lines, which, however, had been much contracted since morning. An attack of cavalry upon Buena Vista and a demonstration upon Saltillo were also repelled, and during the night Santa Anna abandoned his position and fell back upon Agua Nueva. A reconnoissance made on the 26th disclosed the fact that the retreat had been continued in the direction of San Luis Potosi, and Gen. Taylor resumed his former camp at Agua Nueva on the 27th.

The U. S. force engaged was about 5,200, while the Mexican army was stated by Santa Anna in his summons to be 20,000 strong. The loss in U. S. troops was 746, of which 267 were killed; the Mexican loss in killed and wounded was about 2,000.

Buen Ayre: See BONAIRE.

Buendia, bwen-dee'ăă, JUAN: Peruvian general; b. at Lima, 1814. He early entered the army as an artillery cadet, ascending by regular grades to the rank of general; in 1874 he commanded the force which crushed the insurrection of Pierola. When the Chilian war broke out in 1879 he was put in command of the army of the south at Tarapaca. With 7,000 Bolivians and Peruvians, very badly equipped, he attacked 10,000 Chilians on the heights of San Francisco, near Pisagua (Nov. 8, 1879); he was defeated with terrible loss, and retreated to Tarapaca, where the Chilians attacked him, but were repulsed (Nov. 27), losing most of their artillery. Buendia then continued his retreat to Arica. He was court martialed, but exonerated, and served in the defense of Lima. After the war he retired to private life.

HERBERT H. SMITH.

Bue'nos Ay'res: a province of the Argentine Republic; bounded N. E. by the Rio de la Plata, E. and S. E. by the Atlantic Ocean, and S. W. by the Rio Negro, which separates it from Patagonia. The area is estimated at 63,000 sq. miles. The surface is an alluvial plain, in which timber and stones are scarce; the soil is mostly fertile. Here are vast treeless, grassy plains, called *pampas*, which afford pasture to immense herds of cattle and horses. These constitute the principal riches of the inhabitants. This province is not liberally supplied with rivers or running streams, but contains a great number of salt lakes. The principal river besides the Paraná (La Plata) is the Rio Colorado, which traverses the S. W. part of the province. The climate in the N. part is mild, and has a mean summer temperature of 90° F. It became independent of Spain in 1810, seceded from the Argentine Republic in 1853, and was reunited to it in June, 1860. A large number of Europeans have emigrated to this province. Pop. (1895) 921,222. Capital, La Plata (founded in 1884), and situated about 40 miles S. E. of the city of Buenos Ayres.

Buenos Ayres: a seaport of South America; capital and largest city of the Argentine Republic; on the right bank of the La Plata; lat. 34° 36′ S., lon. 58° 22′ W. (see map of South America, ref. 8–F). It is nearly opposite to Montevideo, which is 100 miles distant. The streets cross each other at right angles, are paved with granite, and bordered by low brick houses, which usually have each a garden adjoining. The principal public buildings are a large cathedral, numerous churches, the House of Representatives, and a college, with which are connected a large library, an observatory, and a normal school. The adjacent country is alluvial, and nearly destitute of timber. The climate is dry and healthy. Many fine public buildings have lately been completed, and others are in progress. Its trade and prosperity are impeded by the want of a safe and commodious harbor. The chief exports are hides, beef, grain, wool, tallow, horns, and skins. It is rapidly growing in importance. Pop. (1882) 295,000; (1892), 549,307; (1895) 665,243.

Bufarik, or **Boofarik**, boo-fāă-reek': a village of Algeria; 18 miles S. S. W. of Algiers; on the road from Algiers to Blidah and Oran; an important military station. It has a trade in cotton, grain, olives, oranges, and an important weekly market. Pop. (1891) 8,064.

Buffalo: either of two species of ruminant animals of the family *Bovidæ*, the *Bubalus buffelus* and *Bubalus caffer*. The former is a native of India, where it has been long domesticated, and is an important and useful animal. It is generally used as a beast of burden in India and also in Italy, where it was introduced about 600 A. D. It is larger and more powerful than an ox, and has a larger head in proportion to the size of the body; the dorsal line rises into a considerable elevation above the shoulders. It has large crooked horns, which are curved first outward and downward, and next backward and upward. The buffalo is partial to marshy places, and is addicted to wallowing in the mud and shallow water. Its flesh is inferior to that of the ox, but the milk of the female is said to be excellent in quality. The tame buffaloes of India are easily managed and guided by a mere rope, and the driver often rides on their backs. The jungles of India are also infested by wild buffaloes of the same species, sometimes called arna or arnee, a fierce and dangerous animal, which is more than a match for a tiger. The Cape buffalo (*Bubalus caffer*) is a native of South Africa, and has not been domesticated. It has large horns, the bases of which are close together. The horns spread or diverge laterally, are next bent downward, and have the point curved upward and inward. The animal measures about 8 feet from the base of its horns to its tail, and is about 5½ feet in height. It is a dangerous animal, and will attack men without provocation, but it is sometimes mastered by the lion. Its hide is so thick and tough that the Caffers make shields of it. Vast herds were formerly found in South Africa. For the American buffalo, see BISON.

Cape buffalo.

Revised by D. S. JORDAN.

Buffalo: a city; port of entry, and important railroad and commercial center; capital of Erie co., N. Y. (for location of county, see map of New York, ref. 5–C); in lat. 42° 53′ N., lon. 78° 55′ W.; at the foot of Lake Erie and head of

Niagara river. It is also the western terminus of the Erie Canal. In population and wealth it is the second city in the State. The city is delightfully situated, having a navigable water-front of about 7 miles, with numerous substantial and extensive piers, breakwaters, basins, and canals, constructed at an expense of several millions of dollars, partly by the Federal Government and partly by the State and municipal authorities. It has one of the finest harbors on the lakes, formed by the Buffalo river, navigable for about 2 miles from its mouth. The entrance is protected by extensive breakwaters. The city extends down the Niagara river and Lake Erie about 9 miles, and at right angles with it the same distance. The Niagara is here crossed with a fine iron truss railroad bridge, completed in 1873 at a cost of $1,500,000.

Buffalo is noted for its wide and beautiful streets, and the profusion of trees and shrubbery with which they are decorated. The report of the State assessors for 1900 puts the valuation for the purpose of taxation at $245,873,587, an increase of $9,000,000 for the year; exempt from taxation, $32,148,030. The bonded debt of the city Jan. 1, 1901, was $16,561,644.94, as compared to $15,986,339.08 for Jan. 1, 1900, an increase during the year of $32,663.37. The city treasurer received from all sources in 1900, $9,187,673.19.

The extensive water-works are the property of the city. There are several gas companies, three electrical lighting companies, natural gas, a magnificent park and boulevards almost surrounding the city, a State normal school and school of practice, 3 high schools, and 60 district schools, besides many other educational establishments. The City and County Hall, built of granite, was completed in 1876 at a cost of $1,400,000. The State has erected an insane asylum, which accommodates 1,500 patients; it cost over two million dollars. The city has a music hall and a merchants' exchange. There are 4 large markets, 40 grain elevators, and a new $3,000,000 post-office building. There are 2 State armories and an arsenal. There are 187 church edifices. Of the latter, two (one Roman Catholic and the other Episcopalian) are imposing cathedrals. With literary, benevolent, and educational institutions Buffalo is well supplied. Among them are the Women's Union; the Buffalo Public Library, with a library of 100,000 volumes, and real estate and buildings worth $350,000; the Society of Natural Sciences, with an extensive collection, and a large museum of casts of fossil remains; the Albright Art Gallery, an historical society, law library, Grosvenor Library (free), 26 hospitals, 2 orphan asylums, 2 medical colleges, a female seminary, and several Catholic colleges. Buffalo has over twenty cemeteries, and a crematory. It has 80 newspapers and periodicals, 11 of them dailies. There are 15 banks of discount, with an aggregate capital of $5,050,000; and 4 savings-banks, with deposits amounting to about $45,850,016. The building and loan association movement has been extensively developed.

Commerce.—Buffalo is the great E. terminus of the lake traffic, especially of the grain, ore, and lumber trade. In 1900 grain receipts by lake were 214,971,364 bush. (including flour estimated as wheat). The lumber trade is very extensive. Imports of all kinds of coal in 1900 were 6,767,217 tons; exports by lake, 1,826,091 tons; and imports of ore, 1,392,559 tons. The receipts of live stock in 1900 were 28,539 cars cattle, 26,492 cars hogs, 3,656 cars sheep. In 1900 the arrivals and departures of vessels were 9,973, with nearly 10,701,222 tonnage.

Manufactures.—In 1901 Buffalo had 4,000 manufacturing establishments, with a capital of $67,867,154, employing 150,000 persons, who received $24,617,408 in wages, the total value of the product being $96,448,654.

On Dec. 29, 1814, a force of British and Indians crossed the Niagara, landed at a point between Buffalo and Black Rock, and in an engagement on the 30th defeated the American militia under Gen. Hall. They then sacked and burned both villages, and murdered all the inhabitants that were not able to get away. Only the jail and one house were left. This was done in revenge for the burning of Newark, Canada. After the war Buffalo grew rapidly, and in 1828 contained about 7,000 inhabitants, the completion of the canal in 1825 giving a strong impetus to its growth. It became a city in 1832, and then had 15,000 inhabitants. Pop. (1835) 15,700; (1880) 155,134; (1890) 255,664; (1892) 278,796; (1895) 335,709; (1900) 352,387.

Buffalo: city; capital of Johnson co., Wy. (for location of county, see map of Wyoming, ref. 8–J); has electric lights and water-works. Farming, stock-raising, and mining are its principal industries. Pop. (1890) 1,087; (1900) 710.

Buffalo-berry (*Shepherdia argentea*): a large shrub of the family *Oleaster* or *Elæagnaceæ*; dicœcious flowers and silvery-scurfy opposite leaves; introduced to cultivation as a fruit-plant in 1890. It bears small, ovoid, scarlet, acid berries in clusters. It is native to the interior region E. of the Sierra Nevadas and W. of the Mississippi, extending from Saskatchewan to the mountains of New Mexico.

Buffalo-fish: any one of the large suckers (*Ictiobus* and *Sclerognathus*); of the family *Catostomidæ*; found in the Mississippi valley. They reach a weight of 10 or 12 lb., but are not much valued as food, being flavorless and full of bones.

Buffet, Louis Joseph: politician; b. in Mirecourt, Vosges, France, Oct. 26, 1818; elected to the Chamber of Deputies from the Vosges in 1848; Minister of Commerce and Agriculture under Louis Napoleon; Finance Minister in the Ollivier cabinet 1870; elected president of the National Assembly, to succeed M. Jules Grévy, Apr. 4, 1873; vice-president of the council and Minister of the Interior 1875; elected life senator June 16, 1876.

Buffon, büf'fōn, Georges Louis Leclerc, Comte de: naturalist and philosopher; b. in Montbar, in Burgundy, Sept. 7, 1707. He was liberally educated, and traveled in his youth in Italy and England. In 1739 he was elected to the Academy of Sciences and appointed intendant of the royal garden in Paris. He published in 1749 the first three volumes of his *Natural History*, in which he was assisted by Daubenton. Twelve other volumes of it appeared between 1749 and 1767. This work, which made an epoch in the study of the natural sciences, displays a brilliant imagination and presents many ingenious ideas. He was admitted into the French Academy in 1753. Among his most admired works is the *Epochs of Nature* (Époques de la Nature), which appeared in a supplement to his *Natural History*. He received from the king the title of Count de Buffon in 1776. D. in Paris, Apr. 16, 1788. See Condorcet, *Éloge de Buffon*; Cuvier, *Éloge de Buffon*, prefixed to an edition of the *Natural History* (36 vols., 1826); Flourens, *Buffon: Histoire de sa Vie, etc.* (1844).

Bufon'idæ: See Toad.

Bu'ford, John: soldier; b. in Kentucky in 1826; graduated at West Point in 1848; served on frontier duty 1848–61; quartermaster of the Second Dragoons 1855–58; in the Sioux expedition 1855; engaged at Blue Water in quelling the Kansas disturbances 1856–57; on the Utah expedition 1857–58. In the civil war he served as assistant inspector-general (major), making inspections 1861–62; in command of cavalry brigade in Northern Virginia campaign 1862; engaged at Madison Court-house, Kelley's Ford, Thoroughfare Gap, and Manassas (wounded); chief of cavalry of the Army of the Potomac in Maryland campaign; engaged at South Mountain and Antietam; in Rappahannock campaign, commanding cavalry brigade 1862–63; engaged at Fredericksburg, Stoneman's raid, and Beverly Ford; in command of a division of cavalry in the Pennsylvania campaign 1863; engaged at Gettysburg and numerous skirmishes in Central Virginia 1863; engaged at Culpeper, Bristow Station, and numerous movements and skirmishes. He was an admirable cavalry officer; rose to be major-general of volunteers, died from the effects of exposure and wounds, Dec. 16, 1863, at Washington, D. C.

Buford, Napoleon Bonaparte: soldier and engineer; b. in Woodford co., Ky., Jan. 13, 1807; graduated at West Point in 1827; and Apr. 15, 1862, brigadier-general U. S. volunteers. He served on garrison and topographical duty; as assistant professor at the Military Academy till Dec. 31, 1835, when he resigned, and entered upon railroad and banking business chiefly at Rock Island, Ill. In the civil war he was colonel of the Twenty-seventh Illinois Volunteers till promoted brigadier-general; engaged in the battle of Belmont; attack of Island No. 10; capture of Union City, Ky.; siege and battle of Corinth, Miss.; siege of Vicksburg; in command of Helena, Ark. Brevet major-general U. S. volunteers Mar. 13, 1865, and Aug. 24, 1865, mustered out of volunteer service. He was superintendent of a mining company in Colorado; special U. S. Indian commissioner 1867–68; Union Pacific Railway commissioner 1868–69. D. Mar. 28, 1883.

Bug, or **Bog**: a river of Russian Poland; the southern of the two rivers with this name rises in Galicia; flows nearly


BUFFALO
A
B
E
F
1
2
3
4
ENGLEWOOD
AMHERST
CITY LIMIT
DEL. LACK. WEST'N
NEW YORK
International Jc.
Erie County Poor House
LAKE ERIE AND WESTERN
D. L. & W. Sta.
Erie Sta.
WEST SHORE
Military Road Sta.
Cross Cut Jc.
N. Y. C. & H. R.
BELT LINE
PARKSIDE
HIGHLAND PARK
KENSINGTON
DELAWARE PARK
The Meadow
The Lake
New York State Insane Asylum
Forest Lawn Cemetery
Mt. St. Joseph Acad.
Delaware Avenue Cemetery
German M. E. Cem.
Soldiers' Place
Fair Ground
HUMBOLDT PARK
CEMETERIES Sta.
Buffalo Jc.
Wagner Sleeping Car Co.
SQUAW ISLAND
Black Rock Harbor
BLACK ROCK
Black Rock Sta.
International Bridge
NIAGARA RIVER
FORT ERIE
Ferry Sta.
Water Works
Inlet Pier Sta.
Fort Porter
THE FRONT
The Circle
MASTEN PLACE
Reservoir
Scajaquada Cr.
Kensington Ave. Sta.
Central Park Sta.
Main St. Sta.
Humboldt Parkway
Bidwell Parkway
Chapin Parkway
Lincoln Parkway

INDEX.

Railroads.

Union Depot, C 6
" " Buf., Roch. & Pitts., C 6
Union Depot, Grand Trunk, C 6
Union Depot, Lake Shore & Mich. Sou., C 6
Union Depot, Michigan Cen., C 6
Union Depot, New York Central & Hudson River, C 6
Union Depot, Western New York & Penn., C 6
Union Depot, West Shore, C 6
Delaware, Lack. & West'n, B 6
New York, Lake Erie & West'n, C 6
Lehigh Valley, C 6
N. Y., Chi. & St. Louis, C 6

Hotels.

1. Arlington, C 6
2. Broezel House, C 6
3. Crandall House, E 5
4. Mansion House, C 6
5. Stafford House, C 6
6. The Genesee, C 5
7. The Niagara, B 4
8. The Iroquois, C 5
9. Tifft House, C 5

Public Buildings, Etc.

10. Board of Trade, C 6
11. Buffalo General Hospital, C 4
12. Buffalo Homœopathic Hos., B 5
13. Buffalo Library Ass'n, C 5
14. Catholic Institute, C 5
15. City Hall & Court Ho., C 5
16. Coal and Iron Exchange, C 6
17. County Jail, B 5
18. Erie County Penitentiary, B 5
19. Fort Porter, A 4
20. Masonic Temple, C 5
21. Municipal Court Building, B 5
22. Post Office and Custom Ho., C 6
23. Exposition Building and Fair Ground, D 3
24. 74th Regiment Armory, C 5
25. 65th Regiment Arsenal, C 5
26. Water Works, F 4
27. Y. M. C. Association, C 5
28. Woman's Christian Ass'n, C 5

Theatres.

29. Academy of Music, C 6
30. Corinne Lyceum, C 5
31. Court St. Theatre, C 5
32. Music Hall, C 5
33. Star Theatre, C 5
34. St. Stephen's Hall, C 6
35. Robinson's Musee Theatre, C 5

Churches.

BAPTIST.

36. Delaware Avenue, C 4
37. Hudson Street, B 5
38. Prospect Avenue, B 5

EPISCOPAL.

39. Church of Ascension, C 4
40. St. Paul's, C 6
41. Trinity, C 5

METHODIST.

42. Delaware Avenue, C 5
43. Glenwood, C 4
44. Richmond Avenue, B 4

PRESBYTERIAN.

45. First, B 4
46. Lafayette St. C 5
47. Westminster, C 4

ROMAN CATHOLIC.

48. St. Joseph's Cathedral, C 6
49. St. Louis (German and French) C 5
50. St. Mary's (German) C 5
51. St. Michael's (German).
52. St. Peter's (French) C 5

MISCELLANEOUS.

53. Church of Our Father, Unit., C 5
54. Church of the Messiah, Univ. B 4
55. First Congregational, C 4
56. Temple Beth Zion, Jewish, C 4
57. N. Y. State Normal School, B 4
58. Woman's Industrial Union, B 5
59. Erie Co. Savings Bank, C 6

northward and northwestward; after a course of about 450 miles enters the Vistula at the fortress of Modlin, about 18 miles N. W. of Warsaw.

Bug, or **Bog** (anc. *Hypanis*): a river of Russia; the northern of this name rises in Podolia; flows nearly southeastward, and enters the estuary of the Dnieper 30 miles W. of Kherson. Its whole length is estimated at 500 miles. It is navigable for small vessels from its mouth to Vosnesensk, upward of 100 miles.

Bug Bible: See BIBLE.

Bugeaud, bü'zhō', THOMAS ROBERT, Duc d'Isly: general; b. in Limoges, France, Oct. 15, 1784; rose in the Napoleonic wars to a colonelcy. Soon after the revolution of 1830 he was created a marshal of France. Having won several victories in Algeria, he was appointed governor-general of the same in 1840. He defeated the army of the Emperor of Morocco at Isly in 1844. During the revolution of Feb., 1848, he commanded the army at Paris. D. from cholera in Paris, June 10, 1849. See his *Memoirs* by Comte d'Ideville (Eng. trans. 1882).

Bugenhagen, boo'gen-hää-gen, JOHANN, surnamed POMERANUS, or Dr. Pommer: learned German Protestant Reformer; b. at Wollin, Pomerania, June 24, 1485. He was converted to the doctrines of Luther in 1520, and became pastor at Wittenberg in 1522. He was a devoted friend of Luther, whom he assisted in the translation of the Bible. His chief works are a *Commentary on the Psalms* (Basel, 1524), and an arrangement of the *Passion History*. He organized the Lutheran Church in Pomerania, Hamburg, Brunswick, and Denmark. D. in Wittenberg, Apr. 20, 1558. See his *Life* by J. B. Vogt (Elberfeld, 1867) and by H. Hering (Halle, 1888). His correspondence, edited by J. B. Vogt, appeared in Stettin in 1888.

Bug-fish: the menhaden (*Brevoortia tyrannus*); a herring-like fish of the Atlantic coasts of the U. S.; so called from the fact that a small crustacean (*Oniscus prægustator*) is often to be found living in the fore part of its mouth.

Bugge, bŏŏg'ge, ELSEUS SOPHUS: philologist; b. in Laurvik, Norway, Jan. 5, 1833; appointed lector in the university at Christiania in 1864, and professor in 1866. Bugge's contributions to almost all branches of philology have been important. He is an eminent runologist and Béowulf scholar. His great edition of the *Poetic Edda* appeared in 1867 (Norrœn Fornkvæði). His *Studies Concerning the Origin of the Northern Mythology*, etc. (Studien over de nordiske Gude- og Heltesagns Oprindelse, 1881–89; Germ. tran., Studien, etc., by O. Brenner, 1881–89), are revolutionary in tendency and have provoked violent opposition. (See NORTHERN MYTHOLOGY.) Of his other works may be mentioned his collection of Norse ballads (*Gamle Norske Folkeviser*, 1858), and his edition of the *Volsunga* and other sagas, *Norrøne Skrifter of Sagnhistorisk Indhold* (1864–73). Much of his most important work has appeared in learned periodicals.

G. L. KITTREDGE.

Bu'gis: a people of the Malay Archipelago; chiefly inhabiting Celebes and Macassar. They are noted for their commercial enterprise, and own many vessels employed in the navigation of the East Indian seas. They are muscular, middle-sized, and of a light-brown color, and have made considerable progress in civilization. They manufacture cotton cloth, build durable sailing-vessels, and are said to be skillful workers in copper and iron.

Bugle: a brass musical wind instrument; has been improved by keys so as to be capable of all the inflections of the scale. In its original form the bugle is the signal horn for the English infantry, as the trumpet for the cavalry. Five sounds only are required for the various calls. This instrument is never used in the orchestra.

Bugle: a plant of the genus *Ajuga* which contains about fifty annual or perennial herbaceous plants of the *Labiatæ* or MINT FAMILY (*q. v.*), bearing whorls of very irregular flowers. None are natives of North America. Half a dozen species have been introduced into flower-gardens, where they are quite ornamental and easily grown. C. E. B.

Bu'gloss [via Fr. and Lat. from Gr. *βούγλωσσος*, ox-tongued; *βοῦς*, ox + *γλῶσσα*, tongue, perhaps from the shape and roughness of its leaves]: a common name given to several species of plants of the family *Boraginaceæ* and of the genera *Anchusa* and *Lycopsis*. The *Lycopsis arvensis* is a common weed in the grain-fields of Great Britain. The *Lycopsis* has a funnel-shaped corolla with a curiously curved tube. The *Echium vulgare*, called viper's bugloss, is a native of Europe and naturalized in the U. S.

Bühler, GEORG: Indologist; b. at Berstel, in Hanover, July 19, 1837; studied at Göttingen, Paris, and London, and became professor in Elphinstone College, Bombay, in 1863. He made many expeditions in search of Sanskrit manuscripts, exploring the libraries of Gujerat, Rajputana, etc., and even Kashmir; made valuable reports to Government upon his work; and purchased many old manuscripts, which are now in the Dekkan College, Puna, accessible to scholars. He also purchased for the libraries of Oxford, Cambridge, and Berlin. With Kielhorn he founded in 1868 the Bombay Sanskrit Series, a very useful collection (to date, 40 vols.). In 1880 he was called to the University of Vienna, where, with his colleagues of the Oriental Institute, he established in 1887 the *Wiener Zeitschrift für die Kunde des Morgenlandes* (to date, 6 vols.). His studies in Hindu law appeared in the *Digest*, in translations of Manu and other law-books, vols. xxv., ii., and xiv. of Max Müller's *Sacred Books of the East*, and elsewhere. His achievements in Indian epigraphy and chronology (in the *Indian Antiquary* and *Epigraphia Indica*), literary and religious history, are of great importance.

Buhl-work: a Germanized form of Boule or Boulle work; a form of decorative inlaying for cabinet work, brought to perfection by André Charles Boule (1642–1732), a French cabinet-maker, whose name was given to this form of art. He used brass, tortoise-shell, ivory, and gold, working out designs of flowers, landscapes, and even hunting scenes, and invented a process of multiplying copies of his designs and obtaining figures and matrices by one operation. The work is done with veneers.

Buhrstone: See BURRSTONE.

Building and Loan Associations: societies established for the purpose of enabling persons of moderate means to become the owners of homes by a succession of small payments; called also *Building Societies* (in Great Britain and Pennsylvania); *Co-operative Banks* (Massachusetts); *Co-operative Savings and Loan Associations* (New York).

The first of these associations was established at Birmingham, England, in 1781. In 1836 they had become so numerous and important that a Building Societies act (now superseded by that of 1874) was passed in that year. The first American society seems to have been organized at Frankford (now a part of Philadelphia) in 1831. The system has flourished most in Pennsylvania, but is widely popular, as will be seen from the following table, reported to the U. S. League of Building and Loan Associations at their annual meeting in Indianapolis in July, 1900:

STATES.	Number of associations.	Total membership.	Total assets.
Pennsylvania	1,174	281,456	$112,120,436
Ohio	773	287,477	102,409,699
Illinois	599	100,000	54,104,602
New Jersey	335	99,160	46,100,000
New York	299	89,409	37,253,725
Indiana	424	109,043	31,425,587
Massachusetts	125	68,349	26,744,647
California	151	37,780	20,285,454
Missouri	191	38,000	13,835,817
Michigan	72	32,775	10,159,562
Iowa	79	23,000	5,723,799
Connecticut	15	12,773	3,774,526
Wisconsin	52	13,450	3,582,922
Kansas	46	12,000	2,880,764
Nebraska	60	13,813	3,3 2,781
Maine	32	8,155	2,975,716
Tennessee	26	4,795	2,874,097
Minnesota	46	7,500	2,848,179
New Hampshire	17	4,950	1,921,927
North Dakota	7	1,000	364,130
	4,523	1,244,885	$484,728,370
Other States	962	267,800	97,137,800
Totals	5,485	1,512,685	$581,866,170

Reports for 1894 show 2,767 associations in the United Kingdom, with 587,856 members, and funds of £51,546,007. Similar associations exist in the British colonies.

The capital of a building association is provided by the issue of shares ordinarily worth $200 each. These are not sold outright, but are paid for in installments at the rate of $1.00 a month. If there were no such thing as interest it would of course take 200 months, or nearly seventeen years, to pay for a share: but the money thus paid in is loaned out and the subscribers are credited with the interest, so that the time is much shortened. If the money is so invested as to earn 6 per cent. above expenses, the shares will *mature* in

126 months or about ten and a half years; that is, 126 monthly payments of $1.00 each will entitle the holder, at the end of that time, to $200 in the treasury of the society.

But how is this money invested? It is loaned to members in sums not exceeding the maturity value of their shares to assist them in owning their homes. If a man is making payments on one share he is entitled to become a borrower to the extent of $200; if he is making payments on five shares he may borrow $1,000, and so on—provided, of course, that he can show that the money is to be safely invested. Only it will generally happen, in the early stages of a society's life, that there are more men who want to borrow than there are funds available. In this case, who shall have the preference? Sometimes this is decided by order of subscription to the shares; sometimes by lot; but in most societies the loan is awarded to the man who will bid the highest premium for the privilege of having it, and these premiums form an important part of the society's profits. Sometimes this premium is paid in the form of a gross sum deducted from the principal of the loan; more commonly it takes the form of a small monthly payment in addition to the interest itself. Thus a man who had subscribed to five shares, and secured a loan of $1,000 at a premium of 40 cents a share per month, would have to pay each month as follows:

Subscription to five shares	$5 00
One month's interest on $1,000 at 6 per cent.	5 00
Premium on loan of $1,000 (five shares)	2 00
Total	$12 00

This sum of $12.00 per month he would continue to pay until his shares matured, that is, until they were worth $200 each. At that time, probably some twelve and a half years from the date of the original organization, he would own five full-paid shares of $200 each, which would stand to his credit on the books of the association, and which would, without further transactions, cancel the principal of his debt. At this same time those who had been subscribers and not borrowers would find that they had credits without corresponding debts, and the treasurer of the association would pay them in full from the funds which the financial operations just described would have enabled him to accumulate. When this was done the affairs of the association would be said to be wound up.

In the older building societies affairs were actually managed in this way. All the payments were begun at the same date; all the shares matured at the same date, and at this time the affairs of the association were absolutely closed. This was not without its advantages. The complete winding up insured a certain plainness and straightforwardness of accounts which it was harder to secure as certainly in any other fashion. But the advantage was rather dearly purchased. In the first place, the system made it hard for new members to enter the association after it was once established. They could only do so by paying in a lump sum the amount which they would have contributed month by month, with the addition of the profits which such contributions would have earned during the time which had elapsed since the association was organized. In the second place—and this was much more serious—it was necessary to accumulate a good deal of cash for the purpose of winding up any such association all at once. The non-borrowing shares had to be paid in full, and these were often very numerous. To accumulate this cash it was necessary to keep much money comparatively idle for months before the winding up of the association, for it was impossible to find borrowers for short-time loans as freely as for long-time loans in the early period of the society's life. Of course, any such failure to realize profits told upon the gains of the investors as a whole. To meet these difficulties, inherent in the "terminating" plan just described, the system of series of shares was invented. Under this system the society is not arranged for winding up at a definite time, nor do all the shares mature at the same date. If a number of men want to come in a year after the society is started they are encouraged to do so; and instead of being compelled to pay back dues in a lump sum they are allowed to subscribe to new shares which will mature a year later than the old ones. We thus have successive series of shares, usually, though not always, bearing dates one year apart, and maturing at similar intervals one after another, whose accounts and profits are kept separately. If a non-borrowing member in an older series wishes to become a borrower, he is encouraged to draw out the amount due to his credit on the older series and let his shares in that series be canceled; and then he subscribes to shares in a new series as a basis for whatever further money he needs in the way of loans. As the shares of the older series approach maturity, opportunities are given for voluntary withdrawal on the basis of the profits already earned, and in some societies authority is given for the compulsory retirement, at proper valuation, of non-matured shares. The object of all these provisions is to avoid the necessity of accumulating large sums of idle cash for the exigencies of any single moment, which would be a source of loss and of danger. In England this difficulty is sometimes obviated by providing that certain shares are to be reinvested instead of being paid up, and in the German *Baugenossenschaften* this principle appears to have been carried yet further. Such methods tend to create a separate body of non-borrowers, who furnish no small part of the capital, and deprive the scheme of some of its essentially co-operative character. The extreme of this deprivation is seen in the building societies of France, which are generally managed by representatives of the lenders alone. The workman pays for his home by installments, as in Great Britain or the U. S., but he does not furnish the bulk of the capital by such payments, nor does he control its management and disposition. Under such circumstances much of the educational value of these institutions is lost.

In case the subscriber to a non-borrowing share is unable to keep up his payments he is generally allowed to withdraw and receive back the money that he has paid in, provided the society has funds available for that purpose. Whether he should be allowed the full share of profits already earned, or only a part of them, is a disputed question. As the shares approach maturity it is generally well to encourage voluntary withdrawal for reasons just given, and in that case full profits should be allowed. At earlier periods in the life of the shares it is thought better to hold back a part of the profits, as penalty for too early withdrawal.

The mechanism of these societies is simple. Their affairs are controlled by a president and board of directors; but the most active officials are the secretary and treasurer. At the monthly meetings, which are held regularly, the secretary takes the names of applicants, receives the fees of members and hands them over to the treasurer. At each of these meetings the amount available for loaning is announced, and public bids are made for the award. The loan is granted to the highest bidder, subject to the approval of the "property committee" of the board of directors, whose duty it is to see that the borrower does not invest the money in an unsafe manner. If he wishes the loan to buy a house already built, they have to see that the price is not in excess of the permanent value of the property; if he wishes to build, they may examine into the character of the real estate, house-plans, etc. In cases of the latter class the money is not generally paid to the borrower in a lump sum, but given by the treasurer to the contractor from time to time, as the building progresses. If the committee reports unfavorably on the security, the loan is of course awarded to some one else. The treasurer, who may have large amounts of money to handle, is, in all well-managed societies, an official under bonds. He is assisted in his duties by a "finance committee" of the board of directors, distinct from the property committee just described. Further details and suggestions as to organization and management are given in Judge Seymour Dexter's excellent little book *Co-operative Savings and Loan Associations* (New York), also in the *Report of the Pennsylvania Bureau of Industrial Statistics* for 1888. So economical is the administration of these societies that the more recent Pennsylvania reports show current expenses of about 1 per cent. of the moneys handled.

The advantages of societies of this kind are very great; but they are not to be sought in the most obvious lines, or in the ways which are ordinarily assumed. To begin with, these societies do not always or generally furnish a means by which an intelligent workman can get his home *cheaper* than by dealing with reputable savings-banks. The financial statements purporting to show comparative cost by different methods of payment are often misleading. So well informed a writer as Mr. Linn, whose articles in *Scribner's Magazine* have been a most useful means of disseminating information on this subject, presents an illustration of economy which starts from an absolutely false assumption as to the possible relations between interest-rate, premium, and time of maturity. A man who puts his money in a savings-bank at 4 per cent. until he accumulates a fund large enough to enable him to borrow the balance of what he needs at 6

per cent., with the right to make partial payments on the principal, gets his house cheaper than he can through the agency of any ordinary building society. For the neighborhood of Philadelphia, where the system is so well established that a great deal of capital stands constantly at the disposal of these societies, this statement should perhaps be modified; but for the country as a whole, it is a safe one to make; at any rate, wherever the interest which a man pays on savings-bank loans is only about 2 per cent. greater than that which he can receive on savings-bank deposits.

The shorter the time in which the shares mature the worse is the economy for the borrowers as a class. If the shares mature in less than eleven years, it shows as a mere matter of arithmetic that the non-borrowers are making *ten* per cent. on the money advanced, a rate of profit which in these days is quite excessive. The borrowers as a class must pay this. But the answer is made that the borrowers gain, along with the rest, by the fact that the period of payment is shortened by the more rapid maturity of the shares. The speciousness of this argument constitutes one of the dangers of this form of association. The borrowers apparently share in all the profits: they do not see that if the non-borrowers furnish two-thirds of the capital, the borrowers pay the whole extra profit by excessively high premiums and only get one-third of it back. The temptation to make premiums too high is one that is very difficult to avoid; and few members of a building society have the financial knowledge to resist it. If the shares of a society mature in less than twelve years, with the rates of interest prevailing in some U. S. cities, it may be confidently stated that the borrowers have sacrificed their own commercial advantage.

Another claim urged in behalf of these associations is that they stimulate the habit of saving by making it compulsory. It is said that a man will save more when he is compelled to put it in a building society than when he simply has the option of putting it in a savings-bank. This is doubtless true, but the gain is attended with certain serious losses. In case of sickness this compulsory saving, instead of being a help to a man, may be the worst possible burden. If he has been attracted into paying a high premium, he may find that this burden becomes enormously heavy, and unless the administration of the society is unusually intelligent the danger from this source is very great indeed. If a man's earnings and expenses are perfectly regular, regular saving furnishes the best possible check against extravagance; but if he is brought face to face with unexpectedly increased expenses and unexpectedly diminished earnings, it adds to a load which is heavy enough at best.

A more unmixed gain to the community as well as to the members lies in the fact that these societies enable workmen to become owners of real estate sooner than any other means which has yet been devised. The combination of payments in the share with security for the loan makes it possible for these societies to advance up to 70 or 80 per cent. of the value of the property, while the savings-banks are restricted to 50 per cent. However the account may stand in the matter of dollars and cents, the workman is a great gainer in happiness and self-respect in becoming a real-estate owner as soon as possible. The "magic of property" will enable him to work harder and feel the load less. Even when he is paying an unduly high premium, he is paying it under conditions which make him feel its burdens least and its benefits most. And besides the gain to the individual house-owners and their families, there is a tremendous gain to the community in having the ownership of real estate widely distributed. It puts every owner more completely on the side of law and order than he ever was before. He feels himself an integral part of the state more fully, and is the more ready to take the full share of his responsibilities as a citizen.

The association also has a strong educational effect on its members in teaching them practical lessons concerning the conduct of business. They learn to provide for a future debt by constant investment of their savings in an attractive form. They find out about the handling of money; about interest and the laws which govern it; about the relation between values in the present and future; and a thousand other things which lay the foundation for business success. They also learn about the conditions and methods of building; they learn to buy and build with better judgment than their unaided knowledge would have taught them. So great have been the gains of this sort that there are not a few such societies in which rich men take part as means of both learning and teaching—an interchange of suggestions as to the better ways of utilizing money in building houses. This educational influence is not the result of any machinery; it comes from the contact of man with man. It is not found in the "national" loan associations, which simply provide a means of investment and borrowing—too often under disadvantageous conditions. Even at their best the national associations are subject to most of the special dangers of the local ones, with few of their distinctive advantages. The co-operative character and the educational influence which this involves are either absent from the national associations or present only in name. The expense of advertising connected with such associations is large; the effective control by investors or any one else is small. In fact, the moment a building association goes outside of certain narrowly defined lines of business, there are great opportunities for abuse of power. The recent history of building societies in England has furnished a conspicuous example of this. Many of them entered upon banking transactions for which they had neither the proper organization, the proper oversight, nor the proper cash reserve. In some cases their methods of business were legitimate enough, and the public suspicion of their characters proved to be unjustified; but not a few were unsound from beginning to end. In his report for 1892 the registrar of friendly societies wisely insists upon constant inspection of the accounts by the investors themselves as the only effective safeguard against abuse of power by the building society officials.

ARTHUR T. HADLEY.

Building-stone: stone suitable for building purposes. The varieties of stone most commonly employed for building purposes may be grouped under the general names of granite, marble, limestone, and sandstone, though other rocks, such as the serpentines, traps, porphyries, and recent volcanics, are not infrequently utilized when their colors are suitable, or where, on account of locality or means of transportation, they are to be had at a less cost than other stone.

It may be well, before proceeding to describe in detail the various stones used in architectural application, to call attention briefly to the essential qualities which such stone should possess. These qualities, named in the order of their importance, are as follows, regard being had to their use in ordinary building:

(1) Durability. (2) Permanency of color. (3) Crushing strength and elasticity. (4) Cheapness.

Durability.—Not all stones are equally durable, and this is due to a variety of causes. Taken from its quarry-bed and placed in the wall of a building a stone becomes exposed to the constant variations of temperatures, to the chemical action of acid rains and atmospheres, to the combined chemical and physical action of growing organisms, to the compressive weight of the overlying material, and perhaps to the mechanical action of wind-blown sand or the wear of passing feet. To these must be added the destructive action of artificial heat, as when a building is injured by fire. The constant expansion and contraction produced by variations in temperature are perhaps more trying than is ordinarily supposed. Stones, as a rule, possess but a low conducting power. They are aggregates of minerals, more or less closely cohering, each of which possesses its own degree of expansion and contraction. As temperatures rise, each constituent expands, crowding with resistless force against its neighbor; as temperatures fall a corresponding contraction takes place. A slow and gradual weakening and disintegration is the inevitable result. Artificial heat, as produced by a burning building, is necessarily more injurious in proportion as the temperature is higher. Sufficient data are not at hand for estimating accurately the comparative fireproof properties of various stones, but it is an assured fact that granite in this respect ranks extremely low, while the fact that certain siliceous sandstones are used for furnace backings would seem to show that they are at least very nearly if not quite fireproof. Up to the temperature at which it is converted into quicklime, ordinary limestone has been found more durable than granite. The durability of color of any stone depends mainly upon the presence or absence of ferruginous and carbonaceous matter. Stone containing iron in the form of sulphide or protoxide carbonate compounds is liable to change from a white or blue-gray to a buff, yellow, or brown-red color. Where this change takes place uniformly throughout a stone it is often beneficial, changing a cold gray to a warm buff tint. Such a change is spoken of as "mellowing"; frequently, however, the ox-

idation takes place in spots or streaks, and the result is unsightly. Carbonaceous material, which imparts a dark color to the stone, may in time bleach out to a dirty whiteness.

When a stone becomes saturated with water from rain or other causes, and is then subjected to freezing temperatures, an energetic agent for disintegration is brought into play. Water passing from a liquid to a solid state exerts a pressure of 138 tons to the square foot of surface. It is therefore not surprising that a small amount of water confined within the pores of a stone produces in time very disastrous results.

The water from rainfalls passing through the atmosphere takes up a small amount of carbonic acid. This when brought in contact with stone in the walls of a building is productive of a slight solvent action, particularly in marbles and limestones, or in sandstones with calcareous cements.

In certain cases the crushing strength and elasticity of stone are matters of importance. It must, however, be admitted that these qualities have in times past been greatly overestimated. It is a rule among builders never so to place a stone that it shall be subjected to more than one-tenth or even one-twentieth the pressure it is known to be capable of sustaining. Under such circumstances there are few kinds of stone that are not strong enough for all ordinary purposes of construction, and the test of ratio of absorption, resistance to freezing, and permanency of color, are of vastly greater importance than that of compression. The relative cheapness of materials and their color are still, and perhaps must always be, the controlling factors in deciding what materials shall be used in the greater number of cases. Cheapness is necessarily dependent upon abundance, proximity of quarries to market, and ready means of transportation, together with the ease with which a stone may be quarried and worked. The last quality, unfortunately, not infrequently leads to the selection of a soft, porous, and inferior article.

Testing.—The tests which thus far have been made upon stone to ascertain their fitness for any particular form of architectural application were made mainly with a view of ascertaining their crushing strength and resistance to action of frost. The crushing strength is tested by means of machines, in which small cubes are submitted to a measured force until they are crushed. Such machines are manufactured by Fairbanks & Co., of New York, and the Riehle Bros., of Philadelphia. There is also a remarkable testing-machine, invented by A. H. Emery, in use at the Watertown arsenal in Massachusetts. A large number of such tests have been made under the direction of Gen. Q. A. Gillmore at Staten Island, N. Y., by Gen. Franklin at the Navy-yard in Washington, by engineers at the Watertown arsenal, and others. The results obtained by these investigators do not afford very satisfactory data for a comparison of the relative strength of the different materials, owing presumably to a lack of uniformity in the methods employed and in preparing the cubes to be experimented upon. Enough, however, has been done to warrant the assertion that in other than very exceptional circumstances no further tests of this nature are needed, since under the conditions ordinarily existing a very weak stone will prove sufficiently strong for all practical purposes.

The question, indeed, is no longer what will a carefully prepared cube of the stone bear to-day, but rather how will it endure the vicissitudes of a trying climate, and what will it bear after years of exposure to the action of heat and frost. To these questions the ordinary tests give us no clew. The following figures indicate the range in compressive strength and weight per cubic foot among various rocks so far as they have been ascertained:

DESCRIPTION.	Strength in lbs. per cubic inch.	Weight in lbs. per cubic foot.
Granite	15,000 to 25,000	165 to 170
Trap (diabase)	20,000 " 30,000	175 " 185
Marble (crystalline limestone)	6,000 " 12,000	165 " 170
Marble (crystalline dolomite)	8,000 " 13,000	168 " 175
Limestone	5,000 " 14,000	145 " 170
Sandstone	5,000 " 17,000	130 " 160

For a single test, the best that can be applied to stone is one to ascertain its power to resist the action of frost. This can best be done by actually freezing prepared cubes when saturated with moisture. Chemical methods, as saturating with a solution of sulphate of soda, which is then allowed to crystallize, have proved unsatisfactory and unreliable. The power of stone to resist the action of an acid atmosphere was tested by Prof. N. H. Winchell at Minneapolis, Minn., by placing prepared cubes in a dish of water through which carbonic acid was kept constantly bubbling. The resistance to heat was tested by placing the specimen in a muffler, raising to a white heat, and noting the change in color and disintegration, if any. While still hot the cubes were dropped into cold water and the effect noted.

None of the tests that can be made in the laboratory are equal for practical results to an examination of the old exposures in a quarry or of stone as it appears in the walls of a building of long standing. Any serious disintegration or discoloration will here have made itself apparent.

"A good building-stone, whatever its kind, should possess a moderately fine and even texture, with the grains well compacted; should give out a clear ringing sound when struck with a hammer; and show always a clear, fresh fracture. It should also be capable of absorbing only a proportionately small amount of water."

Granite has ranked from time immemorial as one of the strongest and most desirable of building materials. Unfortunately, its great hardness has until recently proved a serious drawback to its use in other than the most massive structures. The invention of machines for cutting, grinding, and polishing, has, however, very largely done away with this difficulty, and the stone is now in very general use, not merely for house walls and massive masonry, but in turned and polished columns, pilasters, balustrades, monuments, and tombstones. Commercially, the name granite is made to include a variety of siliceous rocks having only a massive and granular crystalline structure in common; the diabases and gabbros are thus included under the name of *black granite*. Properly the name is restricted to eruptive rocks consisting essentially of the minerals quartz, potash feldspar, and one or more minerals of the mica, hornblende, or pyroxene group. The prevailing color of granite is some shade of gray, though pink and red colors are common. The gray hues are due to the prevalence of mica or hornblende; the pink and red to the prevailing pink and red feldspars. The ordinary grays are used mainly for general building, curbings, and pavements, while the darker colors, as those of Quincy (Mass.), and the pink and red varieties, are utilized in ornamental work and for the bases of statues. Granites occur in all the States bordering upon the Appalachian Mountain system, but are more extensively quarried in Maine and Massachusetts than elsewhere, a fact due to the excellent facilities for shipping as much as to the quality of the material. The most noted granites of the U. S. are those of Hallowell, Red Beach, Vinalhaven, Dix's and Hurricane islands, and adjacent localities on the coast of Maine, Concord, N. H., Quincy and Cape Ann, Mass., Westerly, R. I., Richmond, Va., Iron County, Mo., and East St. Cloud, Minn. Good granites abound in the Rocky Mountain region, but are as yet undeveloped, excepting to a slight extent in Colorado and California. Among other noted stones belonging to this class are the red granites from the Bay of Fundy, Nova Scotia, and from near Peterhead, Scotland. A gray granite with pink crystals of porphyritic feldspar is obtained in Shap, Westmoreland co., England, and a coarse, dark red-brown variety in Sweden.

Marble.—The term "marble" as ordinarily used includes any stone composed essentially of carbonate of lime alone, or the carbonate of lime and magnesia in varying proportions, and which, owing to its color and texture, is sufficiently beautiful for a high grade of building material, or for monumental or decorative work. In color marbles vary from pure white, through all shades of gray, to black; yellow, pink, brown, and red are by no means uncommon, the gray and black hues being, as a rule, due to carbonaceous matter, and the others to iron oxides. In texture they vary from finely and coarsely granular to compact and apparently amorphous, at times highly fossiliferous. A high grade of marble for polished interior decorative work should be so compact as to yield under the hands of the workman a close, enamel-like surface with little if any granulation. For building and statuary purposes, on the other hand, a granular stone is the most desirable, giving in tool-dressed or rock-faced work an effect much more pleasing to the eye than do the compact varieties.

The principal sources of American marbles are at present the beds of Silurian limestone and dolomite which border the Appalachian Mountain system. Vermont produces some 60 per cent. of the entire output. Coarse dolomite marbles eminently suited for constructive purposes occur in

Western Connecticut and Massachusetts, and in Southeastern New York; a coarse building-marble is also quarried in Northern Georgia. Pink and chocolate variegated marbles suitable for furniture and interior decorative work occur abundantly in Eastern Tennessee, and have been quarried for many years. This is now the chief source in the U. S. for colored decorative marble. Good marbles are known to occur in the Rocky Mountain region, but as yet they have come into but little use, owing to their inaccessibility. Recent developments in Colorado and California are, however, very promising.

The principal foreign sources of marble are Northern Italy, the French Pyrenees, Belgium, Germany, and Algeria: Spain and Portugal are also productive. The most noted of these are the white statuary marble of Carrara, the black and gold and Sienna marbles of Italy; the so-called Numidian marbles of Algeria; the *griotte* or French red from the Pyrenees; the St. Anne and Sarracolin from Belgium; the Formosa and Bougard from Germany; and the yellow from Portugal.

The so-called "onyx marble" is in reality a compact and very beautiful variety of travertine. This is by far the most beautiful and highly prized of all marbles. The principal sources of supply in times past have been Egypt and Algeria, more recently Mexico, and still more recently high-grade material of this nature has been found in Arizona and California in the U. S. Extensive deposits are also reported in the desert region of Lower California. The verd antique marbles, so called, are mentioned under the head of SERPENTINE (*q. v.*).

LIMESTONES.—Limestones vary in color and texture, as well as in durability for constructive purposes, as do the marbles. They may be compact and amorphous, finely or coarsely crystalline, or fossiliferous. Some, like the Florida coquina, are mere aggregates of more or less comminuted shells. The limestones as a rule are less desirable for constructive purposes than are the granites, marbles, or sandstone; this on account of their colors and poor working qualities. There are, however, important exceptions. The most important of the limestones used for constructive purposes are the oölites or oölitic limestones from the subcarboniferous beds of Southern Indiana and adjacent portions of Kentucky; these are of a white or cream color, fine grained and readily wrought. They are eminently suited for finely carved and ornate styles of architecture. In color and texture they correspond closely with the Jurassic oölites of England, which have been in use in that country since early in the twelfth century. The dolomitic Silurian limestone underlying the city of Chicago, and adjacent portions of Will and Cook Counties, is another important source of material for both building and flagging purposes. In many instances the stone contains sufficient bituminous matter to discolor and impart to it a peculiar antique look which is much esteemed by some. Important beds of limestone for structural purposes also occur in Iowa, Kansas, and Missouri. Ohio also has many quarries of local importance, but few of them are known beyond the limits of the State.

SANDSTONES are among the most variable of natural building materials. As the name denotes, they are composed essentially of consolidated sand, but the composition, texture, and color of this sand may vary almost indefinitely. As a rule, the predominating constituent in a sandstone is the mineral quartz, in rounded or more or less angular grains. Feldspar and minerals of the hornblende, pyroxene, or mica group are, however, common. The usual cementing or binding constituent in sandstone is silica, carbonate of lime, iron oxide, or clayey matter. The durability of the stone, as well as its working qualities, is dependent more upon the character of this cement than upon that of the grains composing the stone itself. Of all cementing materials the siliceous is the most durable, and the clayey the least so, since the first is less susceptible to the solvent action of water from rainfalls. Both ferruginous and calcareous cements are slightly soluble and liable to slow removal, whereby the stone becomes friable and slowly disintegrates. The clayey cement is a source of weakness on account of its tendency to absorb water, whereby the stone is rendered liable to injury by freezing. In color sandstones are as variable as in texture. The prevailing hues are some shades of gray, buff, drab, red, or brown, the coloring-matter being mainly iron in some of its forms. A white color denotes the absence of iron. The red is due to anhydrous iron sesquioxide; brown to a hydrous sesquioxide; the gray color may be due to iron in the form of a protoxide carbonate. Such stones are liable to turn yellowish on exposure. In certain of the Ohio quarries the stone is brown in color as exposed in the surface outcrops, but dark blue-gray below the water level, the change being due to the oxidation in the upper layers of the protoxide carbonate. In many sandstones the cementing silica has so orientated itself around the original quartz granules as to convert the stone into a granular aggregate of imperfect crystals. Such stones are properly quartzites, and rank among the most indestructible of building-stones, though unfortunately they are extremely hard to work. The well-known Potsdam sandstone of St. Lawrence co., N. Y., is one of the best examples of this phenomenon.

All stone are softer and most readily worked when first quarried than after seasoning, but this characteristic is most strongly marked in sandstone. This is due to the fact that the stone as it lies in the ground contains a small amount of sap, or quarry water, as it is called, and this carries the cementing material in solution, to be deposited on evaporation. So abundant is this quarry water in many sandstones that the rock is liable to serious injury if frozen without previous seasoning. On this account many quarries in northern latitudes can be worked only during the warmer seasons of the year.

The favorite sandstones for constructive purposes in the U. S. are the Ohio freestones, or Berea grits, from the Waverly division of the sub-carboniferous formations in Ohio, and the brown and red freestones from the Triassic formations of the Atlantic States and eastern slopes of the Rocky Mountain range. The first is a fine light drab, gray, or buff siliceous sandstone, very readily wrought, and, when properly laid, very durable. The best-developed quarries are in the towns of Berea, Amherst, East Cleveland, Illyria, and Independence, in Lorain and Cuyahoga Counties. The Triassic stone is of a prevailing brown or red-brown color, and has been used frequently in New York and other Eastern cities in the form of ashlar blocks for house fronts. Unfortunately, little judgment was exercised in either the selection of the material or its preparation and laying in the wall. Serious disintegration has not infrequently resulted and the stone been brought thereby into undeserved disrepute. The principal quarries in the East are along the Connecticut valley in Massachusetts and Connecticut, particularly at Portland in the last-named State, and in various towns in Passaic, Essex, Hunterdon, and Mercer Counties in New Jersey, and at the mouth of Seneca creek in Maryland. Extensive quarries are also operated at Hummelstown, in Dauphin co., Pa. Within a few years operations have begun in Triassic beds forming the eastern foothills of the Rocky Mountains near Golden, Col., and Flagstaff, Arizona. Beds of Medina sandstone of a red-brown and gray color in Western New York furnish also a high-grade building and paving stone. Thin bedded blue-gray aluminous sandstones belonging to the Hamilton group are admirably suited for pavements, steps, sills, and lintels, and are extensively quarried in Albany, Green, and Ulster Counties in this same State, and in Luzerne, Wyoming, and other counties in Pennsylvania. The stone is popularly known as "bluestone" or "flagstone," on account of its color or the prevailing use to which it is put. Silurian sandstones, also of a brown or red color, are found in the northern part of the upper peninsula of Michigan, and are being worked at various points in Marquette, Baraga, and Houghton Counties to furnish materials to cities along the lakes. A dense quartzite of Potsdam age occurring near Sioux Falls, in South Dakota, has been worked for building and paving materials, and to a slight extent for ornamental work, such as turned columns and polished tiling. A beautiful light-buff stone from sub-carboniferous beds near St. Genevieve, Mo., has been utilized to some extent. The sandstones of the Pacific coast have been as yet but little developed, as there has been until recently but small demand for such materials. Large quantities occur around the Bay of San Francisco, in California; in Douglas co., Ore., and on Chuckaunt Bay, in Washington.

The most noted of foreign sandstones which are brought into the U. S. are the pale olive green Coal Measure stones from the vicinity of Dorchester, New Brunswick, and the bright-red "Corsehill stone" from near Annan, in Dumfriesshire, Scotland. A brown-red Potsdam stone is also imported to some extent from Verde island, Nipigon Bay, Lake Superior.

PORPHYRY, as the name is ordinarily used, includes any rock with a porphyritic structure. The quartz porphyries

of Eastern Massachusetts are of exceptional beauty when polished, but their intense hardness prohibits their extensive use. The green antique porphyry, or *Marmor Lacedæmonium viride* of the ancients, is a porphyritic diabase, while the red Egyptian porphyry, or *Rosso antico*, is, according to Delesse, a porphyrite.

Alabaster, a fine translucent variety of gypsum, is little used for other work than that of making small stands, vases, and statuettes. It is too soft for use where exposed to wear. No alabaster of importance is produced in the U. S., the chief source of supply being Northern Italy, whence it is exported in the manufactured form under the name of "Florentine marble."

Serpentinous rocks are abundant in numerous localities along the Appalachian and Coast Range belts of mountains, but are at present in little demand owing to the fact that the colors are cold and do not readily harmonize with their surroundings. The rock is as a rule, moreover, badly jointed, and this renders the procuring of large slabs or blocks a matter of great difficulty. Serpentines of compact texture and susceptible of a light lustrous polish occur at Deer island, Maine; near Roxbury, in Vermont; Lynnfield, Mass.; Milford, Conn.; Essex co., N. Y.; in Harford co., Md.; on the Gila river, Grant co., New Mexico; and near Victor, in San Bernardino co., Cal. A coarse, porous, light-green serpentinous rock is quarried in Chester co., Pa., and furnishes a cheap and durable building material for the many cities and towns in the vicinity.

The most noted of foreign serpentines, or verd antiques, are those of the Lizard district, in Cornwall, England; the "Connemara green" from County Galway, in Ireland; and the serpentinous *breccia* from near Genoa, Italy.

Trap is a term used to include a number of igneous rocks which may be more accurately described under the names of diabase, dolorite, basalt, melaphyr, diorite, and gabbro. These rocks are little used for building or decorative purposes, owing to their somber hue and poor working qualities. They are, however, exceedingly strong and often very durable. The Mesozoic traps of the Atlantic border are extensively used for road ballast and street pavements, and more rarely for bridge work and general constructive purposes. Gabbros from the coast of Maine, and near Duluth, Minn., are also in great favor for monumental work, acquiring a high polish, and being dark gray or nearly black in color; such are commercially known as "black granites."

The total value of the building-stone production of the U. S. for 1899, as given by the Geological Survey, was as follows: Granite (including trap rock, valued at $1,275,041), $11,618,339; sandstone (including bluestone, valued at $815,284), $6,362,944; slate, $3,962,733; marble, $4,011,681; limestone, $18,757,963; total, $44,713,660.

Consult also a treatise *On the Building and Ornamental Stone of Great Britain and Foreign Countries*, by Edward Hull (London, 1872); *Stones for Building and Decoration*, by George P. Merrill (Wiley & Sons, New York, 1891); *Granite and our Granite Industries*, by G. W. Harris (London, 1891); *Building-stone of New York State*, by J. C. Smock, *Bulletin*, New York State Museum; *Handbook and Catalogue of the Collection of Building and Ornamental Stones in the United States National Museum*, by George P. Merrill, *Smithsonian Report*, 1886, part ii., pp. 277–648; *Report on Building-stone and Quarry Industry of the United States* vol. x. *Reports of Tenth Census* (1884); *History and Uses of Limestone and Marbles*, by S. M. Burnham (Boston, 1883); *A Report on Building-stone*, by Prof. James Hall (Albany, N. Y.); *Notes on Building Construction*, part iii., South Kensington Educational Series (London, 1879); *An Encyclopædia of Architecture*, by Joseph Gwilt (London, 1851); *Technologie du Batiment*, by Theodore Chateau (Paris, 1880); *Matériaux de Construction de l'Exposition Universelle de 1855*, by A. Delesse (1856); *Report of Commissioners on Building-stones for the New Houses of Parliament* (London, 1839–45); *Economic Geology*, by David Page; Ansted's *Practical Geology*; *Report on Compressive Strength of Building-stones of the United States*, by Gen. Q. A. Gillmore; *Report on the Building-stone of Iowa*, by Prof. Gustave Heinrich and Lieut. W. P. Butler (1871); *Report on Marble, etc., for the United States Capitol Extension*, President's Message (1852); *Smithsonian Report* for 1856; *Building and Ornamental Stones shown in the Centennial Exposition*, Philadelphia, 1876, by J. S. Newberry, Report of Judges, Group L; *Experiments on the Resistance of Stones to Crushing made under the Direction of Gen. Franklin, at Hartford, Conn., Trans. Am. Soc. Civil Engineers*, No. xlviii.; *Experimental Tests of Building-stones*, by R. G. Hatfield, *ibid.*, lvi.; *Building-stone of Minnesota*, by Prof. N. H. Winchell, vol. i. *Final Report on Geology of Minnesota*.

George P. Merrill.

Buildings, Warming and Ventilation of: See Warming and Ventilation of Buildings.

Buisson, Ferdinand E.: See the Appendix.

Bujalance, boo-*kh*ăă-laan'thăy: a town of Spain; province of Cordova; about 25 miles E. of Cordova (see map of Spain, ref. 18–E). Its wall is flanked with old towers; it has an old Arabian castle and a college. Here are manufactures of woolen goods, glass, and pottery. Pop. 10,500.

Bukovina, boo-kō-vee'na: a province of Austria; bounded N. by Galicia, E. and S. by Roumania, and W. by Hungary, and Galicia (see map of Austria-Hungary, ref. 5–L). Area, 4,035 sq. miles. With the exception of both banks of the Pruth, its chief river, the country is mountainous throughout. The climate is severe, but healthful. It has very little commerce and industry. The chief occupations of the inhabitants are agriculture and cattle-raising. Iron, copper, and rock-salt are mined in large quantities. Bukovina was originally a part of Transylvania, with which country it passed under Turkish rule in 1529; ceded to Austria in 1777; united with Galicia in 1786; organized as a separate crownland in 1849. Pop. (1891) 646,591.

Bulak, or **Boulac**, boo-laak': a town of Egypt; on the right bank of the Nile; about a mile from Cairo; at the branching of the Pelusiac arm of the Nile. It formerly stood on an island. The vessels navigating the Nile discharge their cargoes at Bulak, which is the port of Cairo, and contains a custom-house. It has manufactures of cotton and silk, a Government printing-office, and a very valuable museum of Egyptian antiquities. Pop. about 13,000.

Bulb [from Lat. *bulbus*, from Gr. *βολβός*, onion]: in botany, a generally rounded or ovoid structure consisting of a short stem, upon which are attached many thickened bases of leaves, usually in the form of concentric layers. For the most part bulbs are subterranean, or partly so, and from the lower part of the short stem roots grow out and downward into the soil. The onion is a good example of a bulb, and in it the little stem may be easily seen by making a vertical section, while the arrangement of the layers may be best seen in a cross-section. By a close comparison of bulbs and buds it is readily seen that their structure is similar. Each is but the quiescent state of a shoot, in which by the checked growth of the axis the leaves are developed in close proximity. Thickened stems are sometimes erroneously called bulbs, as in the crocus, gladiolus, etc., where they are more properly called *corms*. Thickened roots of particular shapes are often termed *bulbous roots* in allusion to their resemblance to bulbs in form, although there is otherwise no similarity.

C. E. B.

Bul'bul: the Persian name of the nightingale; sometimes used by English poets. The same name is given by the people of India to a different species of bird, the *Pycnonotus hæmorrhous*. It is a small bird of brilliant plumage, and remarkable for its pugnacity and its lively manners. It likes to build near houses. Its constant singing is described as pleasant, but hardly musical, at least not to be compared with that of the true nightingale.

Bulga'ria (anc. *Mœsia Inferior*): a principality of Europe; bounded N. by the Danube, E. by the Black Sea, S. by the Balkan Mountain range, and W. by Servia (see map of Turkey, 3–D). Area, 24,360 sq. miles. The surface is level in the N. and mountainous in the S., and is generally well wooded. The soil in some parts is fertile. It is drained by numerous small tributaries of the Danube. The chief articles of export are horned cattle, grain, wine, iron, wood, hides, wax, and attar of roses. The principal towns are Rustchuk (Russe), Plevna, Razgrad, Sevliovo, Rahova, Vratya, Varna, Widin, Sofia, and Schumla. The Bulgarians belong to the Greek Church, but for many years endeavored to become independent of the patriarchate of Constantinople, and to have all the Bulgarian dioceses of Turkey united under one Bulgarian exarch. The demand was granted by the Turkish Government in Apr., 1870. The people are of the Finnish-Ugrian race, but adopted very early the Slavonian language. This country was conquered by the Turks in 1396. By the treaty of Berlin in 1878 (see Berlin Congress), it was made an autonomous and tributary principality under the Sultan of Turkey. Pop. (1888) 2,193,934. Capital, Sofia. In Oct., 1885, Eastern Roumelia (area about 13,500

sq. miles, with 960,441 pop. in 1888) was annexed to Bulgaria. Prince Alexander of Bulgaria abdicated Sept. 7, 1886. Ferdinand, Duke of Saxony, was elected Prince of Bulgaria by the National Assembly July 7, 1887, and assumed the government Aug. 14, 1887. His election and the union of Eastern Roumelia to Bulgaria have not yet (1896) been confirmed by the great powers. See ARMY, and Jirecek, *Das Fürstenthum Bulgarien* (1891).

Bulgarian Language: See SLAVIC LANGUAGES.

Bulgarian Literature: The literature of Bulgaria falls into two distinct and widely separated periods. The first of these extends from the ninth to the fourteenth century, the date of the conquest of the Bulgarians by the Turks; the second comes wholly within our own century. The literary language of the two periods is different, and the very alphabet has changed. In the early period the so-called Cyrillic alphabet obtained, being the alphabet given to the Slavic race by Cyril and Methodius, the apostles to the Slavs, who were themselves Bulgarians from Salonica and began the spreading of the Orthodox Greek faith among the Slavs from Bulgaria. There, too, they designed the Slavic alphabet, and translated the Scriptures and various Church books; and the ancient Bulgarian dialect and style of writing are both called Cyrillic. Being then of all the Slavs nearest to and most in contact with the Byzantine Greeks, the Bulgarians advanced in literature more rapidly than any other Slavic nation. Most of the literary production of that time, however, was theological in its character. The Gospel of Ostromir' is taken as the purest standard, for style and also for orthography, of the Cyrillic or Old Bulgarian literature. The language compares favorably with Latin and Greek for richness and pliability, and translations were freely made from these tongues. Many manuscripts containing such translations are preserved in the great libraries of Europe, though unfortunately few have as yet been published. Scholars have, however, derived important aid from them for the study of the originals. Old Bulgarian literature reached its zenith during the reign of the Tzar Simeon (latter part of the tenth century). Though consisting, as has been indicated, largely of translations, it well deserves study for the light it throws upon the general literary relations of mediæval Europe.

After the conquest of Bulgaria by the Turks (1396), the Greek subjects of the Turkish Government succeeded in prejudicing their rulers against the unruly Bulgarians, and in obtaining the right themselves to invade the country with their churches, schools, and language. Speedily the Greek tongue replaced the Bulgarian in religion and education. The Greek bishops, with intent to Hellenize the Bulgarians, destroyed the public, and even private, libraries in which were Bulgarian books, so that only scattered manuscripts were preserved.

The gap in Bulgarian literature from the fourteenth to the nineteenth century is bridged by a single class of literary productions, popular ballads, tales, and proverbs; and these are rarely other than modern in the form we have. Still they are in substance traditional, and give us much information as to the life of Bulgaria during these centuries. The ballads often make use of Bulgarian history under the tzars, especially the last, Tzar Shishman; but for the most part they describe the wrongs suffered from the Turks and Greeks, and the deeds of the heroic avengers of these wrongs. There are love ballads also. All are sung to melancholy, long-drawn airs, said to have been adopted after the Turkish conquest. In the heroic ballads, the chief figures, represented as banner-bearers of bands of Haiducs, are the leaders of bodies of insurgents; and the Bulgarian heroes are often confused with the ballad heroes of Servia and Montenegro. There are many collections of these ballads, of which the following may be named, those of Bezsonoff, the brothers Miladinoff, Kachanofski, Verkovich, Hieff, and Shapkareff. See BALLAD POETRY.

Modern Period.—The first Bulgarian book of the new epoch was published in 1806. Certain Bulgarians educated in Russia formed a club in Odessa for the purpose of reviving Bulgarian literature, and also with the intent to make Bulgaria an independent exarchate. The last point was not gained until Apr., 1870, after many and severe trials. But long before this, local revolts against the Greek patriarchate had banished the Greek bishops, with their books and language, from most of the Bulgarian churches and schools. About the middle of the century, a gymnasium was established at Bolgrad, in Bessarabia; and the brothers Apriloff, of Odessa, had endowed another in their native town in Bulgaria, Gabrova. Text-books and periodicals began to be published in Bulgarian. At first an attempt was made to preserve the Old Bulgarian alphabet and language—or at least, as Rakóvski advocated, to adopt an intermediate dialect, which should serve as a medium for all Slavs, as Old Bulgarian had formerly done. It was found, however, that the language had undergone such modifications that the modern form of it was related to the old form much as modern to ancient Greek, or Italian to Latin. Accordingly, the old idiom, with the Russisms it had acquired from the printing of the Church books in Russia, was consigned to the use of the Church, while the living language was adopted for the schools and for literary purposes. The old accentuation and abbreviations and from eleven to sixteen letters of the old alphabet have been abandoned: and the calligraphic handwriting and the smooth Russian type are employed. These changes, however, have not been thoroughly or systematically carried out; and the tendency to adopt the phonetic system of writing, advocated especially by Prof. Drinoff, causes great confusion in Bulgarian orthography.

The following writers of the new epoch deserve to be mentioned: P. R. Slavéicoff, I. Grúeff, Neófit Rílski, Lúben Karavéloff, and S. Rakóvski. Though not writers of cosmopolitan training or European reputation, these men have done much for the literary future of their race. Slavéicoff, especially, the most productive of all, has proved himself a born poet and a sharp satirist. His *Sméshen Kalendár*, *Nova-moda Kalendár*, and his periodical *Gáida* have been the principal factors in the overthrow of the Greek hierarchy and the awakening of independent Bulgarian life. Slavéicoff has also translated many novels and poems into Bulgarian, and has edited several periodicals. Grúeff has worked mainly as a teacher through the schools. He has composed and translated many text-books. Rílski, first a teacher and then hegumenos of the monastery of Rila, has translated the New Testament, and composed the first Bulgarian dictionary and grammar, but only the grammar was published in 1835. Karavéloff is a noted novelist and journalist.

Education is making greater progress in Bulgaria than in any other Slavic country. Missionaries from the U. S. have contributed much to this, and, indeed, to the development of Bulgarian literature. Dr. Riggs published in 1844 a Bulgarian grammar, and Mr. Morse in 1859 the first vocabulary. Bulgaria has now a university at Sofia, 7 gymnasia for boys and 6 for girls, 2 normal schools, 1 commercial, 2 agricultural and 1 technical, all under the care of the Government, and very prosperous. The exarchate supports also a gymnasium in Salonica and many grammar schools in Macedonia. For professional training, Bulgarians must still go to foreign countries.

In the way of periodicals, Bulgaria has eleven magazines or reviews, of which the *Sbornic*, edited by the Ministry of Education, *Periodichesko Spisanie*, and *Trud* are very good; and twenty-eight newspapers, of which two are dailies.

E. S. YOVTCHEFF.

Bulgarin, FADDÉÏ VENEDIKTOVITCH: Russian writer; b. in the department of Minsk, in Lithuania, 1789; d. near Dorpat, Sept. 13, 1859. In his youth he served in the Russian army against Napoleon, and in Finland; but in 1810, having withdrawn from the Russian service, he joined the famous Polish legion at Warsaw, and served under Napoleon in Italy, Spain, and Germany (1810–14). After the conclusion of peace he entered the Russian administration, and at the same time began to write. In 1825 he founded with Gretch the journal *Sseviernaja Ptchelá* (*Northern Bee*), for which he wrote many years. He was an able writer, but unjust, servile, and venal. In politics and literature both he was a fierce absolutist and reactionary; and as such he enjoyed the special favor of the Russian Government. His feud with the Russian romanticists, especially Pushkin, was of the bitterest. He is now chiefly remembered for his novels, which have undeniable power, and which have been translated into most of the languages of Europe. The chief of these are *Ivan Vuishigin, or the Russian Gil Blas* (1829); *Demetrius* (1830); *Mazeppa* (1832); *Peter Ivanovitch Vuishigin, sequel to the Russian Gil Blas* (1834). Besides these novels, Bulgarin wrote a great work, *Russia, Geographical, Statistical, and Literary* (6 vols., St. Petersburg, 1836), and *Memoirs* (*Wospominania*, 6 vols., St. Petersburg, 1844–49; Germ. trans. by Reinthal and Clemenz, 6 vols., Jena, 1858–61).

A. R. MARSH.

Bulkeley, Morgan Gardner, A. M.: Governor of Connecticut; b. in East Haddam, Conn., Dec. 26, 1837; educated in Hartford High School; mayor of Hartford 1880–88; elected Governor of Connecticut in 1889; and in 1891 held over with the aid of the House of Representatives, owing to alleged defects of election returns, although he had not been a candidate for the office.

Bulkhead: on board ship, a partition separating the cabins and staterooms on the same deck, as *cabin bulkhead*, *wardroom bulkhead*, etc. Water-tight bulkheads are transverse partitions of iron dividing the holds of the modern steamship into compartments. Transverse and longitudinal bulkheads increase the structural strength of a ship, and, by confining a fire or a leak to one compartment, add to her safety.

A *collision bulkhead* is a transverse partition in the fore body of a ship. Should the bow be stove in by a collision, it confines the water to the forward compartment. The name is also applied to a structure of wood or stone, to hold back earth, as on a water front, in a mine, etc. S. B. Luce.

Bull (in Lat. *taurus*, Fr. *taureau*): the male of animals belonging to the family *Bovidæ* and genus *Bos*. The name is also applied to the males of some other animals, such as the elk, sea-lion, seal, whale. (See Bovidæ.) Also the name of one of the twelve signs of the Zodiac, and of a constellation which does not coincide with the sign. (See Taurus.) In conversation, a ridiculous speech defined by Sydney Smith as "an apparent congruity and a real incongruity of ideas suddenly discovered." The use of the term was known as early as the fourteenth century.

Bull, or **Papal Bull** [from Lat. *bulla*, knob, seal]: an ordinance or decree of the pope, equivalent to the edicts, proclamations, or letters-patent of secular sovereigns, some of which were formerly called bulls. (See Bull, Golden, below.) All bulls are written in Latin, except those addressed to the United Greek churches. They are generally designated by the first words of the text; thus the bull issued in 1536 against heretics was called the bull "In Cœna Domini," and that directed against the Jansenists in 1713 was the bull "Unigenitus." The publication of a bull is termed fulmination (from the Lat. *fulmino*, *fulminatum*, to "hurl a thunderbolt," *fulmen*). Bulls are written on parchment, and a leaden seal is appended to every bull by means of a silken cord if the object of the bull be the granting of a favor; but if it be a matter of justice, the cord is of hemp.

Revised by John J. Keane.

Bull, Golden: a term applied to a decree or enactment of Charles IV., Emperor of Germany, published in 1356, in two diets held in succession at Nuremberg and Metz, in order to fix the laws in the election of emperor and to regulate the number and privileges of electors. It is preserved at Frankfort-on-the-Main. Another "golden bull," of Andrew II. of Hungary, in 1222, fixed the privileges of the nobles, and was regarded as a national constitution.

Bull, John: See the Appendix.

Bull, Ole Bornemann: Norwegian violinist; b. at Bergen, Feb. 5, 1810. He visited Paris in his youth, and afterward performed in Italy and England with great success. In 1845 he purchased a large tract of land in Pennsylvania, and founded the colony of Oleana. This failed, and he returned to Europe, but subsequently visited the U. S. several times. D. at Bergen, Norway, Aug. 18, 1880.

Bul'la: a genus of molluscs belonging to the order of *Opisthobranchs* (see Gasteropoda) and family *Bullidæ*, which receives its name from the swollen globular shell with which all the species are provided. The whorls of the shell are few in number, the outer ones greatly swollen, and the spire is frequently covered by the outer whorl. The animal has a broad, flat head, which is united to the fleshy tentacles to form a frontal disk. Gills occur only on the right side. The species, of which over fifty are known, are all marine, and are mostly inhabitants of warmer seas, especially those with sandy bottoms. Fossil species occur in Cretaceous rocks.

Bulla velum.

Bull-baiting: a sport formerly common in England, but illegal since 1835. The bull was baited by inciting dogs to attack him, and in order that the bull's temper might be excited his nose was blown full of pepper. Sometimes the bull was fastened by a rope, and bulldogs were set at him, one at a time, to fasten themselves on his nose, which operation was called pinning the bull. The sport, however, chiefly consisted in seeing the dogs tossed.

Bulldog [so called from the practice of Bull-baiting (*q. v.*)]: a variety of dog especially bred in Great Britain. It is remarkable for its courage, faithfulness, persistency, and strength. It is now much less frequently bred than in past times. The size of the neck and fore quarters of this dog is quite in excess of the development of the other parts. The bulldog is one of the most fierce, and even dangerous, of his species. Its chief value at present is for crossing with other breeds. The greyhound, the terrier, and the pointer, each have their courage and persistency much improved by this cross, if judiciously made.

Bulldozing, Bulldoser, or **Bulldozer**: a slang term of Louisiana origin, having as yet a variable significance. Its first use was in the parishes of Feliciana and Baton Rouge, in 1876, to describe the doings of a band of a dozen Regulators styled the "Union Stop," who undertook, in the absence of law, to check the stealing and killing of stock, which were destroying the cattle and hogs of that region. The punishment of offenders was with the well-known bull-whip—a hickory handle of 12 or 15 inches and a plaited thong of 3 to 5 feet. A dozen lashes (or the dozen composing the band) gave the name to the process or dose of strapping, and it was called "bulldosing" or "bulldozing." It soon was applied to all summary punishment not authorized by law. More recently it became a political term, particularly as applied to the influencing of negro voters by those of their own color; but bulldozing has become a term used to describe all the various kinds of intimidation, real or imaginary, used at elections.

Buller, Gen. Sir Redvers Henry: English soldier; b. in Devonshire in 1839; entered the army in 1858; served with distinction in China, the Ashanti war, the Zulu war, the Boer war, the Egyptian war of 1882, and the Sudan campaigns of 1884–85; quartermaster-general 1887; under-secretary for Ireland 1887; adjutant-general 1890–97; in command at Aldershot 1898–99. Commanded the British forces in South Africa in 1899. He relieved Ladysmith, March 1, 1900.

Bullet (in Fr. *balle*; Germ. *Kugel*): a projectile of lead to be discharged from various kinds of small-arms. For smooth-bore arms bullets are usually spherical, but for rifled musketry various forms of the elongated bullet are used. Most of these bullets have an expansive base, either hollow or plugged with wood, the design being to force the soft lead outward, so as to cause it to fit the grooves of the rifle, and thus give the bullet a rotation around its long axis during the motion forward. This rotation increases the range and precision. Bullets were formerly always cast, but now they are more frequently stamped in steel dies.

Bulletin [Fr.]: in diplomatics, a term equivalent to schedule, and variously applied to different public acts. In recent times the word is often used to denote an official report, a dispatch of a military commander, and in a wider sense any public notice or announcement, especially of recent events. In France the ticket or slip of paper which each elector uses in voting at elections is called a bulletin.

Bull-fighting (in Sp. *corrida de toros* or *fiesta de toros*): a contest between men and bulls carried out as a show for the public entertainment. Bull-fights were introduced at Rome by Julius Cæsar, and were popular during the reigns of the emperors. They were introduced into Spain by the Moors in the eighth century. They were abolished there by Philip V., but were revived early in the nineteenth century. They are now a popular sport in Spain as well as in Spanish America. Lately efforts have been made to introduce them into the south of France, but have met with some opposition. At the present time bull-fights are carried out by private individuals or for the benefit of hospitals or other public institutions. In Madrid the fights take place in the Plaza de Toros, an arena round which the seats are ranged as in an amphitheater, with rows of boxes at the top. It is said there is room for 10,000 spectators. The actors in the bull-fight are generally professionals, but amateurs are sometimes permitted to take part. The fight is divided into three acts. In the first act the *picadors* take part, in the second the *chulos*, and the third act is reserved for the *matador*. The picadors, who are dressed like the knights of ancient times, are mounted and armed with lances (hence

the name, from Spanish *pica*, a pike or lance. They take their place at the center of the arena. The chulos, who are on foot, are dressed in colored cloaks. The matador is on foot, and carries a sword and a *muleta*—a stick with a piece of red silk fastened to it. When the magistrate gives the signal a bull is let out into the arena. If the bull is a brave one, the picadors assume a defensive attitude; but if he is sluggish, they attack him vigorously. If they fail in irritating him, the animal is stabbed in the back of the neck. Whenever a picador's horse is wounded or he himself is thrown, the chulos advance and distract the bull's attention with their cloaks. The bull generally kills some of the horses, and on rare occasions one or two men. When the bull becomes exhausted, the picadors are succeeded by the chulos with banderillas—small barbed darts—to which firecrackers are sometimes attached. These the chulos discharge at the bull to stimulate his flagging energies. In the last act the matador enters alone. The bull being enraged by the sight of the muleta makes a dash for it, and the matador standing aside drives his sword in front of the left shoulder. A team of mules then enters, and the dead body of the bull is quickly carried away. The matador is greeted with cheers, but the populace is equally well satisfied should the bull be the victor, when another matador enters the arena.

Bullfinch (*Pyrrhula europæa*): a European bird of the family of *Fringillidæ*; about the size of the common sparrow; often kept as a cage-bird, especially by the Germans.

Bullfinch.

It is easily trained. The plumage is bluish gray above, the breast is of a bright tile red, and the crown of the head and the greater wing-coverts are black. It builds on bushes or trees near the ground, and feeds chiefly on seeds, berries, and buds. Its song is not naturally very agreeable, but it can be improved by education, and trained bullfinches are sold for high prices. The pine bullfinch (*Pinicola enucleator*) is a beautiful northern bird of both hemispheres. The male is of a splendid red, the female an orange green.

Bullfrog (*Rana catesbiana*): a frog found in the U. S.; of olive-green color; generally 8 to 12 inches long, though in some cases it attains the length of 19 to 21 inches. It derives its name from the remarkable loudness of its voice, which is of a deep bass, and resembles the bellowing of a bull. It is almost wholly aquatic. The hind legs of this frog are often used as food.

Bullhead: the popular name of small fishes of the genus *Cottus*, of which there are several species in Europe and America. Another name commonly given them is Miller's-thumb (*q. v.*). *Ameiurus nebulosus* and occasionally other species of catfish are locally known as bullheads in the Northeastern States.

Bullinger, bŏŏl'ling-*er*, Heinrich: Swiss reformer; b. in Bremgarten, in the canton of Aargau, near Zurich, July 18, 1504; d. in Zurich, Sept. 17, 1575; studied theology in Cologne, and became a teacher in the convent at Kappel 1523; by the writings of Luther, Melanchthon, and Zwingli led to embrace the Reformation. In 1529 he was chosen pastor of his native city, and married, and in 1531 he succeeded Zwingli as pastor of Zurich. He wrote with great dignity against Luther in the controversy concerning the Lord's Supper, but he finally came to an agreement with Calvin; and he drew up the Second Helvetic Confession 1566, the most elaborate Reformed creed. Of his numerous writings—commentaries, sermons, dogmatical expositions, polemical treatises against the Lutherans, the Anabaptists, etc.—there is no collected edition; but they enjoyed great authority in their time. His *Reformationsgeschichte*, edited by Hottinger and Vögeli, appeared first in 3 vols. (Frauenfeld, 1838–40); his sermons, the so-called *Decades*, were early translated (London, 1577; new ed. Cambridge, 1849–52, 4 vols.) and their reading was enjoined by convocation on the inferior ministers. See his *Life*, by C. Pestalozzi (Elberfeld, 1858) and by Roget Christoffel (Zurich, 1875); also G. R. Zimmermann, *Die Zuricher Kirche und ihre Antistes* (Zurich, 1877).

Bullion: gold or silver in mass, and hence gold or silver without reference to shape or form. The term is ordinarily used of uncoined gold and silver, but is sometimes applied to coined metal when sold by the bulk instead of according to its face value, especially when worn, or depreciated by alloy. Gold and silver are called bullion when smelted from the ore and not perfectly refined, or when perfectly refined but in ingots or bars, or in any uncoined form.

Bullions, Peter: See the Appendix.

Bullock, Charles: Anglican clergyman; b. in 1829; educated in St. Bee's College, Cumberland; was appointed rector of St. Nicholas, Worcester, 1860; removed to Blackheath in 1874; founded and edited several popular religious periodicals—*The Fireside*, *Home Words*, *The Day of Days*, and *Hand and Heart*, afterward called *The Church Standard*; he also published *England's Royal Home*, *The Home Life of the Prince Consort*, etc.

Bullock, Rufus Brown: first Governor of Georgia under the new constitution adopted in pursuance of the reconstruction measures of Congress; b. in Bethlehem, Albany co., N. Y., Mar. 28, 1834; educated at Albion Academy; sent to organize a Southern express business at Augusta, Ga.; was a member of the State constitutional convention which was called in 1867. In the ensuing election in 1868 the constitution formed by this convention was ratified; and he was declared to be duly elected Governor of the State. This office he held until the fall of 1870, maintaining in the face of great obloquy the rights of Negro representatives in the Legislature, and appealing to Congress for support. When a new Legislature strongly opposed to his policy was elected, he resigned office and retired to Atlanta. The courts vindicated him from every allegation of corrupt practices. He greatly extended the railroad and traffic systems of Georgia.

Bullock, William A.: inventor; b. in Greenville, Greene co., N. Y., in 1813; became a machinist; founded the *Banner of the Union* (Philadelphia, 1849); removed to Catskill, and invented a press to print his paper; constructed a "planetary press" for Frank Leslie, which worked with unmatched speed; improved his invention until he had produced the self-feeding, automatic-adjusting, and printed sheet delivering web-press, capable of turning out 30,000 newspapers, cut apart and folded, in an hour; injured while setting up one of his own presses in Philadelphia, and d. there Apr. 14, 1867.

Bull Run, Battle of: a battle which has been classed as one of the decisive battles of the civil war in the U. S. As the *first* pitched battle—the first trial of strength between the North and South—its inception and issue were pregnant with grave consequences to the future of a struggle in which the two combatants were yet hesitating to engage. In its purely *military* results it has been well said that "the cannon of Bull Run echoed henceforth on every battle-field of the war." The bombardment of Fort Sumter found the Government completely destitute of an organized force—the army scattered on distant frontiers (a large portion indeed captured through the agency of its commander), and the navy dispersed to remote quarters of the earth. For no inconsiderable period the possession of the national capital seemed to be due rather to the hesitation or irresolution of the Confederates than to its capability of vigorous defense. But the President's call for 75,000 volunteers for "three months" (his power to call out the militia to "suppress insurrection" being thus legally limited) had assembled in Washington and elsewhere a large militia force which, strengthened by such portions of the regular force as could be made available, had been diligently trained under direction of army officers.

Simultaneously with the occupation of the Virginia shore

of the Potomac by the Union army, the Confederates had established themselves at Manassas Junction, a point on the railroad 25 miles W. from Alexandria, and the junction of the great Southern railroad route (connecting Washington with Richmond and the South) and the Manassas Gap R. R., leading to the valley of the Shenandoah, where another Confederate force under Johnston confronted Patterson, who had recently crossed the Potomac at Harper's Ferry.

Map of the battle of Bull Run, July 21, 1861.

The occupation of Manassas was recommended to the Confederates by the fact that it controlled the railroad routes, and was itself a strong position. An elevated plateau in the crotch formed by the Occoquan and its principal tributary from the north, Bull Run, of which the beds are canal-like cuts in horizontal strata of red sandstone, it was of difficult approach to an attacking army, while the general character of the country, broken, wooded, with few roads fit for the movement of troops, was favorable to the defense.

Leading almost directly W. from Alexandria, diverging slightly to the north from the railroad, a macadamized road passed through Centreville, 22 miles distant.

From Centreville, a little W. of S. and 6 or 7 miles distant, lay Manassas Junction. About midway between these two points flowed the rivulet of Bull Run (the real defensive line of the Confederates) in a general direction from N. W. to S. E.

A road led from Centreville almost directly to the Junction, crossing Bull Run 3 miles from Centreville at E. Mitchell's Ford, a short distance below which is Blackburn's Ford. The turnpike before mentioned continued its westerly course toward Warrenton, in a nearly straight line beyond Centreville, crossing Bull Run at the Stone Bridge, 4 miles distant. Somewhat eastwardly of S., a country road from Centreville crossed Bull Run and the railroad at Union Mills.

The Confederate force was distributed along Bull Run from Union Mills to the Stone Bridge (nearly 8 miles), with reserves and a fortified position at or near the Junction.

The line was a strong one, for the stream, though containing but little water at that season, was, owing to the character of the bed and to the abrupt and wooded slopes of its right bank, a formidable obstacle.

The army of Gen. McDowell, which marched to the attack of this position, numbered about 30,000 men. Save perhaps 700 or 800 regular troops (fragments of regiments) of the old army, it was composed wholly of raw volunteers, none of whom had been in a soldier's garb more than two or three months, and at least half of whom were enlisted only for a term of three months, then just about expiring. Such an army as this was certainly not the best suited for an offensive campaign. Troops *utterly* raw; brigades and divisions, the component parts of which had never been brought in contact before, commanded by officers who, though generally of ability, were for the first time exercising these extensive commands, and who had hardly even seen the troops they commanded.

Such was the army which marched from the banks of the Potomac on the afternoon of July 16. It moved in four columns, one by the turnpike, one by the lateral country roads on the right, one on the left of the railroad, and another between the turnpike and railroad, following what is known as the "Braddock" road, from its having been made by that general on his memorable march to Fort Duquesne in 1754, which terminated in his disastrous defeat and death.

The "plan" of the campaign organized by Gen. McDowell had been carefully studied by him in conjunction with his staff officers for a week or two before the movement commenced. It was a feature of it, after reaching Fairfax Court-house, to make a sudden movement to the left, crossing the Occoquan just below the junction of that stream with Bull Run, aiming at the enemy's railroad communications. His personal reconnoissances in that direction, made on the 18th, led him to consider the country impracticable for the operations of his army.

However imperative it was (for many reasons) to lose no time (a regiment, the term of which expired on the eve of the battle, actually marched "to the rear," as Gen. McDowell expressed it, "to the sound of the enemy's cannon") it was out of the question to attack until some plan could be devised which would promise success. A day was accordingly spent in reconnoissances.

The Stone Bridge, already mentioned as forming the left of the enemy's defensive position, was a single-arched structure over the narrow stream. The passage was found to be guarded by field-guns, and the road and adjacent ground beyond obstructed by formidable abattis. Several roads were ascertained to lead to fords between Blackburn's and the Stone Bridge, but they were mere by-paths, the opposite banks of the stream generally steep and tangled, and probably obstructed.

It was found that a couple of miles above the Stone Bridge there was a good ford at Sudley Springs, which was but slightly guarded, and that above that point the stream was, almost everywhere, easily passable. No continuous road communicated from the turnpike with the Sudley ford, but reconnoissances showed that the intervening country was almost everywhere practicable to all arms.

The writer finds in his note-book the following memorandum of a "plan of battle" or attack, which, founded upon the above results of reconnoissance, was submitted to Gen. McDowell.

1st.—One division to advance on Warrenton Turnpike at 3 o'clock to-morrow morning. The leading brigade to threaten the bridge over Bull Run—throwing skirmishers

into the woods on both flanks. No serious effort will be made on the bridge, but artillery may be opened upon it, as if to open the way for an assault, and the operation to be conducted *as if* an assault were intended.

The 2d, 3d, and 4th brigades to turn to the right at the road ½ to ¾ of a mile beyond Cub Run. On reaching the forks to the two fords a brigade will turn off on the *left* fork, advancing on it *just enough* to clear the route for the passage of the two following brigades, which take the *right* fork toward Sudley Springs. The ford at Sudley Springs will be turned by a march around and some 200 yards above it. The leading brigade will be followed by the one in rear, and the whole force advance rapidly by the road from Sudley Springs southward to reach the Warrenton Pike by the shortest ronte. The brigade left on the road to the lower ford will then pass over. Detachments from the advanced brigades should be sent to take in rear the defenders of the lower ford and Warrenton Pike bridge. The brigade left at the Stone Bridge will cross over and join the other two.

2d.—Another division should follow to take position behind Bull Run, to be ready to pass over if necessary—bnt, unless ordered from headquarters, to remain on the east side.

3d.—Another division should, simultaneously with the commencement of the first operation, commence the semblance of an attack on Blackburn's Ford. Every appearance of a formidable assault should be made, but *no attempt to force the passage*, unless the enemy shows unmistakable signs of retiring.

4th.—Another division should remain in reserve at Centreville.

This plan was adopted by the general, modifying the composition only of the different columns thus:

One division under Col. Miles to remain in reserve at Centreville, and to make, with one of its brigades, a false attack on Blackburn's Ford; another division (Tyler's) to move by the turnpike up to the Stone Bridge and threaten that point, and, at the proper time, to carry it and unite with the principal column, which, consisting of the two divisions of Hunter and Heintzelman (about 12,000 men), was to diverge from the turnpike, and, by a flank movement, reach the Sudley Ford, and descending the right bank of the stream, take the defenses of the Stone Bridge in the rear. The united force would then give battle, strike at the enemy's railroad communication, or act otherwise, as circumstances might dictate.

This plan was carried out in its main features, but it failed in one important particular. It was calculated that the marching column should diverge from the turnpike by early daylight (the route being so wooded that a night march was deemed imprudent) and reach Sudley Ford by 6 or 7 A. M. The Stone Bridge division did not clear the road over which both, for a certain distance, had to pass, so that the column could take up its march until near 6 o'clock. The route through fields and woods to Sudley proved to be far longer and more difficult than was believed. The column did not reach the Sudley Ford till near half-past nine, three or four hours "behind time." When it reached the ford the heads of the enemy's columns were visible, on the march to meet the attack.

This loss of time caused the loss of the battle. It might have been unwarrantable to have *counted* on punctuality with an army so utterly inexperienced in tactical manœuvers and in marching; nevertheless the immediate end aimed at was gained—the passage of Bull Run was accomplished and the Confederate left turned, while the appearance of Tyler's column in the front of the Stone Bridge had disconcerted their plan of attacking *our* left by crossing at the lower fords. Hunter, having crossed at Sudley Springs, led his column down to take in reverse the Stone Bridge position. Evans, who held the Confederate left at that point, had had his attention occupied through the morning hours by Tyler in his front; but the march of Hunter's column became evident long before the ford was reached, and ere it reached the bridge Evans, sending for re-enforcements, had formed *en potence* across Hunter's line of march. A sharp combat ensued, which resulted in forcing the Confederate position and in opening the Stone Bridge to Tyler's division; two of the brigades (W. T. Sherman's and Keyes's) immediately passed and joined their force with Hunter's. Thus had been gained the *immediate* end of the tactical plan of the operation. The Confederate left had been turned, the Warrenton Turnpike taken from them (opening to us the Stone Bridge); and their line had been driven back a mile and a half. Gen. McDowell had thus brought nearly all his three divisions into position on the enemy's left flank, and was advancing nearly 18,000 strong. The Confederate left (all his troops that had been engaged) had been thrown into confusion. Gens. Johnston and Beauregard hastened to the scene, ordering up to their routed left all the brigades which could be spared from the center and left of their line. "We came," says Johnston, "not a moment too soon," for "the long contest had greatly discouraged the troops of Bee and Evans." He found "that the aspect of affairs was critical," but by great efforts "and some example" the "battle was re-established," and, after a time, "many of the broken troops, fragments of companies, and individual stragglers, were reformed and brought into action."

The position on which a stand was now made was a tableland in which the slopes from Young's creek (crossing the Union line of march at right angles and emptying into Bull Run near the Stone Bridge) terminate in the general level of the country. To carry the position, McDowell advanced the brigades of Wilcox and Howard on the right, supported by part of Porter's brigade and the cavalry under Palmer; the brigades of Franklin and Sherman in the center and up the road, and Keyes's brigade on the left. Schenck's brigade (of Tyler's division) was still at Centreville; but the positions of these troops, coupled with the demonstrations made, still detained several Confederate brigades confronting them.

A severe contest ensued for this position, with varying success, the result of which was, at 3 P. M., the possession of the hill, the fighting having commenced at 10.30 A. M. of a July day. The men, who had been up since 2 o'clock in the morning, were exhausted by fatigue, want of food and water, and somewhat demoralized by the vigorous resistance they had encountered.

"It was at this time," says Gen. McDowell, "that our adversary's re-enforcements came to his aid from the railroad train, understood to have just arrived from the valley with the residue of Johnston's army. They threw themselves in the woods on our right and toward the rear of our right, and opened a fire of musketry on our men, which caused them to break and retire down the hill-side. This soon degenerated into disorder, for which there was no remedy. Every effort was made to rally them, even beyond the reach of the enemy's fire, but in vain." According to the statement of the Confederate commander, it was not wholly "re-enforcements just arrived from the valley" viâ Manassas Junction —Elzey's brigade, under Gen. E. K. Smith—which at *this* critical moment "threw themselves on our right, etc.," with consequences described by Gen. McDowell. In fact, our extreme right was flanked by Early's brigade of Beauregard's forces, which, having been employed in partial execution of his plan of attack on the Union left and rear at Centreville, had been thus brought up when that plan failed by the miscarriage of his orders to Ewell (who was to begin the movement from his extreme right), coupled with the development of our attack on his left.

Enough has been written to show how greatly misrepresented and misunderstood has been this battle. It was one (and the first) of the few battles of the whole war deliberately *planned* beforehand, *executed* (except as to punctuality in time) in full accordance with its plan, and *successful* up to a point at which it was believed the final result must be decided. That the success so far accomplished did not, as it should have done, prove decisive, was due to causes inherent in the raw and otherwise unsuitable character of the attacking force for tactical movements and long-continued *aggressive* action. The battle was pronounced by the Confederate President, himself a soldier, who at Buena Vista had learned the meaning of such words, "a hard-fought field."

On the authority of Gen. Jordan, Beauregard's chief of staff, Ewell's, Longstreet's, Jones's, Holmes's, and half of Bonham's brigades, not engaged at all, Early's and Elzey's brigades and other regiments, some newly arrived—in all over 15,000 men—were "in excellent condition": the real obstacle to an advance after the battle was "the lack absolutely of one day's rations, coupled with insufficient transportation for the indispensable small-arms and artillery ammunition—as the advance would have been, not upon the Federal position at Arlington, but by crossing the Potomac somewhere about Edward's Ferry, and taking Washington in reverse." On the Union part, Miles's whole division, in reserve at Centreville, and Runyon's, 7 miles farther back, guarding communications, had been unengaged, while Howard's and Keyes's brigades were nearly

fresh. Both sides had received severe handling, and the language already quoted from Gen. Johnston shows the critical aspect and gloom on the Confederate side of the field up to the moment when the elation of scarcely expected victory came to dispel it.

And concerning the "panic" which, although *military* writers have generally been free from this injustice, has been so commonly held up as *the* picture of the battle, the instances even with armies of veteran troops like Napoleon's (Albuhera and Vittoria, etc.) are so numerous that the exceptional case of Bull Run, when the Union army was almost wholly made of three-months men, should excite no surprise: it was not such as to prevent a stand at Centreville, "the apparent firmness" of which, says Gen. Johnston, "checked our pursuit." The disorder and mob-like appearance was rather, as described by Major (afterward Major-General) H. J. Hunt, the result of "sheer fatigue." They were, says he, "footsore, hungry, and tired; but had we been attacked I have little doubt that a stout resistance would have been made." Revised by JAMES MERCUR.

Bull Run, Second Battle of: While the Army of the Potomac, under Gen. McClellan on the Peninsula, was operating against Richmond, Gen. Pope, June 26, 1862, took command of the troops in Northern Virginia, then unopposed by any forces N. of Richmond. To draw from Richmond some of Lee's army, and thereby relieve the Army of the Potomac of resistance to its operations against that city, Pope collected his scattered forces and placed them S. of the Rappahannock, along the Orange and Alexandria R. R. and from Sherryville to Culpeper Court-house, with directions for the cavalry to be rapidly pushed to Gordonsville and Charlottesville, and to destroy the railroad connecting those places with Richmond and the West. These movements, however, were so slow that Lee, informed of their purpose, hastened Jackson and Ewell to Gordonsville and thwarted them.

In the meantime the authorities at Washington decided to form a junction on the Rappahannock of the forces under McClellan and Pope, and, Aug. 3, ordered McClellan to transfer his army from Harrison's Landing viâ Acquia Creek to Falmouth, where Burnside's corps had arrived. To quickly withdraw the Army of the Potomac, with its very limited supplies of land and water transportation, involved abandonment to the enemy of thousands of sick and wounded, the destruction of enormous supplies of arms and ammunition, provisions, tents, etc., demoralization to the army, and injury to the Union cause. Without any loss of material the army as a body (some having gone) at the earliest moment (Aug. 14) moved to Yorktown and Fort Monroe, whence, for want of water transportation, it was slow to embark and reach its destinations. July 30 Pope joined his army in the field, and continued concentrating his forces, the advance of which (Banks's corps) had reached Cedar Mountain. Jackson, with Ewell, on Aug. 8 and 9, moved on Cedar Mountain, where, Aug. 9, he was attacked with great spirit by Banks, who, unsupported, was repulsed with heavy losses. Jackson, on the 11th, fearing attack by Pope's combined superior forces, withdrew to Gordonsville.

Lee, seeing the withdrawal of McClellan relieved Richmond of all danger, determined to crush Pope before he could be re-enforced by the Army of the Potomac, and, on the 13th and 14th, pushed forward the van of his army under Longstreet, Hood, and Stuart, and crossed the Rapidan on the 20th. Reliably informed of Lee's intentions, Pope retired behind the Rappahannock. Lee, unable to cut Pope off from Fredericksburg, moved up the river to turn his right flank. On the 22d Stuart crossed the river, passed through Warrenton to Catlett's Station, where he captured Pope's papers and baggage, and destroyed many wagons. On Stuart's return, informed of Pope's forces and locations, Lee commenced moving to Pope's right, sending forward Jackson and Stuart, 23,000 strong, to push across the mountains to Pope's rear, capture the dépôt at Manassas, and break communication with Alexandria—concealing his intentions by threatening Pope at river crossings with his main forces, 25,000 strong, under Longstreet. Jackson succeeded the night of the 26th. Pope, while on the Rappahannock, knew of a large body going to his right, but at 10 A. M. on the 27th did not know what force was in his rear other than cavalry, and "considered it doubtful if the enemy means to attack us or not," but that "he might attempt to keep us in check, and throw considerable force across the Potomac in direction of Leesburg." Up to this time Pope, then at Warrenton Junction, had been joined by corps and divisions under Reno, Reynolds, Heintzelman, and Porter, and the brigade of Pratt under Sturgis, making his total strength about 63,500 against Lee, then about 56,000.

Early on the 27th Pope decided to interpose between the enemy and Manassas, and form a line E. of Thoroughfare Gap, so as to be readily re-enforced from Washington and to fall upon the enemy's flank, or to retire behind Bull Run, if necessary. McDowell, at Buckland Mills, was ordered with Reynolds and Sigel to Gainesville that night, Reno and Kearny to Greenwich, where Porter at Warrenton Junction with Piatt was to follow on the 28th, when relieved by Banks. At 3 P. M. Pope withdrew along the railroad, following Hooker, who had been sent toward Manassas to reopen communication. Hooker, near Bristoe Station, encountered Ewell, who, after a short engagement, retired behind Broad Run and joined Jackson at Manassas. Pope joined Hooker at sunset, and then learned that Jackson and Stuart were between him and Washington. Pope determined to destroy Jackson or "to bag the whole crowd" before Lee could rescue him, and ordered Porter to march from Warrenton Junction at 1 o'clock and join him at daybreak on the 28th; Reno and Kearny to join him at dawn, and McDowell with Sigel to march on to Manassas with his right on Manassas R. R., and left extending N. Pope stated in orders to Porter: "The enemy has been driven back, but is retiring along the railroad. We must drive him from Manassas, and clear the country between that place and Gainesville, where McDowell is." The night was very dark, the road narrow and through timber, crossed by streams without bridges, and by a railroad with cars running, and also crowded by the entire wagon-train of the whole army Porter knew this, and that it was impossible to reach Pope (10 miles distant) any earlier by marching at 1 o'clock than at 3, and on arrival have his command in condition to pursue the retreating enemy 10 miles further.

Porter started at 3 A. M., and, though greatly obstructed, reached Pope at 8; was not wanted, and was twice ordered to remain at Bristoe, for "when wanted, you will be sent for." Jackson had retired from Manassas during the night, and on the 28th had his command strongly posted behind the railroad embankment between Sudley Springs and Groveton, prepared to resist attack and to await the arrival of Lee, who he knew was close by at Thoroughfare Gap. Pope, misled to the belief that Jackson was at Centreville by some of his troops going toward Centreville, followed with Heintzelman and Reno, and called McDowell to him, thus leaving open the road between Lee and Jackson. McDowell sent Sigel and Reynolds to Manassas as directed, but, knowing Lee was coming through Thoroughfare Gap, sent Ricketts's cavalry to resist his advance. Under subsequent orders he sent King up the Warrenton Pike toward Centreville, while he went to join Pope. King before dark had a severe contest with Jackson W. of Groveton. Having no instructions and no support, he moved that night to Manassas. Ricketts, repulsed by Lee, marched to Groveton viâ Greenwich and Manassas, reaching there at dark on the 29th. Lee (or Longstreet), thus unopposed, joined Jackson by 10 A. M. on the 29th, and was in position on his right at Groveton by 12 M. McDowell went to Manassas to advise Pope, but the latter had gone to Centreville. Hearing the sound of King fighting with Jackson, he started through the woods to find him, but got lost and did not join his command till the 29th.

On the morning of the 29th Jackson was strongly posted behind the railroad embankment and in the woods between Sudley Springs and Groveton. Longstreet had arrived at 10 A. M., and by 12 M. formed on Jackson's right, extending S. beyond Manassas Gap R. R. Sigel N. and Reynolds S. of Warrenton Pike, at Groveton, engaged Jackson with skirmishers and artillery at long range. They were joined by noon by Heintzelman and Reno, pushed forward by Pope at Centreville. Porter, N. of Manassas, was hastening under orders to Centreville, "where it was very important to be at an early hour. A severe engagement is likely to take place, and your presence is necessary," when at 9 A. M. he was ordered to take King, at Manassas, and "move on Gainesville." Ricketts, with Buford's cavalry, was *en route* from Gainesville, viâ Greenwich, to Manassas. Banks at Bristoe guarded the army trains. Porter reached Dawkin's Branch at 11.30 A. M., and found Longstreet taking position on the west bank twenty-four to thirty-six hours earlier than Pope announced his expected arrival. He was preparing to attack Longstreet when McDowell arrived

and, under authority, assumed command, stopped all offensive operation and, withdrawing King beyond support, retired, viâ Sudley road, to take position on Porter's right and "establish communication with the forces at Groveton," as ordered. Porter, knowing that Longstreet was more than twice his strength and well protected, and that whichever one attacked by crossing the open valley between them would meet with disaster, posted his forces to invite and risk attack, and, at times, threatened it—each with the object of holding Longstreet from attacking Pope or assisting Jackson. So successful was Porter that Longstreet, anticipating attack, drew Wilcox's division at about 4 P. M. from Jackson's support, and retained him till too late to support Hood when sent back. Porter all day and till 3.30 A. M. on the 30th held his troops facing Longstreet and protecting his flank and rear along the road to Bethlehem Church, constantly expecting information or orders from McDowell or Pope, but receiving none till too late to be executed.

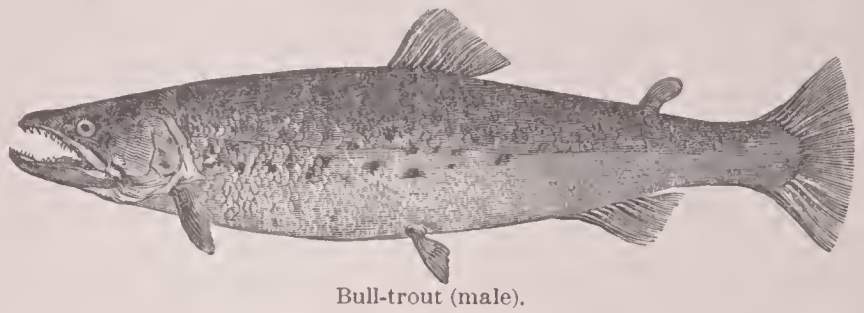
Pope at 1 P. M. joined the forces opposing Jackson and stopped the skirmishing and the artillery duels at long range going on all the morning and at 3 P. M. ordered Hooker to attack. Grover, of Hooker's division, vigorously attacked and broke Jackson's first and second lines and penetrated to the third, but, unsupported, was flanked and driven back with heavy loss. Hearing of McDowell's approach, Pope at 4.30 sent orders to Porter to attack Jackson in flank and, if possible, his rear, and in due time for simultaneous action directed Kearny to attack his left flank. Porter received his order at dusk, too late to execute, even if Longstreet had not been between him and Jackson. McDowell had not informed Pope of Longstreet's arrival, nor forwarded Porter's dispatches giving the state of affairs in his front. Kearny vigorously and gallantly attacked, but was repulsed with heavy losses. At sunset, on McDowell's arrival, Pope ordered him to push King's division after the "retreating" foe. The division was met by Hood advancing to attack and was badly defeated. Night closed the contest, each army holding its own ground.

Pope's army on the 29th was much cut up, weakened, had no hope of support, distant from food for men and horses, and all were greatly fatigued. Lee's army was re-enforced that night, making it stronger than Pope's, which till then was about its equal. Pope, however, determined to renew the struggle on the 30th, and by noon had gathered all his forces, Banks excepted, N. of Warrenton Pike, facing Jackson. Believing that "Jackson was retreating to the mountains to unite with Longstreet," who he would not acknowledge had arrived, Pope assigned "McDowell to the command of the pursuit," and ordered him "to push forward Porter's corps on the Warrenton Pike, followed by King and Reynolds, in pursuit of the enemy, and to press him vigorously during the whole day." Ricketts and Heintzelman were ordered to move on the road from Sudley Springs to Haymarket, held by Jackson on the 29th. Porter's advance, under Butterfield, vigorously assaulted Jackson, and at once developed the enemy's united army posted and prepared for any emergency, and turning Pope's unprotected left flank. Beyond driving the enemy behind the railroad embankment and developing their positions, Porter's attack accomplished nothing. As line after line advanced, the enfilading fire of the enemy's batteries on the left, together with the infantry fire in front, almost annihilated the attacking force and compelled withdrawal. Sykes went to the Henry Hill, and Butterfield, having expended his ammunition, to the rear. Warren, of Porter's corps, seeing Reynolds removed to the rear from the most important defensive point S. of the pike, and the flank exposed, at once hastened to reoccupy it with his small brigade, and, although almost annihilated by Longstreet's advance, held it long enough for Reynolds's and Ricketts's divisions and portions of Sigel's corps to form on his left and with Sykes's regulars on the Henry Hill to save Pope's line of retreat from seizure by Longtreet. This position was firmly held against vigorous attacks till, under cover of darkness, Pope's army retired unmolested across Bull Run and took position on the heights of Centreville. The army was withdrawn from Centreville the night of Sept. 1, and took position in the defenses of Washington, fighting *en route* with Jackson the battle of Chantilly. The command of the army was then transferred to McClellan. FITZ JOHN PORTER.

Bull's Eye: in architecture, the technical name given to a glass lens used for the purpose of concentrating the light of a given center upon an object. It is also applied to a circular window of plain glass. On shipboard the bull's eye is a small pulley in the form of a ring, with a rope spliced round the outer edge, and another sliding through a hole in the center. In rifle practice, the small black center in the circle on the target is called the bull's eye. In astronomy, the bull's eye is Aldebaran, a bright star in Taurus.

Bull-terrier: a dog bred by a cross, more or less remote, between the bulldog and some one of the terriers; frequently uniting in a remarkable degree the courage and strength of the bulldog with the docility, activity, quick scent, and intelligence of the terrier. This little animal is especially famous for its zeal and success in killing rats.

Bull-trout, Gray-trout, Whitling, or **Sewen**: names applied in England to the salmon trout (*Salmo trutta*); a



Bull-trout (male).

large trout found in the mouths of rivers approaching the salmon in size and habits, but inferior as food. The name bull-trout is applied in Oregon to the Dolly Varden trout (*Salvelinus malma*). D. S. JORDAN.

Bulnes, bool'-nĕz, MANUEL: Chilian general and statesman; b. at Concepcion, Dec. 25, 1799. When only sixteen years old he was imprisoned by the Spaniards for eight months, owing to his revolutionary ideas; released by the advance of San Martin, he joined his army (1818) and served as colonel in most of the battles of the Chilian revolution. From 1820 to 1823 he commanded a force against the Araucanian Indians, and completely subdued them; was made brigadier-general in 1831, and in 1838 commanded the Chilian army of 5,000 men sent against Santa Cruz in Peru; he took Lima, won the battles of Huarez and Puente del Bunin, and finally, in conjunction with Gamarra's Peruvians, routed Santa Cruz at the Pan de Azucar, near Arequipa (Jan. 19, 1839). This drove Santa Cruz from the country, and the Peru-Bolivian confederation was broken up. For this victory Bulnes was created marshal of Ancacho by Gamarra, and Chili made him a lieutenant-general. He was elected president of Chili in 1841, and re-elected 1846, serving for ten years; his administration was prosperous throughout, and marked by great material and intellectual progress. Gen. Bulnes was afterward senator and councilor of state. D. at Santiago, Oct. 18, 1866. HERBERT H. SMITH.

Bü'low, FRIEDRICH WILHELM, Baron von: b. on the paternal estate of Falkenberg, Prussian province of Brandenburg, Feb. 16, 1755; entered the army in 1769; was a lieutenant-general at the opening of the war of independence in 1813. Twice he defeated Oudinot in minor encounters, and by his victory over Ney at Dennewitz (Sept. 6, 1813) he prevented the French from pushing onward to Berlin. In the battle of Leipzig he took a conspicuous part; then drove the French out of Westphalia, Holland, and Belgium, joining the allies in Paris, where the Prussian king made him Count of Dennewitz and gave him estates worth $150,000. He also distinguished himself at Waterloo, finishing the campaign by occupying Montmartre at Paris. D. at Königsberg, Feb. 25, 1816.

Bülow, HANS GUIDO, von: musician; b. at Dresden, Jan. 8, 1830; studied law in Leipzig and Berlin; determined, under the influence of Richard Wagner and Liszt, to devote himself exclusively to music; studied under Liszt at Weimar 1851–53; settled in 1854 in Berlin, where he was made Professor of the Piano at the Conservatory of Music in 1855. Having made several concert-tours in Germany and Russia, and acquired a great reputation as a pianist, he removed in 1867 to Munich, where he became chapel-master to the king. After that time he made two concert-tours in the U. S., and also acted as orchestra conductor in Berlin, Hamburg, and other large German cities. Von Bülow was a man of great intellect, but eccentric and self-opinionated to the verge of insanity. His annotations of Beethoven's sonatas and of other older classical piano compositions are valuable. He

composed several pieces both for the pianoforte and orchestra, and wrote much for the *Neue Zeitschrift für Musik*, and both his compositions and his writings show enthusiasm for the ideas of Wagner. D. in Cairo, Feb. 13, 1894.

Bulwark (in Fr. *boulevard*): in fortification, a rampart or bastion; an outwork for defense; that which secures against an enemy; a shelter or means of protection. On shipboard a bulwark is the parapet raised round the deck for the purpose of protecting men and goods from slipping overboard, and of excluding the waves from the deck. In ships of war the bulwark is sufficiently high and solid to afford the crew some protection against the shot of the enemy.

Bul'wer, Edward George Earle Lytton (Baron Lytton): English novelist; b. in London, May 25, 1803; in 1826 graduated at Trinity Hall, Cambridge. He soon after visited France, and published after his return his novel of *Falkland* (1827), which was followed by *Pelham, or the Adventures of a Gentleman* (1828); *The Disowned* (1828); *Devereux* (1829); *Paul Clifford* (1830); *The Siamese Twins*, a poem, (1831); and *Eugene Aram* (1832). In 1831 he was returned to Parliament for St. Ives, and from 1832 to 1841 he represented the city of Lincoln. He published in 1833 *England and the English*; the same year visited Germany and Italy. He produced in rapid succession *The Pilgrims of the Rhine*; *The Last Days of Pompeii*; *Rienzi, the Last of the Tribunes* (1835); and *The Student*, a series of contributions to the *New Monthly Magazine*, of which he was for some time editor. His drama entitled *The Duchess of La Vallière* (1836) was not well received. In 1837 he brought out *Athens, its Rise and Fall*, and *Ernest Maltravers*, a novel, which was continued under the title of *Alice, or the Mysteries*. His dramas entitled *The Lady of Lyons* (1838) and *Richelieu* were very successful, as well as the comedy of *Money*, which came out soon after. His *Night and Morning*, a novel, published in 1841, was followed by *Zanoni* (1842); *The Last of the Barons* (1843); *Lucretia, or the Children of the Night* (1846); and *Harold, the Last of the Saxon Kings* (1848). His novels entitled *The Caxtons* (1850), *My Novel* (1851), and *What Will he Do with It?* (1858), first appeared in *Blackwood's Magazine*, to which Bulwer was a frequent contributor. *A Strange Story* came out in *All the Year Round* in 1861. Although his reputation rests chiefly on his novels, he distinguished himself in various departments of literature. His translations of Schiller's poems (1844) were received with favor, and he published original poems—*O'Niel, or the Rebel* (1827); *The New Timon* (1846); and *King Arthur* (1848). His novels have great popularity throughout the English-speaking world, as well as on the Continent of Europe, and have been translated into several languages. Bulwer was made a baronet in 1838, and in 1844, on the death of his mother, came into possession of the Knebworth estates and assumed the name of Bulwer-Lytton. He had published in 1835 a Liberal political pamphlet entitled *The Crisis*, which caused a great sensation. He was elected lord rector of the University of Glasgow in 1856, and in 1858 he held for a time the office of Secretary of State for the Colonies. He was made a peer in 1866, with the title of Baron Lytton. In 1827 he married Miss Rosina Wheeler, of Limerick (1802–82), who wrote *Chevely, or the Man of Honor* (1839); *Bianca Capello*; *The Budget of the Bubble Family*, etc. The union was unhappy, and the parties separated in 1836. D. at Torquay, Jan. 18, 1873.

Bulwer, Edward Robert: See Lytton, Edward Robert Bulwer-Lytton.

Bulwer, William Henry Lytton Earle (Baron *Dalling* and *Bulwer*): English diplomatist and author; a brother of Bulwer-Lytton the novelist; b. in London, Feb. 13, 1801; was elected to Parliament in 1830; sent as ambassador to Madrid in 1843, where he opposed Narvaez, who ordered him home. In 1849 he was transferred to Washington, where he negotiated the Bulwer-Clayton treaty guaranteeing the neutrality of interoceanic routes across Central America; in 1851 was created a Knight Grand Cross of the Bath. He became minister plenipotentiary at Constantinople in 1858. He was afterward ennobled. Among his works are *France, Social and Literary* (1834); a *Life of Lord Byron* (1835); one of Palmerston (1870); and *The Monarchy of the Middle Classes*. D. in Naples, Italy, May 23, 1872.

Bulwer-Clayton Treaty: See Clayton-Bulwer Treaty.

Bummalo'ti: the local name for *Harpodon nehereus*, a fish of the family *Synodontidæ*, abundant at certain seasons on the coast of India. It has a long body covered with thin, translucent scales, a thick head, wide mouth, and slender, recurved teeth. It is dried and exported in considerable quantities from Bombay and parts of the adjacent coast, being known in commerce as *bummalah* or Bombay duck.

Bum'stead, Freeman Josiah, M. D.: b. in Boston, Mass., Apr. 21, 1826; graduated at Williams College in 1847; studied medicine in Paris; became a practitioner in New York, where he was appointed Professor of Venereal Diseases in the College of Physicians and Surgeons; also surgeon to the Eye and Ear Hospital and the Charity Hospital. He published *Pathology and Treatment of Venereal Diseases* (1861), and valuable translations from Ricord and Cullerier. D. in New York, Nov. 28, 1879.

Bunce, Francis Marvin: naval officer; b. in Hartford, Conn., Dec. 25, 1836; graduated at the Naval Academy in 1857; became lieutenant in 1861, lieutenant-commander in 1863, commander in 1871, captain in 1883, commodore in 1895, rear-admiral in 1898. He participated in the capture of Morris Island July 10, 1863, in the attacks on the defenses of Charleston harbor, and in the assault on Fort Sumter of Sept. 18, 1863. In 1891–94 he commanded the naval training station at Newport, and then became a member of the inspection board. He was president of the naval examining board 1895–97. In 1897 he was in command of the North Atlantic station, and of the New York navy-yard.

Bunce, Oliver Bell: publisher and author; b. in New York, Feb. 8, 1828. He was for some years editor of *Appletons' Journal* and published a number of books, among which are *Bachelor Bluff* (1882) and *Don't* (1884), a manual of etiquette which has had an immense sale. D. in New York, May 15, 1890. Henry A. Beers.

Bunce, William Gedney: painter of Venetian scenes and landscapes; b. in Hartford, Conn., Sept. 19, 1842; pupil of William Hart, Andreas Achenbach, Düsseldorf, and P. J. Clays, Brussels; member of the Society of American Artists 1879. His pictures are notable for tender and delicate color-schemes, but are not realistic. He spends most of his time abroad, principally in Venice; has painted lately at Biarritz, France, and when in the U. S. has a studio in New York. William A. Coffin.

Bun'combe: a district of North Carolina. The phrase "talking for Buncombe," often heard among politicians, was first used by a member of Congress from that district. During a long speech which he made several members, who had not patience to listen, retired from the hall. He then told the remaining members that they also might go, for he "was only talking for *Buncombe*."

Bundelkhand', or **Bandelkhand**: territory of Central India; bounded N. E. by the river Jumna. It extends from lat. 24° to 26° 26′ N., and from lon. 78° to 81° 36′ E. Area about 10,241 sq. miles, of which about 8,700 sq. miles are subject to the British, while the rest of the country is governed by numerous native princes, who are tributary to the British. It is said to contain diamonds and rich beds of iron ore. The chief towns are Calpe, Banda, Jhansi, and Callinger. Pop. 1,403,000.

Bun'di, or **Boondee**: a native state, Rajputana, British India; between 24° 58′ and 25° 55′ N. lat., and 75° 23′ and 76° 36′ E. lon. Area, 2,300 sq. miles. It is generally hilly and wild, and is much infested by robbers. Principal crops, maize, wheat, pulse, and oil-seeds. It is watered by the Chambia and Nij. Pop. 255,000. British protectorate was assumed in 1818, and costs the chief $20,000 annually. Chief town, Bundi; pop. 31,000.

Bungay, George Washington: journalist; b. in Walsingham, England, July 22, 1818; removed to New York when nine years of age; was for a time on the *Tribune* with Horace Greeley; wrote many poems, the best-known being *The Creed of the Bells*; had a wide acquaintance with statesmen and authors; was a popular lecturer. D. July 10, 1892.

Bunion, or **Bunyon** [cf. *bunny*, lump, swelling]: a painful inflammation of the *bursa* or membranous sac of the joint which connects the great toe with its metatarsal bone. The pressure of a boot causes this bursa to inflame and swell, and this may go on to suppuration. Rest and poulticing are generally sufficient to subdue the attack, and wearing a shoe which is so constructed as to save the bunion from pressure will generally prevent a recurrence.

Bunka'ra, or **Blue River**: a stream of Colorado; rises near South Park, among the Rocky Mountains; unites with

the Grand river about 20 miles W. of Hot Sulphur Springs. Total length estimated at 100 miles.

Bun'ker, DENNIS MILLER: genre, landscape, and portrait painter; b. in New York, Nov. 6, 1861; d. in Boston, Dec. 28, 1890. He began his art education in 1878 in the National Academy schools, afterward attending the classes at the Art Students League; went to Paris in 1881, where, after spending three months in the Académie Julian and the class of Hebert in the École des Beaux-Arts, he became a pupil of Gérôme, and worked under his instruction until 1884, when he returned to New York. His first pictures were exhibited at the Academy and elsewhere in New York several years before he went abroad, and while he was a student he painted and sold a good many pictures. The first picture he exhibited after his study in Paris was a figure of a young man in a studio playing a guitar and entitled *Bohemia*. For this picture he received the third Hallgarten prize at the National Academy in 1885, and the same year was elected a member of the Society of American Artists. He was the principal instructor in the Cowles Art School in Boston from 1886 to 1889, and while there painted a number of excellent portraits. For his beautiful picture *The Mirror* (Society of American Artists, 1890) he was awarded the James W. Ellsworth prize of $300 at the exhibition of the Art Institute of Chicago (1890). His work, though not lacking in refinement and delicacy, is essentially robust and virile. In *The Mirror* (engraved in the *Century Magazine*, Feb., 1891) sincerity and grace are happily blended, and the picture is especially notable for elegance of line and beauty of expression. A portrait of the artist's wife, the last work he completed, is in the Metropolitan Museum, New York.

WILLIAM A. COFFIN.

Bunker Hill: a rounded eminence in Charlestown, now a part of Boston, Mass. It is about 110 feet high and connected by a ridge with another small eminence 700 yards distant called Breed's Hill. These two elevations are famous for the battle fought here between the British and American forces June 17, 1775. The American redoubt was on Breed's Hill, but by common usage the event is known as the battle of Bunker Hill.

After the stirring events of the spring of that year the troops organized in New England had taken up a line extending from Roxbury to Cambridge under command of Gen. Artemas Ward; Putnam, Starke, Prescott, Gridley, and Pomeroy were there, and by the middle of June not less than 20,000 men had assembled.

Gen. Gage was in chief command of the British at Boston, and had been recently largely re-enforced by Gens. Howe, Burgoyne, and Clinton.

It having been ascertained by the provincial army that Gage meditated seizing and fortifying Bunker Hill and the heights of Dorchester on the night of the 18th, it was determined by the Americans to forestall this design, and on the night of the 16th a detachment of 1,000 men, under command of Col. William Prescott, was dispatched from Cambridge to Charlestown for the purpose of fortifying Bunker Hill. They were joined at Charlestown Neck by Gen. Putnam and Major Brooks, and at a council it was decided to fortify Breed's Hill, not as high as Bunker Hill, but nearer Boston. By daybreak a formidable work had been thrown up on the spot now marked by the Bunker Hill Monument. This being discovered by daylight, the Lively opened fire upon it, which soon extended to all the shipping and the battery on Copp's Hill in Boston; the British troops were called to arms and preparations for an attack were made; Prescott meanwhile continued to strengthen his position and sent to Cambridge for re-enforcements. The entire American force engaged, however, did not probably exceed at any time 1,500.

A force of British under Gens. Howe and Pigot, covered by the guns of their shipping, had embarked in boats and landed at Morton's Point, E. of the foot of Breed's Hill. This movement produced the greatest excitement in Cambridge and re-enforcements were hastened to Charlestown, Gens. Warren and Pomeroy arriving at 2 P. M. at the moment Howe, whose force by this time had been increased to about 4,000, began his advance around the eastern slopes of Breed's Hill and along the Mystic river with the intention of gaining the rear of the American lines; but, this movement having been anticipated, Knowlton had taken up a position near Bunker Hill and thrown up a breastwork nearly 250 yards in length, and another line had been built in front of a stone and rail fence, between which was placed new-mown hay, and between the breastwork and the rail fence the artillery was placed. The Connecticut and New Hampshire troops were W. of the redoubt, and a force was posted at the foot of the southwest side of Breed's Hill, near Charlestown, and a work had been commenced on Bunker Hill. Gen. Warren, who was with Prescott in the redoubt, refused to take command from either Prescott or Putnam, saying he came to fight as a volunteer. Howe was foiled in his flank movement and compelled to make a direct attack, and, having ordered the guns of the shipping and the battery at Copp's Hill to open fire on the redoubt, moved forward under its cover up the slopes of Breed's Hill in two wings, the right under his own command, the left under Pigot: Gen. Howe with his command to carry the position at the rail fence, while Pigot attacked the redoubt. Prescott's orders to his men were to reserve their fire on the advancing columns till the whites of the men's eyes could be seen. The British opened fire when within gunshot, but no reply was heard from the breastworks till they were within close range, when volley after volley was poured into their ranks, causing them to fly in disorder toward their boats. Howe succeeded, however, in quickly rallying his troops, and being re-enforced by some 400 marines and provided with artillery, of which latter they were deficient in the first attack, a second advance was made over the same ground.

In the mean time re-enforcements had been sent to Prescott, but those sent from Cambridge were prevented from crossing Charlestown Neck by the severe fire of the batteries and shipping of the British, and but few additional troops reached the redoubt before the second attack.

As before, the Americans reserved their fire till the British line was at short range, when it was delivered with the same deadly effect.

Hot shot from Copp's Hill having meanwhile set fire to some houses in Charlestown, the whole town was soon in flames, and Gen. Howe hoped to storm the redoubt under cover of the smoke; but a light wind which had just sprung up cleared away the smoke and disclosed the advancing columns, which were again broken and driven in confusion by the fatal fire from the patriots within the redoubt. Howe was now re-enforced by Clinton, and a third attack was made upon this little band, whose ammunition was now nearly exhausted, and Howe, having discovered the weakness of this part of the line, attacked the position between the rail fence on the E. of the redoubt and the breastwork, sweeping it with his artillery and forcing its defenders within the redoubt. The ammunition of the Americans was now completely exhausted, and the British, advancing, scaled the work, but were met by the Americans with muskets clubbed, and a hand-to-hand conflict ensued. But the superiority of the British in numbers was too great, and Prescott was compelled to order a retreat, himself and Warren being the last to leave the works. Stark and Knowlton maintained their position at the rail fence until the retreat had been effected, when they retired slowly and in good order. Warren had hardly left the redoubt when he fell, shot through the head; Prescott escaped uninjured. Falling back across Bunker Hill, Putnam here made an ineffectual attempt to rally the retreating army within the partially finished works. The retreat continued across Charlestown Neck, where many were killed by a severe fire from the shipping and batteries; but the British did not continue their pursuit beyond this point.

The British loss in killed and wounded was about 1,050; the American loss was not over 450.

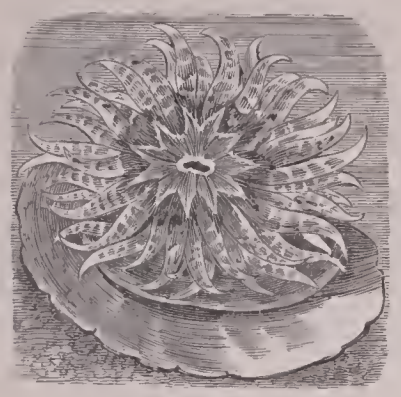
A granite obelisk, 221 feet in height, now marks the scene of this important struggle on Breed's Hill, and is known as Bunker Hill Monument. Gen. Lafayette laid the corner-stone June 17, 1825, and Daniel Webster delivered one of his most memorable orations on the occasion. The monument was completed in 1842, and was dedicated June 17, 1843, in the presence of the President of the U. S. and his cabinet, Daniel Webster being, as before, the orator of the occasion.

Bunker Hill: city (founded in 1836); Macoupin co., Ill. (for location of county, see map of Illinois, ref. 8–D); on Clev., Cin., Ch. and St. L. R. R.; 37 miles N. E. of St. Louis, Mo.; has seven churches, public school with high-school course, academy, military school, flouring-mills, and coal mine. The raising of grain, fruit, and cattle and dairy-farming are the principal industries of this section, which is the largest milk-producing point tributary to St. Louis. Pop. (1880) 1,441; (1890) 1,269; (1900) 1,279.

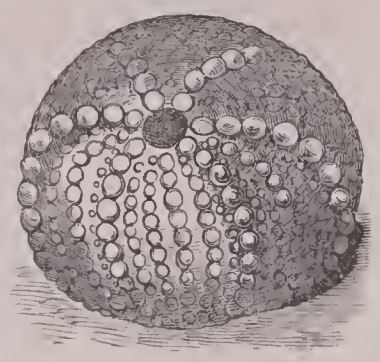
EDITOR OF "GAZETTE."

Bunner, Henry Cuyler: journalist and author; b. in Oswego, N. Y., Aug. 3, 1855. He was editor of the comic weekly *Puck* from its establishment in 1877 until his death. Published a volume of poems, *Airs from Arcady* (1884); and several novels, *A Woman of Honor* (1883); *The Midge* (1886), etc. D. at Nutley, N. J., May 11, 1896.

Bunodes gemma'cea: called in English *gem pimplet*: a species of Actinidæ (*q. v.*). When open it bears a striking resemblance to a flower, but when closed it assumes a



Bunodes, open.



Bunodes, closed.

spherical form, having the appearance of an echinus stripped of its spines. The generic name is from the Greek βουνώδης, signifying "resembling an eminence or a woman's breast" (referring to its form when closed); the specific name is from the Latin *gemma*, a "bud," or small protuberance, and has allusion to the wart-like protuberances on the exterior surface.

Bunsen, Christian Karl Josias, von, Ph. D., D. C. L., Chevalier: writer and diplomatist; b. at Corbach, in Westphalia, Aug. 25, 1791. He studied theology and the Oriental languages at Marburg and Göttingen, and especially in Paris; was appointed, at Niebuhr's suggestion, secretary to the Prussian embassy at Rome in 1818, where he remained many years and devoted much time to philology and historical research. In 1827 he succeeded Niebuhr as Prussian minister at Rome. In 1838 he was recalled, and in 1839 became Prussian ambassador to Switzerland. He was sent as ambassador to London in 1841, and acquired a greater influence and a higher position in English society than any German diplomatist had ever enjoyed. His principal works are *Die Verfassung der Kirche der Zukunft* (Hamburg, 1845); *Ægyptens Stelle in der Weltgeschichte* (5 vols., Gotha, 1845–57; Eng. trans. *Egypt's Place in Universal History*, London, 1848–67); *Christianity and Mankind* (7 vols., London, 1854); *Gott in der Geschichte* (3 vols., Leipzig, 1857–58; Eng. trans. *God in History*, London, 1868–70, 3 vols.); and *Vollesändiges Bibelwerk für die Gemeinde* (9 vols., Leipzig, 1858–70: only the first, second, and fifth were completed by him; the others are from his notes by Holtzmann and Kamphausen). He had a high reputation as an Egyptologist, and was liberal in religion and politics. He was recalled from the court of St. James in 1854, and was raised to the peerage as Freiherr (baron) in 1858. D. in Bonn, Nov. 28, 1860. A monument was erected to him at Corbach on Aug. 25, 1891. See *Memoirs of Baron Bunsen*, by his wife (2 vols., London, 1868).

Bunsen, Robert Wilhelm: German chemist; b. in Göttingen, Mar. 31, 1811; succeeded Wöhler in the Polytechnic Institution of Cassel; became in 1851 Professor of Chemistry at Breslau, and in 1852 at Heidelberg. He is the author of several works, the most important perhaps being on gas analysis. His investigations on organic compounds of arsenic, kakodyl, etc., in 1841, attracted much attention. He has invented important pieces of apparatus, several of which bear his name, as the Bunsen battery, gas-burner, photometer, filter pump, etc. His most brilliant discovery was probably that of spectrum analysis and the Spectroscope (*q. v.*), made in connection with Kirchhoff. This instrument established a new era in astronomy, and has already led to most valuable discoveries in chemistry. By its aid Bunsen himself discovered two new alkaline metals, *cæsium* and *rubidium*, and Lamy and Crookes discovered *thallium* and Riehe and Richter *indium*. He also devised a new system of analysis by flame reactions. His laboratory was a favorite resort for persons from the U. S. studying chemistry in Europe.

Bunsen Burner: a gas-burner; the invention of Robert Wilhelm Bunsen; intended to secure perfect combustion. By it air is caused to mix with the gas before ignition, thus producing a smokeless, sootless flame of little light, but of great heating power. The appliance has been much improved, and is of great importance in the laboratory, workshop, and kitchen.

Bunt: See Smuts.

Bun'ter Sand'stein (variegated sandstone): a German name for the "new red sandstone"; the lowest portion of the Triassic series; called *grès bigarré* by French geologists. As the Trias is more perfectly developed in Germany than in Great Britain, the German beds are considered the typical group of the Triassic period. Large quantities of bunter sandstein flank the Vosges Mountains. It is there generally a fine-grained, solid sandstone, useful as a material for building, and is often of a blue, red, or greenish tint. The most remarkable fossils of this formation are the remains of huge batrachians, including the *Labyrinthodon*.

Bunting: a name properly given to numerous small streaked sparrows of the genera *Emberiza*, *Euspiza*, *Plectrophenax*, etc. These birds are mostly European, but some are found in America. One of their number is the ortolan of Europe, so highly prized for the table. The bobolink is sometimes called rice-bunting, and several other birds are often improperly called buntings.

The cirl bunting (*Emberiza cirlus*).

Bunting, Jabez, D. D.: Wesleyan minister; b. in Manchester, England, May 13, 1779; entered the ministry 1799; gained distinction as an eloquent preacher; had so great influence in his denomination that he has been called "the second founder of Methodism." D. in London, June 16, 1858. See his *Life*, by T. P. Bunting and G. S. Rowe (London, 1887).

Bunyan, John: author of *Pilgrim's Progress*; b. at Elstow, near Bedford, England, in Nov., 1628 (baptized Nov. 30), and learned the trade of a tinker; enlisted in the army of the Parliament, probably (the point is curiously enough uncertain) about 1645; soon quitted the army, and married at about the age of twenty. After passing through severe spiritual conflicts, he attained inward peace and profound religious views. He joined the Nonconformists in 1653; in 1655 he removed to Bedford, and began to exhort; in 1657 he was regularly recognized as a preacher, but still continued to practice his trade. He conducted services in Bedford and other places. In 1660 for so doing he was confined in Bedford County jail, and there remained till 1672. In 1675 he was again in prison, but only for six months. It was during this time that he wrote the *Pilgrim's Progress*, which he published in 1678, and a second edition the same year, and a third in 1679, much enlarged. The second part appeared in 1684. His preaching tours were made from

Bedford, and were not without risk. He went frequently to London to preach, and wherever he went had large congregations. In the spring of 1688 he had the "sweating sickness"; later caught a severe cold by riding through heavy rain to London from Reading, whither he had gone to, and did, reconcile a father and son. In London he lay for a while sick of a fever, and finally died there Aug. 31, 1688. His masterpiece, *The Pilgrim's Progress*, is the greatest of allegories, and one of the religious classics of the English tongue, and by means of translations more widely spread than any book save the Bible. It betrays a mind fairly saturated with the Bible and such books as *Fox's Martyrs* and Bagley's *Practice of Piety*. While so simple as a story that a child can understand and enjoy it, it is so profound in its doctrines that the trained theologian best appreciates it. His second famous allegory is *The Holy War*, first issued in 1682. It has no rival in any language save his own *Pilgrim's Progress*. Among his other writings, which are numerous, many dating from his long imprisonment, should be mentioned *Grace Abounding to the Chief of Sinners* (1666), his spiritual autobiography, which recounts how he became a holy man from being a careless sinner; *The Life and Death of Mr. Badman* (1680); *The Jerusalem Sinner Saved* (1688), a remarkable sermon; *The Heavenly Footman* (1698). There are innumerable editions of these works of Bunyan, but no complete edition worthy of his fame has recently been printed. The life of Bunyan has been exhaustively treated by Rev. John Brown (London, 1885; 2d ed. 1887); readable is the shorter work by E. Venables (1888). SAMUEL MACAULEY JACKSON.

Bunyon: See BUNION.

Bunzlau, bŏonts'low: a town of Prussia; in Silesia; on the Bober; 28 miles by rail W. N. W. of Liegnitz (see map of German Empire, ref. 4–H). It has a normal school, and manufactures of woolen goods, hosiery, linens, etc. Pop. 11,600.

Bunzlau, Jung, yŏong'bŏonts'low (i. e. Young Buntzlau): city of Bohemia; on the river Iser; 37 miles N. E. of Prague. It has an old castle, a gymnasium, and manufactures of cotton and woolen fabrics, leather, and soap (see map of Austria-Hungary, ref. 3–E). Pop. (1890) 11,518.

Buoy, bwoi, or boi: a floating body usually intended as a mark for the guidance of mariners. It is made either of wood or metal, and is often hollow. Buoys are generally moored by chains to the bed of the channel. They are of various, shapes, sizes, and colors to distinguish them one from another, and indicate to the mariner each a specific instruction. Starboard buoys, usually red, are on the right of a vessel ascending the channel, or on the coast going with the flood-tide current; port buoys, usually black, are on the left in the same circumstances; spherical buoys, striped, indicate the end of a shoal; a hollow conical buoy is called a "can-buoy"; a double conical buoy is called a "nun-buoy"; a floating wooden spar is a "spar-buoy." The bell-buoy is a contrivance for rendering a buoy audible, whether it is visible or not; it is flat on top, where a bell is mounted, the clapper of which is set in vibration by undulations of the water. The Courtenay buoy is surmounted by a whistle connected with a hollow tube long enough to reach stiller water beneath. As the buoy rises and falls on the waves the water in the tube correspondingly changes, so that the air rushes in or out of the whistle as the air in the tube expands or is compressed. Lighter buoys are used to mark river channels. A common shape for buoys to be used to mark shoals in rivers or in other sheltered places is that of a frustrum of a cone. They are anchored point downward, with the name of the buoy on the top. In laying submarine telegraphs buoys are used when cables are cut and abandoned during rough weather, afterward to be picked up and repaired, when the work of laying the cable goes on as before the storm.

A buoy-rope on shipboard is the rope which connects the anchor with a buoy floating above it. It is simply intended to point out the locality of the anchor, but if it be strong it is useful in assisting to raise the anchor at times when the proper cable is cut or injured.

Buphaga: See BEEF-EATER.

Bupres'tis [from Gr. *βούπρηστις*, an insect whose sting is said to have caused cattle to swell up; *βοῦς*, ox + *πρήθειν*, puff up]: a genus of coleopterous insects of the family *Buprestidæ*, which includes more than 1,000 species. They are remarkable for the splendor and richness of their colors. They are found in North America, but are more abundant in tropical countries. The *Buprestis gigas*, of Cayenne, is

The giant buprestis.

about 2 inches long, and is larger than any of the North American species.

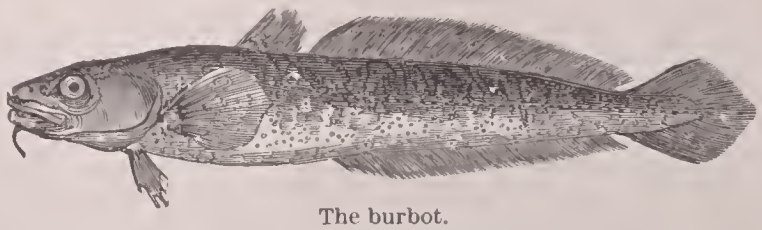
Bur: a rough, prickly covering (involucre) of the seeds of some plants, as the chestnut. The term is also applied to the flower-head or involucre of the *Arctium lappa* (burdock), the prickles of which are hooked at the point. In engraving on steel or copper, bur is a slight ridge raised on the edges of a line by the graver or the dry-point.

Bur'bage, RICHARD: actor; one of Shakspeare's associates; b. about 1567. He seems to have belonged to one of those companies of traveling actors which, under the name of "Englische Comödiachen," now and then visited the Continent, more especially North Germany, Holland, and Denmark; exercised considerable influence on the development of the drama and the theater in those countries; inherited a share in the Blackfriars, and, with Shakspeare, Heming, and others as partners, built the Globe theater, where he took leading parts in all sorts of plays until he died. He played Richard III. and other tragic *rôles* with great spirit. D. in London, Mar. 13, 1618–19. See Collier's *History of English Dramatic Poetry* (1879).

Bur'beck, HENRY: soldier; b. in Boston, Mass., June 8, 1754. He was a soldier in the Revolution, and was appointed captain under the Confederation May 1, 1787. In 1789 he was commissioned a captain of artillery, major in 1791, lieutenant-colonel in 1798, and colonel in 1802. He served with distinction in the Revolutionary war, in that of 1812 with Great Britain, and on frontier service. He was breveted brigadier-general 1813, and retired from the army June, 1815. D. in New London, Conn., Oct. 2, 1848.

Bur'bidge, GEORGE WHEELOCK, D. C. L.: Canadian jurist; b. in Canning, New Brunswick, Feb. 6, 1847; educated at Mt. Allison Wesleyan College; admitted to the bar in 1872; appointed queen's counsel in 1885. He practiced his profession at St. John; was secretary of the commissioners for consolidating the laws of New Brunswick; a commissioner to revise and consolidate the statutes of Canada in 1883; Deputy Minister of Justice for the Dominion from May, 1882, until appointed judge of the Exchequer Court of Canada Oct., 1887. This court, which consists of but one judge, has exclusive original jurisdiction in respect of any matter which might in England be the subject of an action against the crown. NEIL MACDONALD.

Bur'bot (*Lota lota*): a fish of the rivers and lakes of the arctic and subarctic regions of both hemispheres; is the only



The burbot.

fresh-water species of the family *Gadidæ* or codfishes. It reaches a weight of 8 or 10 lb. It has two dorsal fins, the

second of which is very long, and a very long anal fin. Its flesh is white, firm, and is not highly esteemed as food. It is capable of living a long time out of water. It is also known in the U. S. as eel-pout, cusk, and ling.

Bur'bridge, Stephen Gano: general of volunteers; b. in Scott co., Ky., Aug. 19, 1831; educated at Georgetown College and at Kentucky Military Institute, Frankfort; studied law in the office of the late Senator Garrett Davis at Paris, Ky. In 1849 he returned to Georgetown, D. C., and engaged in mercantile business till 1853, when he turned his attention to farming, and at the outbreak of the civil war was conducting a large farm in Logan co., Ky. He espoused the cause of the U. S., and raised the famous Twenty-sixth Kentucky, which he led until the battle of Shiloh, where he was promoted to be a brigadier-general of U. S. volunteers; fought to expel Bragg from Kentucky in 1862; ordered to join the expedition against Vicksburg; led the charge at Arkansas Post and at Port Gibson; commanded the military district of Kentucky, and drove John Morgan into Tennessee. For this service he was breveted major-general. Resigned in 1865. D. in Brooklyn, Dec. 1, 1894.

Burck'hardt, Jakob: See the Appendix.

Burckhardt, Johann Ludwig: Swiss traveler; b. in Kirchgarten, near Lausanne, Nov. 24, 1784. After studying at Leipzig and Göttingen he went to London in 1806, carrying with him a letter of introduction from the celebrated Blumenbach to Sir Joseph Banks, and entered the service of the African Association, which in 1809 sent him to explore the interior of Africa. He spent about two years in Syria; prepared himself by the study of Arabic and medicine, inuring himself to all kinds of hardships and privations. He traveled through Cairo and Nubia to Mecca, where he arrived in 1814. Disguised as a Moslem hâjî, he made a pilgrimage to Mt. Ararat and to Medina with peril to his life. D. in Cairo, Oct. 15, 1817, and bequeathed his Oriental MSS. to Cambridge University. His *Travels in Nubia* (in English, London, 1819); *Travels in Syria and the Holy Land* (1822); *Travels in Arabia* (1829); *Notes on the Bedouins and Wahabys* (1830); and *Arabic Proverbs; or the Manners and Customs of the Modern Egyptians, Illustrated from their Proverbial Sayings* (1830), are highly esteemed. See his *Life*, prefixed to his *Travels in Nubia*.

Burden, Henry: inventor and ironmaster; b. in Dumblane, Scotland, Apr. 20, 1791; removed to the U. S. in 1819; set up business as a farm-tool manufacturer, and made the first cultivators; in 1825 invented a process of making railroad spikes which greatly cheapened railway construction; in 1822 was an ironmaster, and eventually the head of one of the largest rolling-mills and iron and steel establishments in the U. S., located near Troy, N. Y.; especially famous for his machine which turns iron bars into finished horseshoes at the rate of sixty a minute; grew very rich; d. in Troy, N. Y., Jan. 19, 1871.

Burden of Proof: the obligation or necessity of proving the fact in dispute in an issue joined in a court of justice. The general rule is that the burden of proof rests upon the party who asserts the affirmative of the issue. The same rule is applied if he grounds his case on a negative statement or allegation. If, however, the proof by which this negative allegation may be disproved is peculiarly within the knowledge of the opposite party, a *prima facie* case is established by its simple assertion. In general, the party upon whom rests the burden of proof has the privilege of opening and closing the case. In most civil causes judgment must be given for the party establishing a preponderance of evidence, but in criminal cases the accused must be acquitted unless the jury are satisfied of his guilt beyond a reasonable doubt. Hence the rules concerning the burden of proof are of great importance in criminal prosecutions. The burden of proof is on the government throughout the whole case. Revised by F. Sturges Allen.

Burdett', Sir Francis: a popular and liberal English legislator; b. Jan. 25, 1770. In 1793 he married a rich heiress, Sophia Coutts. He was elected to Parliament about 1795; became an effective speaker; advocated parliamentary reform for a while, during which time he was twice arrested, once imprisoned and fined for criticisms of the Government; turned Conservative in 1835. He represented Westminster for many years (1807–37), and then Wiltshire until his death; was the idol of the London populace. D. Jan. 23, 1844.

Burdett-Coutts, Angela Georgiana, Baroness: daughter of Sir Francis Burdett; b. Apr. 21, 1814; gained distinction by the liberal use of her vast fortune. She built churches, among which is the beautiful St. Stephen's at Westminster; endowed the bishopries of Adelaide, Cape Town, and British Columbia; aided emigrants on a great scale, and provided a "Home" at Shepherd's Bush for such women as had lapsed into evil ways. In 1871 she was made a baroness in her own right. Ten years later she married William Lehman Ashmead Bartlett (b. in New Brunswick, N. J., in 1851), who took her name, whereby she lost some part of her inheritance.

Burdette, Robert Jones: humorist and journalist; b. at Greensboro, Pa., July 30, 1844; removed to Peoria, Ill., in his youth; enlisted in Forty-seventh Illinois Volunteers in 1862 as a private, and served through the war; became one of the editors of the Peoria *Transcript* in 1869; in 1874 associate editor of the Burlington *Hawkeye*, his humorous contributions to which made him famous. Licensed as a Baptist minister in 1887. He is popular as a lecturer, and has published *The Rise and Fall of the Mustache*; *Hawkeyes*; *Life of Wm. Penn*; *Innach Garden*; *Sons of Asaph*; and *Chimes from a Jester's Bells*.

Burdick, Francis M., A. M., LL. B., LL. D.: professor of law; b. at De Ruyter, N. Y., Aug. 1, 1845; was educated at Hamilton College and at Hamilton College Law School, Clinton, N. Y.; practiced law in Utica, N. Y., 1872–83, and was mayor of the city 1882–83; was Maynard-Knox Professor of Law and History in Hamilton College 1882–87; Professor of Law in Cornell University Law School 1887–91; and became Dwight Professor of Law in Columbia College Law School, New York, in 1891. Dr. Burdick has published *The Study of Law as a part of a General Education* (Albany, 1887), and *Cases on Torts* (New York, 1891; new ed. 1895). Received the degree of LL. D. from Hamilton College in 1895.

Burdock (*Arctium lappa*): a plant of the family *Compositæ*; has a globular involucre with imbricated coriaceous scales, each tipped with an abrupt and spreading, awl-shaped, hook-pointed appendage. This involucre, which is called a *bur*, catches hold of the clothes of persons who come into contact with it. The burdock is a native of Europe and naturalized in the U. S., growing as a weed in waste places, fence-corners, and near dwellings. It is used in medicine as a diuretic and diaphoretic.

Burdwan, or **Bardwan**: a town of Bengal, India; capital of a division and district of the same name; on the Dummodah, and on the Grand Trunk Road; 68 miles by rail N. W. of Calcutta (see map of N. India, ref. 7–I). It has manufactures of silk and cotton fabrics, and a large palace, but the houses are generally rather mean. Pop. 35,000.

Bure: See Buri.

Bureau Ver'itas: an institution for the classification of the steamships and sailing-vessels of all nations; used by underwriters, maritime insurance agents, etc. It was founded at Antwerp in 1828, by Charles Bal. During the revolution of 1830, which separated Belgium from Dutch rule, the Bureau Veritas was removed to Paris, France, where it was long known as the French Lloyd's. In the Franco-German war of 1870–71 the bureau was finally located at Brussels, in Belgium. Its surveyors and agents are found in the seaports of all maritime countries, and their ratings of vessels are the fruit of the utmost severity in examination.

Burg, bŏŏr*kh*: a town of Prussian Saxony; on the river Ihle; 17 miles by rail N. E. of Magdeburg. It was settled by French and Walloon colonists, and has been for many centuries celebrated for its manufactures of woolen cloth. Here are also manufactures of linen, machinery, pottery, etc. Pop. (1890) 17,572.

Burgdorf, bŏŏr*kh*'dōrf (in Fr. *Berthoud*): a town of Switzerland; canton of Berne; on the river Emmen; 13¾ miles by rail N. E. of Berne (see map of Switzerland, ref. 4–E). It has a castle and manufactures of ribbons and silk. Pestalozzi opened a school here in 1798. The Sommerhaus baths are in the vicinity. Pop. (1888) 6,876.

Bür'ger, Gottfried August: German poet; b. near Halberstadt, Dec. 31, 1747. He studied at Göttingen, and his literary career was greatly influenced by reading Shakspeare and *Percy's Relics of Ancient Poetry*. His works consist chiefly of ballads and songs, which, though very popular, did not relieve him from poverty. Among his best productions are *Lenore* (1772) and the *Wild Huntsman*. D. in Göttingen, June 8, 1794. See Pröhle's *G. A. Bürger* (Leipzig, 1856).

Bur'ges, Tristam, LL. D.: statesman and orator; b. in Rochester, Mass., Feb. 26, 1770; graduated at Brown University in 1796; studied law, which he practiced with success at Providence, R. I., and became a leader of the Federal party. He was for a time chief justice of Rhode Island, and afterward a professor in Brown University. In 1825 he was elected a member of Congress, in which he continued ten years, and gained a high reputation. He was eminently logical and terribly sarcastic. D. in Providence, Oct. 13, 1853.

Burgess, Alexander, D. D., LL. D.: Bishop of Quincy, Ill.; b. in Providence, R. I., Oct. 31, 1819; graduated at Brown University 1838, and the General Theological Seminary, New York city, 1841; ordained 1842; held parochial charges at East Haddam, Conn.; Augusta and Portland, Me.; Brooklyn, N. Y.; and Springfield, Mass. Consecrated Bishop of Quincy, May 15, 1878; published a memoir of his brother, the Bishop of Maine, carols, hymns, special sermons, charges, etc.

Burgess, George, D. D.: Bishop of Maine; b. at Providence, R. I., Oct. 31, 1809; graduated at Brown University in 1826; was a tutor there for a time; studied in Germany two years; rector of Christ church, Hartford, Conn. (1834–47); and was, Oct. 31, 1847, consecrated Bishop of Maine, acting also as rector of Christ church, Gardiner. He went to Haiti to found a mission, and died there of apoplexy Apr. 23, 1866. He published *Pages from the Ecclesiastical History of New England* (Boston, 1847); *The Last Enemy, Conquering and Conquered* (Philadelphia, 1850); a volume of sermons; a metrical version of the Psalms (New York, 1840); and other works.

Burgess, James, LL. D.: archæologist; b. in Kirkmahoe, Dumfriesshire, Scotland, 1832; went to Calcutta as Professor of Mathematics, 1855; engaged in educational work in Bombay 1861–73; published the monthly *Indian Antiquary* 1872–85; in 1873 was put in charge of the archæological survey of Bombay; in 1885 appointed director-general of the archæological survey of India, retiring in 1889. Editor of *Epigraphia Indica* and author of various works on the temples of India.

Burgess, John William, LL. D.: educator; b. at Cornersville, Giles co., Tenn., Aug. 26, 1844; educated at Cumberland University, Lebanon, Tenn., and Amherst College, Mass., whence he graduated in 1867; was admitted to the bar of Massachusetts in 1869; appointed Professor of English Literature and Political Economy at Knox College, Galesburg, Ill., in 1869; in 1871 studied history and public law at Göttingen, Leipzig, and Berlin; was appointed Professor of History and Political Science at Amherst College in 1873; Professor of Political History and Public Law at Columbia College, New York, in 1876, and of Constitutional and International History and Law in 1880.

Burgher and **Antiburgher**: See Associate Presbytery and Presbyterian Church.

Burgkmair, bŏork'mīr, Hans: a noted German painter and engraver on wood; b. in Augsburg in 1472. He was a friend of Albert Dürer. His paintings are in galleries at Munich, Berlin, Augsburg, and Vienna. In 135 wood-cuts he depicted *The Triumph of the Emperor Maximilian*, for which the emperor wrote the text. D. in 1531.

Burglary [Anglo-Fr. *burglarie*, origin obscure]: in criminal law, the act of breaking and entering into a dwelling-house of another or a church in the night-time, with intent to commit a felony therein. There are four circumstances necessary to constitute the offense, referring to place, time, the acts done, and the intent. The place is a dwelling-house or a church. It is not necessary, in order to constitute a "dwelling-house," that there should be any person residing in the house at the time. It is enough if it be habitually used as a dwelling, though it may at the time be closed, as in the case of a person having two or more residences. Difficult questions sometimes arise as to buildings connected with the house and within the curtilage, and as to the case of lodgers having separate rooms and entering by a common door. In the last instance the inquiry would be whether each lodger has a distinct dwelling-house. Consult Bishop or Wharton on *Criminal Law*.

As to time, the rule is that the offense must be committed by night. The better opinion is that both the breaking and entering must be by night, though the two acts, so far as they are distinct in their nature, may be committed on separate nights. It is held to be night when a person can not by the light of the sun clearly discern the face of another. This is quite indefinite, and as burglary is a heinous offense some fixed though arbitrary rule seems desirable. In some of the States the time is fixed by statute. The fact that the face can be seen by moonlight does not affect the question.

The acts to be done are breaking (actual or constructive) and an entry. The word "breaking" is not to be construed so as to require any great degree of force or violence. Unlatching a door or raising a window is sufficient. If a door or window be left open, an entry through them would not be a breaking, though the act of coming down a chimney would be. Any entry will suffice, such as thrusting the hand or an instrument to be used in the commission of a felony, through a broken pane of glass. The thrusting or forcing in of an instrument to be used in breaking only does not of itself constitute a burglarious breaking and entry. The act of discharging a loaded pistol or gun through a door or the glass of a window with a felonious intent would be both a breaking and an entry. It is sufficient if the entrance be procured through fraud or intimidation. It is doubtful whether the act of *breaking out* of a house will be sufficient, though the other ingredients of the offense, except breaking in, be present.

Finally, there must be an intent to commit a felony. If a felony be actually committed, the intent may be inferred. It will be immaterial whether the felony exists at common law or is created by statute. An intent to commit a trespass will not suffice.

The common-law ingredients of this crime have been modified in the U. S. by statute. Burglary is sometimes divided into degrees; some of these degrees would include breaking and entry in the daytime, or into buildings other than dwelling-houses and churches, or breaking out of a building, as well as into it. In some of the States, statute law makes the intent to commit any crime sufficient.

T. W. Dwight.

Burgomaster: the great ice-gull, *Larus glaucus*, of the aretic regions of both hemispheres.

Burgon, John William: Dean of Chichester, England; b. in Smyrna, Asia Minor, Aug. 21, 1813; educated at Worcester College, Oxford; B. A. 1845; wrote the Newdigate prize poem 1845; fellow of Oriel College 1846; took holy orders 1848; Gresham lecturer in Divinity 1868; vicar of St. Mary the Virgin, Oxford, 1863; Dean of Chichester 1876; author of *The Life and Times of Sir Thomas Gresham* (2 vols., 1839); *Petra, a Poem* (1846); *Oxford Reformers* (1854); *A Plain Commentary on the Four Holy Gospels* (8 vols., 1855; new ed. 4 vols., 1877); *Historical Notices of the Colleges of Oxford* (1857); *Plain Commentary on the Book of Psalms*, Prayer-book version (2 vols., 1857); *Inspiration and Interpretation* (1861); *Letters from Rome* (1862); *A Treatise on the Pastoral Office* (1864); *Ninety-one Short Sermons* (2 vols., 1867); *Disestablishment, the Nation's Formal Rejection of God and Denial of the Faith* (1868); *England and Rome: Three Letters to a Pervert* (1869); *The Last Twelve Verses of the Gospel according to St. Mark Vindicated* (1871); *The Athanasian Creed* (1872); *A Plea for the Study of Divinity in Oxford* (1875); *The Revision Revised* (1883); *Poems* (1885); *Lives of Twelve Good Men* (1888; 2 vols., 3d ed. 1889). D. in Chichester, Aug. 6, 1888. See his *Life* by E. M. Goulburn (London, 1892, 2 vols.).

Burgos, boor'gōs: a province of Spain, in Old Castile; bounded N. by Santander, E. by Biscay, Alava, and Logroño, S. E. by Soria, S. by Segovia, and W. by Valladolid and Valencia. Area, 5,651 sq. miles. It is drained by the Douro and the Ebro, which rises within its limits. The surface is partly mountainous. Gold, silver, copper, iron, and lead are found in it. Pop. (1887) 337,822.

Burgos (Lat. *Burgi*): a city of Spain; capital of province of same name; on the river Arlanzon; at the foot of the Sierra de Oca; 140 miles by rail N. of Madrid; lat. 42° 20′ N., lon. 3° 45′ W. It was formerly the capital of Old Castile, and was far more populous than it is now. It was founded in 844 A. D., and has many antique buildings. The court was removed from Burgos to Madrid in the sixteenth century, after which the importance of the former declined. The most remarkable edifice here is the cathedral of brown stone, which is one of the noblest specimens of Gothic architecture in Europe. This was commenced in 1221. Burgos is the seat of an archbishop, and has a college and some manufactures of woolen and linen fabrics. The rail-

way which connects Bayonne with Valladolid passes through this town. Pop. (1887) 31,301.

Burgos, Laws of: a system of laws for the regulation of Indian labor in America, promulgated at Burgos, Spain, Dec. 27, 1512. They were the result of an attempt by the Dominicans of Hispaniola to protect the Indians; the monks were opposed by the colonists, and King Ferdinand referred the question to a special junta which prepared these laws. They provided that the Indian laborers should have houses, land for planting, and a *peso* of gold annually to buy clothes; religious instruction was secured to them; regular inspectors of the mines were created, and it was forbidden that the Indian miners should be forced to work more than five months consecutively; every effort was to be made to attract the Indians by gentle means. These humane laws caused much dissatisfaction and soon became a dead letter.

Herbert H. Smith.

Burgoyne, John: British general and dramatist; b. Feb. 24, 1723; commanded a force which captured Alcántara, in Spain, in 1762; was sent to the American colonies in 1775; fought under Carleton to expel the insurgents from Canada. In the summer of 1777 he took command in Canada of an army of 8,000 men, which was ordered to enter New York State and advance to Albany to meet Clinton, who was to ascend the river, thus cutting the colonies in twain. He was repulsed at Stillwater in September, and was captured with his whole army at Saratoga in Oct., 1777, by the army under Gen. Gates; returned home in 1778, and wrote a vindication of his campaign entitled *A State of the Expedition* (1780). (See Saratoga, Battle of.) He wrote successful dramas called *The Maid of the Oaks* (1780); *Bon Ton*; and *The Heiress* (1786). D. in London, Aug. 4, 1792.

Burgoyne, Sir John Fox: field-marshal; son of Gen. John Burgoyne, and godson of Charles James Fox; b. in London, July 24, 1782; entered the Royal Engineers as second lieutenant in 1798. During a period of seventy-three years' service he slowly but steadily ascended, until at an age far beyond the scriptural limit of the life of man he reached that summit of his professional career which, in a published letter, dated Wilhelmshohe, Oct. 29, 1870, earned for him from the French emperor, Napoleon III., the designation of "Le Moltke de l'Angleterre." He served as commanding engineer under Gen. Frazer at the assault of Alexandria and siege of Rosetta, Egypt, in 1807; and under Sir John Moore in his Portuguese campaign and retreat in 1808. Through the Peninsular war he took a prominent part, as an engineer officer, in its greater sieges and battles, e. g. the siege of Ciudad Rodrigo, the two sieges of Badajoz; as commanding engineer at the desperate siege of Burgos and of that of Sebastian (shot through the neck in the assault), and the battles of Busaco, Salamanca, Bidassoa, Nivelle, etc. He came out of the Peninsular war aged thirty-two and the senior officer of engineers who had been engaged in the sieges of Spain. As commanding engineer under Gen. Pakenham he was present at the assault of Gen. Jackson's lines below New Orleans, Jan. 8, 1815, as also at the capture of Fort Bowyer (Mobile Point), Feb. 11. He was called again to the field (aged seventy-two) for the Crimean war. Against the opinion of the French engineers he pointed out at the beginning the Malakoff as the proper and decisive object of the siege operations. On his recall he resumed his position at the War Office as inspector-general of fortifications, to which place he had been appointed in 1845. His services in this capacity and his various reports and official writings were deemed to justify the publication of a work entitled *Military Opinions of Sir John Burgoyne* (London, 1859). After seventy years' service he retired in 1868 with promotion to the rank of field-marshal, and the appointment of constable of the Tower of London. Though then aged eighty-six, his physical powers were good and his mind unimpaired. He died Oct. 7, 1871, at the age of eighty-nine, and was buried in the historic Tower of London.

Bur'gundy (in Fr. *Bourgogne*; Lat. *Burgundia*): one of the most important of the former provinces of France; now forms the departments of Côte d'Or, Saône-et-Loire, Yonne, part of Ain, and part of Aube. The whole population of the departments of Ain, Saône-et-Loire, Côte d'Or, Yonne, Aube, Haute-Marne, and Haute-Saône amounted in 1891 to 2,477,921. The name was derived from an ancient German tribe called in Latin *Burgundi* or *Burgundiones*, who settled in this part of Gaul about 408 A. D. Gondemar, King of Burgundy, was defeated and killed in 534 by the Franks, who then obtained possession of Burgundy. The kingdom of Burgundy, re-established in 561, was much more extensive than the province of that name, and its extent varied in different periods. It included the provinces of Burgundy, Franche-Comté, Dauphiné, a part of Switzerland, Lyonnais, and nearly all the basin of the Rhône. In 879 A. D. Burgundy renounced its allegiance to the weak Carlovingian king, and became an independent state ruled by King Boso. It afterward in part belonged to the kingdom of Arles (933–1032). Upper Burgundy was a kingdom from 888 to 933. In these ages there were often several lines of princes claiming the title of King of Burgundy, and ruling over parts of the country. King Rudolf III., dying without male issue in 1032, bequeathed his kingdom to the Emperor Conrad II. Conrad's son Henry erected it into a duchy, feudal to Germany, sometimes called Little Burgundy. Meanwhile the northwestern portion of old Burgundy remained a fee of the French crown, governed by a line of dukes. This line became extinct in 1361, but John II. of France made his son, Philip the Bold, duke in 1364. After this Burgundy became an important state, which was much of the time virtually independent. Several of the dukes who reigned over it were powerful and famous princes. On the death of Charles the Bold, in 1477, the ducal line became extinct, and the duchy was annexed to France. From 915 to 1384 Franche-Comté was under a line of counts of Burgundy, but Philip the Bold made it a part of his dominions in 1384. See De Barante, *History of the Dukes of Burgundy* (13 vols., 1826); Dubois, *La Bourgogne depuis son Origine* (2 vols., 1867).

Burgundy, Dukes of: See Charles the Bold, Philip the Bold, and Philip the Good.

Burgundy, Louis, Duke of: Dauphin of France; b. in Versailles, Aug. 6, 1682; grandson of Louis XIV. and the father of Louis XV. He was a youth of violent passions and extremely haughty, but his character was, it is said, reformed by Fénelon, who was his preceptor. He married Adelaide of Savoy about 1698. On the death of his father he became dauphin and heir-apparent to the throne. D. of scarlet fever, Feb. 18, 1712.

Burgundy Pitch (*Pix Burgundica*): a resinous concrete exudation from the *Abies excelsa* or Norway fir. It is rendered commercial by melting it in hot water, by which process part of its volatile oil is separated from it. By straining it through a coarse cloth some impurities are removed. It is of a yellowish-white color, is hard and brittle when cold, but is softened by a moderate degree of heat. It has a pleasant resinous odor and a slightly bitter taste. It is used in medicine as an external application in the form of a plaster. The Burgundy pitch of commerce comes chiefly from the neighborhood of Neufchâtel, Switzerland.

Burgundy Wines: the name of French wines produced in the former province of Burgundy, the best coming from the range of hills called Côte d'Or, between Dijon and Châlons. These hills are about 800 to 1,000 feet high, and the finest vineyards are about half way up. The wines are celebrated for richness of flavor and perfume. The best red wines of Burgundy are called Clos-Vougeot, Chambertin, Romané-Conti, Volnay, Pomard, and Richebourg. The white wines of Burgundy are said to be the finest in France, but the quantity produced is less than that of the red.

Burhanpur', or **Barhanpur** (Hindi, *Barhanpura*): a city of Nimar district, Central Provinces, British India; the ancient capital of the Kandesh; on the river Tapti; 309 miles by rail N. E. of Bombay (see map of S. India, ref. 2–D). It is on the Great Indian Peninsular R. R. It is one of the largest and best-built cities of the Deccan, and has wide and regular streets and brick houses. Among the remarkable buildings is a mosque built by Aurungzebe, and an old royal palace which is nearly ruined. This city was taken by Akbar about 1600. It has manufactures of gold and silver thread for brocade. Pop. 30,017.

Bu'ri, or **Bure**: the first of the gods of the Norse mythology (Æsir). It is related that when the mythic cow Audhumla (whose name, from *audr*, desert, and *hum*, darkness, may be said to symbolize the original chaotic darkness) began to lick the frost-covered rocks of the primeval chaos, there came forth a beautiful and mighty being in human form called Buri, whose son Bör (that is born, and hence, like the Latin *natus*, signifying a son) was the father of Odin.

Buri: a species of palm; native of the Philippine islands. Its trunk is employed in the construction of houses; sugar and spirituous liquors are made of the sap; the pith yields a

valuable article of food (sago); and mats and sails are made from its fiber. This palm is the *Arenga saccharifera.*

Burial: See FUNERAL.

Burial Societies: See FRIENDLY SOCIETIES.

Bur'idan (Fr. pron. bü'ri-daăn'), JEAN: scholastic philosopher; b. at Béthune, Artois, France, about 1300. He was a pupil of Occam; lectured at Paris; belonged to the Nominalist school. He wrote commentaries on Aristotle's *Metaphysica*, and other works, and was the reputed author of a celebrated sophism called "Buridan's Ass," but it is not found in his books. The subject of this was an ass placed between two equidistant and equal bundles of hay, and starving on account of the equal balance of the two motives. For some unknown reason he left Paris for Vienna, and was instrumental in founding the university there. D. after 1358.

Bu'rin: a post-town and port of entry of Newfoundland; capital of district of same name; has a fine harbor on the west side of Placentia Bay, and a jail. Pop. 2,000.

Burins: See CHIZEROOTS.

Burke, EDMUND, LL. D.: statesman, orator, and writer: b. in Dublin, Ireland, Jan. 1, 1728, or, according to some writers, in 1730. At an early age he became the pupil of Abraham Shackleton, a Quaker of superior attainments and excellent character, who taught a school at Ballitore. Having entered Trinity College, Dublin, he devoted himself to history, philosophy, the classics, etc., not neglecting poetry and other works of imagination. He afterward studied law at the Middle Temple, London, but returned to Ireland in 1751, and took the degree of A. M. His *Vindication of Natural Society*, an ironical criticism of Lord Bolingbroke's attacks on Christianity, came out anonymously in 1756. This was followed by a *Philosophical Inquiry into the Origin of our Ideas of the Sublime and Beautiful*, which was highly commended by Dr. Johnson. Burke married, in 1757, Mary Jane, daughter of Dr. Nugent, of Bath, and the union appears to have been a very happy one. Soon after this he formed an intimacy with Dr. Johnson and Garrick; the former, from his first acquaintance with Burke, felt the warmest admiration for his talents, and was accustomed to say that "no man of sense could meet Mr. Burke by accident under a gateway, to avoid a shower, without being convinced that he was the first man in England." In 1759 Burke became private secretary to William Gerard Hamilton, through whose influence chiefly he received a pension from the Government of £300 per annum; but finding that his political independence would be compromised by its acceptance, he threw it up at the end of the year. He was returned to Parliament for Wendover, in Buckinghamshire, about 1765, and re-elected in 1768. Having soon after purchased an estate, he wrote to his friend Shackleton: "I have made a push with all I could collect of my own, and the aid of my friends, to cast a little root into this country. I have purchased a house with 600 acres of land in Buckinghamshire, 24 miles from London." His *Thoughts on the Cause of the Present Discontent* came out in 1770, and in 1771 he was appointed agent of the colony of New York. In 1772 Sir Charles Colebrook, in the name of the directors of the East India Company, offered to Burke, who had already considerable knowledge of Indian affairs, "the first position in a supervisorship of three, empowered to trace out in detail the whole administrative system of India, and to remedy all they could find amiss." This offer he declined, feeling perhaps unwilling to leave Parliament at a time when American affairs were becoming more complicated, and the condition of France filled him with anxious forebodings. Soon after his return from a short residence in Paris, he said in a speech in Parliament, "I see propagated principles which will not leave to religion even a toleration, and make Virtue herself less than a name." In April, 1774, he made a speech on American taxation, and he appears to have been the only member of Parliament who fully comprehended the dangers which threatened the American colonies. In Nov., 1774, Burke represented the city of Bristol in Parliament, and in Mar., 1775, made an admirable speech in favor of conciliatory measures toward the American colonies. Fox said of this oration: "Let gentlemen read this speech by day and meditate upon it by night; they would there learn that representation was the sovereign remedy for every evil." In 1780 he delivered his speech *On the Economical Reform*, and in 1782 became a privy-councilor and paymaster-general of the forces under the Rockingham ministry. His speech on the East India Bill in Dec., 1783, is esteemed one of his best. Burke retired from office soon after the accession of Pitt as Prime Minister, and held no position afterward under the Government. In Feb., 1785, he made a speech on the debts of the Nabob of Arcot, which, says Prior, "was one of those outpourings of a fertile and vigorous intellect which on an unpromising theme seemed to combine all that could instruct, dazzle, and even overpower the reader." His prosecution of Hastings, the most arduous enterprise of his life, was commenced in Jan., 1786, and he conducted the impeachment. On Feb. 15, 1788, Burke made his memorable speech in Westminster Hall, in the presence of an immense assembly. Although a verdict of acquittal was passed in 1795, the noble efforts of Burke led the way to great reforms in the Government of India. In 1790 Burke published his *Reflections on the Revolution in France*, of which more than 30,000 copies are said to have been sold within a few months. It was translated into French, and received with enthusiasm in all parts of Europe. Soon after this he published *An Appeal from the New to the Old Whigs*, in which he refutes the charge brought against him by Fox of having abandoned the principles of his party. About 1795 Burke received considerable pensions granted at the desire of the king, and without solicitation on his part or that of his friends. His acceptance of these well-merited rewards exposed him to severe attacks upon his character, in reply to which he wrote his *Letter to a Noble Lord*, which was received with great favor. Burke's only son, Richard, a young man of great promise, had died in 1794, and this affliction probably hastened the father's death, which took place July 9, 1797. He was buried at Beaconsfield, near his estate. See Prior, *Life of Burke* (London, 1854): Dr. Geo. Croly, *Political Life of Edmund Burke*; Lord Jeffrey, *Miscellanies*; John Morley, *Edmund Burke* (1867).

Revised by C. K. ADAMS.

Burke, JOHN: genealogist; b. near Parsonstown, County Tipperary, Ireland, in 1786; settled in London, and published, besides other heraldic and genealogical works, a *Dictionary of the Peerage and Baronetage of the British Empire* (1826). The twentieth edition was published by his son. D. in Aix-la-Chapelle, Mar. 27, 1848.—His second son, Sir JOHN BERNARD BURKE, LL. D.: b. in London in 1815; became in 1853 Ulster King of Arms, and was knighted in 1854; governor of the National Gallery of Ireland 1874. He wrote many works on heraldry and kindred subjects, e. g. *Anecdotes of the Aristocracy* (1849–50); *The Landed Gentry*; *Reminiscences, Ancestral and Anecdotal.* D. in Dublin, Dec. 13, 1892.

Bur'leigh, or **Burghley**, WILLIAM CECIL, Lord: statesman; b. at Bourn, Lincolnshire, England, Sept. 13, 1520; graduated at St. John's College, Cambridge, studied law; married Mary Cheke, sister of the great humanist, in 1541, who died in three years, leaving an only son; and in 1545 Mildred, daughter of Sir Anthony Cook. In 1548 he was appointed Secretary of State. As he was a Protestant, he resigned office on the accession of Queen Mary in 1553, but by conformity to the Roman Catholic Church escaped persecution in that reign, although he succeeded in defeating a bill to confiscate the property of Protestant refugees. He was again appointed Secretary of State by Queen Elizabeth in Nov., 1558, and was virtually Prime Minister for forty years from that date. In 1571 he received the title of Baron Burleigh, and in 1572 became Lord Treasurer. According to Hume, "he was the most vigilant, active, and prudent minister ever known in England." D. in London, Aug. 4, 1598, and left no less than 300 landed estates. His tomb is in Westminster Abbey. From him through his second son have descended the Earls and Marquises of Salisbury. Lord Burleigh's government was in a critical time, and had to be carried on under a penurious and capricious queen, but one who had the discernment to keep him employed. He employed spies freely, was shrewd, tortuous, patriotic, and what political glory attaches to the reign of Elizabeth he is entitled largely to the credit of. See Arthur Collins, *Life of William Cecil* (1732); Motley, *History of the United Netherlands*, chaps. vi., viii., and xviii.; Froude, *History of England*, vol. v.

Bur'leson, RUFUS C., D. D., LL. D.: one of the earliest educators in Texas; b. near Decatur, Ala., Aug. 7, 1823; spent seven years in Nashville University; taught in Mississippi and in the Theological Institute, Covington, Ky.; graduated June 10, 1847. A few months later he became pastor of the First Baptist church, Houston, Tex. He filled that position three and a half years, and was then

unanimously elected president of Baylor University (*q. v.*). His great life purpose has been to elevate the Baptist denomination, and especially to found a great Texas Baptist university.

Bur'lingame: city and railroad junction; former capital of Osage co., Kan. (for location of county, see map of Kansas, ref. 6–I); 24 miles S. S. W. of Topeka. Coal is found in abundance here, also a fine quality of fire clay. The surrounding country is unsurpassed in productiveness. Pop. (1880), 1,370; (1890) 1,472; (1900) 1,436.

Burlingame, Anson, LL. D.: diplomatist; b. at New Berlin, Chenango co., N. Y., Nov. 14, 1822; graduated at Harvard in 1846. He became a lawyer and a resident of Boston, and represented the fifth district of Massachusetts in Congress from 1854 to 1860. For denouncing the assault made upon Senator Sumner he was challenged by Preston S. Brooks, and selected rifles for the weapon and Canada for the rendezvous, but Brooks refused to travel through the angry North. He acted with the Republicans, and gained distinction as an orator. In 1861 he was sent as commissioner to China, and in 1867 was appointed ambassador from China to the U. S. and the great powers of Europe, negotiating treaties of amity and commerce. D., while engaged in the Chinese service, in St. Petersburg, Russia, Feb. 23, 1870.

Bur'lington, England: See Bridlington.

Burlington: city, important railroad center, and river-port of Iowa; capital of Des Moines co. (for location of county, see map of Iowa, ref. 7–K); situated on the Mississippi river; 207 miles W. S. W. of Chicago, 250 miles by water above St. Louis, and 296 miles by railroad E. of Omaha. The river is here a broad, deep, and beautiful stream. The plan of the city is regular, and the houses are mostly of brick or stone. Many of the private residences are built on high bluffs which afford extensive views of river scenery. This place is the seat of Burlington University, and contains about twenty-five churches and numerous manufactories. Here occurs a valuable variety of carboniferous limestone. (See Burlington Limestone.) Burlington is sometimes called the "Orchard City." Pop. (1860) 6,706; (1880) 19,450; (1890) 22,565; (1900) 23,201.

Burlington: railroad junction; a city; capital of Coffey co., Kan. (for location of county, see map of Kansas, ref. 6–I); on the right bank of the Neosho river; 28 miles S. E. of Emporia and 65 miles S. of Topeka. It has an abundant water-power, a public-school house costing $30,000, and mills. Pop. (1880) 2,011; (1890) 2,239; (1900) 2,418.

Burlington: city and railroad center, of Burlington co., N. J. (for location of county, see map of New Jersey, ref. 5–D); on the Delaware river, nearly opposite Bristol; 20 miles above Philadelphia and 12 miles S. W. of Trenton. The river is here nearly a mile wide, and incloses an island of 300 acres. The city is the seat of St. Mary's Hall (an Episcopalian school for girls) and Burlington College; contains an opera-house, has gas and water systems, and a public library. The principal industries are the manufacture of shoes, canned goods, iron pipes of all sizes, stoves, heaters, and carriages. The town was settled as New Beverly in 1667; incorporated with its present name in 1784; has fine and shaded streets and many old mansions. Pop. (1880) 6,090; (1890) 7,264; (1900) 7,392.

Burlington: city; railroad center; county-seat of Chittenden co., Vt. (for location, see map of Vermont, ref. 4–B); on Burlington Bay of Lake Champlain; 40 miles W. from Montpelier, the capital of the State. It was incorporated as a city in 1865, and is the largest place in the State. Pop. (1840) 4,271; (1880) 11,365; (1890) 14,590; (1900) 18,640. Area of original township, 36 sq. miles; about two-fifths were included in the municipal limits, the rest forming a town called South Burlington.

The heaviest trade in the city is in lumber. The capital invested is over $1,000,000. There are large quarries of building-stone, of limestone, and of fine marble within or near the city limits; lime-kilns and brick-yards are in active operation, and three large cotton-mills, steam marble-mills, machine-shops, foundries, sash, chair, furniture, patent medicine, malt cereals, and shoe factories, paper-mills, and many smaller manufacturing trades are thriving. On the northeast limit of the city the abundant water-power of the Winooski is utilized for woolen and cotton mills, flour-mills, machine-shops, etc. A line of passenger steamers and a large fleet of tugs and barges ply between Burlington and other ports on the lake.

The University of Vermont and State Agricultural College is situated here; it was chartered in 1791, has a flourishing medical department, and ranks as one of the best institutions in the country. Since 1872 young women have been admitted to the classical and scientific departments on the same terms as young men. The college buildings stand on the crown of the hill on whose side the city is built, in a most beautiful and commanding position overlooking the lake. The library is in a handsome stone building; a massive structure of granite, brick, and terra cotta is devoted to laboratories and lecture-rooms; other edifices are a large five-story dormitory of rock-faced marble; a mechanical building; a gymnasium; a museum and art-gallery. A park of 7 acres lies in front of the college buildings, and the farm and buildings of the U. S. Agricultural Experiment Station, attached to the university, are in the rear. The city schools are under control of a board of commissioners elected by the people. The high-school building, erected in 1900 at a cost of $100,000, is one of the best in New England. There are also two large Roman Catholic schools and several private schools within the city limits. St. Mary's (Roman Catholic) cathedral is one of the finest church edifices in this part of the country. There are two orphan asylums—one Roman Catholic and one Protestant. The chief public buildings are the city-hall, the county court-house (a handsome stone building, erected in 1872), the county jail, the U. S. post-office and custom-house (a brick building, erected in 1858), and Y. M. C. A. building. The libraries are the University Library, Young Men's Christian Association Library, and the Fletcher Free Library, which last is under control of the city.

The city is supplied with water from the lake, raised by steam-pumps to a reservoir on the hill, which gives a head of 280 feet; the water-works are under the control of the city. Lakeview Cemetery, opened by the city in 1868, on the bluff overlooking the lake, is a beautiful spot, and Green Mount Cemetery, on the eastern side of the city, overlooking the valley of the Winooski, contains a monument to Ethan Allen, who was one of the early settlers and buried here—a shaft of granite surmounted by an heroic statue of Allen in marble, which was unveiled with imposing ceremonies July 4, 1873.

Electric trolley lines connect the city with the villages of Winooski and Essex Junction.

Burlington was first settled in 1775, but no permanent residences were made till the close of the Revolutionary war, and in 1800 the population was 800. The principal streets are 4 rods wide, laid out at right angles, many of them well shaded with elm and maple trees. The location of the city is unequaled in this part of the country, and the beauty of its scenery unsurpassed anywhere. The geographical position of the city, midway of the eastern shore of Lake Champlain, and the facilities for transportation by rail and water make the whole valley of the lake tributary to it in the way of business. Editor of "Free Press."

Burlington: village (settled in 1837); Racine co., Wis. (for location of county, see map of Wisconsin, ref. 7–F); on Wis. Cent. and C. M. and St. P. R. Rs., and on Fox river; 27 miles W. by S. of Racine. It has seven churches, a graded school, and manufacturing and agricultural industries. Pop. (1880) 1,611; (1890) 2,043; (1900) 2,526.

Burlington Limestone: a formation of the carboniferous period, occurring in Missouri and Illinois, adjacent to the Mississippi river. It affords a valuable building-stone, and is peculiarly interesting to naturalists. The upper bed is of a light-gray color, and is nearly pure carbonate of lime. The lower bed contains more magnesia. "It is," says A. H. Worthen, "exceedingly rich in fossils, especially Crinoidea, and has afforded a greater number both of species and individuals than all the other Palæozoic rocks of this continent combined."

Burma: the largest province of the British Indian empire; stretches from lat. 28° N., far up in the mountains of Tibet, southward in a long strip on the west coast of the Malay peninsula to lat. 10° N.; its greatest breadth is in lat. 21° 30′ from lon. E. 92° to 103°; bounded N.W. by Assam and Manipur, W. by Hill Tipperah, Manipur, and the Bay of Bengal, which also forms its southern boundary, E. by Siam, Tonquin, and China. Area, Lower Burma, 87,220 sq. miles; Upper Burma, 68,922; total, 156,142 sq. miles. Total pop. (1901) 9,221,161. Contains 35 administrative districts. Provinces of Lower Burma are Arakan, Irawadi, Pegu, and Tenasserim, covering the entire seacoast. The Mergui Archipelago

(see MERGUI) is part of, and lies off the lower coast of, Tenasserim. Portions of old Burma have not yet been incorporated into British India, but are frontier territory. Total area estimated at 280,000 sq. miles.

Physical Aspects.—The Yoma Mountains are a coast-range along the east boundary of Arakan, and form a continuation of the Barail and Patkoi range, an offshoot from the Himalayas. Blue Mountain, one of its peaks, is said to reach an elevation of 8,000 feet. On its west side lies the valley of the lower Koladan. E. of it is the basin of the great Irawadi, which receives the large affluent Kyen-duen about 80 miles below Mandalay. The Pegu Yoma range separates the Irawadi from the Sittang valley on the E.; and Poung-Loung range, which crosses the Shan States and has peaks about 7,000 feet high, divides the Sittang from the Salwin valley. The Tenasserim Mountains are on the eastern boundary of the province of the same name, rise 5,000 feet, and are covered with a dense and solitary jungle. The Mekong or Cambodia river passes across the eastern part of Upper Burma from N. to S. N. of the Pegu district the country slopes upward through a rolling country, broken here and there by ranges of hills for 300 miles, and then becomes mountainous, wild, and little known to geographers. The Irawadi and Salwin are the largest rivers: the former navigable for large vessels above Bhamo, 700 miles from the sea, and furnishing the highway of commerce to the Chinese border; the latter navigable for only 80 miles from the coast. The Kyen-duen, also known as the Chindwin, can be ascended 300 miles from its confluence with the Irawadi. All the Burman rivers are subject to great fluctuations of water, and in the dry season (December to July) navigation above the tide-reaches is much impeded. During the rest of the year the alluvial plains are subject to inundations, when the streams are covered with boats of every description and commerce is active. The upper river courses have a less overflow, though fed from the Himalayas, and they force their way through rugged and grand defiles. A canal runs from the Pegu to the Sittang river. Lakes are Thoo, Lahgyin, and Kandaugee. .

The rainfall on the coast exceeds at places 200 inches a year, but diminishes rapidly as the country is ascended, except that in the Shan States and at Bhamo it is excessive (from 80 to 100 inches). At Prome it is 42 inches. The rainy season lasts from five to seven months. The temperature is tropical, but the nights are cool and there are no siroccos. Going to the interior the temperature moderates with the ascent, but at Mandalay the dust and glare in the spring are oppressive. In the ruby district, 5,600 feet above sea-level, the summer heat is moderate (86° max.), and a sanitarium is here established for European troops.

Flora and Fauna.—The alluvial districts produce rice in many varieties (the staple of the country), maize, millet, wheat, tobacco, and sugar (mostly produced from a variety of the palm), cocoa, and in the hill country varieties of the tea plant. Cotton is widely cultivated, but chiefly on uplands. Indigo is indigenous, but is crudely made, and aniline dyes have destroyed its importance. The mango, orange, citron, yam, custard-apple, papaya, capsicum, and plantain are common. The forests are magnificent, and comprise all Indian varieties of trees. Teak abounds especially in Pegu, and stick-lac, with other lacquer gums, is sent down from the Shan and upper districts.

The forests are coverts for many animals. The elephant, and single and double horned rhinoceros haunt the jungles; the tiger, wild hog, and several species of deer are hunted; fish are abundant, and furnish a welcome dietary to the people; the abundant jungle fowl is domesticated; plumage birds enliven the forests; aquatic birds, as geese, ducks, adjutants, cormorants, waders, and sand-birds, are numerous. Domesticated animals are the ox, buffalo, horse, and a few elephants.

Minerals.—Burma is rich in mineral products, but the natural deposits are almost an unworked field. A binoxide of tin is common in the lower Tenasserim region, but the rich ore is crudely reduced. In the same region are coal and lead, antimony, and manganese. In Upper Burma placer gold is found; also silver, copper, tin, antimony, amber, bismuth, petroleum products, fine building-stones, and gems. Iron abounds to the N. of Pagan, the old capital; petroleum is an article of export; amber comes from the upper valley of the Kyen-duen. The gems of Burma are chiefly sapphire and ruby. The richest mineral districts are in Upper Burma toward the Chinese frontier, across which trade has passed for centuries. Jade comes from this border, and its production is farmed out. The sapphire district, some 70 miles N. E. from Mandalay, extends over an area of 100 sq. miles, and is worked from pits. The gems were a crown product, and, according to color, are sold as ruby, amethyst, topaz, and chrysoberyl.

People.—The inhabitants are chiefly Mongoloid. From their own name, Ba-ma as understood by Europeans, comes the name of the country. Generally they are well-formed, dark, active, with lank black hair and slight beards, like the Siamese. There are other tribes, as the Karens in the E., the Paloungs, the Kakhyens or Singphos, a predatory people on the N., and the Shans on the E., who change allegiance as suits their convenience. All are fond of arrack. Religiously the people in Lower Burma are divided in order of importance as Buddhists (the dominant faith), Mohammedans, Hindus, Christians, and about 4 per cent. diversified faiths. Their government was purely despotic, tinctured with a religious reverence for officials. The king's subordinates were provincial governors, equipped with arbitrary powers. They had no salaries, but lived by farming the revenues and by fees. Justice was lucrative to its dispensers. The administration was little better than Oriental extortion. Heredity counted for nothing. A kind of Chinese officialism fixed a man's precedence and authority with badges, costumes, buttons, and girdles, and this was carried to a great detail of color, form, and habit. The priests were mendicants, wore yellow garments; nuns were not bound by irrevocable vows. Theoretically all the people were slaves, and could not migrate without permission. Outcasts, lepers, executioners, pagoda slaves, and undertakers were treated with contempt and cruelty. Women were not secluded; their embraces might be sold for a time without dishonor, but prostitutes were infamous.

The people have a monosyllabic, flexible speech, used for secular purposes, written with circular letters of Indian and Buddhist origin, but Pāli is the sacred language. The literary form is almost wholly dramatic, and the plays are consonant with Occidental morals. Incident and scenic effects are merely suggested, but the production of a play spins out beyond any Greek trilogy. Monastic libraries are common; paper is of bamboo or palm-leaf production. Chronicles are of ancient composition, but unauthentic. Judson's *Dictionary* (1852) and Bastian's *Sprachvergleichende Studien* (1870) are the keys to the language. See also Col. Yule's *Narrative of a Mission to the Court of Ava* (1858).

Industrial Aspects.—Native taxes formerly repressed all industries, the rich paying an annual quit-rent and the poor suffering extortion. The houses are built upon piles in the inundated and most populous districts, and are of wood; brick is common in temples, and arches, pointed, flat, and circular, with domes, abound in public buildings, while carving, gilding, and fantastic ornamentation give them an appearance of barbaric gorgeousness. The loom lingers in families all over the country, and its products are silk fabrics and cotton goods. Porcelain, pottery, bells, lacquered ware, cutlery, personal weapons of steel, rice, and preserved fish are common products. The country exports much to China of the native products named, and receives artistic manufactures in return. In Lower Burma the principal products are rice, lumber, pottery, textile fabrics, salt, cotton, lacquered and gilt work, dyes, cutch, and gold and silver bowls. The British exports from Burma in 1890 were $17,701,325. There were then 1,092 miles of railway completed, Mandalay being connected with the coast thereby.

Weights and Measures.—Lead is used for small coins; money transactions are by weight; the coinage is in confusion. The ball and the dain are the purest silver coins.

(1) Weight: The seeds of a little black pea (*Abrus precatorius*) supply the unit, and weigh from 1 to 2 grains: 8 make a pae, 16 a mat, 64 a kyap, 100 kyaps a piessa or viss. The viss of Rangoon = 3·3333$\frac{1}{3}$ lb. av. = 1·511966 kilgm. Multiple, 150 viss = 1 eandy = 500 lb. av. = 226·7959 kilgm. Sub-multiples, $\frac{1}{100}$ viss = 1 tical; $\frac{1}{100}$ tieal = 1 moos.

(2) Length: The taim or cubit of Rangoon = 18 inches = 457·2 mm. Sub-multiple, $\frac{1}{18}$ taim = 1 paulgat = 1 English inch. Also, 22 paulgats = 1 saundaung, or royal cubit. For road-measure, 7 saundaungs = 1 dha or bambou; 1,000 bambous = 1 dain or taing = 2·4306 miles = 3·9115 km.

(3) Volume: Commodities of all kinds, liquid or dry, are sold by weight.

Government.—A chief commissioner, under the Viceroy of India, rules the province. Under him are eight deputies for as many districts, who are invested with police, judicial, and revenue powers. Beneath them are township officers, of like but

subordinate functions. The country is controlled by 20,000 troops, and a police officered by Indian and Burman leaders. Revenue is derived from the teak forests, a capitation tax, a land tax ranging from half a rupee (17 cents) an acre to 2½ rupees on rice lands, the industry that immensely surpasses all others. Revenue in 1890 nearly $16,000,000, and expenditures a little over $13,000,000.

History.—The early chronicles are not trustworthy. The dominant race probably came 2,000 years ago from Central Asia down the Irawadi valley. In the eleventh century the Bûddhists are known to have been established at Prome, a civilization was developed, and the cities of Pagan, Pegu, Sagain, Prome, and Ava were in an advanced architectural stage. The Shans and Talaings invaded the country, but did not destroy its monuments. European settlements began in the seventeenth century with French and English factories. In the middle of that century a native dynasty of peasant origin brought all Burma under one rule. When the British subdued Assam, friction arose on the Burman borders, and in 1824 Ava, with Arakan and Tenasserim, was ceded to Great Britain. In 1830, on pretext of harassed trade, Great Britain annexed Pegu. The final conquest came in 1885 in retaliation for King Thebaw's proposed alliances with China and his mulcts on a British trading company operating in Upper Burma. On Nov. 28 the Burmese laid down their arms at Ava; Mandalay capitulated, and Thebaw was carried captive to India. The next year all his dominions were annexed to the Queen's empire. See Forbes, *British Burma* (1876); Sir Arthur Phayre, *History of Burma* (1883); Wayland, *Life of Judson* (1853); Anderson, *Expedition to East Yunan viâ Bhamo* (1871); Scott ("Shway Yoe"), *The Burman, His Life and Notions* (1882), and *Burma as it was, is, and will be* (1886). W. W. H.

Bur'mann, Peter: philologist; b. in Utrecht, July 6, 1668; became Professor of History, Eloquence, and the Greek Language at Leyden in 1715; edited Horace, Ovid, Vergil, Quintilian, Lucan, and other classics, and wrote several works, among which is a treatise *On the Revenues of Rome* (De Vectigalibus Populi Romani, 1694). His writings were esteemed for their accurate erudition. D. in Leyden, Mar. 31, 1741.

Bur'meister, Karl Hermann Konrad: a German naturalist; b. in Stralsund, Jan. 15, 1807; educated at Greifswald and Halle; for a time Professor of Zoölogy at the University of Halle. In 1850 he resigned, and went to Brazil; returned to Europe; in 1856 again went to South America. In 1861 he was made director of the National Museum in Buenos Ayres, a position which he held until a severe accident compelled him to relinquish it, when he was pensioned by the Government. He published *Systematische Uebersichte der Thiere Brasiliens* (Halle, 1856); *Description physique de la République Argentine* (Paris, 1876); and *Annales del Muséo Público de Buenos Aires* (1864–74). D. in Buenos Ayres, May 2, 1892. F. A. Lucas.

Burmeister, Richard: See the Appendix.

Burmeister, Willy: See the Appendix.

Bur'naby, Frederick Gustavus: soldier and traveler; b. in Bedford, England, Mar. 3, 1842; author of *A Ride to Khiva* (3d ed. 1876); *On Horseback through Asia Minor* (7th ed. 1877); *A Ride Across the Channel* (1882), an account of a balloon trip. Fell in the battle of Abu Klea, in Nubia, Jan. 17, 1885.

Bur'nand, Francis Cowley: English humorist and journalist; b. Nov. 29, 1836; educated at Eton and at Trinity College, Cambridge, 1858; studied for the Church; became a Roman Catholic, and was called to the bar; since 1880 editor of *Punch*; author of numerous parodies, theatrical burlesques, and other facetiæ, the best known of which are his comedy *The Colonel*, a satire on the æsthetes; his travesty of Douglas Jerrold's *Black-eyed Susan*; *Happy Thoughts* (1868); *More Happy Thoughts* (1871). Henry A. Beers.

Burne-Jones, Edward: painter of figure subjects and designer of decorative work; b. in Birmingham, England, Aug. 28, 1833; pupil of Dante Gabriel Rossetti; belonged to the romantic school of English artists, and was noted more for his conceptions of his subjects and for his peculiar compositions in the treatment of them than for the possession of technical merits. He was elected an associate of the Royal Academy in 1885. At the Paris Exposition in 1878 his pictures, including the *Beguiling of Merlin* (1877), attracted much notice from continental critics, and at the exposition of 1889 he was awarded a first-class medal for the only picture he exhibited, *King Cophetua and the Beggar Maid* (1884). D. in London, June 17, 1898. W. A. C.

Burnes, Sir Alexander: traveler and Orientalist; b. at Montrose, Scotland, May 16, 1805. He entered the army of India in his youth, and by his knowledge of Oriental languages gained a rapid promotion. In 1832 he started from Lahore on an exploring expedition in Central Asia, and visited Balkh, Bokhara, Astrabad, Teheran, etc. Having returned to England in 1833, he published *Travels into Bokhara*. In 1838 he was sent on a mission to Cabul, where he passed some years as political resident. He was murdered there Nov. 2, 1842, by the Afghan insurgents.

Bur'net: the popular name of plants of the genus *Poterium*, belonging to the family *Rosaceæ*. The great burnet (*Poterium officinale*) is cultivated in Germany as a forage-plant, and yields a good crop on poor soils. A similar species grows wild in North America. The common burnet (*Poterium sanguisorba*) furnishes valuable pasturage for sheep on the English downs. It is sometimes seen in American gardens, and is used in salads.

Burnet: town; capital of Burnet co., Tex. (for location of county, see map of Texas, ref. 4–H); on Aust. and N. West. R. R.; 45 miles N. W. of Austin, and 10 miles E. of the Colorado river; has 6 churches, a high school, 2 gins, and a roller flouring-mill. Its interests are chiefly agricultural. Burnet was founded, about 1840, as Fort Croghan, but has been known as Burnet since 1852. Pop. (1880) 490; (1890) 1,454; (1900) 1,003. Editor of "Bulletin."

Burnet, Gilbert, F. R. S.: historian and prelate; b. in Edinburgh, Scotland, Sept. 18, 1643. He became Professor of Divinity in the University of Glasgow in 1669, resigned that chair in 1674, and removed to London. In 1679 he published the first volume of his *History of the Reformation in England* (3 vols., 1679–1714). He refused a bishopric which was offered to him by Charles II. He was a courageous and able asserter of civil liberty in the important crisis which preceded the revolution of 1688, and gained the favor of William III., who appointed him in 1689 Bishop of Salisbury. Among his works are a *Life of Sir Matthew Hale* (1682), and a *History of his Own Times* (2 vols., 1723–34), his most important work. See the biography by his son in the last-named work. D. in London, Mar. 7, 1715.

Burnett', Frances Eliza (*Hodgson*): novelist; b. in Manchester, England, Nov. 24, 1849; came to the U. S. at the close of the civil war, and lived in Knoxville, Tenn., until her marriage, in 1873, to Dr. L. M. Burnett, from whom she was divorced in 1898; married Stephen Townsend in 1900. Her *Little Lord Fauntleroy* (1886) achieved great popularity. Among her novels are *That Lass o' Lowrie's* (1877); *Haworth's* (1879); *Louisiana* (1880); *Through One Administration* (1883); *A Lady of Quality* (1896); *The De Willoughby Claim* (1899). A number of her stories have been successfully dramatized.

Burnett, James. See Monboddo.

Burnett, Peter H.: See the Appendix.

Burnett Prizes: founded by James Burnett, a philanthropist, born in Aberdeen, 1729; died there Nov. 9, 1784. He made a competence in stocking-weaving and salmon-fishing. By his will part of his estate was used for the benefit of the poor of Aberdeen and neighborhood; part was a fund to defray the expense of inoculation (later used for vaccination), and the remaining interest was to be allowed to accumulate for forty years or until £1,600 had accrued, and then to be paid in prizes of £1,200 and £400 respectively to the best and next best "treatises on the evidence that there is a Being all-powerful, wise, and good, by whom everything exists; and particularly to obviate difficulties regarding the wisdom and goodness of the Deity, and this independent of written revelation and of the revelation of the Lord Jesus; and from the whole to point out the inference most necessary and most useful to mankind." The first award was made in 1815, when William Laurence Brown received the highest prize for his *Essay on the Existence of a Supreme Creator, possessed of Infinite Power, Wisdom, and Goodness* (2 vols., Aberdeen, 1816); and John Bird Sumner the second for *A Treatise on the Records of the Creation, and on the Moral Attributes of the Creator; with Particular Reference to the Jewish History, and to the Consistency of the Principle of Population with the Wisdom and Goodness of the Deity* (2 vols., London, 1816; 2d ed. 1818). The second and final award was in 1855, when Robert Anchor Thompson (*Christian Theism* 2 vols., London, 1855; n. e. 1863) and John

Tulloch (*Theism*, Edinburgh, 1855) were the prizemen respectively. Since 1883 the fund has been used to support a lectureship on natural theology in the University of Aberdeen, and no further prizes will be given.

Burnett's Disinfecting Fluid: a solution of considerable strength, containing, as its chief constituent, chloride of zinc and a comparatively small amount of iron, which is always diluted to the extent of about 1 to 5 gal. when used for disinfecting purposes. As a matter of fact it is not a true disinfectant, but only a deodorant and antiseptic, inhibiting the growth of disease germs, but not destroying them. For this reason it has been largely supplanted by chlorinated lime or corrosive sublimate for disinfecting purposes. It is sometimes used for the purpose of preserving timber, and this process is called burnettizing. Another name for Burnett's fluid is Crewe's disinfecting liquid.

Bur'ney, CHARLES, F. R. S., Mus. D.: composer; b. at Shrewsbury, England, Apr. 17, 1726; was a friend of Dr. Johnson and Edmund Burke; wrote, besides other works, a *General History of Music from the Earliest Ages* (4 vols., 1776–89), which is highly esteemed; a *Life of Händel*; one of *Metastasio*; composed *Alfred*, *Robin Hood*, and *Queen Mab* for Drury Lane theater. He was the father of Madame d'Arblay. D. in Chelsea Hospital, where he was organist, Apr. 12, 1814. His library was bought for $67,500 by the British Museum. See his *Life* by his daughter.

Burney, FRANCES: See D'ARBLAY, MADAME.

Burney, STANFORD GUTHRIE, D. D., LL. D.: minister in the Cumberland Presbyterian Church; b. in Robertson co., Tenn., Apr. 16, 1814; educated at Cumberland College, Princeton, Ky.; began preaching at the age of twenty. He was president of Union Female College, Oxford, Miss. (1852–62); Professor of English Literature and of Metaphysics in the University of Mississippi (1865–73); of Biblical Literature in Cumberland University (1877–80); and later Professor of Systematic Theology. He published *Baptismal Regeneration* (1881); *Atonement and Law Reviewed* (1887); *Soteriology* (1888); *Chart of Duty*; *Studies in Moral Science* (1890); *Studies in Psychology* (1890); *Studies in Theology* (1892). He has been active in movements for closer union with other Presbyterian churches.

Burnham, SHERBURNE W.: See the Appendix.

Burnham, WILLIAM H.: See the Appendix.

Burnham Industrial Farm: near Canaan Four Corners, Columbia co., N. Y.; on the borders of Lake Queechy; incorporated in 1887. The farm was a Shaker settlement which was purchased by Frederic G. Burnham, who gave it to be used as an institution for saving unruly boys. It is 580 acres in extent. Up to 1889 it was run on ordinary institutional lines. Not having been entirely successful it was then put in charge of Mr. W. M. F. Round, who had always been one of its trustees. Mr. Round conceived the idea of uniting the system of the Rauhe Haus in Germany and of that at Mettray, France. To accomplish this he organized the order of St. Christopher. This order is made up of consecrated young men of various religious denominations, who are in training for lives of institutional usefulness. Eight brothers are engaged in carrying on the work of the Burnham Industrial Farm, but after a period of three and a half years' training they may be sent by the director to take care of other institutions. Boys may be sent from all parts of the country to the farm in three ways—first, by renunciation of the boys by their parents; second, when committed by magistrate; third, by transfer from other institutions. They may be kept during their minority, but are ordinarily retained not more than two and a half years. They are taught simple trades, gardening, and farming. The farm has no endowment, but is entirely supported by voluntary subscriptions. The institution is planned to accommodate 1,200 boys, but a much smaller number are actually cared for.

Burning-bush: See SPINDLE-TREE FAMILY.

Burning-glasses and **Burning-mirrors**: glasses or mirrors so formed as to collect the sun's rays which fall on them into a point or focus, and thereby produce intense heat. The rays of light or heat may be concentrated either by refraction or reflection; in the former case they must pass through a transparent refracting substance, as glass formed into a proper shape; in the latter they fall on a concave polished surface of silvered glass or bright metal.

The method of exciting heat or producing fire by the concentration of the sun's rays was known from remote antiquity, as is proved by the very ancient although doubtful story that Archimedes burned by means of mirrors the Roman fleet in the harbor of Syracuse. The celebrated Buffon, with 168 mirrors, each about 6 inches square, set fire to planks of beech 150 feet distant, and this with the faint rays of the sun at Paris in the month of March.

In preparing a burning-glass the first thing to be considered is the figure necessary to collect all the rays into the smallest possible space. Descartes, in his *Optics*, showed that a disk of glass, convex on the one side and concave on the other, the convex side being a portion of an elliptic surface and the concave a portion of a sphere, would cause parallel rays falling on its convex side to converge in a single point. But as the practical difficulties of forming a glass accurately into this shape are insuperable, both sides are ground into portions of a sphere. In a lens the focal length depends on the curvature, or the radius of the sphere, and on the refractive power of the substance of which the lens is formed.

The proper form for a burning-mirror is the parabola, but as a parabolic curve is exceedingly difficult to obtain either upon metal or glass, opticians frequently rest content with a spherical curvature of long focus. Recently burning-mirrors have been constructed of glass upon the curved surface of which pure silver is precipitated by chemical means. By this plan the curved surface is produced upon glass, and thus becomes permanent, while the reflection is effected by the polished surface of the silver, which can be easily renewed from time to time. The focus of a burning-mirror is one-half of the radius of curvature.

Among those who have experimented in modern times upon the effects of burning glasses or mirrors are Baron Napier, the illustrious inventor of logarithms, Kircher, Dr. James Gregory, Sir Isaac Newton, and many others. The most powerful solid lens ever constructed was the work of Mr. Parker, an ingenious London artist. It was made of flint glass, was 3 feet in diameter, $3\frac{1}{4}$ inches thick at the center, its focal distance 6 ft. 8 in., the diameter of the burning focus 1 inch, and its weight 212 lb. The rays refracted by this lens were received on a second, the diameter of which in the frame was 13 inches, and its focal length 29 inches. The diameter of the focus of the combined lenses was half an inch; consequently, by the addition of the second lens, the burning power was increased 4 times. With this lens some of the most refractory substances were fused in a very short space of time: for example, 10 grains of common slate in 2 seconds; 10 grains of cast iron in 3 seconds; 10 grains of lava in 7 seconds; 10 grains of jasper in 25 seconds, etc. One account says "the most infusible metals were instantly melted and dissipated in vapor." This glass was afterward carried to China by one of the officers who accompanied Lord Macartney, and left at Peking. A remarkable lens, formed by bending or molding two plates of glass over a parabolic mold, and filling the cavity between with 90 qts. of spirits, was constructed by Rossini, of Gratz, in Styria. The diameter of the plates was 3 ft. 3 in., and they were united by a strong ring of metal. The whole was mounted on a heliostat. In its focus a diamond was instantly kindled and dissipated, and a piece of platinum 29 grains in weight was melted and thrown into violent ebullition. This lens now belongs to the French Government. In France, particularly, the practical application of burning-mirrors to the utilization of the sun's rays in driving heat-engines and in cookery has been extensively studied, with a view to the use of such devices in Northern Africa and other tropical regions. Revised by E. L. NICHOLS.

Burn'ley: a market-town of Lancashire, England; on the Brun; near its entrance into the North Calder; 20 miles N. of Manchester (see map of England, ref. 6–G). It is connected by railway with Blackburn, Liverpool, and other cities. It has manufactures of cotton and woolen fabrics, calico-printing works, brass and iron foundries, machine-shops, tanneries, and rope-walks. Its prosperity is partly derived from the collieries in the vicinity. Pop. (1891) 87,058; (1901) 97,044.

Burnouf, bür'noof', EUGÈNE: Indologist; b. at Paris, Apr. 8, 1801; one of the founders of the Société Asiatique; became its secretary in 1830; member of the Academy of Inscriptions in 1832; soon after Professor of Sanskrit at the Collège de France. His Sanskrit studies furnished him the key not only to the sacred language of Bûddhism, the Pali (*Essay on the Pali*, 1826), and to that of the Avesta (*Vedidad Sade*, 1829–43; *Commentary on the Yaçna*, 1833, etc.), but

led him also to the decipherment of the cuneiform inscriptions. His *Introduction to the History of Bûddhism in India* (1844) put the study of this great religion on a scientific basis. D. in Paris, May 28, 1852, his works, like his life, unfinished; but his masterful control of facts, coupled with the brilliancy of his imagination—in a word, his genius for discovery—and, above all, his self-forgetting love of truth, make him one of the heroes of "the heroic age of Oriental studies." See J. Mohl, *Vingt-sept ans d'histoire des études orientales*, i. 458–469. C. R. Lanman.

Burns, Anthony: a fugitive slave; b. in Virginia about 1830; d. in St. Catherines, Canada, July 27, 1862. Escaping from slavery, he was arrested under the fugitive slave law in Boston, May 25, 1854, an event which created an intense excitement, in which Theodore Parker, Phillips, Higginson, and other eminent citizens participated. A meeting was held in Faneuil Hall to protest against his rendition; the court-house was assaulted by a mob to rescue him; he was sent back South on a revenue cutter; afterward gained his liberty; studied at Oberlin; became a Baptist minister to a colored congregation in St. Catherines. The interest in the case grew out of the exhibition of the determination in the North to uphold the common law and State statutory safeguards of personal liberty against the fugitive slave law compromise, which transferred the trial of a Negro's freedom to the courts of the State where the claimant resided, and in slave States no such safeguards existed for a person of African descent.

Burns, Francis, D. D.: colored bishop of the Methodist Episcopal Church; b. in Albany, N. Y., Dec. 5, 1809; sent as missionary to Liberia, Africa, in 1834; taught in a school at Cape Palmas; joined the Liberia Conference in 1838; founded the Monrovia Academy in 1851; ordained bishop of his denomination in Liberia in 1858; and, after nearly five years of service, d. in Baltimore, Md., Apr. 18, 1863.

Burns, Sir George: baronet; one of the founders of the Cunard line of steamers; b. Dec. 10, 1795; entered into partnership with his brother James in Glasgow about 1818; co-operated with Samuel Cunard and others in founding the Cunard line of steamers in 1838, as the result of a general invitation from the British Government for tenders for the conveyance of American mails by steam-vessels; created a baronet in May, 1889. D. June 2, 1890, and was succeeded in the title and estate by his eldest son, Sir John Burns, of Castle Wemyss, Renfrewshire,

Burns, John: English labor organizer and leader; b. in Vauxhall, London, 1858, in very humble circumstances; attended school until he was ten, when he entered a candle-factory. He afterward apprenticed himself to an engineer at Millbank, and worked as foreman engineer for twelve months on the Niger in West Africa. On his return he made a six-months tour through Europe. During his youth he was an omnivorous reader, and is said to have imbibed his socialistic theories from a Frenchman who was employed in the same shop with him. He addressed audiences of workingmen for years, and was probably the most prominent labor agitator in Great Britain. In 1885 he was the socialist candidate for Parliament for the western division of Nottingham, but was defeated. He was prominent in the agitation of the unemployed in 1886. In 1887 he contested the right of public meeting in Trafalgar Square, and suffered six weeks' imprisonment for resisting the police. During the great dock strikes in London (Aug. 15, 1889–Sept. 14, 1889) he was one of the most influential leaders of the strikers, and was a member of the Mansion House committee of conciliation which brought about the settlement of the difficulties and the end of the strike. He was also prominent in the Scotch railway strike in 1891. Mr. Burns is a member of the London County Council, and was elected (July 6, 1892) a member of Parliament for Battersea. His sincerity and ability are unquestioned. C. H. Thurber.

Burns, Robert: the national poet of Scotland; b. near the town of Ayr, Jan. 25, 1759. His father was a yeoman farmer. Although his life seems to have been one long struggle with misfortune, Burns's father was at great pains to give his children a good education. When he was able he sent them to school; and not unfrequently when the day's work was ended he taught his children himself. Burns was early familiarized with those trials and hardships to which the poor are so often exposed, and to which he sometimes alludes with such power and pathos in his poetry. The poet had a robust frame and active body, as well as a strong intellect and acute sensibilities. He is said to have done at the age of fifteen the work of a man.

In the case of Burns, as in that of Sappho, it was love that taught him song. A little before he reached his sixteenth year he "first committed the sin of rhyme." A "bonnie, sweet sonsie lass" had been associated with him in the labors of the harvest-field. Her singing "made his heart-strings thrill like an Æolian harp," and first inspired him with the idea of writing songs. An irresistible attraction toward what he calls the "adorable half of the human species" was perhaps his most remarkable characteristic: and hence it was as an amatory poet that he was especially distinguished, though patriotism, friendship, conviviality, and the rural life of the Scotch peasantry are constant motives in his poetry. Unhappily, this remarkable susceptibility to the tender passion degenerated, under the influence of evil company, from its first purity, and led him into illicit amours, which were the cause of his principal misfortunes. In proportion as he cast off the restraints of morality, he seems to have lost his reverence for religion. With his other faults and vices, intemperance went hand in hand. But he had too much sense of right and too much feeling to be able to drown altogether the reproving voice of conscience.

He had formed in 1785 a *liaison* (which was, according to the usage of Scotland, virtually a marriage) with Jean Armour, a person somewhat above his own position in life. She bore him twins, and although he had previously given her a written acknowledgment of marriage her father was greatly incensed against the poet, so that he determined to leave Scotland and seek his fortune in the New World. But before quitting his native country forever, he resolved (1786) to publish his poems. The success of the experiment induced him to change his plans. He was encouraged to visit Edinburgh, where he made the acquaintance of many men at that time distinguished in literature, including Dugald Stewart and Dr. Blair, besides many others. It was during Burns's visit to the capital that Scott, then a very young man, had an opportunity of beholding and listening to the gifted stranger. He has left a very interesting account of Burns's appearance.

Among men of rank who interested themselves in the poet, Lord Glencairn was especially prominent. Burns always remembered his kindness with the most heartfelt gratitude, and afterward dedicated to his memory the beautiful and touching lines entitled the *Lament for James, Earl of Glencairn*. Soon after his visit to Edinburgh he published (1787) a new edition of his poems. In 1788 he openly declared his marriage with Jean Armour, and about this time was appointed an officer of the excise, with a salary of £50 a year; it was subsequently increased to £75. His intemperate habits, which had been aggravated by the excitement and irregularities of his recent life in Edinburgh, and his subsequent pecuniary distresses gradually gained a great ascendency over him, but rarely if ever to the extent of rendering him incapable of performing the duties of his office. He removed in 1791 to Dumfries, where he passed the remainder of his life. D. July 21, 1796. Nearly twenty years after his death a splendid mausoleum was erected to his memory in the churchyard at Dumfries, whither his remains were removed on June 5, 1815. See Lockhart's *Life of Burns* (1828); Currie's *Life of Burns*, prefixed to the *Correspondence* of the poet; A. Cunningham, *Life and Land of Robert Burns* (1840); Carlyle, *Miscellanies*; a *Life*, by Principal J. C. Shairp, in the English Men of Letters Series; and the complete collection of his works (1877–82, 7 vols.) by Douglas and Nichol.

Burns, Robert Ferrier, D. D.: Canadian clergyman; b. in Paisley, Scotland, Dec. 23, 1826; educated at Glasgow University and at New College, Edinburgh; removed to Canada in 1845, completing his course at Knox College, Toronto. Previous to his appointment as pastor of the Fort Massey Presbyterian church, Halifax, in 1875, he held pastorates in Kingston, St. Catherines, Chicago, and Montreal, in the order named. He was a delegate to the Pan-Presbyterian Council held at Philadelphia in 1880, and to that held at Belfast in 1884. Among his published works are *Maple Leaves for Grave of Lincoln* (St. Catherines, 1865); *Maine Law* (Halifax, 1875); *Modern Babylon* (1876); and *Confession and Absolution* (1883). His father, Robert Burns, D. D., was Professor of Church History and Apologetics in Knox College, and was the most distinguished minister of his time in Canada. Neil Macdonald.

Burns, William Wallace: general; b. in Coshocton, O., Sept. 3, 1825; graduated at West Point in 1847; became a brigadier-general of volunteers in 1861; major-general volunteers in 1862; and brevet brigadier-general U. S. army in 1865. He served in the Army of the Potomac until 1863. Reverting to his position as an officer in the subsistence department he served until Sept. 19, 1889, when he retired for age with the rank of colonel. D. suddenly at Beaufort, S. C., Apr. 19, 1892.

Burns and Scalds: in *medicine*, injuries caused by dry heat (burns), or by moist heat, such as that of hot water or steam (scalds). In both cases the results are quite similar. Various degrees of burns are described according to the depth to which the injury penetrates. Thus in cases of the first degree there may be merely redness and slight inflammation of the skin. In those of the second, third, or higher degrees the skin is destroyed, and the underlying tissue and muscles are implicated. Where large parts of the body exceeding half of the whole surface are involved death is almost inevitable. The immediate effect of the burn is great shock, followed by complete collapse if relief is not afforded. Occasionally disturbances of internal structures results from extensive burns, as, for instance, ulceration in the duodenum or Bright's disease.

The treatment consists in the application of soothing lotions or ointments, the use of anodynes for the pain, and stimulants in case of threatened collapse. A mixture of lime-water and sweet oil, which is generally known by the name of Carron-oil, is very useful. In slight burns the pain may be relieved by dusting baking-soda upon the surface.

W. P.

Burnside, Ambrose Everett: military officer and Governor; b. in Liberty, Ind., May 23, 1824; graduated at West Point 1847; as lieutenant of artillery served in war with Mexico 1847–48; on frontier duty in New Mexico 1849–50, engaged with Jacarillo Apaches (wounded); with Mexican boundary commission 1851–52; resigned Oct. 2, 1853; manufacturer at Bristol, R. I., 1853–58, of breech-loading rifles, which he had invented; cashier of land department Illinois Central R. R. Company 1858–59; treasurer Illinois Central R. R. Company 1860–61. In the civil war, as colonel of Rhode Island three-months volunteers, he served in Maj.-Gen. Patterson's operations about Cumberland, Md., and in the Manassas campaign, 1861, was engaged at Bull Run. Appointed brigadier-general U. S. volunteers, Aug. 6, 1861, and promoted to major-general May 18, 1862; he served in organizing the coast division and in command of department of North Carolina 1862; engaged at Roanoke island, Newbern, Camden, and Fort Macon; in command of Ninth Army-corps at Newport News and Fredericksburg 1862; in Maryland campaign engaged at South Mountain and Antietam, in command of left wing; in general charge of Harper's Ferry 1862; in command of Army of Potomac Nov. 7, 1862, to Jan. 28, 1863; defeated at Fredericksburg; in command of department of Ohio 1863; engaged against Morgan's raiders; captured Cumberland Gap; occupied East Tennessee after several actions and sustained a siege at Knoxville; in command of Ninth Corps in Richmond campaign 1864; engaged at Wilderness, Spottsylvania, North Anna, Tolopotomy, Bethesda Church, and Petersburg, including mine assault; resigned Apr. 15, 1865, from volunteer service. Civil engineer 1865–66; president of Cincinnati and Martinsville R. R. Company in 1865; of Rhode Island Locomotive Works in 1866, and of Indianapolis and Vincennes R. R. Company in 1867; Governor of the State of Rhode Island 1866–69. He was elected U. S. Senator from Rhode Island in 1875, and re-elected in 1880. D. in Bristol, R. I., Sept. 13, 1881.

Burnt Offerings: See Sacrifice.

Burnt Sienna: a pigment made by heating raw sienna to a high temperature. Raw sienna occurs in nature, and owes its color to the presence of compounds of iron. Both pigments are used in oil, water, and fresco.

Burnt Umber: a pigment made by heating raw umber to a high temperature. Umber was formerly obtained from Umbra, in the Papal States, whence its name. It is a compound of silica, iron, and manganese. Burnt umber is used in oil and water colors, and is highly valued.

Bur Oak, or **Burr Oak** (*Quercus macrocarpa*): a species of oak of medium size found in the U. S., principally E. of the Rocky Mountains. It is also called over-cup oak and mossy-cup oak. Its timber is valuable.

Burr, Aaron: scholar; father of the Vice-President; b. in Fairfield, Conn., Jan. 4, 1716; graduated at Yale in 1735; licensed to preach in 1736; settled over the Presbyterian church in Newark, N. J., in 1738; chosen president of the College of New Jersey, Princeton, N. J., in 1748; d. there Sept. 24, 1757. In 1752 he married Esther, daughter of the elder President Edwards. She died Apr. 7, 1758, in the twenty-seventh year of her age. They left two children—a daughter, who married Hon. Tapping Reeve, chief justice of the Supreme Court of Connecticut, and a son, Aaron, noticed below. Dr. Burr was a scholarly and eloquent man. He published a Latin grammar (1752) known as *The Newark Grammar*; a pamphlet on *The Supreme Divinity of our Lord Jesus Christ*, reprinted in 1791, and several discourses.

Burr, Aaron: politician and Vice-President of the U. S.; b. in Newark, N. J., Feb. 6, 1756; son of the preceding; graduated at Princeton in 1772; joined the provincial army at Cambridge, Mass., in 1775; served as a private soldier, and afterward as aid to Montgomery on the Quebec expedition; served on the staffs of Arnold, Washington (whom he disliked), and Putnam, becoming a lieutenant-colonel, and commanding a brigade at Monmouth. He resigned from the army by reason of ill-health in 1779; practiced law at Albany in 1782, and in New York city in 1783; became Attorney-General of New York in 1789; was a Republican U. S. Senator 1791–97. In 1800 he and Jefferson each had seventy-three electoral votes for the office of President of the U. S. The choice was thus left to Congress, which, on the thirty-sixth ballot, chose Jefferson for President and Burr for Vice-President. In 1804 he mortally wounded in a duel his rival Alexander Hamilton, and in consequence lost greatly in political and social influence, and soon after embarked in a wild attempt upon Mexico and, as was asserted, upon the southwestern territories of the U. S., thereby involving in ruin his friend Blennerhassett. He was in 1807 tried at Richmond, Va., on a charge of treason, but was acquitted. To escape his creditors he retired to Europe for a time, but returned to New York in 1812, and again practiced law. D. on Staten Island, Sept. 14, 1836. Burr was a man of much ability and very brilliant and popular talents, but his influence was destroyed by his unscrupulous political acts and his grossly immoral conduct in private life. See his *Life*, by M. L. Davis (1836–37); by James Parton (1857).

Burr, Enoch Fitch: mathematical and religious author; b. at Green's Farms, Fairfield, Conn., Oct. 21, 1818; graduated at Yale in 1839; spent several years in New Haven in scientific and other studies; was settled over the Congregational church in Lyme, Conn., in 1850. Since 1868 he has been a lecturer on the Evidences of Religion at Amherst College. He has published, among other works, *A Treatise on the Application of the Calculus to the Theory of Neptune* (New Haven, 1848); *Ecce Cœlum* (1867); *Pater Mundi* (1870); *Doctrine of Evolution* (1873); *A Song of the Sea* (an illustrated poem, 1873); *The Voyage* (1874); *Dio the Athenian* (1881); *Celestial Empires* (1885); *Universal Beliefs* (1887); *Long Ago* (1888); *Practical Relations* (1889); *Aleph, the Chaldean* (1891).

Burr, George Lincoln, A. B.: professor of history: b. at Oramel, N. Y., Jan. 30, 1857; educated at Cortland Academy, Cornell University, universities of Leipzig and Zurich, and the Sorbonne and the École des Chartes, Paris; instructor in History, Cornell University, 1881–84; engaged in historical study and research, mainly abroad, 1884–88; librarian of the President White Library, Cornell University, since 1878; Professor of Ancient and Mediæval History, Cornell University, 1892; author of *The Literature of Witchcraft* (New York, 1890); *The Fate of Dietrich Flade* (New York, 1891); *Charlemagne* (Heroes of History Series); and various magazine articles and reviews.

Burr, Jonathan Kelsey, D. D.: minister of the M. E. Church; b. at Middletown, Conn., Sept. 21, 1825; educated at Wesleyan University; filled some of the most important pulpits in the Newark and New Jersey conferences; author of *Commentary on the Book of Job*; and articles on *Incarnation* and *Krishna* in *McClintock and Strong's Biblical Cyclopædia*; member of the American Committee of Revision of the New Testament. D. at Trenton, N. J., Apr. 24, 1882.

Burr, William Hubert: civil engineer; b. in Watertown, Conn., July 14, 1851; graduated in 1872 at Rensselaer Polytechnic Institute, Troy, N. Y.; was Professor of Ra-

tional and Technical Mechanics at Rensselaer Polytechnic Institute 1876–84; engineer of construction and general manager of the Phœnix Bridge Company 1884–91; vice-president of Sooysmith & Co., contracting engineers, 1891–92. In Jan., 1893, he was appointed Professor of Civil Engineering in Columbia College, New York city. He is the author of *Stresses in Bridge and Roof Trusses, Arched Ribs and Suspension Bridges* (New York, 1879); *The Theory of the Masonry Arch* (1881); and *The Elasticity and Resistance of the Materials of Engineering* (1883).

Bur'rage, Henry Sweetser, D. D. (Brown Univ., 1883): Baptist minister and author; b. at Fitchburg, Mass., Jan. 7, 1837; graduated at Brown University 1861, at Newton Theological Institution 1867; studied at the University of Halle 1868–69; pastor of a church in Waterville, Me., 1870–73; editor of *Zion's Advocate*, Portland, Me., since 1873. Besides a large number of review articles and historical papers, Dr. Burrage published the following works: *The Act of Baptism in the History of the Christian Church* (Philadelphia, 1879); *History of the Anabaptists in Switzerland* (Philadelphia, 1883); *Baptist Hymn-writers and their Hymns* (Portland, 1888). In addition, Dr. Burrage has edited the following: *Brown University in the Civil War* (Providence, 1868); Rosier's *Relation of Waymouth's Voyage to the Coast of Maine, 1605, Gorges's Society* (Portland, 1887).

Burrampooter: See Brahmapûtra.

Burrard Inlet: narrow inlet in the southwest corner of British Columbia; 9 miles long; forms one of the best harbors on the Pacific coast. On its south shore is Vancouver, the western terminus of the Canadian Pacific R. R.

Burriana, boor-ri-aa'nă: a town of Spain; province of Castellon de la Plana; on the Rio Seco; near the Mediterranean (see map of Spain, ref. 16–I). It exports wine, oil, and fruit. Pop. 10,000.

Bur'rill, Thomas Jonathan, Ph. D.: botanist; b. at Pittsfield, Mass., Apr. 25, 1839; Professor of Botany in University of Illinois; published many reports and papers, principally on fungi. The more important are: *The Bacteria* (1882); *Parasitic Fungi of Illinois* (1885–87).

Charles E. Bessey.

Bur'ritt, Elihu: reformer and linguist; called The Learned Blacksmith; b. in New Britain, Conn., Dec. 8, 1811. He worked for many years at the trade of a blacksmith, and became a self-taught master of many ancient and modern languages. As a public lecturer he advocated temperance and peace in the U. S. and in England. Among his works are *Sparks from the Anvil* (London, 1848); *Thoughts on Things at Home and Abroad* (Boston, 1854); *Walk from John o'Groat's to Land's End* (London, 1864); *Walks in the Black Country* (1868); *Chips from Many Blocks* (1878). D. in New Britain, Conn., Mar. 7, 1879. See his *Life*, by Charles Northend (New York, 1879).

Burr Oak: See Bur Oak.

Bur'roughs, George: the only clerical victim of the Salem witchcraft delusion; b. about 1650; graduated at Harvard College in 1670; was a preacher in Falmouth (now Portland), Me., in 1676, and in Salem, Mass., 1680. In 1683 he went back to Falmouth, where he remained until the Indians sacked the town in 1690; returning to Salem, he was accused in 1692 of witchcraft, placed on trial, and, owing to the infatuation then prevailing, was declared guilty of exercising diabolical powers, and executed Aug. 19, 1692. At the scene of execution he declared his innocence, his appeal moving the spectators to tears; and though he repeated the Lord's Prayer, which no witch was supposed to be able to do without mistake, he was doomed to suffer.

Burroughs, John: essayist; b. in Roxbury, N. Y., Apr. 3, 1837. From 1863 to 1872 he was in the Treasury Department at Washington, and then a national bank examiner. Since 1873 he has resided at West Park on the Hudson, and has published many volumes of out-door papers, such as *Winter Sunshine* (1875); *Birds and Poets* (1877); *Locusts and Wild Honey* (1879); *Pepacton* (1881); *Fresh Fields* (1884); *Signs and Seasons* (1886). His sympathy with animal life is expressed in a charming style.

Henry A. Beers.

Burrowing Owl, called also **Coquimbo Owl**: a remarkable bird (*Speotyto cunicularia*), which, "disdaining all the traditions of its family," hunts for its prey (consisting chiefly of beetles and other insects) in broad daylight, facing the glare of the noonday sun without any inconvenience. It is a small, lively bird, and is found in many parts of America, being especially abundant W. of the Mississippi, and inhab-

Burrowing owls.

iting the same localities as the marmot (or prairie dog), whose dwelling it often shares, the rattlesnake sometimes also occupying the same abandoned burrows. Although the burrowing owl prefers to dwell in the holes already excavated by the prairie dog, it will, if obliged to do so, dig burrows for itself; but these are not so deep or so neatly made.

Revised by D. S. Jordan.

Bur'rows, William: a naval officer; b. near Philadelphia, Pa., Oct. 6, 1785. He entered the navy at the age of fourteen; served on the Barbary coast; on the outbreak of war with Great Britain (1812), while on his way to the U. S., he was taken prisoner. He reached home in June, 1813, and immediately resumed his duty. He commanded the brig Enterprise in an engagement with the British brig Boxer off Portland, Me., Sept. 5, 1813, during which he was mortally wounded. He lived, however, long enough to receive the surrender of the British vessel. His remains were interred in Portland by the side of Blythe (*q. v.*), the commander of the Boxer, who was also killed in the same action.

Burrstone, or **Buhrstone**: a cellular siliceous rock of fine texture, used for millstones. The siliceous material does not consist of grains cemented together as in sandstones, but appears to have been deposited from solution, either chemically or through the agency of minute organisms. The cavities giving the cellular structure are molds of small shells, shell fragments, or seeds which were dissolved out after the formation of the rock. Burrstone has been obtained from Eocene formations of France, Belgium, North Carolina, and Alabama. Its value for the grinding of grain depends on its open texture, which prevents the surface from becoming smooth by wear. The best grades are usually found only in small pieces, and a number of these are combined to make a millstone. They are fitted together, set in a matrix of plaster of Paris or other cement, and the whole bound with an iron hoop. Since the introduction of the roller process in flouring-mills the use of burrstone has diminished. The American quarries are not now worked, and the value of imported stones fell from a maximum of $125,000 in 1880 to about $18,000 in 1894. Certain standstones quarried in New York, Pennsylvania, Virginia, etc., are commercially known as burrstones, and these are still used for the grinding of the coarser grains.

Bursian, boor'si-an, Conrad: archæologist and classical philologist; b. in Mützschen, Saxony, Nov. 14, 1830; took his degree in Leipzig in 1852. After traveling in Greece and Italy for a number of years, he occupied professorships in Leipzig, Tübingen, Zurich, Jena, and finally in Munich, where he died Sept. 21, 1883. Among the most valuable of his numerous publications may be mentioned *Seneca Rhetor* (Leipzig, 1857); *Geography of Greece* (2 vols., 1867–72); *History of Classical Philology in Germany* (1883). He is also the author of excellent reports on the history of philology in the *Jahresberichte über die Fortschritte der classischen Alterthumswissenschaft*, of which he was the founder and editor. For an account of his life and a complete list of his writings, see *Biograph. Jahrbuch*, vi. (1883), p. 1–11.

Alfred Gudeman.

Burs'lem: a market-town of Staffordshire, England; 2¼ miles N. W. of Newcastle-under-Lyne; on an eminence near

the Trent Canal (see map of England, ref. 8–G). The occupation of the inhabitants is earthenware manufacture, and it is the principal place in the district called the Potteries. Pop. (1891) 30,862.

Burt, Armistead: b. in Edgefield co., S. C.; received a liberal education; admitted to the bar in 1823; settled at Abbeville, where he practiced law until his death. He was member of Congress 1843–53; during part of the Thirtieth Congress acted as Speaker to the House of Representatives. He was an ardent secessionist, and a member of the State Legislature in 1865 which enacted "the Black Code." In 1876 he took an active part in the revolution which made Hampton Governor. Mr. Burt was one of the ablest advocates in the State. D. Oct. 30, 1883.

Burt, William A.: b. in Worcester, Mass., June 13, 1792; became a surveyor of Erie co., N. Y.; in 1824 removed to Michigan; surveyed Northern Michigan (1840–47), introducing important improvements in surveying. At the World's Fair in London, 1851, he obtained a medal for his solar compass. He was for a time judge in one of the Michigan State courts, and one of the originators of the canal at Sault Ste. Marie. D. Aug. 18, 1858.

Bur'ton, Asa, D. D.: b. in Stonington, Conn., Aug. 25, 1752; graduated at Dartmouth College in 1777; Jan. 19, 1779, was settled over the Congregational church in Thetford, Vt., 1779, where he died May 1, 1836. He was the champion of the so-called "Taste scheme," in opposition to the "Exercise scheme" of Dr. Emmons, and conducted the controversy with great ability. Besides occasional sermons, he published at Portland, Me., in 1824, a volume of *Essays on Some of the First Principles of Metaphysics, Ethics, and Theology*. See his memoir by Thomas Adams.

Burton, Sir Frederick William, LL. D., R. H. A., F. S. A.: artist; b. in Ireland, 1816; educated in Dublin; from 1851 till 1858 was in Munich and Nuremberg. He exhibited often in London at the Royal Academy and at the Dudley Gallery. From 1874 he was director of the National Gallery. D. Mar. 16, 1900.

Burton, John Hill, LL. D., F. R. S. E.: historian and advocate; b. in Aberdeen, Scotland, Aug. 22, 1809; published, besides antiquarian books on Scotch law and history, *The Life and Correspondence of David Hume* (2 vols., 1846); *Political and Social Economy* (1849); and *The History of Scotland from Agricola's Invasion to the Revolution of 1688* (1867), which is highly esteemed; a *History of Queen Anne's Reign* (1881); and *The Book Hunter* (2d ed. 1882). D. near Edinburgh, Aug. 10, 1881.

Burton, Nathaniel Judson, D. D.: Congregationalist; b. at Trumbull, Conn., Dec. 17, 1824; graduated at Wesleyan University, Middletown, Conn., 1850, and at the Yale Divinity School, New Haven, Conn., 1853; pastor at Fair Haven, Conn., 1853–57; at the Fourth Congregational church, Hartford, Conn., 1857–70; the Park church, Hartford, Conn., from 1870 until his death there Oct. 13, 1887. Since his death a volume of his Yale lectures on preaching has been published. George P. Fisher.

Burton, Capt. Sir Richard Francis: traveler and Orientalist; b. in Hertfordshire, England, of Scottish parentage, Mar. 19, 1821. Having served many years in the East Indian army, he published in 1851 *Sindh, and the Races that Inhabit the Valley of the Indus*. Disguised as a Mussulman he performed a perilous exploration of Arabia in 1853, and published a *Personal Narrative of a Pilgrimage to El Medinah and Meccah* (3 vols., 1856). He served in British consulates from 1861 until his death, chiefly in the countries of which he wrote. He also undertook extensive explorations in Central Africa, along the Congo, in the highlands of Brazil, etc., and published *The Lake Regions of Central Africa* (1860); *The Highlands of Brazil* (2 vols., 1869); *Zanzibar* (2 vols., 1872); *Two Trips to Gorilla Land and the Cataracts of the Congo* (1875); *The Gold Mines of Midian* (1878); *The Gold Coast* (1882). Capt. Burton's works, which number nearly fifty volumes, include, besides travels and grammars of several East Indian dialects, versions of the poems of Camoëns, and an important translation of the *Arabian Nights* (1885–88, 16 vols). D. in Trieste, Oct. 20, 1890. See his *Early Private and Public Life*, by F. Hitchman (2 vols., London, 1887).

Burton, Robert: clergyman; b. at Lindley, in Leicestershire, England, Feb. 8, 1576; educated at Brazenose College, Oxford. He became vicar of St. Thomas's, in Oxford, 1616; after 1630 rector of Segrave, keeping both benefices until his death. He was author of a quaint and popular work entitled *The Anatomy of Melancholy; what it is, with all the Kinds, Causes, Symptoms, Prognostics, and several Cures of it: Philosophically, Medicinally, Historically Opened and Cut up, by Democritus Junior* (1621). It is an amusing medley of quotations and reflections made by a man of rare genius and learning. D. in Oxford, Jan. 25, 1640. There are many editions of the *Anatomy of Melancholy*, the sixth, which contains changes by the author, was published shortly after his death. There is a more modern edition, in 3 vols., in which the quotations are translated.

Burton, William Evans: comedian and writer; b. in London, Sept. 24, 1804. He acted with distinguished success both in Great Britain and in the U. S. While in the former country he wrote a drama, *Ellen Wareham*, which for a time enjoyed a great popularity. He compiled the *Cyclopædia of Wit and Humor*. He was also very successful as a manager. He built the National theater in Philadelphia, and in New York purchased Palmo's opera-house, and afterward the Metropolitan theater on Broadway. D. in New York, Feb. 10, 1860.

Burton-on-Trent: a town of England; in Staffordshire; on the river Trent; 11 miles by rail S. W. of Derby (see map of England, ref. 9–H). The Trent is here crossed by a stone bridge of 29 arches, which in 1864 replaced one of 36 arches, and 1,545 feet long, built before the Norman conquest. Burton has large breweries of celebrated ale; also iron-works and manufactures of cotton goods. It is on the Grand Trunk Canal. Pop. (1891) 46,047; (1901) 50,386.

Buru, **Bouro**, or **Booro**: an island of the Malay Archipelago; about 60 miles W. N. W. of Amboyna; between lat. 3° and 4° S., and between lon. 126° and 127° E. Area, estimated at 3,284 sq. miles. The surface is mountainous, but the soil is fertile. It contains Mt. Dome, which is said to be 10,400 feet high. Cajeli Bay, on the north side, affords good anchorage. Pop. about 20,000, mostly Malays and Alfuros.

Burugird', or **Booroogird**: a town of Persia; province of Irak-Ajemee; in a fertile valley; about 184 miles N. W. of Ispahan and 74 miles S. S. E. of Hamadan. It has a castle and several mosques. It has an extensive trade in cotton goods, of which it is said to export over $200,000 worth annually. Pop. about 20,000.

Bury, ber'ri: a manufacturing town of Lancashire, England; on the river Irwell; 10 miles by rail N. W. of Manchester (see map of England, ref. 7–G). It is on a railway which connects it with Bolton and Liverpool. It contains more than twenty churches and Dissenting chapels, several public libraries and literary institutions. Here are important manufactures of cotton and woolen goods, machinery, and paper, also calico-printing works and dye-works. Mines of coal and quarries of good freestone have been opened in the vicinity. Bury returns one member to Parliament. The eminent statesman Sir Robert Peel was born near here. Pop. (1891) 57,206; (1901) 58,028.

Burying-beetles: certain beetles of the order *Coleoptera* and family *Sylphidæ*; famous for their habits of interring the bodies of dead animals. When the carcass of a mouse or other small animal is found, several of them collect around it, and by digging the earth from beneath gradually sink it several inches below the surface. In it the female deposits her eggs, and when the larvæ are hatched they find themselves in the midst of suitable food.

Bury St. Edmunds, or **St. Edmundsbury**: an ancient borough of England; county of Suffolk; finely situated on the river Larke; 26 miles by rail N. W. of Ipswich and 95 miles by rail N. E. of London (see map of England, ref. 10–K). It is well built and remarkably clean. It has a botanic garden, a guildhall, a fine Gothic church (St. Mary's), a celebrated grammar school founded in 1550, and some remains of a large Benedictine abbey (505 feet by 212), which was founded by Canute, and became the richest (except one) in England. Here is an old belfry or quadrangular tower about 85 feet high, which is one of the finest remains of Saxon architecture extant in Britain. Parliaments were held here in 1272, 1296, and 1446. Bury has a large trade in wool, butter, grain, and cheese. It returns one member to Parliament. Sir Nicholas Bacon was born here. Pop. (1891) 16,630.

Bus'becq, or **Busbecq**, Augier Ghislen, de (Lat. *Busbequius*): Flemish scholar and traveler; b. at Commines in 1522. He was employed on several important diplomatic missions, and was sent as ambassador from the Emperor

Ferdinand to Solyman II. of Turkey. He wrote a valuable account of this embassy, entitled *Legationis Turcicæ Epistolæ Quatuor* (1589). D. near Rouen, Oct. 28, 1592. See Forster and Daniel, *Life and Letters of Ogier Ghiselin de Busbecq* (London, 1880).

Busby, bŭz'bi, Dr. Richard: a famous schoolmaster; b. at Lutton, Northamptonshire, England, Sept. 22, 1606. He was head master of Westminster School for about fifty-six years (1640–95); was a very successful teacher and a strict disciplinarian. He is said to have educated a larger number of eminent men than any other teacher who ever lived. D. Apr. 6, 1695.

Büsch'ing, Anton Friedrich: geographer; b. in Schaumburg-Lippe, Germany, Sept. 27, 1724. He became in 1761 minister of a Protestant congregation in St. Petersburg; in 1766 removed to Berlin, where he was employed as director of a gymnasium; published a *Description of the Earth* (1754), which was the most complete work on geography that had then appeared; also a *Magazine of History and Geography* (25 vols., 1767–93). D. in Berlin, May 22, 1793.

Busen'to (in Gr. Πυξοῦς; Lat. *Buxentum*): a river of Italy; in the province of Salerno; empties into the Gulf of Busento at the city of Policastro. Upon the death of Alaric, the Visigoth king, his followers turned the course of the river, and after having buried him again led the river into its old course, thus covering all trace of Alaric's grave from the eyes of his enemies.

Bush, George: biblical scholar; b. in Norwich, Vt., June 12, 1796; graduated at Dartmouth College in 1818; studied at Princeton Theological Seminary 1820–22, in the same class with Albert Barnes; from 1824 to 1829 was pastor of a Presbyterian church in Indianapolis, Ind. He became in 1831 Professor of Hebrew and Oriental Literature in the University of New York; was converted to the doctrines of Swedenborg in 1847; left his professorship and was pastor of a New Church Society in New York 1848–52; stated supply of one in Brooklyn, N. Y., 1854–59. Among his works are a *Life of Mohammed* (New York, 1832); a *Hebrew Grammar* (1835); and *Bible Commentaries* (8 vols., 1840, *et seq.*). D. in Rochester, N. Y., Sept. 19, 1859. See his memoir by W. M. Fernald (Boston, 1860).

Bush-buck: See Bosch-bok.

Bushel (in Fr. *boisseau*): an English measure of capacity, containing 8 gal. or 4 pecks. Each gallon holds 10 lb. avoirdupois of distilled water, and measures 277·274 cubic inches; consequently the imperial bushel contains 80 lb. of distilled water, and is equal to 2,218·192 cubic inches. The old Winchester bushel contains 2,150·42 cubic inches. The State of New York, by statute of 1829, adopted the imperial bushel, but in the revised statutes of 1851 this was abolished and the Winchester bushel substituted. By law in some parts of the U. S., and in commercial usage, a bushel of grain and of other staple commodities is reckoned in pounds avoirdupois; a bushel of wheat has 52 lb. weight. See Gallon.

Bushire, or **Aboo-shehr**: a seaport of Persia; on the Persian Gulf; about 120 miles W. S. W. of Sheeraz; lat. 29° N., lon. 50° 50′ E. It is at the northern extremity of a sandy peninsula, and is the principal commercial emporium on the coast of Persia. The anchorage, which is the best on the coast, consists of an outer harbor, exposed to the N. W. winds, and a safe inner harbor. It has a large trade with British India, from which it imports rice, indigo, sugar, and English cotton goods. The chief articles of export are raw silk, shawls, horses, carpets, silk goods, grain, Sheeraz wine, pearls, dried fruits, etc. Pop. 27,000.

Bushmen, or **Bosjesmans**, bosh'ez-manz: a name given to some roaming tribes of savages who live in Southern Africa, along the Orange river. They are similar to the Hottentots; are very diminutive in stature, and of a dark-brown complexion. They build no houses and have no tents. They are malicious and intractable, and live by hunting and robbery.

Bush'nell: a city; McDonough co., Ill. (for location of county, see map of Illinois, ref. 5–C); on Chic., Bur. and Quincy and Tol., Peoria and West. R. Rs.; 70 miles N. of Quincy and 192 miles S. W. of Chicago. There are here good public schools, a normal college, manufactories of pumps, small hardware, and fine brick. The city has waterworks and electric lights. The city is situated in the midst of a high, rich, prairie agricultural district, and has ample supplies of timber and coal. Pop. (1880) 2,316; (1890) 2,314; (1900) 2,490. Publisher of "Record."

Bushnell, Horace, D. D., LL. D.: Congregational minister; b. in Litchfield, Conn., Apr. 14, 1802; graduated at Yale College in 1827; was tutor from 1829–31. Having previously studied law, he turned to theology, and was settled over the North church in Hartford, Conn., from 1833–59, when the failure of his health compelled him to resign his pastorate, though he was still able to do literary work and to preach occasionally. He was distinguished for the originality and boldness of his thinking, and for the brilliancy and vigor of his style. Among his published works are a Phi Beta Kappa oration in 1837 on *The Principles of National Greatness*; *Christian Nurture* (Hartford, Conn., 1847; n. e. New York, 1860); *God in Christ* (Hartford, Conn., 1849); *Nature and the Supernatural* (New York, 1858); *The Vicarious Sacrifice* (1865; revised in 1873); *Forgiveness and Law* (1874). He was also the author of numerous discourses and essays on theological and literary themes, all of which have the stamp of genius. His select works were published in New York in eight volumes (1876–77), and in 1881 three additional volumes of *Miscellanies* from his pen were issued. He exerted a stimulating and widely extended influence in the field of religious thought. He was one of the most attractive preachers of his day. With a vivid imagination and talents for speculation, he combined singular practical good-sense in every-day affairs. See his memoir by his daughter (New York, 1880). D. in Hartford, Conn., Feb. 17, 1876.

Revised by George P. Fisher.

Bushwhackers (in the language of the U. S. civil war) were those men who rarely or never wore a uniform, and claimed to be peaceful farmers or herdsmen when in presence of a superior hostile force, but had firearms concealed at a convenient distance, and did not scruple to use them on any opportunity to pick off from an ambush a soldier while he was moving in fancied security. Bushwhackers were especially murderous in Missouri, and were often treated, when they were captured, with unrelenting severity.

Business Colleges: schools in which young men and women are trained for business careers. Commercial teaching was first attempted in the U. S. in private schools established for the purpose. These have grown from scattered schools of little repute, for instruction in bookkeeping, writing, and arithmetic, to well-organized institutions, with courses adapted to training their pupils for every department of business activity. The time of study necessary for graduation in the business colleges of the U. S. is from four to twenty-five months in day courses and from four to thirty-six months in evening courses. The demand for stenographers and typewriters has much increased the attendance on the business colleges. Most of the colleges give the student practical knowledge of how business is transacted in the large cities in banking, insurance, real estate, and commercial houses, by means of the college bank, college jobbing-house, etc. The student is required to act as cashier, paying teller, receiving teller, shipping clerk, salesman, and bookkeeper. He buys, sells, makes deposits, draws checks, and sustains in general the same relation to the college bank and jobbing-house that the merchant has in the outside world. Commercial law, commercial calculations, and frequently the tariff laws of different nations, also form a part of the course. According to the annual report of the U. S. commissioner of education for the school year 1898–99, there were 320 business colleges, which had 1,781 instructors, 70,186 students (of whom 56,109 attended day schools and 14,077 attended evening schools), and 16,204 graduates of the year. The importance of commercial training has become so generally recognized that business courses are now provided in the regular systems of public education in many countries. The addition of such a course to the curricula of the higher public primary schools has been indorsed at several international educational congresses, notably at Paris in 1889. In 1898–99 there were 61,332 students in the commercial departments of city, normal, and secondary schools and colleges in the U. S. C. H. Thurber.

Busi'ris (in Gr. Βούσιρις): in Greek mythology, a fabulous personage; supposed to have been a son of Neptune, and a King of Egypt, who sacrificed all the foreigners entering his dominions, and was killed by Hercules.

Busken-Huet, Conrad: See Huet, Conrad Busken.

Buskin: a covering for the leg or for the ankle and foot; a shoe reaching up to the middle of the calf and tightly laced. The word buskin is used by English writers as a translation of Latin *cothurnus*, which was a high shoe worn by ancient tragic actors, and had thick cork soles. The term is also used to denote the tragic drama or tragic style, having been used in contradistinction to *soccus*, a sock or flat-soled shoe worn by comedians.

Bussang (also **Boossa**): a town of Central Africa; in the Sudan; on an island in the Niger; lat. 10° 14′ N., lon. 6° 11′ E. It is inclosed by a wall, and is within the limits of the British Niger protectorate. Pop. estimated at 12,000. Mungo Park died here.

Bus'sey, Benjamin: b. in Canton, Mass., Mar. 1, 1757; served in the Revolutionary army at Burgoyne's capture. He was a silversmith of Dedham, Mass., and afterward a very successful merchant of Boston. D. in Roxbury, Mass., Jan. 13, 1842, leaving $350,000 to Harvard University, half to found the Bussey School of Agriculture, and half to sustain the Law and Divinity Schools.

Busson, büs'sōṅ', Charles: landscape-painter; b. at Montoire, Loir-et-Cher, France, July 15, 1822; pupil of Rémond and of Français; first-class medal, Paris Exposition, 1878; officer of the Legion of Honor 1887. His work belongs to the style of the school founded on Poussin, and has little in common with modern landscape-painting as interpreted by the masters of the "Fontainebleau group" and their followers. It is not without dignity, and is sincere and more notable for composition than for actual truth to nature. William A. Coffin.

Bus'su Palm: the *Manicaria saccifera*, of the family *Palmaceæ*; a tree 15 to 20 feet high, with large, rigid, sub-erect leaves, which are at first entire. It is a native of the lower Amazon region. The large leaves are used by the natives of the region in building their huts, while the spathes are easily transformed into receptacles for containing food or other articles. The fruits have no economic value. This palm is related to the toddy-palm (*Caryota*), piassabe-palm (Attalea, *q. v.*), and Cocoanut (*q. v.*), with which it is associated in the sub-family *Ceroxylinæ*. It has long been grown in conservatories. See Palm Family. C. E. B.

Bust (in Ital. *busto*; Fr. *buste*): a sculptured representation of the head and upper part of the human body. Those made by the Greek sculptors are generally worked in the upper part of an upright block of stone or marble, usually of the height of a person of proportionate stature. The busts of later times are sometimes the complete representation of the head and body down to the line where it is cut off evenly; but more often they consist of the head and shoulders only, raised upon a somewhat ornamental base or foot. Portrait busts were extremely common under the Roman empire, and again in the fifteenth and sixteenth centuries. Russell Sturgis.

Bustamente, boos-ta-men'te, Anastasio: Mexican revolutionist and statesman; b. at Tiquilpan, province, now state, of Michoacan, July 27, 1780. He entered the Spanish army as a subaltern officer in 1808, and in the first struggles fought against the revolutionists; but in 1821 he joined Iturbide, commanded a division in the march on Mexico, and was a member of the provisional junta before Iturbide was declared emperor. With the fall of that chief (1822) he was sent for a time into retirement; but in 1829 he was elected vice-president in the Guerrero administration, and commanded the army. After a few months he revolted against Guerrero, heading the Centralist party, which aimed to overturn the federal form of government. The success of this movement made Bustamente acting president of Mexico in 1830. In 1832 Santa Anna headed a revolt against him; in the war which followed Bustamente personally led his troops in several actions, but was finally beaten and forced to resign; he was imprisoned, and in 1833 banished. The capture of Santa Anna in the Texas war (1836) brought the Centralists again into power; they called Bustamente back, and in 1837 he was elected president of Mexico. During his administration there was a brief war with France (1838), and disorders which broke out in 1840 finally forced Bustamente to give up the presidency to Santa Anna (1842). He traveled for some time, but returned to take part in the war with the U. S., and served with the army until 1848. D. at San Miguel Allende, Feb. 6, 1853.
Herbert H. Smith.

Bustamènte, Carlos Maria, de: Mexican politician and historian; b. in Mexico city in 1774. He studied law, became an advocate in 1801, and was editor of the *Diario de Méjico* from 1805. Taking part in the earlier revolutionary movements, he commanded a regiment under Morelos (1812), was captured and imprisoned at Vera Cruz; released by Santa Anna, he marched with him to the capital (1821). From this time he took a prominent part in political life, being member of congress, holding various offices, and writing so boldly that he was several times imprisoned. In the intervals he published various historical works on the war of independence and the subsequent period. As he was an eyewitness, and a fluent and careful writer, his works are of great value. Among them are *Cuadro historico de la Revolución de la América Méjicana* (1823–32, 6 vols.); *Historia del emperador Agustin de Iturbide*; and *Historia del gobierno del jeneral Santa Anna*. D. at Mexico, Sept. 21, 1848. Herbert H. Smith.

Bustard: a bird of the genus *Otis* and order *Grallæ*. The bustards have three toes, which are all directed forward, long naked legs, and bills of moderate length. They are mostly inhabitants of open plains, to which all their habits are adapted. Although they are capable of flying, they often endeavor to escape from danger by running. The great bustard (*Otis tarda*) is the largest of European land birds, and sometimes weighs 30 lb. It is found in the eastern and southern parts of Europe, and abounds in the open plains or steppes of Tartary. The plumage is of a pale chestnut color on the upper parts, finely variegated with black. The wings are diversified with black and white, and the tail is tipped with white. The male has on each side of the chin or neck a tuft of feathers nearly 9 inches long, under which is a spot of naked skin, and in the throat a sac or pouch capable of holding 3 or 4 pints of water. Their flesh is highly esteemed as food. The little bustard (*Otis tetrax*) is common in Southern Europe and Northern Africa, and is not half so large as the *Otis tarda*. South Africa produces a species called *Otis kori*, or Kori bustard, which is 5 feet high or more, and is a noble-looking bird. Its flesh is good. Macqueen's bustard is a fine Asiatic bird. Several other bustards are known, all Old World species, except one, which is Australian.

Bus'to Arsiz'io: a town of Italy; province of Milan; 23 miles by rail N. W. of Milan; on a fertile plain (see map of Italy, ref. 2–B). It has several churches, one of which is adorned with fine old frescoes by Ferrari. Here are manufactures of cotton thread. Pop. 13,500.

Butcher, Samuel Henry, LL. D.: professor of Greek; b. in Dublin, Ireland, Apr. 16, 1850; educated at Marlborough College; fellow and assistant tutor at Trinity College, Cambridge, 1874–76; fellow and lecturer at University College, Oxford, until 1882; was then made Professor of Greek at Edinburgh University. Joint author of *Translation of the Odyssey* (1879); author of *Demosthenes* (1881); and his inaugural address, *What we owe to Greece* (1882).

Butcher-birds: the *Laniidæ*, or *Shrikes*. See Shrike.

Butcher's Broom (*Ruscus asuleatus*): a biennial evergreen plant of the family *Liliaceæ*; has a stem from 1 to 3 feet high, and ovate, alternate, sharp-pointed leaves. The fruit is a red berry nearly as large as a wild cherry. It is indigenous in the south of Europe, and is cultivated for ornamental purposes. The root is aperient and diuretic.

Bute: an island of Scotland; in the Frith of Clyde; separated from the mainland by a narrow strait called the Kyles of Bute, which is about a mile wide. The island is about 15 miles long, and has an area of nearly 60 sq. miles. The mildness of the climate renders it a favorite resort for invalids. The chief town is Rothesay. Here are Rothesay Castle (in the burgh of Rothesay), and Dunnagoil, a vitrified fort on the southwest coast. The seat of the Marquis of Bute, called Mountstuart House, is on the east coast.

Bute, or **Buteshire**: a county in the southwest part of Scotland; comprises the islands of Bute, Arran, the Cumbraes, Holy isle, Pladda, and Inchmarnock. Area about 225 sq. miles, or 143,977 acres, of which 22,966 are cultivated. Pop. (1891) 18,408; (1901) 18,659.

Bute, Marquesses of: Earls of Windsor and Viscounts Mountjoy (1796); Barons Mountstuart (1761); Barons Cardiff (1766, in Great Britain); Earls of Dumfries (1633); Earls of Bute (1703); Viscounts of Ayr (1622); Viscounts Kingairth, Lords Mountstuart, Cumbrae, and Inchmarnock (1703); Lords Crichton and Cumnock (1633); Barons Crich-

ton of Sanquhar (1488, in Scotland), and baronets (1627, in Scotland).—John Patrick Crichton Stuart, the third marquess, b. Sept. 12, 1847, succeeded his father in 1848. In 1868 he joined the Roman Catholic Church. He published a translation of the *Breviary* (2 vols., 1879). D. Oct. 4, 1900.

Bute, John Stuart, Earl of: a minister of state; b. in Scotland in 1713; was educated at Eton; married a daughter of Lady Mary Wortley Montagu. He became groom of the stole to the Prince of Wales, who was afterward George III., over whom he acquired a great influence. In Mar., 1761, he was appointed one of the principal Secretaries of State; May 29, 1762, he became Prime Minister, and held office until the following April. His policy was peace with France and royal absolutism at home. He resigned because of his unpopularity, but for twenty years was suspected of and hated for a secret intimacy with the king. He traveled on the continent of Europe, then retired to his estate in Bedfordshire, and occupied himself with building and studies, astronomy and natural history. D. Mar. 10, 1792.

Bu'tea: a genus of handsome evergreen trees and climbing shrubs of the family *Papilionaceæ* (see Leguminosæ), nearly related to the beans proper (*Phaseolus*), and dedicated to John, Earl of Bute (*q. v.*), a patron of botany. The flowers are in racemes, scarlet or orange, and with a large keel and recurved banner. The leaves are trifoliate, and the leaflets large and ovate in outline. Some of the species yield lac and kino, while from their flowers a dye is made. Five species are known, all natives of Southeastern Asia. *B. frondosa* and *B. superba* are grown in conservatories, and are regarded as possessing high ornamental value. C. E. B.

Butin, bü'tăñ', Ulysse Louis Auguste: painter of genre, principally of the life of fishermen and sailors; b. at St.-Quentin in 1838; pupil of Lemâle, of Picot, and of Pils; second-class medal, Salon, 1878; Legion of Honor 1881. His pictures are notable for sound technique and truthfulness in the rendering of out-of-doors effects. *Burial of a Sailor at Villerville*, an excellent example, is in the Luxembourg Gallery, Paris. D. in Paris, Dec. 9, 1883. W. A. C.

But'ler: town; De Kalb co., Ind. (for location of county, see map of Indiana, ref. 2–G); on Lake Shore and Wabash R. Rs.; 72 miles W. of Toledo, O.; has Wabash R. R. repair-shops and a wind-engine factory. The surrounding country is fine agricultural land. Pop. (1880) 1,056; (1890) 2,521; (1900) 2,063. Editor of "Record."

Butler: capital of Bates co., Mo. (for location of county, see map of Missouri, ref. 5–E); on Mo. Pac. R. R.; in a fertile prairie, 75 miles S. by E. from Kansas City. Butler, which was founded in 1857, burned during the war of the rebellion and afterward rebuilt, has seven churches, good public schools, mills and grain-elevators, water-works, and electric lights. The principal industry is agriculture. Pop. (1880) 2,162; (1890) 2,812; (1900) 3,158.
Editor of "Bates County Democrat."

Butler: borough; on railroad; capital of Butler co., Pa. (for location of county, see map of Pennsylvania, ref. 4–B); on the Conequenessing creek; 31 miles N. of Pittsburg; has three extensive glass-manufactories (two for bottles and one for plate glass); natural gas is used in all of them. It has also a large planing-mill, several oil-well-supply manufactories, a number of flouring-mills, etc., and is the center of prolific oil-fields. It has a fine court-house and public-school buildings. Pop. (1880) 3,163; (1890) 8,734; (1900) 10,853. Editor of "Times."

Butler, Alban: Roman Catholic divine; b. at Appletree, in Northampton, England, 1710; studied at Douay, in France; was professor there; later president of the English Catholic College of St.-Omer, in France. D. at St.-Omer, May 15, 1773. He is best known in the world of letters by his *Lives of the Fathers, Martyrs, and other Principal Saints* (London, 1756–59, 4 vols.), a work of great learning and judicious criticism. See Charles Butler's *Life of the Rev. Alban Butler* (Edinburgh, 1799). John J. Keane.

Butler, Benjamin Franklin, LL. D.: lawyer, general, and politician; b. at Deerfield, N. H., Nov. 5, 1818; son of Capt. John Butler, who commanded a company of dragoons in the war of 1812, and served under Jackson at New Orleans. Reared by an excellent mother, B. F. Butler graduated in 1838 at Waterville College, Maine; in 1840 was admitted to the bar in Lowell, Mass., where he rapidly advanced to an extensive and lucrative practice, in which he acquired a considerable fortune. He served in the State militia through all grades from private to brigadier-general. A Democrat by inheritance and conviction, he took an active part in politics, and in 1853 represented Lowell in the Legislature, where he lent powerful aid to the bill for reducing the hours of labor in the factories of the State from thirteen to eleven. In 1853 he was a member of the constitutional convention; in 1859 a member of the Senate of Massachusetts. In the national Democratic convention of 1860 in Charleston, S. C., he voted over fifty times to give the nomination for the presidency to Jefferson Davis. On Apr. 15, 1861, upon a call for troops to hasten to the defense of Fortress Monroe and Washington, Brig.-Gen. Butler, who at 5 P. M. was in court in Boston trying a cause, issued the requisite orders for mustering the regiments of his brigade. Apr. 16, the Sixth Regiment left Boston, and on the 18th Gen. Butler, at the head of the Eighth, took his departure, having been ordered to proceed to Washington by way of Baltimore. Two regiments of his brigade had, in the meantime, sailed for Fortress Monroe, which they garrisoned and saved from falling into the hands of the enemy. Prevented from reaching Washington by way of Baltimore, in consequence of the burning of bridges, he seized Annapolis, repaired the railroad between that city and Washington, and thus the Eighth Massachusetts and Seventh New York reached the capital in time to prevent all attempts on the part of hostile forces to seize it. May 13, 1861, at the head of 900 men, he marched upon Baltimore, and encamped on Federal Hill, in the midst of the city, without opposition—a service immediately (May 16) rewarded by President Lincoln with the commission of major-general in the service of the U. S., and by assigning him to the command of Fortress Monroe, where he arrived May 22. He here refused to send back the runaway slaves to their masters, on the ground, originated by him, that the slaves were "property contraband of war." Feb. 23, 1862, he was assigned to the command of the troops, 18,000 in number, forming part of the expedition against New Orleans, Capt. Farragut commanding the naval force. After the heroic passing of the forts defending the Mississippi by Capt. Farragut, Gen. Butler (May 1, 1862) landed and took possession of the city, where he remained until Dec. 16 following, when he was relieved by Maj.-Gen. N. P. Banks. During Butler's administration of the department of the Gulf he taxed the wealthy Confederate citizens to support the thousands of inhabitants reduced to destitution by the war, enforced a thorough sanitary system, and governed the city with an ability and justice never surpassed. Nov., 1863, he was appointed commander of the department of Virginia and North Carolina. In the winter he conceived the project of attacking Richmond from City Point and Bermuda Hundred. On May 5, 1864, he occupied City Point and Bermuda Hundred, and intrenched himself upon that peninsula in a position strong for defense, but from which he could not advance, holding it with supplies, and subsequently aiding the movement of Gen. Grant upon Petersburg, after the repulse of the Wilderness and Cold Harbor. He went with a detachment of his forces in Nov., 1864, to New York during the presidential election, a rising being expected in that city by which the election was to be carried by the Democracy. With a small force he held the city in peace and quiet, and compelled an orderly election. He was sent against Fort Fisher in Dec., 1864, where he first exploded a powder-boat without effect; subsequently landed his troops for an assault after a severe bombardment by the fleet; but upon the advice of his chief engineer, who considered the works impregnable by assault, he withdrew his forces. Before the second expedition Gen. Butler was relieved of his command. In 1866 he was elected to Congress from the Essex district in Massachusetts. He was nominated Sept. 19, 1882, by Massachusetts Democratic Convention for Governor, and was elected Nov. 7, 1882; was defeated Nov. 6, 1883, and was "Greenback" candidate for President of the U. S. in 1884. He published *The Autobiography and Personal Reminiscences of Maj.-Gen. Benjamin F. Butler* (1892). D. in Washington, D. C., Jan. 11, 1893.
Revised by James Mercur.

Butler, Charles: nephew of Alban Butler; jurist and writer; b. in London, England, Aug. 14, 1750; was a Roman Catholic. He wrote, besides other works, *Horæ Biblicæ* (1797); *Life of the Rev. Alban Butler* (1799); *Historical Memoirs respecting the English, Irish, and Scottish Catholics* (1819–21). D. June 2, 1832.

Butler, Charles, LL. D.: See the Appendix.

Butler, Clement Moore, D. D.: divine and scholar: b. in Troy, N. Y., Oct. 16, 1810; graduated at Washington (now

Trinity) College, Hartford, Conn., 1833, and at the General Theological Seminary, New York city, 1836. He was ordained in 1836; rector of St. John's church, Georgetown, D. C., 1841–44; of Grace church, Boston, 1844–47; of Trinity church at Washington 1847–54; chaplain of the Senate of the U. S. 1849–53. He was subsequently rector of the Protestant Episcopal Church at Rome (in Italy) 1862–64; in the last-named year he was appointed Professor of Ecclesiastical History in the Episcopal Divinity School in West Philadelphia; resigned in 1884. Besides numerous sermons and lectures, Dr. Butler published *The Book of Common Prayer Interpreted by its History* (Boston, 1846; 2d ed. Washington, 1849); *Old Truths and New Errors* (New York, 1850); *The Flock Fed* (1859); *St. Paul in Rome* (Philadelphia, 1865); *Inner Rome* (1866); *Manual of Ecclesiastical History from the First to the Thirteenth Century* (2 vols., 1868); also a *Continuation of the same from the Thirteenth to the Eighteenth Century*; *The Reformation in Sweden* (New York, 1883); and various other works. D. in Philadelphia, Mar. 5, 1890.

Butler, Elizabeth Southerden Thompson: military painter of the contemporary English school; b. at Lausanne, Switzerland, of British parents about 1844. She received her art education at the South Kensington Museum Schools and in Florence, where she was a pupil of Giuseppe Bellucci. At the Royal Academy, London, she exhibited a picture entitled *Missing*, which attracted notice for its strong, vigorous painting, and followed it the next year with *The Roll Call*. She at once obtained a wide reputation as an artist of original and striking ability, and her work became popular in England. *The Roll Call* was purchased by the Queen, and is now at Windsor Castle. Miss Thompson married Major William Francis Butler of the British army in 1877, and has continued to paint, but has not exhibited much of late years. Her pictures are especially notable for their excellent composition and dramatic force. Some of her prineipal works, besides the two above mentioned, are *Remnants of an Army* (1879); *Scotland for Ever*; *Defense of Rorke's Drift* (1881); *Floreat Etona*; and *Charge of the Scots Greys at Waterloo* (1882). Studio in London.

William A. Coffin.

Butler, Frances Anne Kemble: See Kemble.

Butler, George B.: genre and portrait painter; b. in New York; contemporary; pupil of Couture, Paris; National Academician 1873; member of the Society of American Artists 1880; lived a number of years at Capri, Italy, and painted pictures there. He has devoted himself mostly to painting portraits. Studio in New York.

William A. Coffin.

Butler, Henry Montagu, D.D.: master of Trinity College, Cambridge; b. in Harrow, 1833; graduated at Trinity College, Cambridge, 1855; ordained 1859; head master of Harrow 1859–85; select preacher, Oxford, 1877–78, and 1878–80–82; Cambridge 1879–85; Dean of Gloucester 1885–86; master of Trinity College 1886; vice-chaneellor of university 1889. Author of *Sermons Preached in the Chapel of Harrow* (1861; 2d series, 1869).

Butler, Howard Russell: landscape, marine, and portrait painter; b. in New York, Mar. 3, 1856; pupil of Dagnan-Bouveret and of Gervex, Paris; member of the Society of American Artists 1889, and of the Architectural League, New York; honorable mention, Salon of 1886; Temple silver medal, Pennsylvania Academy, Philadelphia, 1888; third-class medal, Paris Exposition, 1889. As president of the American Fine Arts Society he devoted much of his time to the organization of that institution, which is composed of a union for exhibition purposes in its building in West Fifty-seventh Street, New York, of the Soeiety of American Artists, the Architectural League of New York, and the Art Students League; gradnated in the scientific course at Princeton College in 1876, and practiced law in New York before he began the study of painting in 1883.

William A. Coffin.

Butler, James Glentworth, D.D.: Presbyterian minister; b. in Brooklyn, N. Y., Aug. 3, 1821; studied at the New York University and at Union (1846–47) and Yale (1848–49) Theological Seminaries; was pastor of the Walnut Street Presbyterian church, Philadelphia, 1852–68; secretary of the American and Foreign Christian Union 1868–71; pastor in Brooklyn, N. Y., 1871–73. Of late years he has devoted himself to his great commentary *The Bible Work*, by which he is chiefly known. Of the New Testament part, vol. i. appeared in 1878, vol. ii. in 1879. On the Old Testament, vol. i. appeared in 1886, vol. ii. in 1888, vol. iii. in 1889, and vols. iv., v., vi. in 1892. Vols. vii. and viii. are nearly ready (1893). In 1890 he published *The Fourfold Gospel*.

Butler, John Jay, D.D.: a Free-will Baptist minister; b. at Berwick, Me., Apr. 9, 1814; graduated at Bowdoin College in 1837; studied theology at Andover, Mass., 1841–44; Professor of Sacred Literature in Whitestown Theological Seminary (1844–54); of Systematie Theology at the Theological School of New Hampton, N. H. (1854–70); Professor of Sacred Rhetoric and Homiletics in Bates College Theological Seminary, Lewiston, Me.; and sinee 1873 of Sacred Literature, Hillsdale College, Mich. For many years he was connected with the *Morning Star*, a religious paper of Dover, N. H. He published commentaries on parts of the Bible, and a work on natural and revealed theology. D. June 16, 1891.

Butler, Joseph: bishop and writer; b. at Wantage, Berkshire, England, May 18, 1692. About 1714 he wrote an able refutation of Dr. Samuel Clarke's celebrated *a priori* argument; graduated at Oriel College, Oxford, 1718: was appointed preacher at the Rolls chapel in 1719; obtained the rieh benefice of Stanhope in 1725; became chaplain to Lord Chancellor Talbot in 1733; Bishop of Bristol in 1738. In 1750 he was translated to the see of Durham. A sermon by Bishop Butler before the Soeiety for Propagating the Gospel in Foreign Parts awakened no little interest from its strenuous advocacy of the work of the society in the American colonies; while a MS. plan for the introdnction of bishops into America, written by him in 1750, and first published by the Rev. East Apthorp in a controversy with the Rev. Dr. Mayhew some years later, connects this distinguished prelate with the civil and ecclesiastical history of America. His chief work is *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature* (London, 1736). D. in Bath, unmarried, Jnne 16, 1752. See T. Bartlett, *Memoirs of the Life of Joseph Butler, Bishop of Durham* (London, 1839). The best edition of his works is that issued in two volumes from the Oxford University Press (1849), with a preface by Bishop Halifax.

Butler, Matthew Calbraith: U. S. Senator; b. near Greenville, S. C., Mar. 8, 1836; edueated at South Carolina College; admitted to the bar in 1857; served in the Confederate army during the war; elected to the Senate in 1876; re-elected 1882, 1888.

Butler, Nicholas Murray, Ph.D.: educator; b. in Elizabeth, N. J., Apr. 2, 1862; educated in the public schools of Paterson, N. J., Columbia College, N. Y., University of Berlin, and University of Paris; in 1887 organized the New York College for the Training of Teachers; in 1888 became Professor of Philosophy and Education in Columbia College; dean of the university faculty of philosophy since 1890; editor of *The Educational Review* 1891; author of *Horace Mann and American Systems of Education*, and essays on manual training and allied subjects. W. T. Harris.

Butler, Pierce Mason: son of William, a Senator named below; colonel, and former Governor of South Carolina; b. in Edgefield district, S. C., Apr. 11, 1798; entered the army in 1819 as second lieutenant of infantry; promoted to first lieutenant 1822; captain 1825; resigned from the army in 1829; president of a bank at Columbia until 1836; accepted the appointment of lieutenant-colonel in Goodwin's regiment of South Carolina volunteers, and served against the Seminole Indians in Florida. On his return was elected (1838) Governor of South Carolina; at the end of his term became Indian agent, and was acting as such at the outbreak of the Mexican war, when he was elected colonel of the "Palmetto regiment" of South Carolina volunteers, which he led to the seat of war, distinguishing himself at Cerro Gordo and subsequent battles; at Churubusco, Aug. 20, 1847, he eontinued to lead his men after being wounded, when he was shot a second time, through the head, and killed.

Butler, Samuel: an English poet; b. in Worcestershire, Feb. 8, 1612; was liberally educated, and became in early youth clerk to a justice of the peaee; afterward entered the service of Sir Samuel Luke, who is supposed to be the prototype of Hudibras. He published in 1663 the first part of *Hudibras*, a witty poem satirizing the Puritans, which obtained great popularity, and thus furnished a multitude of proverbial sayings, such as:

> He that complies against his will
> Is of the same opinion still.

The second part appeared in 1664, and the third in 1678. D. poor in London, Sept. 25, 1680.

Butler, THADDEUS J.: See the Appendix.

Butler, WILLIAM, D. D.: missionary of the Methodist Episcopal Church; b. in Dublin, Ireland, Jan. 31, 1818; graduated at Didsbury College, near Manchester, England, 1844; entered the ministry of the Wesleyan Church, and served in the New England conferences; became secretary of the American and Foreign Christian Union of the Methodist Episcopal Church 1869; resigned in 1873; founded Methodist Episcopal missions in India (1856) and Mexico (1873); author of Methodist Episcopal portion of *Cyclopædia of Missions*; *The Land of the Veda* (New York, 1872); *From Boston to Bareilly and Back* (1885); *Mexico in Transition from the Power of Political Romanism to Civil and Religious Liberty* (New York, 1892).

Butler, WILLIAM: b. in Prince William co., Va., in 1759; graduated as student of medicine at South Carolina College; became a lieutenant in Gen. Lincoln's army in 1779; was engaged at Stono; served in Pulaski's corps until the death of the latter; afterward served with Gens. Pickens, Lee, and Greene; became commander of a body of mounted rangers, and was engaged in many battles with the Tories. Shortly after the war he was appointed brigadier-general, and in 1796 major-general, of militia; member of convention in 1787 to decide on the adoption of the Federal Constitution; member of convention which adopted the constitution of South Carolina; member of the Legislature; M. C. 1801–11; commanded South Carolina troops in 1812. D. in Columbia, S. C., Nov. 15, 1821.

Butler, WILLIAM ALLEN: lawyer and poet; b. in Albany, N. Y., 1825; graduated at the University of New York in 1843. He wrote, besides other works, the very popular satirical poem, *Nothing to Wear, an Episode of City Life* (1857); also a biography of *Martin Van Buren* (1862), and *Domesticus* (1886), a tale of labor troubles.

Butler, WILLIAM ARCHER: philosopher; b. in Annerville, near Clonmel, Ireland, in 1814; educated at Trinity College, Dublin, where he became Professor of Moral Philosophy in 1837, and in the same year was ordained. In 1842 he became, in addition to being professor, rector of Raymoghy, and played a prominent part in the Roman Catholic controversy. He had brilliant gifts, and his fame, which was mainly posthumous, is permanent. He was admired as a preacher equally by the simple and the learned. His chief work is *Lectures on the History of Ancient Philosophy* (2 vols., 1856). Other works are *Sermons, Doctrinal and Practical* (Dublin, 1849; 2d series, Cambridge, 1856); *Letters on the Development of Christian Doctrine*, in reply to Newman (Dublin, 1850). (See his memoir in the first series of his sermons.) D. in Dublin, July 5, 1848.

Butler, WILLIAM ORLANDO: general; b. in Kentucky in 1793; served in the war of 1812 and the Mexican war; major-general in 1846. He was the Democratic candidate for Vice-President in 1848, but was not elected. D. in Carrollton, Ky., Aug. 6, 1880. See his *Life* (1848) by F. P. Blair, Jr.

Butler, ZEBULON: soldier; b. at Lyme, Conn., in 1731; served in the French war and in the expedition to Havana; became captain in 1761; settled at Wyoming, Pa., in 1769; was lieutenant-colonel of Connecticut troops serving in New Jersey 1777–78; became colonel Mar. 13, 1778. He commanded the small garrison at Wyoming, Pa., at the time of the massacre, July 3, 1778 (see WYOMING VALLEY); and served bravely in Gen. Sullivan's expedition against the Indians of the Six Nations at Newtown (now Elmira), N. Y., in 1779, and during the whole of that Indian war. D. at Wilkesbarre, Pa., July 28, 1795.

Butte, byut, **City**: county seat of Silver Bow co., Mon. (for location of county, see map of Montana, ref. 6–E); on Northern Pacific, Oregon Short Line, Great Northern, and B. A. and P. R. Rs. Was settled in 1863 as a gold-placer camp. Within 4 miles of the court-house are over 4,000 mining claims—gold, silver, and copper. It has 6 copper smelters and 1 sampling works, capacity about 6,000 tons per day; besides the smelter at Anaconda using 5,000 tons per day of Butte copper ore, and one at Great Falls using 4,000 tons per day. The city has a fine court-house, city-hall, 3 opera-houses, 30 miles street railway, telegraph and telephone service, gas, electric lights, etc., high school, and public library of about 30,000 volumes. Pop. (1880) 3,368; (1890) 10,723; (1900) 30,470. Mineral product of county, 1889, $9,135,728; 1900, $54,069,175. EDITOR OF "BUTTE MINER."

Butter [from Lat. *bu'tyrum*, from Gr. *βούτυρον*]: the fatty substance extracted from milk. In ancient times the Hebrews made use of butter as food, but the Greeks and the Romans used it only as an ointment in their baths; and it is probable that the Greeks obtained their knowledge of the substance from the Scythians, Thracians, and Phrygians, while the Romans obtained it from Germany. In Southern Europe, at the present time, butter is very sparingly used, olive oil often taking its place; and in Italy, Spain, Portugal, and Southern France it is sold by apothecaries as a medicinal agent for external application. In the East Indies the natives use *ghee*, which is butter clarified by boiling. Butter is usually made from cow's milk, which has the following average composition:

Fat (butter)	per cent.	3·50
Casein		3·80
Albumen		0·75
Sugar (lactose)		4·25
Salts (alkaline and earthy)		0·70
Water		87·00
Total		100·00

The composition varies widely with the food, breed, age, and individuality of the cow, the age of the calf, the time and frequency of milking. The last milk drawn at a milking is richer in butter than the first. (See MILK.) The casein, sugar, and the salts are in solution, while the fat is in suspension in the form of minute globules, which are readily seen by the aid of the microscope. They vary in size from $\frac{1}{10000}$ to $\frac{1}{20000}$ of an inch in diameter. They are quite transparent, refract light strongly, and give the milk its white color. It was formerly supposed that each globule was covered with a thin membrane or envelope, but this has been disproved by Von Baumhauer and F. Knapp, and by Dr. S. M. Babcock, who has shown that the fat globules of milk behave in all respects like the globules of artificial emulsions of other fats and oils. The globules are composed of a mixture of several neutral fats or glycerides, chiefly the liquid fat olein and the solid fats palmitin and stearin, with small quantities of butyrin, myristin, caproin, caprylin, and caprin. The small amount of these latter fats gives to butter its characteristic odors and flavors; beside these, it is pretty certain that many of the volatile fats of the food may pass directly into the butter globules without change. In this way not only are the delicate desirable flavors of the sweet-scented grasses and clovers transmitted to the butter, but also the less desirable ones that are characteristic of onions, turnips, cabbage, etc. Moreover milk, and particularly the fats in the milk, readily absorbs odors and taints from the atmosphere surrounding it; so that in order to make butter of the finest quality and flavor, not only must the animal be supplied with clean, wholesome food and water, but the atmosphere surrounding the animal and the milk during all the process of manufacture must be pure, and all surroundings and utensils kept as nearly absolutely clean as possible.

Cream.—Cream is that part of milk into which a large proportion of its fat has been gathered. It is composed of the same constituents as milk, but they are not in the same or any constant relative proportion. Analyses have shown from 8·17 to 70·2 per cent. of fat in cream. Dr. Voelcker gives the composition of cream as follows:

Fat (butter)	per cent.	33·43	25·40
Casein		2·62	7·61
Sugar		1·56	
Salts		0·72	2·19
Water		61·67	64·80
Totals		100·00	100·00

A cream containing 30 per cent. of fat is considered rich. Cream is separated from milk wholly as a matter of convenience. Butter may be made from whole milk as well as from cream. The separation is effected by means of the difference in specific gravity between the fat globules and the milk serum, but the separation is never complete. Some of the milk serum adheres to and is carried up with the larger globules, and some of the smaller globules are held back by the serum, which is always more or less viscous, so that the cream always contains some milk serum, and there is always some fat remaining in the skim milk. The completeness with which the fat is removed from the skim milk is one of the most important economies in the manufacture of butter, as under different systems of separation the loss of fat in the skim milk may be from 6 to 40 per cent. of the whole. In practice, the separation of the cream is effected either by the force of gravity acting upon the fat globules in the milk when set at rest, or by centrifugal force acting upon the

globules in a rapidly revolving cylinder constructed for the purpose. The oldest and still the most common way of separating the cream is to set the milk in shallow pans from 2½ to 4 inches deep, in a room at a temperature, if possible, not above 60° F. In the course of thirty-six to forty-eight hours the cream will have more or less completely risen to the surface and can be removed by skimming. Milk on standing becomes sour; that is, it undergoes a fermentation by means of which a part of the milk sugar is changed to lactic acid, and this acid acting upon the casein causes it to coagulate or thicken; when this thickening takes place any remaining fat globules are prevented from rising, so that the completeness of the creaming depends somewhat upon the length of time which the milk may be kept sweet after it is set. The difficulty in keeping the milk sweet for a time sufficient for all the fat globules to rise led to the practice of surrounding the milk, as it was set, with cold water, and it was subsequently found that when this was done the depth of the milk could be greatly increased. The practice of cold deep setting, as finally developed, is to place the milk, as quickly as possible after it is drawn from the cow, into cans 8 inches in diameter and 20 inches deep. These cans are set or even submerged in water which is as nearly as possible the temperature of melted ice. It has been found that under these conditions not only does the cream rise in a shorter time, but much more completely than when set in pans. Since it would ordinarily be expected that increasing the depth of the milk would increase the time required for the cream to rise, and also interfere with the completeness of the creaming, several theories have been put forward to account for this quicker and more complete creaming. The one most commonly held has been that the serum of milk being a better conductor of heat than the fat, it cools more rapidly when placed in contact with cold water, and this more rapid cooling, causing a greater contraction, would increase the difference in specific gravity between the fat globules and the serum, and so aid in their separation. But this has been shown to be fallacious, for, though it is true that water is a better conductor of heat than fat, the small size of the fat globules (their diameter being about $\frac{1}{5000}$ of an inch) renders it impossible that, under any circumstances, there can be more than a small fraction of a degree difference between the temperature of the fat and that of the milk serum. Moreover, within the limits of temperature practical for creaming (90° F. to 40° F.), the coefficient of expansion of butter fat is more than three times as great as that of water, so that, in order to maintain the same relative difference in their specific gravities when the temperature is falling, the milk serum must cool more than three times as rapidly as the fat. In other words, when the milk serum has cooled from 90° F. to 40° F., or through 50° F., the fat globules should have lost less than 17° F., and should still have a temperature of over 73° F. Such a condition is manifestly impossible; but any less difference than this would cause the fat to become relatively heavier than at first, and would operate against the creaming.

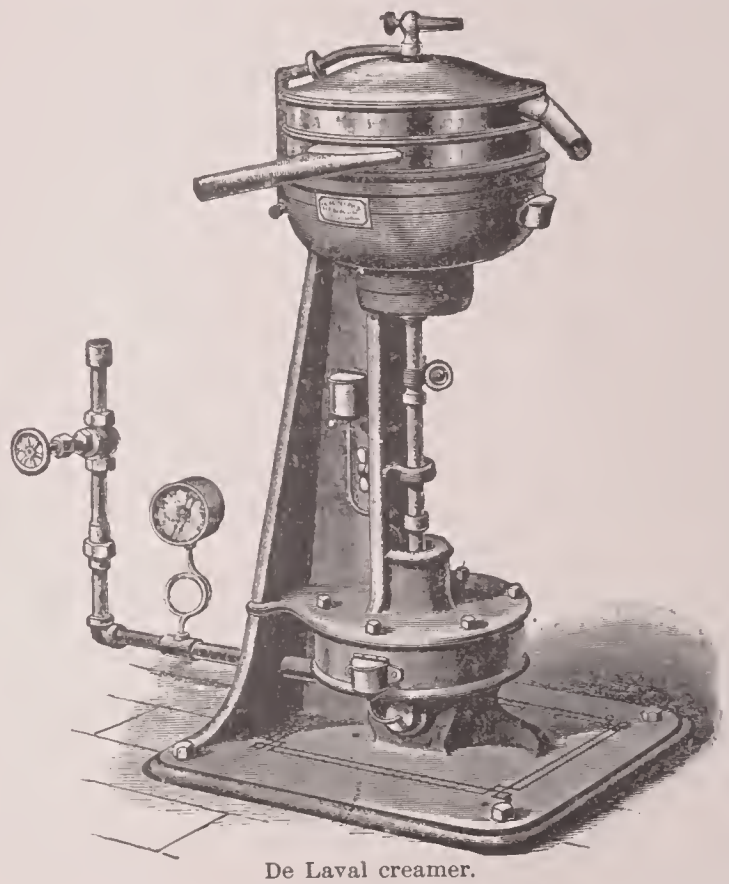
Dr. Babcock, by the discovery of fibrin in milk, has offered a more rational theory. Fibrin upon exposure to the air coagulates or forms clots, and it does this more readily at a temperature at or near blood heat. These clots forming in the milk tend to prevent the rising of the fat globules. The rapid reduction of the whole mass of the milk to a temperature below 50° F. prevents the formation of fibrin clots, and so renders the separation of the fat globules from the milk serum easier and more complete.

In 1877 a patent was granted to Lefeldt and Lentsch for a machine which should separate the cream from milk by centrifugal force. Since then the early machine has been much improved by De Laval and others, until at the present time the most effective means of cream separation is afforded by the use of these machines. Briefly, the machine is composed of a strong steel bowl or cylinder, so arranged that it may be made to revolve at a speed of 6,500 to 7,500 revolutions per minute. The milk being introduced at the center of the cylinder, the centrifugal force causes it to be carried to the sides, and, acting with greater force upon the heavier particles or serum of the milk, separates the milk in the bowl into a layer of skim milk next the wall and cream nearer the center. Exits are so arranged that any desired proportion may be constantly drawn off from both the skim milk and cream layers, and the whole milk constantly flowing into the bowl the operation is continuous. By regulating the speed of the machine and the rate of inflow the fat of the milk may be almost completely gathered into the cream, and only the very smallest globules left in the skim milk. For the best results the milk should be at a temperature of 86° to 90° F. The inflow should be regular, and the number of revolutions not fall below 6,500. The larger power machines have a capacity of 3,000 to 4,000 lb. of milk per hour, and smaller hand-power machines have a capacity of 250 to 350 lb. per hour.

Under ordinary conditions the comparative loss of fat in the skim milk by these different systems of separation will be about as follows with milk containing 3·5 per cent. of fat:

SYSTEMS OF SEPARATION.	Per cent. of fat in skim milk.	Total loss of fat, per cent.
By setting in shallow pans	0·70	20
" " " deep cans	0·56	16
" the centrifugal machine	0·14	4

Cream may be churned into butter as soon as it is removed from the milk and while it is still sweet. Such butter, known as sweet-cream butter, is of a peculiar flavor, and at the present time is only in limited demand in the markets of the U. S. The more usual practice is to "ripen" the cream before it is churned. By ripening is meant the development of a mild degree of acidity. The cream that is to be churned at one time is brought to a temperature of about 70° F., at which temperature it is kept for twelve to twenty-four hours.



De Laval creamer.

During this time it should be frequently stirred, and many believe that it is of great advantage if it can be freely exposed to a pure atmosphere. At the end of twelve to twenty-four hours lactic acid will have developed in sufficient quantity to cause a slight coagulation of the casein, and at the same time the characteristic flavors will have developed; the cream is then ready for the churn.

Churning.—By agitating cream or milk at a proper temperature, the fat globules may be made to unite and separate from the watery serum, which is called buttermilk. This is commonly done in a wooden vessel—a churn. Formerly the churn was simply a small barrel-shaped vessel supplied with a cover and a wooden dash or plunger. This is known as the dash-churn, and the agitation of the cream is effected by moving the dash or plunger rapidly up and down through the cream. Innumerable contrivances have been invented for effecting this agitation, and the Patent Office is filled with models of various sorts of churns; but there is no churn better than a plain box or barrel without inside dasher, floats, or contrivances of any sort. The necessary agitation is produced by the concussion of the particles of cream upon each other by either revolving the box or barrel, or swinging it from side to side. The matter of causing the fat globules to unite into butter is largely one of temperature, and, as has been shown by the churning of artificial emulsions of various

fats and oils, the proper temperature for churning bears a definite relation to the melting-point of the fat to be churned. Ripened cream may be churned at any temperature between 56° and 70° F., according to circumstances. In a great majority of cases 62° to 64° F. is the best temperature at which to churn. Sweet cream should be churned at a temperature six to eight degrees lower than ripened cream of the same character. If the churning temperature is too low, the fat globules are so hard that they will not stick together. If the churning temperature is too high, the fat globules are so soft that they do not readily unite, and the butter is of a very soft, oily nature. Below 50° and above 80° F. but very little butter can be obtained from churning; while above the melting-point of butter fat (93° to 96° F.) the fat globules, instead of uniting upon agitation, are broken up into still smaller particles. The time required for churning depends largely upon the temperature, the ripeness of the cream, and the rate of agitation. A high temperature and an advanced stage of ripeness shorten the process. A speed of about 700 feet per minute is considered to be the best. It is best to churn at such a temperature that from forty-five minutes to one hour will be required before the butter separates, or "breaks," as it is called. When the globules have united into masses the size of kernels of wheat, the churning should be stopped; the butter, being lighter, will rise to the top, after which the buttermilk may be drawn off. The butter should then be washed, until all traces of buttermilk are removed, in water at a temperature of 45° to 50° F. If too cold water is used in washing, the delicate flavoring-oils will be carried off in the wash water and the quality of the butter injured. After the butter is washed it should be salted with clean, fine, pure salt, usually an ounce to the pound, and the surplus water removed. The salting and removal of the moisture are done by working the mass thoroughly with a wooden paddle or lever upon a smooth wooden table. Various forms of workers are in use, but those are best which remove the moisture and work in the salt by means of direct pressure upon the mass rather than by a grinding motion. When the moisture is sufficiently removed, and the salt is completely dissolved, the butter is packed in tubs or printed in molds, and is ready for market. Working is best done at a temperature of 50° F. The complete removal of the buttermilk plays an important part in the keeping qualities of the butter. Pure butter fat may be kept for months without becoming rancid, but if any buttermilk is left in the butter, the casein of the buttermilk acts as a ferment upon both the sugar and the butter fat. The former is changed to lactic acid, and a little of the latter to free, fatty acids and glycerin. Salt tends to prevent this fermentation, and sometimes white sugar and saltpeter are added for the same purpose, but the complete removal of the buttermilk is of much more importance than the addition of preservatives. When freshly made from the milk of cows that are fed upon grass or succulent food, butter is of a golden yellow color and granular texture; but upon dry food, especially upon the poorer kinds, the butter is paler, even to whiteness. The texture depends upon the size of the granules when churning is stopped, and upon the care used in working. Certain breeds of cows, notably those of the Channel islands, Jersey and Guernsey, impart a high color to the butter made from their milk. The poorer and paler kinds of butter are often artificially colored, usually with an extract of annotto ground in oil. Butter varies very much in composition, mainly in the proportions of fat and water, and these are largely dependent upon the care taken in working it. Butter of good quality should have a composition about as follows:

Fat	per cent.	84
Casein		2
Ash (including salt)		3
Water		11
Total		100

The proportion of fat in butter may vary from 77 per cent. to 95 per cent.; it should not be less than 80 per cent., and the percentage of water should not exceed 15. Butter melts at from 93° to 96° F., and the melting-point or hardness is an important point in the quality of butter. The hardness varies with the varying proportions of olein, palmitin, and stearin in the butter, and these vary with the individuality and breed of the cow, with the kind of food, and with the length of time the cow has been in milk. With cows fresh in milk in the spring, and fed on fresh grass, the olein, stearin, and palmitin are usually found in the proportion of about 50, 30, and 20. Later in the season, when the cows are further advanced in milk, and the pastures drier and harder, the proportions may be found to have changed to 30 of olein, 50 of stearin, and 20 of palmitin.

The Butter Business.—The average yield of butter is 1 lb. from 22 to 25 lb. of milk. The average milk yield of the cows of the U. S. is from 3,000 to 3,500 lb. per annum. This would indicate a butter yield of 120 to 150 lb. per cow per annum, and is probably not far from the amount actually produced. There are, however, numerous dairies scattered through the whole country where the butter yield amounts to 300 lb. and over per cow per year, and individual instances are on record where single cows have produced 700, 800, 900, and in one case 1,153 lb. 15¾ oz. in a single year. Such records serve to show that the butter-producing capacity of the cows of the country is capable of a much higher development than that now attained. A great stimulus to the production of butter, and an important factor in the improvement of its quality, was the establishment of butter factories, or creameries, as they are called. They have been in successful operation now for about twenty years, and are scattered throughout the whole of the U. S., but are found in greatest numbers in the States of Wisconsin, Illinois, Iowa, and Minnesota. In these factories it is possible to make up the butter from a large number of cows owned by many patrons, under the supervision of a single man, with the greatest skill and with the most approved machinery. The direct effect is to remove from the farm, and particularly from the farmhouse, a large amount of drudgery, to economize the labor and minimize the cost of production, and to manufacture a product of a uniformly high quality. These factories are often co-operative, and so return to the patrons the largest possible net amount from the raw materials. In some of the factories the milk is brought to the factory and the cream separated by large centrifugal machines; in others, the milk is set for creaming at the farm, usually by a cold, deep-setting process, and only the cream taken to the factory by wagons that go about from farm to farm for the purpose of gathering it. The pooling of milk, and particularly of cream, from a large number of patrons, usually varying quite widely in quality, gave rise to some difficulty in the matter of making a just and equitable division of returns. At first, the milk was paid for, or the dividends made on the basis of the weight or measure of the milk or cream. This was soon found to be unsatisfactory, particularly to those patrons who furnished the best quality of either milk or cream, and various means were devised for quickly and easily determining the true butter-producing value of any given sample of milk or cream. None of these were entirely satisfactory, and it was not until 1890 that Dr. Babcock hit upon a means, partly chemical, partly mechanical, and known as the "Babcock test," by means of which the percentage of fat in milk may be easily, quickly, cheaply, and accurately determined. In a large number of factories this method is now used with the best satisfaction for determining the percentage of fat in each patron's milk each day, and the dividends are apportioned among the several patrons, not on the basis of the quarts or pounds furnished, but upon the pounds of fat present in the milk. While there is nothing about the process of manufacturing butter in large quantities in butter factories that of itself should make the butter of any better quality or even so good as can be made with the same care upon the farms where the milk is produced, still, from the fact that upon a large majority of farms sufficient care is not exercised, and because of the advantages which the factory has in marketing large amounts of butter of a uniform quality, the factory system is usually found to be the most satisfactory way in which the producer of the milk may turn it into butter with the largest recompense in money.

Fraudulent preparations are often widely advertised and extensively sold among the unsophisticated for largely increasing the yield of butter. These preparations are usually known as butter powders, and are largely composed of alum or some similar substance, whose effect is to coagulate the casein and enable the operator to mix it with the butter, forming a frothy mixture of sour curd and butter fat. The directions for the use of a certain one of these, composed of equal parts of alum and sugar, are typical of all: "To a quart of milk twelve hours old add 1 lb. of butter; warm by setting the churn in blood-warm water. Add a teaspoonful of the powder and churn as usual. You will have 2½ lb. of delicious fresh butter." It is needless to say that such a mixture is not butter at all, and is anything but delicious.

The *adulterations* most frequently found in butter are excess of water and salt. They may be detected and esti-

mated by melting a weighed quantity of the butter and allowing them to settle out. Lard and other inferior fats are sometimes mixed with butter by unscrupulous grocers, but are easily detected. The chief competitor, however, of butter is known as

Artificial Butter.—Artificial butter, whose base is suet, is usually known in the market as *oleomargarine*; that made from the fat of swine is called *butterine* or *suine*. (See Butter, Artificial, below.) With improved processes the production largely increased, and oleomargarine became a very serious competitor of real butter in the markets. While there is no doubt that it is a good and cheap substitute for the poorer grades of butter, still from the facts that impure and often diseased materials were used in its manufacture, that oleomargarine is believed by many to be less digestible in the human stomach than pure butter, and, most important of all, that oleomargarine was fraudulently put upon the market as pure butter, Congress, at the earnest solicitation of dairymen and against the most vigorous efforts of the oleomargarine manufacturers, on Aug. 2, 1886, passed a law, known as the Oleomargarine Act, the provisions of which were as follows: A special tax of $600 is levied on manufacturers, a tax of $480 on wholesale dealers, and a tax of $48 on retail dealers. Besides this, a stamp tax of two cents per pound is assessed on every pound, or package containing a fraction of a pound, manufactured in the U. S.; and upon that imported from other countries a tax of fifteen cents a pound is levied, besides any customs duty. For the fiscal year ending June 30, 1891, $1,077,924 were collected by the internal revenue department under this act. The effect of this law has not been such as was hoped by its framers—to prohibit the manufacture of oleomargarine—for the amount manufactured has actually increased since the passage of the act. The law, however, has not failed in noteworthy results. It has helped to raise the price of butter, especially that of good butter, by preventing oleomargarine from masquerading as a more expensive article. It has kept the price of oleomargarine down, greatly to the advantage of consumers, by compelling it to be sold under its own name. It has relieved that product from the reproach of being a fraudulent article, and has given it an honorable position in commerce as a legitimate means of utilizing waste products, and as a cheap, wholesome substitute for an expensive necessity. Besides the national act, many of the States have also passed laws governing the manufacture and sale of artificial butter, and some of them, notably New York, have gone so far as to actually prohibit them. The New York law has been in operation for several years; it was bitterly attacked by the manufacturers of oleomargarine, but has been declared constitutional by the highest State court.

Vegetable Butters.—The name "butter" is applied to several vegetable fats, such as palm, cacao, cocoanut, nutmeg, and shea butter. The latter is made from a nut like the olive, and is used in Africa as a substitute for butter.

Metallic Butters.—In chemistry the name butter was formerly applied to certain oily compounds which resembled melted butter; as the butter of antimony, bismuth, zinc, and tin, which were the chlorides of the respective metals. *Bog butter* is a fossil butter found occasionally in the Irish peat-bogs. It is believed to have been made by man. *Rock butter* is an iron alum which appears as a pasty exudation on alum slates.

Henry H. Wing.

Butter, Artificial, Butterine, Oleomargarine: mixtures of various fats prepared as substitutes for butter. A French chemist, Mége-Mouries, first devised a method of making artificial butter on the large scale, which he described in 1870 as follows: "The fat of best quality from recently killed bullocks is finely cut in a kind of sausage-grinder in order to break up the membranes. The fragments fall into a tank heated with steam, which for every 1,000 parts of fat contains 300 parts of water and 1 part of carbonate of potash, and two stomachs of sheep or pigs. The temperature of the mixture is raised to 45° C. After two hours, under the influence of the pepsin in the stomach, the membranes are dissolved and the fat melted and risen to the top of the mixture. The fat is next drawn off into a second tank, kept at a somewhat higher temperature, and 2 per cent. of common salt added. After two hours more the fat becomes clear and takes on a yellow color, and acquires somewhat the taste and odor of fresh butter. The fat is now drawn off into vessels and allowed to cool. It is then cut into pieces, wrapped in linen, and put in a hydraulic press and kept at a temperature of about 25° C. By pressure the fat is separated into two portions, viz.: stearin 40 to 50 per cent., and fluid oleo 50 to 60 per cent. The stearin remaining in the presses is used in candle-making."

Since 1870 many patents have been issued for the preparation of artificial butter, and large quantities are manufactured. All the methods have this in common, that they involve the use of animal fats other than butter. In some of them Cottonseed Oil (*q. v.*) is used. One of the largest manufacturers of artificial butter in the U. S. thus describes the process:

"The fat is taken from the cattle in the process of slaughtering, and, after thorough washing, is placed in a bath of clean, cold water, and surrounded with ice, where it is allowed to remain until all animal heat has been removed. It is then cut into small pieces, . . . and cooked at about 150° F. until the fat, in liquid form, has separated from the fibrin or tissue; then settled until it is perfectly clear. Then it is drawn into graining-vats and allowed to stand a day, when it is ready for the presses. The pressing extracts the stearin, leaving the remaining product, which is commercially known as oleo oil, which when churned with cream or milk, or both, and with usually a small proportion of creamery butter, the whole being properly salted, gives the new food-product *oleomargarine*. . . . In making butterine we use neutral lard, which is made from selected leaf lard in a very similar manner to oleo oil, excepting that no stearin is extracted. This neutral lard is cured in salt brine for forty-eight to seventy hours, at an ice-water temperature. It is then taken, and, with the desired proportion of oleo oil and fine butter, is churned with cream and milk, producing an article which, when properly salted and packed, is ready for market. In both cases coloring-matter is used, which is the same as that used by dairymen to color their butter. At certain seasons of the year, viz., in cold weather, a small quantity of salad oil made from cottonseed is used to soften the texture of the product, but this is not generally used by us."

It is the general opinion of those who have studied the subject that artificial butter is a wholesome article of food. Its composition is very similar to that of natural butter, and experiments have shown that the two are about equally digestible. The prejudice against oleomargarine is largely due to ignorance. Methods of analysis have been devised by which it is possible to determine whether a given specimen is natural or artificial butter.

Ira Remsen.

Buttercup: See Ranunculus.

But'terfield, Daniel: b. in Utica, Oneida co., N. Y., Oct. 31, 1831; educated at Union College; went into mercantile pursuits; became colonel of a militia regiment which he led to Washington and to Patterson's Shenandoah army on the breaking out of the civil war; was made brigadier-general of volunteers Sept., 1861; major-general Nov., 1862, and at the same time colonel of the Fifth Infantry in the regular army; took part in many actions under Gens. McClellan, Pope, and Burnside; was chief of Gen. Hooker's staff at Chancellorsville and Lookout Mountain, and in the campaign to Atlanta. He was breveted major-general in the regular army; resigned in 1869; sub-treasurer of the U. S. in New York; then in the express business. Published *Camp and Outpost Duty* (1862).

Butter-fish: a small silver flat-bodied fish of the family *Stromateidæ* (*Stromateus triacanthus*) found along the Atlantic coasts of the U. S. Its flesh is fat, whence the name, and it is much valued as food. The name is applied to other fishes, as the gunnel (*Murænoides gunnellus*) of the North Atlantic.

Butterfly: the common name of the *Rhopalocera* or day-flying Lepidoptera (*q. v.*). They are distinguished from the other Lepidoptera (moths) by the diurnal habits, the antennæ enlarged or clubbed at the tip, and by holding the wings, when at rest, folded vertically over the back. Other characters must be sought in entomological treatises. Butterflies are usually divided into five "families." In the *Hesperidæ*, commonly called skippers on account of their jerky flight, the antennæ are bent or hooked at the tip. These are mostly small, dark-colored forms, with large abdomens, more like those of moths than of other butterflies. In the four other families distinguished from one another by characters too technical for consideration here, the club of the antennæ is not bent. The *Papilionidæ* includes the swallow-tailed butterflies, large forms of remarkable beauty, of which about twenty-five species occur in the U. S. The larvæ of these are noticeable from the fact that they possess two pro-

trusible fleshy horns which emit a disagreeable odor, thus serving as organs of defense. The *Pieridæ* are smaller forms, white, yellow, or orange in color. Here belong the Cabbage Butterflies (*q. v.*). The *Lycænidæ* are still smaller, and our common species are usually divided into the blues, the coppers, and the hair-streaks, according to the color and ornamentation of the wings. There are about 125 species known in the U. S. The largest family of butterflies is the *Nymphalidæ*, the members of which vie with the swallow-tails in size. In these the fore legs are so reduced in size that they are of no use in walking. Most striking of the family are the large Morphos of Brazil, with an eyelike spot on each hind wing. The Heliconias of the same regions should also be mentioned. These are strong-flying, narrow-winged forms, which are protected from birds, etc., by their disagreeable odor and taste. In the same regions are numerous Pierids which have no such protection, but which so closely resemble the Heliconias in form, color, and mode of flight, that no bird having once tasted a Heliconia would be apt to take one of them. Some species of *Nymphalidæ* have a wide distribution. Thus the morning cloak or Camberwell beauty (*Vanessa antiopa*) is common to the north temperate regions of both hemispheres, while the *Vanessa cardui* occurs in all parts of the globe except South America and the Aretic regions.

A remarkable feature in the history of butterflies is the Di- or Polymorphism (*q. v.*) existing in many species. Thus the swallow-tail *Papilio ajax* of the U. S. passes the winter in the chrysalis state. Those which emerge from the chrysalis early in spring have the markings of the form earlier known as *P. marcellus*, while those that emerge in the summer are known as *P. telamonides*. Both of these lay eggs, from which are developed in the same season butterflies of the *ajax* type, and from these come the chrysalids.

In spite of their beauty butterflies must be regarded as pests, since their larvæ feed upon vegetation, and sometimes occur in such numbers as to do great damage. They have always been favorites with collectors. See Lepidoptera, and Kirby's *Synonymic Catalogue of Diurnal Lepidoptera* (London, 1871–77). J. S. K.

Butterfly-weed: the *Asclepias tuberosa*; an herbaceous plant which is indigenous in many parts of the U. S., and is sometimes called **Pleurisy Root**. It has nearly sessile leaves, varying from linear to oblong-lanceolate, and has showy, orange-colored flowers. The root is diaphoretic and expectorant, and has been used in medicine. See Asclepias.

Butterine: See Butter, Artificial.

Buttermilk: the part of milk that remains after the butter has been separated from it. It contains casein, sugar, water, and all the original ingredients of milk, except the greater part of oily matter. It is a nutritious beverage, and is extensively used in many places as food.

Butternut, or **White Walnut**: the *Juglans cinerea*, and its fruit, which is indigenous in the U. S. The tree grows to the height of from 50 to 75 feet, with gray bark and widely spreading branches, and has oblong-lanceolate downy leaflets, which are serrate, pointed, and rounded at the base. The petioles and branchlets are downy also, and have clammy hairs. The fruit is oblong and clammy, and contains an oily, eatable kernel. The nut is deeply sculptured and rough with ragged ridges, and is two-celled at the base. The wood is valuable in the arts, and contrasts finely with black walnut. The nuts, if gathered in June, can be made into fine pickles. The name *Butternut* is given also to a South American tree, *Caryocar nuciferum* (family *Ternstræmiaceæ*), which bears large drupes containing four one-seeded edible nuts. Revised by Charles E. Bessey.

Butter, Shea: See Bassia.

Butter-trees: species of East Indian trees of the genus *Bassia* and family *Sapotaceæ*, so named on account of the butter-like fat obtained from their seeds, and used as food. There are other fat-yielding trees which bear this name.

Butterwort: an herbaceous plant of the genus *Pinguicula* and family *Lentibulariaceæ*; distinguished by a two-lipped calyx, the upper lip trifid, the lower bifid; and a spurred corolla, two-lipped and gaping, the upper lip arched. The *Pinguicula vulgaris* is a small stemless perennial, growing in marshes and on wet rocks in Europe and the U. S. It has the power of coagulating milk, and is used for that purpose by the Laplanders. Revised by Charles E. Bessey.

But'terworth, Hezekiah: journalist; b. in Warren, R. I., Dec. 22, 1839. Became assistant editor of the *Youth's Companion*, Boston, in 1871, and has published much popular juvenile literature, such as *Zigzag Journeys* (1878–90) etc.

Buttlar, bŏŏt'lar, Eva, von: b. at Eschwege, in Hesse, in 1670; in 1687 married to De Vésias, a French emigrant who lived at the ducal court of Eisenach as dancing and fencing master and tutor to the pages; lived here for several years; in 1697, having met with the famous Pietist, Voekerodt of Gotha, she changed the whole character of her life, left her husband, and returned to her native town. Her religious enthusiasm soon degenerated into fanaticism and blasphemy. On Jan. 2, 1702, a new "Christian" congregation was formed at Allendorf, in Hesse, in which she was worshiped first as the Holy Ghost, afterward as the mother of the Lord, who should give birth to the new Christ. In spite of the public indignation aroused by many immoral practices, the congregation maintained itself for some twelve years. The movement cast reproach upon all Pietists. D. at Altona, near Hamburg, about 1717. See E. F. Keller, *Die Buttlarische Rotte* in Niedner's *Zeitschrifft für hist. Theologie* (1845); and M. Goebel, *Geschichte des christlichen Lebens in der rhein-westphäl. evang. Kirche* (2 vols., Coblenz, 1852, ii. 728–809); and her *Life* by Ludwig Christiany (Stuttgart, 1870).

Buttmann, boot'man, Philipp Karl: philologist; b. at Frankfort-on-the-Main, Germany, Dec. 5, 1764; was appointed secretary of the Royal Library of Berlin in 1796, and chief librarian of the same in 1811. He was a friend of Niebuhr, and an excellent Greek scholar. He edited several Greek classics, and published, besides other works, a *Greek Grammar for Schools* (1792); a large *Greek Grammar* (Ausführliche Griechische Sprachlehre, unfinished); and *Lexilogus, or Explanation of the Greek Words* (1818). D. in Berlin, June 21, 1829.

Bütt'ner, Christian Wilhelm: b. at Wolfenbüttel, Brunswick, Germany, in 1716; was for many years professor in the University of Göttingen; died at Jena in 1801. He traveled extensively, and made very comprehensive studies of languages and of natural history. He gave the first idea of a glossography, or geography of languages, and formed rich collections of natural history. In honor of him Leopling named a species of plants belonging to the sixteenth class of the system of Linnæus, and comprising several tropical shrubs related to the cocoa-tree, *Büttneria*.

Button [from O. Fr. *boton*, bud, knob, button: Ital. *bottone*: Span. *boton*; deriv. of O. Fr. *boter* > Mod. Fr. *bouter*, shoot, thrust, a word of Teutonic origin; cf. O. H. G. *bōzan*, beat; O. Eng. *bēatan* > Eng. *beat*]: an article of dress of various forms, used either for ornament or for fastening together the parts of a dress by means of a loop or worked buttonhole. Buttons are used for various articles of male and female apparel, and for hats, bonnets, shoes, and gloves. The word is also applied in *carpentry* to a flat oblong piece of wood or metal, turning on a nail or screw, to fasten doors and the like; and in *assaying* to a round mass of metal remaining in the cupel after fusion; but the use of the word in relation to articles of dress is the one of most importance. The button is generally considered a sign of civilization. The savage fastens his blanket or tunic, his leggings and moccasins, with strings, and has no idea of buttonhole or button; and it is only when a considerable degree of civilization is attained that we find buttons taking the place of strings or lacings, while fashion, in the artificial condition of society in great cities, requires a profusion of buttons, not so much for use as for ornament. Except the occasional use of a gem to fasten the toga at the neck, the Greeks and Romans seem to have had no idea of buttons, as indeed their flowing robes did not require them. They were first applied to dresses (probably in the thirteenth or fourteenth century) for purposes of ornament only, but somewhat later the buttonhole, an expansion of the idea of the loop, was invented, and the button became indispensable for the dress. In the beginning of the seventeenth century the manufacture of buttons had attained some importance in England, Birmingham being then, as now, its principal seat. These buttons were of cloth, covering a wooden disk, of gold, steel, and ivory, the last three the work of the goldsmiths, who were very expert in the arts of chasing and carving metals. Some of the steel buttons made at the Soho works about this time were sold at 140 guineas the gross, or almost $5 the button. About 1745 Matthew Boulton made many improvements in inlaid and steel buttons. Gilt buttons came into use soon after the accession of George III. in 1760, and John Taylor, of Birmingham, originally a cabinetmaker, patented many improvements in gilt, plated, and lacquered

buttons. The making of the shanks or eyes of these buttons was improved by Ralph Heaton, also of Birmingham, not far from 1800. This is still a separate branch of the business at Birmingham. From 1760 to the present time the manufacture of buttons has been a constantly growing industry in Great Britain, France, Switzerland, and the U. S. All descriptions of buttons may be classed under three distinct heads—viz., shank buttons, hole buttons, and covered buttons—but each kind is made of a great variety of materials and an almost infinite diversity of forms. The covered buttons, having a basis of wood, brass, zinc, or tin, have their covering of farmer's satin, prunella, broadcloth, brocade, velvet, silk, mohair, grenadine, twist, linen, cotton, and in short, every description of textile fabric. Both the shank and the covered buttons are to a considerable extent made on the *shell* plan—i. e. the face of the button is stamped out of a thin sheet of metal—and may have a flat, oval, or round surface, as desired; and the back or under surface is also stamped, and, its edges being turned, it is pressed into the upper shell and locked there by the pressure. The principle on which all shell buttons are made was first devised by B. Sanders, a Dane, who had lost most of his property in Copenhagen in the bombardment of that city in 1807, and removed to Birmingham, England, where he commenced the manufacture of buttons. He applied it only to covered buttons, which he made of sheet brass or tin in two parts, the upper blank or disk having its edge turned up and being covered with cloth, silk, or lasting, and the under blank, which was smaller than the upper and convex in form, having a wire shank, and the cloth and paper or cardboard which was to keep it in place put inside of it, and the two were pressed together, the turned edges interlocking so as to make a perfect button. An improvement was made in these by a son of Mr. Sanders, the lower blank having a circular hole in it (and receiving in consequence the name of "collet"), through which in the act of pressing the two blanks together a portion of the cloth or textile inside of the collet was thrust, so as to make a flexible cloth shank in place of the wire one. Other modifications were made by other inventors which reduced the price and greatly increased the facility of production. One of these was the production of what is known as the silk-back button, which dispenses with the collet, though it substitutes for it a round piece of sheet iron smaller than the upper blank. The so-called silk-back is a very thick heavy cloth having a silk face, which is cut out, of the proper size, by a die, its back having first been coated with a heavy sizing; a filling of soft spongy paper is placed upon this sizing, and the back is then gathered over the small blank of sheet iron and pressed into the upper blank or shell, which had previously been covered with the proper material, and the button is completed, no metal appearing upon either surface. In the shell-covered buttons sheet iron is now used for the blanks, and where the metal shows, as in the ordinary flexible shank buttons, it is lacquered. The process for making the metallic shell buttons is different, though the principle is the same. These buttons, whether of flat or oval surface, and whether figured or plain, are made from rolled brass plate; originally the flat buttons were solid and struck out as blanks from a thick plate, the eye or shank soldered on, and the whole finished, polished, and gilt, or silvered by the old cream-of-tartar process for silvering or the mercury amalgam for gilding. It was said that by this latter process six cents' worth of gold would suffice for gilding a gross of buttons. Both processes have been superseded by electro-plating. (See GILDING and ELECTRO-PLATING.) When buttons began to be made on the shell plan the upper blank was forced by the falling of a heavy weight into a finely engraved die of hardened steel, which gave it the oval form and the beautifully ornamented surface, and the under blank into another die, which stamped upon it the maker's name or trade-mark, and at a later date rivcted the shank (which before had been soldered to it) into this plate: a filling of stout paper or binder's board was then placed upon it. The two plates were then pressed together by a fly-press, and the button was trimmed and ready for the gilding. When gilt it was burnished and set on cards containing a dozen, when it was ready for market. Subsequent improvements have combined and simplified these processes, so that now a single machine completes the button except the gilding, burnishing, and carding; and the last process is also performed by a machine. Embossed buttons have been made of horn softened by heat, dyed, and pressed in a die of *bois brûlée* (sawdust and shellac heated), and of india-rubber and gutta-percha vulcanized, which were for some years very popular. These have now mostly given place to oval and flat buttons of ivory, bone, vegetable ivory, mother-of-pearl, and celluloid. The ivory, bone, and vegetable-ivory buttons are engraved and dyed in a variety of patterns and checks. The mother-of-pearl may be either of the ordinary color of pearl or what is known as smoked pearl. The celluloid buttons are made in molds and dies, like the vulcanite and horn. Those made of VEGETABLE IVORY (*q. v.*) are cut from slabs sawed out of the vegetable ivory-nut by bits attached to spindles and made to turn very rapidly, and are then turned, polished, dyed, and worked in figures in a lathe. They are then carefully sorted and put upon cards. The hole buttons, when made of ivory, vegetable ivory, pearl, malachite, onyx, etc., are cut by a tubular saw or bit revolving with great rapidity; the eyes are made by fine revolving drills. Pearl shirt buttons are made in great quantities both in the U. S. and Europe, and many of them are made of cheap substitutes for pearl. Agate or feldspar buttons for underclothing, as well as clay buttons, pressed into molds and baked and glazed like porcelain, are mostly made in Europe, requiring very cheap labor for their production. The greater part of the trouser buttons in use are made either from japanned iron stamped out by a heavy die or embossing swedge, or are made as shell buttons, with the back of paper or wood, and the whole button made by one machine and almost by a single blow. They are afterward japanned. Fancy and ornamental buttons for ladies' dresses are sometimes made of combinations of cloth and glass, or papier-mâché, pearl, metal, or choice woods, sometimes of vulcanite, glass, pearl, or Whitby jet, but oftener at the present day of silk, velvet, silk cords and figures, or what is known as passementerie, or of brocade and embroidered silk. These are usually made upon a wood foundation, especially if they are oval or of fanciful shape. Their manufacture is often carried on in connection with other dress trimmings.

The manufacture of covered buttons, except in its simpler forms of hand-made covered buttons, was not attempted in the U. S. earlier than 1825 or 1826. Samuel Williston, who was the founder of the covered-button business in his country, commenced covering buttons by hand at Easthampton, Mass., in 1826, and by the gradual introduction of machinery and a consolidation of his methods and machines with those of the Haydens at Haydenville in 1834 (the Haydens had been making buttons in a small way after the Sanders patterns from 1831), laid the foundations of the extensive works of the National Button Company, which employs 175 hands and can turn out 2,500 gross per day. Waterbury, Conn., was one of the early seats of the manufacture, but has been largely occupied with the production of metal buttons. In Great Britain five-sevenths of the manufacture are concentrated in Birmingham. France and Austria have great numbers of factories where dress buttons are made in connection with other dress trimming.

In China the knob of gold or of some precious stone worn at the top of the official hat is called a button, and is used to indicate rank. There are nine grades, each indicated by some special color or material. The highest is transparent red (a ruby); the second opaque red (coral); the third transparent blue (sapphire); the fourth opaque blue (lapis lazuli); the fifth transparent white (crystal); the sixth opaque white (stone); the seventh plain gold; and the eighth and ninth worked gold. These are again divided into two classes, distinguished as *principal* and *subordinate*, the latter having the Chinese character for "old age" engraved on them. The ninth button has two such characters engraved on it, and is the button worn by every one who has taken the siu-tsai, or bachelor's degree. Revised by R. LILLEY.

Button-bush (*Cephalanthus occidentalis*): a shrub of the *Cinchona* family, with a white flower in globose heads, whence its name. When in flower it is much frequented by bees.

Buttonwood: See PLANE-TREE.

Buttress [from Fr. *bouter*, thrust, push]: a projection built against a wall or other structure for the purpose of strengthening it, especially where exposed to a horizontal thrust or pressure, as in terrace-walls or in walls supporting heavy vaults or roofs. Rudimentary buttresses are found in Chaldæa, but the buttress never became an architectural feature until the introduction of vaulting by the Romans compelled them to thicken the masonry at the points where the thrust was exerted, and to carry the resisting mass above the roofs of the wings of the building, as in the great halls of the

thermæ. The Gothic architects developed from this device the *flying buttress* (Fr. *arc-boutant*), in which a half-arch, springing from a heavy pinnacled buttress on the line of the outer side-aisle wall, rises to the level of the nave-vaulting above the clerestory, and transfers its enormous thrust downward to the exterior buttress. The earliest buttresses were broad and simple; with the development of Gothic architecture they became narrower but deeper, were broken into receding steps or stages, adorned with gablets, and terminated in lofty pinnacles; while the flying arches became extremely elaborate in France, especially where the vaulting was loftier and bolder than elsewhere. In the perpendicular and flamboyant styles the buttress was sometimes richly paneled over its whole surface. A. D. F. Hamlin.

Butyr'ic Acid [from Lat. *bu'tyrum*, Butter (*q. v.*)] : occurs in the combination with Glycerin (*q. v.*), in the form of a fat in butter, and is one of the members of the series of so-called "fatty acids." When the fat of butter is treated with an alkali, it is saponified, and a salt of butyric acid is obtained. From this, by treatment with any one of the ordinary acids, the butyric acid can be set free. It is formed most readily by fermentation of sugar and of starch. Rancid butter contains it in the free condition together with other acids, and the peculiar odor and taste of such butter are due, to some extent, to the presence of these acids. Butyric acid is a colorless transparent liquid at ordinary temperatures. When cooled down to a very low temperature it solidifies. It is manufactured on the large scale for the purpose of preparing Butyric Ether (*q. v.*).

Butyric Ether: a substance belonging to the general class of Ethers (*q. v.*) which are formed by the action of alcohols on acids. Butyric ether is made by treating a mixture of butyric acid and ordinary alcohol with sulphuric acid, and heating. The ether separates as a layer that can easily be removed and purified. Like most of the substances belonging to the same class, this ether has an agreeable odor. The odor in this case is like that of pineapples, and the ether, which is a colorless liquid, is manufactured and sold under the name of pineapple oil. It is used extensively in perfumery. Whether the odor of pineapples is due to the presence in these of butyric ether has not been determined. The quantity present is, in any case, very small.

Buxbaum'ia: a genus of mosses (named in honor of J. C. Buxbaum, a German botanist), of which only two species are known. *Buxbaumia aphylla* occurs in Europe and America, and is apparently destitute of leaves; the part of it visible above the ground is merely the little capsule, surrounded with minute scales.

Bux'ton: a town and watering-place of Derbyshire, England; in a deep valley near the source of the Wye; 32 miles N. W. of Derby, and 160 miles N. N. W. of London (see map of England, ref. 8–G). Here are calcareous and chalybeate springs, which are annually visited by about 14,000 persons. Buxton is surrounded by beautiful scenery, has several good hotels, and baths which are regarded as among the finest in Europe. One of the Dukes of Devonshire expended £120,000 here in the erection of a pile of stone buildings called the Crescent. Buxton was once the residence of Mary Queen of Scots, then a captive. The inhabitants manufacture ornaments from alabaster and spar, and excellent lime is burned at the quarries near Poole's Hole, an immense stalactite cave about half a mile distant. Near this town is Diamond Hill, famous for its crystals. Pop. (1891) 7,424.

Buxton, Sir Thomas Fowell: philanthropic brewer; b. in Earl's Colne, Essex, England, Apr. 1, 1786; was the son of opulent parents; studied in Trinity College, Dublin. He married in 1807 Hannah Gurney, a sister of Joseph John Gurney and of Mrs. Fry; was elected a member of Parliament in 1818 by the voters of Weymouth, which he represented nineteen years; was made a baronet in 1840. He was an eminent advocate of the abolition of slavery, the improvement of prison discipline, and other humanitarian measures, and had much influence in public affairs. D. Feb. 19, 1845. See his memoir by his son, Sir Charles (London, 1848; n. e. 1872).

Bux'torf (in Lat. *Buxtorfius*), Johann: scholar; b. at Kamen, in Westphalia, Dec. 25, 1564; was well versed in the Hebrew language and rabbinical literature. In 1591 he became Professor of Hebrew at Basel. His chief works are a *Lexicon Hebraicum et Chaldaicum* (1607) and *Biblia Hebraica Rabbinica* (1618). D. at Basel, Sept. 13, 1629. See his *Life* by E. F. Kautzsch (Basel, 1879).

Buxus: See Box.

Buys-Ballot, bois'bäl'lōt, Christophorus Henricus Diericus, Ph. D.: meteorologist and author of the well-known *Buys-Ballot's Law*, expressing the relations of the wind-directions to the position of the storm center; b. in the small village of Kloetinge, province of Zeeland, Holland, Oct. 10, 1817. He obtained the degree of Ph. D. from the University of Utrecht, in which institution he soon became a professor (1847), remaining in this position for forty years. He was, in some sense, the creator of the Dutch meteorological service, of which he was the director until his death. On leaving his professional chair a special medal was struck in his honor. He was an honorary member of the Royal Meteorological Society and of the Austrian Meteorological Society, and knight or commander in orders in Austria, Holland, Portugal, and Russia. He was a prolific writer not only in Dutch, but also in English, German, and French. His earliest papers were upon chemistry and physics, but for the last forty years of his life they were devoted to meteorology. D. in Utrecht, Feb. 2, 1890.

M. W. Harrington.

Buzançais, bü'zään'sā' : a town of France; department of Indre; situated partly on the banks of the river Indre and partly on the islands in its channel; 46 miles S. E. of Tours (see map of France, ref. 5–E). Here are extensive iron-works. Pop. (1891) 5,027.

Buzzard: a bird of the genus *Buteo*, order *Raptores* and family *Falconidæ*; having a small bill, which bends from the base and is not notched. The buzzards resemble the eagle and falcon in form, but are inferior in size and courage. The common buzzard (*Buteo vulgaris*), a native of Europe, measures nearly 4 feet from tip to tip of the wings. It is sluggish and inactive compared with other birds of prey. The prevailing color of its plumage on the upper parts is brown, with a mixture of black. The rough-legged buzzard (*Archibuteo lagopus*) may be distinguished by its having the tarsi feathered to the toes. It is widely distributed in Europe and Africa, and is found in North America. Among the other species of this genus is the red-tailed hawk or chicken hawk of the U. S. (*Buteo borealis*), which often kills poultry. The American bird called turkey-buzzard belongs to the genus Cathartes (*q. v.*).

Buzzard's Bay: in the south part of Massachusetts; is 30 miles long; has an average width of 7 miles; contains the harbors of New Bedford, Fairhaven, and Wareham. It is sheltered from the ocean by the Elizabeth islands.

By-bidding: bidding at an auction sale by a person on behalf of the owner of the property sold, and with no intent of purchasing it. In the U. S. some authorities have held that a single by-bidder may be employed to prevent the property from being sacrificed below a given price, but that the employment of a number to create a false appearance of competition is a fraud. When there has been fraudulent by-bidding a *bona-fide* bidder may refuse to take property knocked down to him, or may claim property knocked down to the by-bidder when his own bid was the highest *bona-fide* bid. By-bidders are often called "puffers." See Auction.

Revised by F. Sturges Allen.

Byb'los, or **Byblus** (in Gr. Βύβλος): an ancient city of Phœnicia; on the Mediterranean; about 22 miles N. N. E. of Berytus; called *Giblah* by the Hebrew writers. It was near the base of Mt. Lebanon, and was said to be the native place of Adonis or Thammuz. This site is occupied by the modern town of Jubeïl and ruins of a Roman theater.

Byblos: an ancient town in the delta of Egypt; celebrated for its manufacture of papyrus, the chief writing-material of the civilized world. It stood in a marshy tract which produced in abundance the byblus or papyrus plant (*Cyperus antiquorum*).

Byerly, William Elwood, Ph. D.: b. in Philadelphia, Pa., Dec. 13, 1849; graduated at Harvard College 1871; received Ph. D. from same 1873; was appointed Assistant Professor of Mathematics at Cornell University 1873–76; held the same position at Harvard 1876–81; was appointed full professor there 1881. In 1878 he was elected fellow of the American Academy of Sciences. He has published *Elements of Differential Calculus* (1879); *Elements of Integral Calculus* (1881); and several syllabi of mathematical courses given at Harvard.

By'field, Nathaniel: b. at Long Ditton, Surrey, England, in 1653; removed to Boston, N. E., 1674, and became a

prominent merchant; was the principal settler of Bristol, R. I.; returned to Boston in 1724; became Speaker of the House of Representatives; was judge of the Bristol County court of common pleas for thirty-eight years, and of Suffolk County 1730–32; member of the council and judge of the vice-admiralty 1704–15 and 1729. D. in Boston, June 6, 1733.

By'ford, WILLIAM HEATH, M. D.: physician; b. in Eaton, Preble co., O., Mar. 20, 1817; was self-educated; became an active practitioner in Chicago; president of faculty and Professor of Clinical Surgery in the Women's Hospital Medical College; twice president of the American Medical Association; author of *Practice of Medicine and Surgery Applied to Diseases and Accidents Peculiar to Women* (rev. ed. 1871); *Theory and Practice of Obstetrics* (New York, 1870).

By-laws: originally laws (now usually called ordinances) made by a community or municipal corporation for the purpose of local government; by extension, rules or laws made by any corporation under authority conferred by its charter or by statute, or made by an unincorporated association with the consent of its members, for its own government or that of its members. It is a general rule that the power to make by-laws is incidental to the existence of a corporation. This power is sometimes expressly conferred upon the corporation in its charter, or vested in a select body, such as a board of directors. Where the charter is silent, however, the power appertains to the corporation itself, except in the case of charitable corporations which, in general, have no such implied authority. By-laws must be reasonable and consistent with law, and be enacted within the State where the charter is in force. A written entry is not essential to their validity, and their existence may be established by custom. The by-laws of a municipal corporation govern all persons within its jurisdiction; those of a private corporation have no force as such over persons not members, but the members are presumed to know them, and are bound by them. A penalty for their breach may be collected by an action at law. The by-laws of a municipal corporation are enacted in the exercise of a quasi-legislative capacity, and the corporation is not liable for damages resulting from the acts of citizens by whom they are broken.

Revised by F. STURGES ALLEN.

Byles, MATHER, D. D.: clergyman and wit; b. in Boston, Mass., Mar. 26, 1706. His father was a native of England; on his mother's side he descended from the Rev. Richard Mather and the Rev. John Cotton. He graduated at Harvard College in 1725; was ordained first pastor of Hollis Street church, Boston, 1733; soon attained eminence in his profession; also attracted considerable attention by his poetical talents. He continued happily with his parish till the excitement preceding the Revolution created a distrust against him, and he was accused of being a Tory and separated from his parish. Charges were afterward made against him that he prayed for the king and received visits from British officers, and in May, 1777, he was publicly denounced in town-meeting. On June 2 following he was placed on trial, pronounced guilty, and ordered to be confined on a guardship, and in forty days to be sent to England with his family; this sentence, however, was not executed, but he was confined to his own house, over which a guard was placed, afterward removed, but again replaced and again dismissed, causing him to say that he was "guarded, reguarded, and disregarded." His literary talent was recognized by many men of genius in England. He continued to reside in Boston, but was not again connected with any parish. D. in Boston, July 5, 1788.

Bylot's Bay: See BAFFIN'S BAY.

Byng, GEORGE: b. in Wrotham, England, Jan. 27, 1662–63; went to sea at the age of fifteen; in 1703 became rear-admiral of the red. Served in 1704 under Sir Cloudesley Shovel, and reduced Gibraltar; also distinguished for his services at battle of Malaga and off Messina, where, July 31, 1718, he dispersed the Spanish fleet. He was afterward made rear-admiral of Great Britain, member of the privy council, Baron Byng, Viscount Torrington, and Knight Companion of the Bath. In 1727 he became First Lord of the Admiralty. D. Jan. 17, 1733.

Byng, JOHN: admiral; son of Viscount Torrington; b. in 1704; gained the rank of admiral of the red in 1748. In 1756 he commanded an expedition sent to relieve Minorca, then blockaded by the French. He failed, and was accused of cowardice by the ministers, who sought to divert attention from their own inefficient measures by sacrificing him to the public indignation. He was tried by a court martial and shot on board the Monarque, at Portsmouth, Mar. 14, 1757.

Byng Inlet: a port of entry of the province of Ontario, Canada; on the north side of Georgian Bay, Lake Huron (see map of Ontario, ref. 1–C); has very extensive saw-mills, whence 20,000,000 feet of lumber are yearly sent to the U. S. It is visited in winter by dog-sledges, and in summer by regular steamers. Pop. about 200.

Byrd, WILLIAM: composer. See BIRDE.

Byrd, WILLIAM, F. R. S.: author; son of William Byrd, a wealthy collector of manuscripts; b. at Westover, Va., Mar. 16, 1674; studied law in London; long held important offices in Virginia. He was a patron of literature, and laid out in 1733 the towns of Petersburg and Richmond. He wrote many valuable sketches of his travels in Virginia. Some of his writings were published by Edmund Ruffin as *The Westover Manuscripts* (1841), and more completely in 1866 as the *History of the Dividing Line and Other Tracts*. They contain the *Records of the Virginia Company* (1619–24), purchased in England by him. D. in Westover, Va., Aug. 26, 1744.

Byron, GEORGE NOEL GORDON, Lord: poet; b. in London Jan. 22, 1788. He belonged to an ancient Norman family, whose name was variously written Burun, Biron, and Byron. JOHN BYRON (*q. v.*), the poet's grandfather, was a noted English admiral. Capt. Byron, the son of the admiral, married Catherine Gordon, a Scottish heiress, who had only one son, the subject of this notice. Capt. Byron was distinguished for nothing but his vices. Having squandered a large portion of his wife's property he deserted her, after which she retired to Scotland, and resided for some time at Aberdeen, where young Byron received the first rudiments of his education. Before he was seven years old, with his mother he visited the Highlands, the picturesque beauty of which, even at that age, made, it is said, a powerful impression on his mind. When he was ten years old he succeeded to the estate and title of his grand-uncle, William, fifth Lord Byron, who had resided at Newstead Abbey, where he died in 1798. The poet had a congenital deformity of his feet, which rendered him lame, and which was during his whole life a bitter mortification to him. When he was about twelve years old he was sent to school at Harrow. While here he became acquainted with Miss Chaworth, for whom he conceived a romantic and passionate love. She was the heiress of Annesley, which was adjacent to Newstead, the estate to which Byron had succeeded. This appears to have been one of the truest and deepest attachments of his life, and he seems to have fully persuaded himself that if he had married Miss Chaworth he would have been a far better as well as a happier man. He went in 1805 to Cambridge, which he left two years afterward without taking a degree. While at the university he published (1807) a volume of poems, *Hours of Idleness*, which was criticised in the *Edinburgh Review*. This critique was written by Mr. (afterward Lord) Brougham, but Byron always supposed that Jeffrey was the author. In retaliation he wrote *English Bards and Scotch Reviewers*, which may be said to have laid the foundation of his fame. This satire, though evincing great talent in its way, is in many parts egregiously unjust, as, for example, where the satirist speaks of Scott. It is but just to add that Byron himself afterward deeply regretted the publication of the poem, and did everything in his power to suppress it.

In 1809, in company with his friend Mr. Hobhouse, Byron commenced his travels through different parts of Europe—Spain, Portugal, European Turkey, and Greece. After an absence of about two years he returned to England, and published the first two cantos of *Childe Harold's Pilgrimage*, which were received with extraordinary favor, so that, as he himself informs us, he "awoke one morning and found himself famous." He soon after took his seat in the British House of Peers. At one time it would appear that he thought seriously of giving himself up to politics, but he soon changed his purpose, and turned his attention again to poetry. Within the next two or three years he produced several minor poems of exquisite beauty—namely, *The Giaour*, *The Bride of Abydos*, *The Corsair*, *Lara*, *The Siege of Corinth*, *Parisina*, and *The Prisoner of Chillon*. On Jan. 2, 1815, he was married to Miss Isabella Millbanke, only daughter of Sir Ralph Millbanke, afterward Noel. She was regarded as a great heiress. But, if Byron may be believed, his fortune was but little improved by this marriage.

He says: "All I have ever received or am likely to receive (and that has been twice paid back, too) was £10,000." The union was a very unhappy one, as well on account of Lord Byron's licentious habits as the incompatibility of temper of the two parties.

Lady Byron gave birth to a daughter, Ada, who became afterward the Countess of Lovelace. She was Lord Byron's only legitimate child; he addresses her in *Childe Harold* as "sole daughter of my house and heart."

Not long after the birth of Ada his wife left him, and, taking the child with her, went to her father's. He left England early in 1816, resolved never again to return to his native land. Passing through Belgium, he visited the field of Waterloo; he subsequently went to Switzerland, and resided near Geneva. Here he wrote the third canto of *Childe Harold*. He afterward abode some time in Venice. He next visited Ravenna, where he formed a *liaison* with the Countess of Guiccioli, whose sprightly and imaginative character, no less than her personal beauty, powerfully attracted him. While at Pisa in 1822 he experienced great sorrow in the tragic death of his friend, the poet Shelley. Early in 1822 Byron, Shelley, and Leigh Hunt were associated in the publication of a journal styled *The Liberal*, but Byron and Hunt quarreled soon after the death of Shelley, and *The Liberal* was discontinued.

While in Italy Byron wrote several of his most admired poems, including the fourth canto of *Childe Harold*, *Mazeppa*, *Manfred*, *Cain, a Mystery*, *Marino Faliero*, *The Two Foscari*, *Sardanapalus*, *Werner*, and *Don Juan*. He espoused with enthusiasm the cause of Greek independence, and in 1823 passed over from Italy to Cephalonia, where he spent several months. In the early part of 1824 he arrived at Missolonghi. He took, Apr. 9, a severe cold, which caused his death on Apr. 19, 1824.

Byron's poetic genius was of a very high order, but more distinguished for clearness and intensity than for breadth or versatility. His intellect partook in a remarkable degree of the character of his emotional nature. It was only under the influence of intense feeling or passion that he could put forth his poetical powers with any success. And hence it is that everything he has written is so strongly colored with his own personal feelings. He was perhaps the most intensely subjective of all the great poets that ever lived. This explains why he had no genius for dramatic composition. He could only represent successfully those characters which resembled his own. His soul was not capacious nor calm enough to reflect without distortion the infinitely varied pictures presented by the comedy and tragedy of human life. Wit and understanding, rather than imagination, were his leading intellectual traits. His most remarkable characteristic, as a poet, was his power of expressing intense passion, particularly of the darker and fiercer kinds. "Never," says Macaulay, "had any writer so vast a command of the whole eloquence of scorn, misanthropy, and despair." See Moore's *Life of Byron* (1830); *Recollections of the Last Days of Shelley and Byron*, by E. J. Trelawney (1858). Revised by Henry A. Beers.

Byron, Henry James: writer of burlesque dramas; b. in Manchester, England, 1834; was a lawyer by profession; contributed much to London *Fun*, of which he was for a time the editor. His principal works are travesties of various popular and standard dramas and operas—*Fra Diavolo*, his first effort (1858); *The Lady of Lyons*, etc.—but he produced several comedies, pantomimes, and novels—*Paid in Full* (3 vols., 1865); *Old Sailors*, first brought out in 1874; and *Our Boys* (1878). He also acquired distinction as an actor in London. D. in London, Apr. 11, 1884.

Byron, John: vice-admiral; grandfather of the poet; son of the fourth Lord Byron; b. at Newstead, Nov. 8, 1723; entered the navy; served in Anson's expedition of 1740; also against Louisburg in 1760; circumnavigated the globe (1764–66); fought D'Estaing off Granada, July 6, 1779, in the American war; was long known in the navy as "Foul Weather Jack," on account of the ill-luck attending his early service. D. Apr. 10, 1786.

Byssus: a bundle of silky or shining, semi-transparent, horny filaments by which many bivalve mollusks attach themselves to rocks or other fixed substances. These filaments are secreted by a gland at the base of the foot of the animal. They are guided to their place by the foot, and expand into a sort of disk at the point of attachment. An example of the byssus may be seen in common mussels. The *Pinna* of the Mediterranean produces long and strong filaments of a silky luster, which can be woven into cloth. This cloth is highly prized, but the *Pinna* has become so rare that it can not be produced in large quantities.

Byz'antine, or **Bezant** [from Byzantium, the old name of Constantinople]: in numismatics, is a term applied to a coin of the Byzantine empire. These coins were of gold, silver, and bronze; bore impressions distinct from the earlier Roman coins; were copied in several countries. They were current in the north of Europe, and even in India. The silver bezant was worth about 10*s.* sterling. The gold bezant was worth at one time £15 sterling.

Byzan'tine Art: the peculiar phase of art-development which originated in Byzantium. The city of Byzantium, or Constantinople, owing to its geographical situation was peculiarly open to mingled art influences, and developed out of Roman traditions, modified by the Greek taste and a liberal admixture of Oriental elements, a new art called Byzantine. It is the first distinctively Christian national art; is especially rich in decorative detail and in the use of color, and displays the failings as well as the merits incident to its transitional character. It flourished from the time of Constantine, 330 A. D., nearly to the fall of Constantinople in 1204, by which time, however, it had lost its original vigor and perfection. It strongly influenced the art of Venice and Northeastern Italy. Its architecture was based on a mingling of Roman and Oriental constructive principles, treated with Greek freedom, but it gave birth to few monuments of great size. Its noblest production, the Church of the St. Sophia (or Divine Wisdom) in Constantinople, now a mosque, was built in 532–538 under Justinian, and was the first great pendentive-domed church ever erected: it still remains one of the most imposing and beautiful structures in existence, resplendent with its unrivaled mosaics, superb columns of jasper and porphyry, and its majestic outlines. St. Mark's in Venice, though built nearly 500 years later by Byzantine architects, in imitation of the Church of the Apostles at Constantinople, is a magnificent example of a later phase of Byzantine architecture, and Ravenna is also rich in splendid Byzantine monuments. The dome is a distinctive feature of all Byzantine religious architecture. The most highly developed of Byzantine arts was that of mosaic; but ivory-carving, the illumination of MSS., and the production of splendid fabrics, were almost equally advanced. In Russia and Greece the traditions of Byzantine art are not yet wholly extinct. A. D. F. Hamlin.

Byzantine Empire; also called **Eastern** or **Greek Empire**: the name of a former empire of Europe which came into existence in 395 A. D., upon the death of the Roman Emperor Theodosius the Great, who divided his empire between his two sons, Arcadius and Honorius. While the latter received the western half as his portion, Arcadius became ruler of the eastern empire, then comprising Syria, Asia Minor, Pontus, Egypt, Thrace, Mœsia, Macedonia, Crete, and Greece, with the capital at Constantinople. The history of the Byzantine empire extends from 395 A. D. to 1453. During the reign of Arcadius ambitious politicians wielded an unlimited power, and oppressed the people to satisfy their rapacity. Arcadius was followed by his seven-year-old son, Theodosius II. (408–450), for whom a prefect ruled with wisdom and strength. In 415 he took his sister Pulcheria as co-regent, who from that time took charge of the entire administration. Peace and prosperity reigned during Theodosius's rule, and were only interrupted by a short war with Persia in 422, which led to the acquisition of a part of Armenia. But peace with Attila, King of the Huns, could only be purchased by large tracts of land on the Danube and large sums of money. Upon the death of Theodosius he was succeeded by his sister Pulcheria. She married the senator Marcianus, who reigned until 457. Under Justinian (527–565), who became famous by his legislation and the victories of his generals, Belisarius and Narses, the Byzantine empire gained great influence and power among the other nations, while in the interior the dissensions of the parties were quelled effectually. Under the nephew and successor of Justinian (Justinus II., 565–578) the empire suffered from invasions of the Lombards and Persians. In 718 Leo III. ascended the throne, and continued to sustain himself in spite of the contest concerning the worship of images which continued for over a century, and of the attacks of the Arabs. He died in 741, having wrested Phrygia from the Arabs, but lost the last rem-

nant of territory in Italy. Basilius I. Macedo, the founder of the Macedonian dynasty, ascended the throne in 867. He introduced reforms in all branches of the administration, and revised the laws of Justinian. He was succeeded by his son, Leo VI., who called upon the Turks to aid him against the Saracens, and thus opened the way for the Turks. After the extinction of the Macedonian dynasty in 1057 Isaac Comnenus was raised to the throne by the unanimous vote of the army. He introduced many reforms, and entered a monastery in 1059. Among his successors Alexius I., who began to rule in 1081, was the most important. He increased the area of the empire considerably. The dynasty of the Comnenian emperors continued to rule until 1204. In 1204 Constantinople was taken by the French and Venetians (called the Latins), who then became masters of the whole empire. They divided it into four parts, giving the first with the capital to Baldwin, Count of Flanders, who was made emperor, and whom the other participants in the expedition recognized as their sovereign. The Venetians received as their share the countries bordering on the Adriatic and Ægean Seas, a part of the Morea, together with several islands; Bonifacius, Count of Montferrat, received Macedonia and part of Greece; dukedoms, countships, principalities, etc., were established at various places; while a number of Greek princes maintained their independence. Under Theodorus Lascaris, who had been elected emperor at Constantinople, an empire was formed at Nicæa (Nice). In Trebizond Alexius Comnenus ruled with absolute power. One of his successors, John Comnenus, became Emperor of Trebizond. Neither Baldwin nor his successors could do anything to avert the impending ruin. Baldwin was taken prisoner by the Bulgarians, and died in 1206. His brother Henry ruled bravely and wisely till 1216, when the empire became a prey to utter anarchy.

The dynasty of the Palæologi began with Michael VIII. Palæologus, who, by the help of the Genoese captured Constantinople in 1261. Michael, the first of the Palæologi, was an able prince, but offended both clergy and people by an attempt to unite the Greek and Latin Churches. Andronicus III., a great-grandson of Michael, became emperor in 1328. During his reign the Turks took Nicæa and Nicomedia and devastated the European coasts. In the reign of his son, Johannes V., the Turks began to gain ground in Europe, and in 1362 Sultan Amurath had made Adrianople his capital. Under the following rulers the empire rapidly declined, giving way more and more to the advancing forces of Turks, until on May 29, 1453, with the capture of Constantinople by Mohammed II. and the death of Constantine XI., the Byzantine empire came to an end, and the Turkish rule was, after centuries of fierce warfare, firmly established in Europe. Revised by C. K. ADAMS.

Byzantine Historians: Greek writers who have treated of the history of the Byzantine empire. They fall into two groups, historians proper and chroniclers. The historians deal with contemporaneous events and special epochs, follow classical models, and write for a cultivated public. The chroniclers deal with universal history, write for the people, and dwell on matters that appeal to the popular taste, such as plague, pestilence, and famine, comets and earthquakes, great buildings, and famous chariot-races. The church makes itself felt throughout, and the language, if not exactly the language of the people, is one the people can understand. The historians constitute the best part of Byzantine literature, but they have no new critical method, no new conception of history. They move along the lines of old formulæ, and the old tradition persists in the representation of life as in the character of the language. They are not uncritical, as antiquity counted criticism, and they show a laudable desire to gather information from living sources. They do not neglect geography or ethnology, and, as many of them were men of high official station, there is no lack of original state papers, of original letters for the substantiation and illustration of the narrative. Despite the artificiality of the language, the character of the period is mirrored in the great space given to diplomatic and theological quarrels, and if the pressure of Byzantine despotism has proved fatal to veracity here and there, if the narrative is colored at times by personal sympathies and personal antipathies, yet on the whole there is a recognition of the historian's duty to be impartial and to be truthful. Of the multitude of authors, only a few can be mentioned here. Among the most important of the historians are Procopius, Agathias, Theophylactus, Constantine Porphyrogenitus, Leo Diaconus, Nicephorus Bryennius (see BRYENNIUS) and his wife, the famous Anna Comnena, all mentioned in their proper places. Among the chronielers may be noted Johannes Antiochenus, Johannes Malalas, Theophanes Confessor, Xiphilinus, and Zonaras. Much remains unpublished.

EDITIONS.—The Paris *Corpus*, edited by Labbé, 1648–1711, in 42 parts; reprinted with additions at Venice, 1729–1733; the Bonn *Corpus*, 1828–78, 49 volumes, much of which has been taken up into Migne's *Patrologia Græca*. See Krumbacher, *Geschichte der byzantinischen Litteratur* (Munich, 1891).

Byzantine Recension: a Greek text of the New Testament; used in Constantinople after it became a metropolitan see in the Eastern Church. It is cited by several Greek Fathers, and was used as the basis of the old Slavic version. It corresponded quite nearly with the present "received text" and with many existing MSS.

Byzan'tium (in Gr. Βυζάντιον): an ancient Greek city; situated on the Thracian Bosphorus, and on the site of the modern Constantinople. It is said to have been founded by a colony of Megarians in 667 B. C. It increased rapidly, and soon became an important commercial city. Few cities could boast so magnificent a position. Commanding as it did the two shores of both Europe and Asia, at the same time secure and advantageously situated for commerce, it had at its command the choicest gifts of nature and the most charming scenery. Byzantium was very evidently the site of extensive tunny-fisheries, the fishes visiting the port periodically in immense numbers, as they do at the present day. The fish were salted and exported. The name "Golden Horn," still applied to a part of the channel of Constantinople, was probably derived from the great revenue flowing from this fishery. The Byzantines also levied a considerable toll on vessels passing from sea to sea. The levying of these tolls once involved them in war with the Rhodians. They also derived much profit from their rich corn-fields not far from the city. On the S. it was bathed by the Propontis (Sea of Mármora), and on the N. by the waters of the Golden Horn. Having been captured by a general of Darius Hystaspis, it was liberated by Pausanias about 478 B. C. A few years later Byzantium became an ally or tributary of Athens, against which it revolted in 440 B. C. It was besieged and taken by Alcibiades in 408. Philip of Macedon besieged it in 340 B. C., but Demosthenes persuaded the Athenians to send a fleet which compelled him to raise the siege. This repulse of Philip was one of the proudest feats of the great orator, who often recurs to it in his speech *On the Crown*. Byzantium was for ages especially exposed to the attacks of barbarians, but the long wars did not beget much valor in the people. From their great commercial prosperity they early became corrupted, and they were proverbially indolent, cowardly, and luxurious. Byzantium was probably either a kingdom or the seat of a tyrannus; afterward it became an aristocracy, and later a crude democracy.

The Byzantians suffered much from the predatory incursions of the Gauls, and, being unable to resist them in battle, agreed about 279 B. C. to pay them an annual tribute. This city supported Pescennius Niger in the civil war against Septimius Severus, who captured it in 196 A. D. after a brave resistance of three years' duration. He then reduced it almost to ruin, but afterward relented and partially restored it. The name of *Augusta Antonina* was given to it in his time. The Greek Christians ascribe the foundation of the Byzantine Church to the labors of St. Andrew the apostle, but this statement is unsupported by trustworthy evidence. It is, however, certain that soon after 200 A. D. there were numerous Christians in the city. In 330 A. D. Constantine the Great selected this place as the capital of his empire, and founded a new city, which he intended should rival Rome, and to which he gave the name of New Rome. This city of Constantine was much more extensive than Byzantium, which occupied in all probability only the most eastern of the seven hills on which the modern capital is built. See CONSTANTINOPLE.

Bzo'vius, or **Bzowski**, bzhov'skĕe, ABRAHAM: a Roman Catholic historian; b. at Proczovie, Poland, in 1567. He was a zealous Dominican prior; was called to Rome by Pius V., where he wrote in Latin 9 volumes of a continuation of the *Annals of Baronius*; an *Ecclesiastical History* (2 vols. fol., Rome, 1616); and other historical works, besides numerous sermons and biographies of several popes. D. in Rome, Jan. 31, 1637.

C

: the third letter of most European alphabets; is in English either a palatal explosive, with the sound of *k*, a sound which it has before *a*, *o*, *u*, and the consonants (except *h*), unless marked with the cedilla, thus, *ç*, as in *façade* and other words, mostly from the French and Portuguese. When marked with the cedilla, or when occurring before *e*, *i*, or *y*, it has the sibilant sound of *s*. *Ch* has (1) the Spanish sound, as in the word *church*; (2) the French sound (equivalent to *sh*, the German *sch*), as in *chaise*; and (3) the hard sound, equivalent to *k*, as in *chord*. The German guttural *ch* is never used in English. C in music is the first note of the "natural" diatonic scale, which scale is so called because it requires neither flats nor sharps in its signature. In the ancient Greek system of tonality the scale of which C forms the initial note was called Ionic. C in Latin stood for 100, and also for the prænomen Caius. In chemistry it is the symbol of carbon; and *c. c.* is an abbreviation for "cubic centimeter."

Caaba: See KAABA.

Caaing-whale, kaw'ing-hwāl' [Scottish, driving-whale]: the *Globicephalus melas*; a large porpoise which abounds in herds on the coasts of Great Britain, North America, Iceland, etc. It takes its name from the fact that when one of the herd is stranded the rest all follow it, sometimes as many as 100 at once rushing to their own destruction in this manner. They are the source of rich booty to fishermen. Other species of the genus inhabit the Mediterranean, the Pacific, etc. It is one of the black-fish whales of North America, and is most frequently caught off the coasts of Scotland.

Cabal' [from Fr. *cabale* < Late Lat. *cabbala* < Heb. *gabbālāh*, tradition; hence the secondary meaning of *cabbala*, secret doctrine or art]: a secret council formed under the reign of Charles II. (1667); consisted of the following members: Sir Thomas, afterward Lord Clifford, Lord Arlington, the Duke of Buckingham, Lord Ashley, afterward Earl of Shaftesbury, and the Earl of Lauderdale. The Cabal was dissolved in 1674. The prevailing opinion that the word was formed from the initials of the names of its members is perhaps erroneous, as it had been used before to denote a secret cabinet, and is said to be derived from the Hebrew (see CABBALA), but this accidental association of the initial letters may have suggested this particular application of the name.

Caballero, kăă-băl-yā'rō, FERNAN (pseudonym of *Cäcilia Böhl von Faber*): Spanish novelist; b. of German parents resident in Cadiz, Dec. 25, 1796. She made a wide reputation by her stories describing the local customs of various parts of Spain. Among her novels the following are worth mentioning: *La Gaviota*; *Un Verano en Bornos*; *Pobre Dolores*; *Clemencia*; and the tales called *Relaciones* and *Cuadros de Costumbres*. D. Apr. 7, 1877. The best edition of her works is that of Madrid, 18 vols., 1855–67.

Cabañas, kăă-baa'nyas: a port of North Cuba, Pina del Rio province, W. of Havana. The bay resembles that of Havana in its formation. Its narrow entrance is overlooked by Fort Reina Amalia. Pop. 1,500.

Cabanel, kăă'ba-nel', ALEXANDRE: painter of genre, history, and portraits; b. at Montpellier, France, Nov. 28, 1823: d. in Paris, Jan. 23, 1889; was a pupil of Picot; won the Grand Prix de Rome in 1845; was a perfect type of the artist whose methods are founded on the classicism of David in his historical work, and only in his portraits, of which he painted a large number, did he show that he was affected by more modern influences. He was for many years one of the Professors of Painting in the École des Beaux-Arts, and among his pupils are some of the most famous French artists. His list of honors is a long one, including a first-class medal at the Paris Exposition of 1855; the medal of honor at the Salon of 1865; medals of honor at the Universal Expositions in 1867 and 1878; member of the Institute 1863; commander Legion of Honor 1884. His *Death of Moses* (1852) is in the Corcoran Gallery at Washington; his portrait of Miss C. L. Wolfe is in the Metropolitan Museum, New York; and five of his works, including the *Apotheosis of St. Louis* (1855) and the *Birth of Venus* (1863), are in the Luxembourg Gallery, Paris. In the Panthéon at Paris are his frescoes depicting the life and education of St. Louis. Many pictures and portraits by him are owned in the U. S. His portraits of men are lacking in virility and vigor, but his portraits of women are distinguished and refined, though often somewhat insipid. He was a graceful and accurate draughtsman. Replicas of his *Birth of Venus* are in the collections of John Wolfe, New York, and H. C. Gibson, Philadelphia. WILLIAM A. COFFIN.

Cabanis, kăă'ba-nee', PIERRE JEAN GEORGE: philosopher and physician; b. at Cosnac, Charente-Inférieure, France, June 5, 1757. He was a friend and political partisan of Mirabeau, whom he attended in his last illness. He was admitted into the Institute in 1796, and became Professor of Medicine in Paris in 1797. In the early part of his life he was an atheist. His principal work is the *Relations between the Physical System and Mental Faculties of Man* (Rapports du Physique et du Moral de l'Homme, 1802), in which he maintained that "the brain secretes thought as the liver secretes bile." But he afterward changed his opinions in this respect, and adopted theistic views. D. near Meulan, May 5, 1808.

Cabbage [from Old French *cabus*, dialectally *caboche*, a cabbage; from Lat. *caput*, a head]: a garden esculent of the mustard family. The cabbage in some of its forms has been cultivated from prehistoric times. It is a native of Europe, where the wild plant is still to be found upon certain seacoasts. *Brassica oleracea*, the species to which the cabbage belongs, is supposed to have given rise to the cauliflower, kales, and Brussels sprouts, and some botanists even suppose that some of the turnips have had a similar origin. In English there is no generic name to cover all these forms as there is in French in the word *chou*. The cabbages are commonly divided into two general groups, the common smooth sorts and the Savoys, which are characterized by blistered leaves. The common cabbages are again grouped according to the shape of the head, as spherical, oblong, conical, and flat; and there are also green and red varieties. Collards is a kale-like vegetable belonging to this same species, or sometimes young cabbage plants, which are used for "greens," are so called. The cabbage is an important crop in temperate climates. In 1890 77,094 acres were devoted to it in the truck-farms of the U. S., and 1,268 acres were devoted to the growing of seed. Seed for early cabbages is sown in hotbeds, but that for the late crops is sown in seedbeds in the open, or sometimes even planted in the position in which the plants are to grow. Cabbages demand a deep and rich soil, and one which is not liable to injury from drouth. Over 100 varieties are now known and cultivated in the U. S. L. H. BAILEY.

Cabbage Butterfly: any one of those butterflies the larvæ of which feed upon cabbage and allied plants. These are mostly confined to that group called *Pieridæ*, the prevailing color of which is yellow or white. Two of the most common species (*Pieris rapæ* and *Pontia protodice*) are natives of North America, but they seem to be lessening in numbers since the advent of the European form, *Pieris rapæ*, which was introduced some thirty years ago. They are difficult pests to deal with since the larvæ bore into the heads of the cabbage, and hence poisons can not be used conveniently.

Cabbage-fly (*Anthomyia brassicæ*): a fly of the same family with the house-fly, flesh-fly, etc., of which the maggots often do injury to the roots of cabbages. It is of the same genus with the turnip-fly, onion-fly, etc. They are found in America and Europe, and are very destructive. The larvæ are a dull-reddish color, and the round of metamorphoses is about eight weeks. Lime-water destroys them.

Cabbage-palm, or **Cabbage-tree**: one of several species of palm, the great terminal bud of which is eaten like cabbage, and also bears nuts of which the kernel is sweet. The

cabbage-palm of the West Indies is the *Euterpe oleracea*, which grows to the height of 120 feet or more. The palmetto (*Sabal palmetto*) is sometimes called cabbage-palm.

Cab'bala, or **Kabbalah** [Late Lat., from Heb. *gabbālāh*, what is received, tradition]: an ancient Jewish system of religious philosophy or theosophy. Those who have studied the subject with the greatest care are not fully agreed among themselves as to its origin and character. The Cabbala attempted to explain the nature of God and of the universe. Some of the late writers of this school taught that God has neither will, intention, desire, nor action, but that ten *Sephiroth*, or intelligences, emanated from God. The first *Sephirah* is called the *Inscrutable Height* (from which the second was derived, as the third from the second, and so on). The names of the other intelligences in order are wisdom, intellect, grace, power, beauty, firmness, splendor, foundation, and authority. As God became active in these *Sephiroth*, so these become externally manifested in the universe.

The psychology of the Cabbala teaches the doctrine of the transmigration of souls, but as the literature of the system is immense, and its teachings recondite and often puerile, it is difficult and unnecessary to state exactly what this philosophy taught. It probably was influenced by the Greek philosophy known as Neo-Platonism. According to recent authorities it originated among Jewish thinkers of the tenth century. See Knorr von Rosenroth's *Cabbala Denudata*, or its English translation, *The Cabbala Unveiled*, by S. L. M. Mathers (London, 1887), containing three books of the Zohar. Revised by W. T. Harris.

Cabbalists: those Jews who believe in the Cabbala, or traditional interpretation of the Pentateuch, said to have been received by Moses from God on Mt. Sinai. See preceding article.

Cabeiri: See Cabiri.

Cabell Court-house: See Barboursville.

Cabell, William: member of a family eminent in the annals of Virginia; b. in Licking Hole, Va., Mar. 13, 1730; eldest son of William Cabell, surgeon, who emigrated from England to America in 1723, and obtained extensive grants of land on the James river. William Cabell, Jr., was sheriff of Albemarle County 1751; "his majesty's presiding justice" and member of the house of burgesses 1757; commissioner for settling military claims 1758; member of the house of burgesses when the colonies revolted; member of the committee that prepared the "bill of rights"; first presiding magistrate for the U. S. after the Declaration of Independence; unanimously chosen presidential elector in 1789. He left an estate of 20,000 acres. D. at Union Hill, Va., Mar. 23, 1798.

Cabestaing. Guillem, de: a famous Provençal poet; lived and wrote in the second half of the twelfth century. Little is known of his life except the improbable tale of the end of it. This is, in brief, that having loved Margarida, wife of Count Raymond of Roussillon, he was slain by the latter, and his heart was offered by the angry lord to his wife to eat. She, having eaten of it, declared that it was the sweetest morsel she had ever tasted, and that she would never eat other food after it. So she threw herself from the turret of the castle and was killed. This tale was very widely known in the Middle Ages, and was used by Boccaccio. See Diez, *Leben und Werke des Troubadours* (2d ed. 1882); Franz Hüffer, *Der Trobador Guillem de Cabestanh, sein Leben und seine Werke* (1869); E. Beschnidt, *Die Biographie des Trobadors G. de C., und ihr historischer Werth* (1879). A. R. M.

Cabet, kăă'bā', Étienne: socialist; b. in Dijon, France, Jan. 2, 1788. He was a radical democrat in politics and a leader of the Carbonari. In 1842 he published a romantic work called *Travels in Icaria*, which was very popular among the workingmen of Paris. He planted in 1846 a colony on the communist system on the Red river in Texas, from which he and his followers removed in 1849 to Nauvoo, Ill., after that town had been deserted by the Mormons. D. in St. Louis, Mo., Nov. 9, 1856. His colony, which had never enjoyed much prosperity, was broken up in 1857.

Cabeza de Vaca: See Vaca, Alvar Nuñez, etc.

Cabin: a small room or inclosure; a cottage, small house, or rudely built temporary residence. Also an apartment in a ship or steamboat for the use of the officers and passengers. These apartments in steamboats are often called saloons. In ships of war the rooms of the admirals and captains are called cabins, and are fitted up with much elegance.

Cabinet: specifically, a body of counselors, generally composed of the heads of executive departments, on which the responsibility of government devolves. The name is taken from the cabinet or private apartment where a king was accustomed to meet his privy council in secret conference. Before the modern cabinet was developed the term was used reproachfully, as implying a government by intrigue of court favorites. It is not now a body known to the law in either the United Kingdom or the U. S. Under the Tudors and Stuarts the privy council was the council of state. The modern cabinet began under William III., who placed the ministry on a parliamentary basis and required party unity among its members, and he and Queen Anne were wont to preside over its meetings. Under the first two Georges, who scarcely understood English, the cabinet acquired independence of the crown, and no subsequent monarch has been able to regain control, so that it is a maxim of the British Government that the monarch shall not attend the discussions of his advisers. He may dismiss his ministry, however, and appeal to Parliament, and even to the country, but the proceeding has become hazardous and is not attempted. The Prime Minister selects from the chief officers of the Government, whose names he submits to the crown, those whom he will have in his cabinet, and he is not restricted as to their number nor their division between the two Houses of Parliament, except that prescription has fixed the number at not less than eleven, viz.: First Lord of the Treasury, Lord Chancellor, Lord President of the Council, Lord Privy Seal, Chancellor of the Exchequer, First Lord of the Admiralty, and the five Secretaries of State. This body is the responsible Government of the United Kingdom, and stands or falls together. Its meetings are secret, no record of its proceedings is kept, it is dishonorable to divulge its deliberations, each member is bound by its decisions or must resign his office in the ministry, and in practice he is a member of Parliament.

In the U. S. the cabinet is composed of the chiefs of the eight executive departments created by acts of Congress, viz.: the Secretaries of State, Treasury, War, Attorney-General, Postmaster-General (created in 1789), Secretary of Navy (1798), Secretary of Interior (1849), and Secretary of Agriculture (1889). Their meeting as advisers of the President is unknown to the law or constitution, and their conclusions in cabinet have no binding force, except that a dissenting member would resign office if he could not conform. By act of 1886 members of the cabinet in the order named, except the Secretary of Agriculture, succeed to the performance of chief executive functions when by removal, death, resignation, or disability, the offices of President and Vice-President are both vacant, until the disability is removed or a President is elected. In this event Congress must be assembled within twenty days. See Camarilla. C. K. Adams.

Cabi'ri, or **Cabeiri** (in Gr. Κάβειροι): ancient divinities worshiped in Samothrace, Phœnicia, Greece, and other countries. The myth of the Cabiri is obscure, and not well explained by ancient writers. Their worship was performed with much solemnity and mystery. The earliest mention of them in literature is in a drama by Æschylus, entitled Κάβειρος, in which they are represented as beneficent beings who mingle freely with the Argonauts during the visit of the latter to Lemnos.

Cable: a rope or a chain mostly employed on shipboard to connect the ship with her anchors. The name is often applied to wire ropes, especially such as are used in suspension bridges and to submarine telegraph lines, etc. Rope cables are made of the best hemp, of manilla, or of coir. The circumference varies from about 12 inches to 26. A number of yarns are twisted to form a *lissum*; three lissums, twisted in an opposite direction, form a *strand*; and three strands twisted in the direction of the yarns in a lissum form a *cable*. The strength of a cable varies according to the square of the diameter. On shipboard, cables receive the names of *sheet* cables, *bower* cables, etc., according to the anchor to which they are attached. Hempen cables have been superseded by chain. Chain cables consist of links the length of each of which is about six diameters of the iron of which it is made, and the breadth about three and a half diameters. See Ropes and Rope-making. Revised by S. B. Luce.

Cable, Electric: a conductor or set of conductors for the electric current, in which protection from injury is provided for by surrounding the insulating coat with a sheath or armor. Cables for use underground, where the chief sources of injury are of a chemical nature, are commonly surrounded

with a sheath of lead. Submarine cables, which are subject to continual abrasion, are incased in an armor of steel wire.

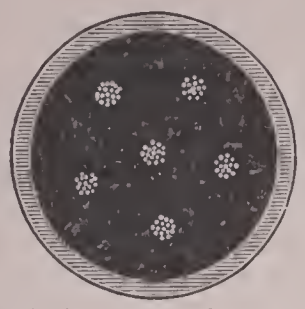


FIG. 1.—Underground cable, containing six-stranded conductors for electric lighting.

FIG. 2.—Submarine cable, with one-stranded conductor.

For the sake of greater flexibility, cables, even when they contain but a single circuit, are usually made up of many strands.

Cable, GEORGE WASHINGTON: novelist; b. in New Orleans, Oct. 12, 1844; served in the Confederate army during the civil war, after the close of which he returned to New Orleans; engaged in surveying, journalism, and various mercantile occupations until 1879, when he began to devote himself wholly to literature. He gave readings from his stories in Northern cities, and since 1885 has resided in Connecticut and in Northampton, Mass. His fictions relate mainly to Louisiana life, and illustrate Creole dialect and character. Among them are *Old Creole Days* (1879–83); *The Grandissimes* (1880); *Madame Delphine* (1881); *Dr. Sevier* (1885); *Bonaventure* (1888), etc. He also wrote essays on the penal systems and the condition of the colored race in the Southern States. HENRY A. BEERS.

Cabot, JAMES ELLIOT: b. in Boston, Mass., June 18, 1821; writer for *The Dial* in 1844; edited *The Massachusetts Quarterly* 1848–50; edited *Audubon's Birds of America*; contributor to the *Atlantic Monthly*, *The North American Review*, and other magazines; undertook on invitation of R. W. Emerson the editorship of his writings; published in 1887 *A Memoir of Ralph Waldo Emerson*. W. T. HARRIS.

Cabot, JOHN: a foreign merchant of Bristol who, after the discovery of America by Columbus, was placed in command of a fleet of five vessels, which sailed in the spring of 1497. They reached the coast of Newfoundland (according to Sebastian Cabot's map, found in the geographical cabinet of the National Library in Paris) on June 24, and were in England again in August. Nothing is heard of him after 1498, and he is supposed to have died about that time. The date of his birth is not known.

Cabot, SEBASTIAN: navigator; son of the preceding; b. in Bristol, England, 1477. He is supposed to have been with his father in the voyage of 1497, and there are some indications that he visited the North American coast in 1503. In 1517 he commanded an English expedition in search of a Northwest passage, discovering the entrance of Hudson's Bay and penetrating to lat. 67° 30′ N. Invited by Charles V. to Spain, he was made Grand Pilot of Castile (1518), and in this capacity commanded four ships which left San Lucar in Apr., 1526, to follow Magellan's route to the Moluccas. Touching on the coast of Brazil, he entered the Plata, ascended the Paraná and Paraguay to the site of Ascencion, and, abandoning the Molucca voyage, built the fort of Espirito Santo on the Paraná, thus founding the Spanish colonies in this region. Receiving no aid from Spain, he returned in 1530, leaving a garrison. He remained in the Spanish service until the end of 1546, when he went to England. Edward VI. granted him a pension, and he was influential in promoting English commercial enterprises, especially to the Baltic. D. in London, 1557. A map of the world, published in Holland in 1544, is aseribed to Cabot. See Biddle, *Sebastian Cabot* (1831); Harrisse, *Jean et Sebastien Cabot* (1882); Demersay, *Histoire du Paraguay*. HERBERT H. SMITH.

Cabra, kaa′brăa (anc. *Ægabrum*): a town of Spain; in the province of Cordova; 30 miles S. S. E. of the city of Cordova (see map of Spain, ref. 19–E). It has a college, a cathedral, a convent, and manufactures of linens, hats, soap, bricks, etc. The neighboring region is volcanic, and produces excellent wine. Pop. about 14,000.

Cabral′, PEDRO ALVAREZ, or PEDRALVEZ: Portuguese navigator; b. about 1460. In 1500 he commanded a fleet of eighteen vessels destined to follow the route to India which had been opened by Vasco da Gama. Obeying his instructions, he kept far out in the Atlantic, and thus, on Apr. 22, discovered the Brazilian coast about lat. 16° 20′ S. (See BRAZIL.) Continuing his route, May 2, Cabral soon lost four ships in a storm; with the rest he proceeded to Mozambique and Calicut. A fort which he founded at Calicut was destroyed; he then made an alliance with the sovereign of Cochin, loaded his vessels with spices, and, losing one more ship on his return, reached Lisbon, July 23, 1501. Of Cabral's subsequent life nothing is known; he probably died about 1526. See Capistrano de Abreu, *Descobrimento do Brasil* (Rio de Janeiro, 1883); Barros, *Decadas das Indias*. HERBERT H. SMITH.

Cabrera, kaa-brā′raa, Don RAMON: general and Carlist; noted for his cruelty; b. in Tortosa, Catalonia, Spain, Aug. 31, 1810. In the civil war which began about 1834 he fought for Don Carlos against the Christinos, and became a leader of guerillas. He gained a victory at Buñol in Feb., 1837, and took Valencia; but he was driven out of Spain by Espartero in 1840, and retired to France. He returned in 1848 and renewed the contest, but he was defeated and went into exile in Jan., 1849; supported the government of Alfonso XII. D. at Wentworth, England, May 24, 1876.

Cabrera Bobadilla y Mendoza, LUIS GERONYMO FERNANDEZ, de: fourth Count of Chinchon; Spanish administrator; b. about 1575. From Jan., 1629, to Dec. 18, 1639, he was Viceroy of Peru. His administration was a difficult one, owing to the constant demand from Spain for a larger revenue; he also had to deal with the Araucanian war in Chili, and with an insurrection of the Urus Indians of Lake Titicaca. The most memorable event of his term was the discovery of the medicinal properties of Peruvian bark, with which the viceroy's wife was cured of a fever. He died at his castle, near Madrid, in 1647. HERBERT H. SMITH.

Cabul, ka-bool′ (properly kaw′bo͝ol): a fortified city of Afghanistan; on the Cabul river, here crossed by three bridges; 80 miles N. N. E. of Ghazni; about 6,400 feet above the level of the sea; lat. 34° 30′ N., lon. 69° 6′ E. (see map of Asia, ref. 5–D). The climate in winter is very severe. The citadel, called Bala Hissar, includes the palace of the Khan, the government offices, royal gardens, and numerous dwellings. The streets are narrow; the houses are two or three stories high, and have flat roofs. The public buildings are not remarkable. Cabul is widely celebrated for the variety and excellent quality of its fruits, apples, pears, pomegranates, grapes, etc. It has an extensive trade as an entrepôt between India and Turkestan. The people of Cabul are Mohammedans and a mixture of several races. Under the Emperor Bâber, Cabul was the capital of the Mogul empire. It was taken by Tamerlane about 1400, and by Nadir Shah in 1738. The British captured it in 1839, but in Jan., 1842, the Afghans revolted and massacred the British army. Shere Ali took it from his revolted brothers in 1868; it was again captured in 1879 by Sir Frederick Roberts, in retaliation for the destruction of the British residency. Pop. 50,000 to 60,000.

Caca′o [Span. form of native Mexican name of the tree *caca-uatl*]: the fruit of the *Theobroma cacao*, a tree of tropical America; of the family *Sterculiaceæ*. Chocolate and cocoa are made of the roasted oily kernels of the cacao nut, which also yields cacao butter. This tree should not be confounded with the cocoanut tree, nor with the coca of Peru.

Cacao Butter: a fixed oil, hard and solid at ordinary temperatures; is yielded in large quantities by the fruit of *Theobroma cacao*. It is extracted by heat and pressure. It contains a very large proportion of stearin, with some olein and palmitin. It is largely used in the preparation of cosmetics, and is especially useful in pharmacy in the preparation of suppositories. The mafurra tallow which is brought from Madagascar closely resembles the above in chemical and physical properties. Cacao butter is not to be confounded with cocoa butter, which is a kind of palm oil, used in the manufacture of soap.

Cac′apon, or **Great Cacapon**: a river of West Virginia; rises near the south extremity of Hardy County; flows nearly northeastward through Hampshire and Morgan Counties, and enters the Potomac. Length about 140 miles.

Cáceres, kaa′thā-rās: a province of Spain; bounded N. by Salamanca, E. by Avila, Toledo, and Ciudad Real, S. by Badajoz, and W. by Portugal. Area, 8,014 sq. miles. It is intersected by the river Tagus. The surface is diversified by several ranges of mountains. Capital, Cáceres. Pop. (1887) 339,793.

Cáceres (anc. *Castra Cæcilia*): a town of Spain; capital of province of same name; situated on high ground, 25 miles W. by N. from Trujillo (see map of Spain, ref. 16–C). It contains an old castle, an episcopal palace, several convents and hospitals, a theater, a Jesuits' college, and a bull-ring which is one of the largest in Spain. It has manufactures of linens, woolen goods, hats, soap, wine, etc. Interesting Roman and Moorish antiquities are found here. Pop. about 15,000.

Caceres, Andres Avelino: Peruvian soldier and statesman; b. in Ayacucho, Nov. 11, 1838. He served as an officer under Castilla and Prado, and, on the overthrow of the latter, was imprisoned for a year. Under President Pardo he distinguished himself by quelling a mutiny. When the war with Chili broke out in 1879 he was a colonel. He served in most of the battles, became brigadier-general, and after the fall of Lima was chosen second vice-president in the provisional Calderon government, June, 1883. The captivity of Calderon and the absence of the first vice-president left Caceres as acting president of Peru. Supported by the interior provinces, he held out against the Chilians, and declared against Iglesias, whom they had made president at Lima. An attempt of Caceres to take the capital failed after a hard street-fight (Aug., 1884), but a second attempt succeeded without bloodshed (Dec. 1, 1885). Caceres then agreed with Iglesias to refer their rival claims to a general election. This resulted in favor of Caceres, who was inaugurated president of Peru, June 3, 1886. Under his administration the country began to recover from the ruin which had resulted from the war; the state railroads and guano beds were given up to a private company, which assumed part of the national debt. Gen. Caceres went as Peruvian minister to France and Spain in 1891. In 1894 he again became president. Herbert H. Smith.

Cáceres, Nueva, noo-ā′vāă (i. e. New Cáceres): a town of the Philippine islands; in Luzon; on its southeast coast, 184 miles S. or S. E. of Manila, a seat of a bishop (see map of East Indies, ref. 3–H). Pop., including suburbs, about 12,000.

Cachalot, kash′a-lot [from Sp. *cachalote*, by way of Fr. *cachalot*]: a book-name for the sperm whale (*Physeter macrocephalus*), the largest of the toothed whales and of the family *Physeteridæ*. It has a blunt head which forms nearly one-third of the total length; there is no back fin, but in its place a low hump; the paddles are short and squarish, and the tail or flukes broad and powerful. The right nostril is aborted, and the left opens by a long slit on the left anterior portion of the head, a conformation which causes the very characteristic "spout" of this species, resembling, as it does, a puff of smoke from a gun, and by which it may be readily recognized at a long distance. The upper jaw overhangs the lower and contains no teeth, although rudimentary teeth are present in the young, concealed beneath the gum. The two halves of the slender lower jaw are opposed for the greater portion of their length, and each contains about twenty-one conical teeth. The color is blackish, lighter beneath. Old males are said to attain a length of 70 feet, but 40 to 50 is the average size. The females are smaller and of more slender build; the year-old young is under 25 feet. The sperm whale is gregarious, associating in schools, or pods, of from four or five up to one hundred, or even more. The large schools are composed of females, young, and medium-sized males; the larger the individuals the smaller the size of the school, the very largest males being solitary in their habits. The males frequently indulge in combats with one another, and occasionally a whale is taken whose jaw is badly twisted out of shape as the result of some fight when young. The spermaceti, whence the species derives its name, is a whitish, oily liquid, hardening on exposure to the air, contained in a cartilaginous receptacle, the "case," in front of and above the skull. In large vessels the head is taken on deck, a hole cut in the "case," and the spermaceti bailed out with buckets. In small vessels the head is made fast alongside, and the operation performed there. Spermaceti is used in the manufacture of various ointments and cosmetics, and was formerly extensively employed for making candles. The blubber, or layer of fat surrounding the body, yields an excellent oil, and a grayish wax-like substance termed ambergris, the product of disease, is sometimes found in the intestine: it is of considerable value in the manufacture of perfumery. It possesses comparatively little odor in itself, and this is supposed to be in some way due to the squids on which the sperm whale feeds. It is, however, valuable as a basis for other perfumes, and has the important property of rendering them more lasting. One of the largest, if not the very largest, pieces of ambergris on record weighed 185 lb., and was sold for about $10,000. A very large whale may yield 10 barrels of spermaceti and 120 barrels of oil. The cachalot inhabits the warmer seas of the globe, favorite grounds being off New Zealand, the Cape de Verde islands, Hatteras, the Sooloo Sea, and Indian Ocean, where it was pursued by American whalers, the number of vessels engaged in the sperm-whale fishery being at one time over 300. The food of the species is fish and squids, and the existence of gigantic cuttle-fishes was known to whalers long before any entire specimens were discovered, from the fragments vomited up by whales in their death struggles. Quite recently several species of large squids, entirely new to science, were taken from a sperm whale killed near the Azores. The head and body of the whale bore marks of the large, toothed suckers with which the long arms of the squid are provided. The cachalot is a formidable adversary when wounded, not only striking with the tail, but biting with such terrible force that whaleboats have been cut in two at one stroke. Owing to the peculiar position of the jaw, the animal bites most effectively when lying on its back. The head is also used as a ram, and a few cases are on record where whale-ships have been attacked and sunk by large sperm whales, the most notable instance being that of the Essex. See the articles Ambergris, Oils, Spermaceti, Whale, and Whale-oil; and for statistics, see the article Whale-fishery. F. A. Lucas.

Cachao: See Hanoi.

Cache, kăăsh: a French word signifying a hiding-place; a name given in the Western U. S. to subterranean holes in which travelers and trappers hide provisions and other property, to preserve them from the depredations of the Indians and wild animals. They are made to closely resemble the surrounding earth. The name is also applied to marked mounds of stone on the shores of Arctic waters, within which whalers and explorers have deposited supplies of food for the use of distressed mariners.

Cache River: of Arkansas; rises near the northeast extremity of the State. It flows in a S. S. W. direction, and enters the White river near Clarendon. Length about 150 miles.

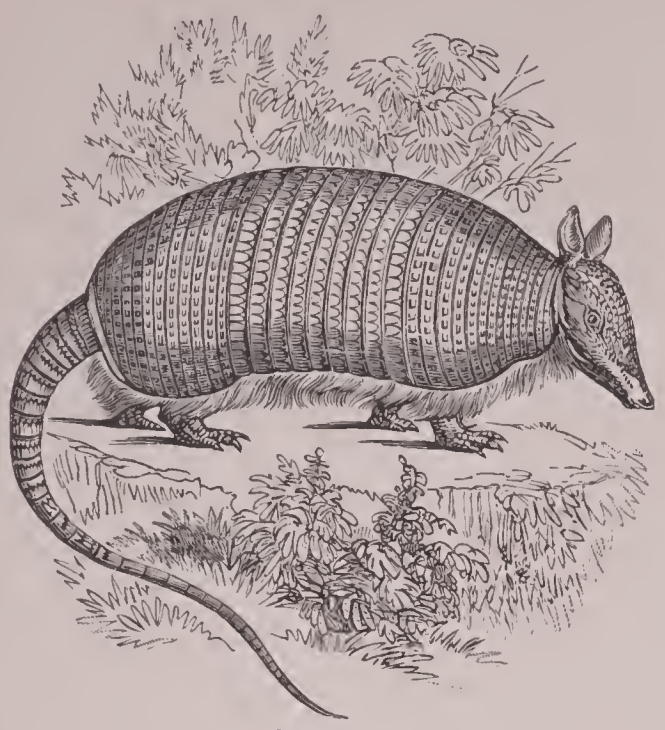
Cachet, Lettres de, letr′de-kăă′shā′: a term applied in France under the old *régime* to letters or orders signed with the private seal of the king and used as instruments of despotic power. Before the seventeenth century they were not often employed, but in the reign of Louis XIV. they became very common. Many persons were arrested by such warrants and imprisoned without trial in the eighteenth century. The chief of police kept forms of *lettres de cachet* signed and needing only the insertion of the name of the person to be arrested, and these were obtained by private persons in order to put out of the way troublesome relatives. About twenty such warrants were issued against Mirabeau. Sometimes they were used to shield offenders from proceedings before tribunals. It is stated that in the reign of Louis XV. *lettres de cachet* were sold by one of the mistresses of the king to any one who would pay money for them. They were abolished in Jan., 1790.

Cache Valley: a fertile valley of Northeastern Utah and Southeastern Idaho. It lies between northerly spurs of the Wasatch Mountains; is 60 miles long and from 10 to 20 broad; has a general altitude of 5,000 feet. The Bear river crosses it obliquely and receives a number of tributaries which are utilized for irrigation. Logan is the largest of its dozen villages.

Cachexia, kă-keks′i-a [from Gr. *καχεξία*, poor condition of body; *κακός*, bad + **ἐξία*, cf. *ἕξις*, condition; deriv. of *ἔχειν*, have, hold one's self]: a term applied in medicine to wasted and anæmic states of the system, due to various debilitating diseases. It is particularly applicable in cases of cancer or other malignant tumors, but in a general sense such terms as tuberculous cachexia, malarial cachexia, gouty cachexia, and the like may be employed. The features present an anxious and aged appearance; the skin is dry, harsh, shriveled, and of an ashy grayish hue; and emaciation is usually marked.

Cachicama, kăsh-i-kaa′ma, called also **Tatou-pe′ba**: the nine-banded armadillo (*Dasypus novem-cinctus*), an edentate mammal found from Texas to Paraguay. It is 16 inches long, and has a long tail. Both body and tail are

covered with plates, those of the tail in horny rings, and those of the body (in part) disposed in nine bands, so united as to admit of some motion. This animal can be readily



Cachicama.

tamed. Its food is principally ants, but it also is fond of vegetables and of carrion.

Cachina: See PUEBLO INDIANS.

Cacholong, kash′ō-long: a beautiful mineral, sometimes called **Pearl Opal**; is a milk-white variety of opal, nearly allied to hydrophane. It is opaque and pearly, has a conchoidal fracture, and sometimes has a reddish tinge. The name is derived from the river Cach, in Bucharia, where it was first discovered.

Cac′odyl, Cacodyle, Kakodyl, or **Kakodyle**; also **Cacodyl′ic**, or **Kakodylic Oxide** [from Gr. *κακός*, bad + *ὀδ-*, smell (cf. *κακωδία*, stink) + suffix *-yl*, substance]: an extremely poisonous organic compound of carbon, hydrogen, and arsenic (C_4H_6As). Correctly speaking, the *fuming liquor of Cadet*; belongs, as it was originally applied by Bunsen, the discoverer of this baneful series of bodies in 1837, to the latter compound, which is also called *alcarsine* (arsenical alcohol), though it is now known that the liquor of Cadet is always mixed with cacodyl itself. Cadet's liquor is obtained by distilling together white arsenic and potassic acetate. The mixed product is treated with hydrochloric acid, which gives cacodylic chloride, and this, treated in an atmosphere of CO_2, with metallic Zn, gives pure cacodyl.

Cacou′na: a post-village and parish of Temiscouata co., province of Quebec, Canada; on the southeast bank of the St. Lawrence (see map of Quebec, ref. 3–E); the terminus of the Rivière du Loup Division of the Grand Trunk Railway; a place of summer resort for salt-water bathing, and for fishing and hunting. Pop. about 1,000.

Cacta′ceæ: the CACTUS FAMILY (*q. v.*).

Cac′tus Family (*Cactaceæ*): dicotyledonous herbs, shrubs, or trees; stems mostly succulent; leaves minute or wanting (in a few cases with ample leaves); ovary inferior; stamens numerous; floral leaves (sepals and petals) usually many. They are related to the myrtles, evening primroses, mentzelias, etc., and are to be regarded as specially modified from this general type for growth in hot, dry climates. About 1,000 species have been described, all natives of the New World, with a single exception (*Rhipsalis cassytha*, variety *mauritiana*). Some species, however, have become naturalized in many countries of the Old World. The most important genera are *Mamillaria*, with spheroidal stems covered with tubercles; *Echinocactus*, with spheroidal stems vertically ribbed; *Cereus*, with elongated, ribbed stems; *Opuntia*, with flattened, articulated stems. CHARLES E. BESSEY.

Cactus-wrens: wrens of the genus *Campylorhynchus*; found in Texas, Arizona, Mexico, and Central America. They live among the cactuses on which they build their nests; hence the name.

Cadahalso, kaă-daal′sō, JOSÉ, de: Spanish poet and dramatist; b. in Cadiz, Oct. 8, 1741; killed at the siege of Gibraltar, Feb. 27, 1782. He was educated in Paris; traveled in Italy, Germany, and England; and entered the army after his return. He made his *début* in literature with *Sancho Garcia*, a tragedy (1771); followed the next year with *Eruditos á la Violeta*, a satirical epic which attracted much attention. A volume of poems appeared in 1773, and after his death his *Moorish Letters*, written on the model of *Lettres Persanes*. An edition of his collected works was published in three volumes in Madrid, 1818.

Cadam′ba, or **Kudum′ba**: an Indian rubiaceous tree which yields a handsome deep-yellow wood that is used for furniture and finishing. The different species to which the name is applied were formerly referred to the genus *Nauclea*, but that genus is now dismembered. The *Nauclea cadamba*, which is the tree to which the name cadamba is chiefly applied, now becomes *Anthocephalus morindæfolius*. *N. cordifolia*, another cadamba-tree, is now known as *Adina cordifolia*. These plants are closely related to the American button-bush, or cephalanthus.

Cada Mosto, kaa′daă-mōs′tō, LUIGI, da: navigator; b. in Venice in 1432. Having entered the service of Prince Henry of Portugal, he explored in 1455–56 the west coast of Africa as far as the mouth of the Gambia. He wrote a narrative of his voyage (1507). D. in 1480.

Cadas′tral Survey [*cadastral* is an adjec. deriv. of Fr. *cadastre*, from Late Lat. *capitastrum*, register of *capita* for taxation]: a survey made with great detail so that its results may be used in taxing property. Such a survey not only produces maps showing the roads, buildings, property lines, etc., but also books giving the names of the land-owners, the area of each parcel of ground, the character of the soil, its assessed value, and the tax payable upon it. A large part of the field work may be completed in connection with topographical surveying, but constant revisions of the cadastral books are necessary. These methods are carried to greatest perfection in Prussia and Saxony. The word cadastral is sometimes applied to any map on a large scale, e. g. the maps of the British ORDNANCE SURVEY (*q. v.*). M. M.

Caddice-fly, Caddis-fly, or **Case-fly**: a common name for insects of the order *Trichoptera*. (See ENTOMOLOGY.) The adult insects are moth-like in many respects, and are thought by many students to represent the ancestors of the *Lepidoptera*. They have four wings, with numerous longitudinal veins and but few cross veins, and are usually covered with hairs, which in some cases are scale-like, like those of the butterflies and moths. The mouth-parts are rudimentary, being neither well adapted for biting or for sucking. The common name comes from the peculiar habits of the larvæ. These are soft-bodied aquatic forms, which, for the protection of their whitish and delicate abdomens, spin tubes or cases of silk, strengthened by bits of stick or stones, and in these cases they live, crawling about like hermit-crabs or retreating into the tube at the approach of danger. Most larvæ are herbivorous, but some live on other insects. Some build nets to aid in catching their prey. The larvæ pass into a pupal stage, and from this into the adult. J. S. K.

Caddoan Indians: a family of North American Indians, the Caddos, whose name is said to be derived from a Caddo word, ká-ede, signifying chief.

The *Pawnee* and *Caddo*, now known to be of the same linguistic family, were supposed by Gallatin and by many later writers to be distinct, and accordingly both names appear in literature as family designations. The boundaries of the Caddoan family, as at present understood, can best be given under three primary groups—Northern, Middle, and Southern.

Northern Group.—This comprises the Arikara or Ree, now confined to a small village on Fort Berthold reservation, North Dakota, which they share with the Mandan and Hidatsa tribes of Siouan Indians. The Arikara are the remains of ten different tribes of "Paneas," who had been driven by the Dakotas from their country lower down the Missouri river. In 1804 they were in three villages, near their present location. According to Omaha tradition, the Arikara were their allies when these two tribes and several others were E. of the Mississippi river.

Middle Group.—This includes the four tribes or villages of Pawnee, the Grand, Republican, Tapage, and Skidi. The original hunting-ground of the Pawnee extended from the Niobrara, in Nebraska, S. to the Arkansas, but no definite boundaries can be fixed. In modern times their villages have been on the Platte river W. of Columbus, Neb. The

Omaha and Oto were sometimes S. E. of them near the mouth of the Platte, and the Comanche were N. W. of them on the upper part of one of the branches of the Loup Fork. The Pawnee were removed to Indian Territory in 1876.

The Skidi (Panimaha, or Pawnee Loup), according to Omaha tradition, formerly dwelt E. of the Mississippi river, where they were the allies of the Arikara, Omaha, Ponka, etc. After their passage of the Missouri they were conquered by the Grand Pawnee, Tapage, and Republican tribes, with whom they have remained to this day. De Lisle gives twelve Panimaha villages on the Missouri river N. of the Pani villages on the Kansas river.

Southern Group.—This includes the Caddo, Wichita, Kichai, and other tribes or villages which were formerly in Texas, Louisiana, Arkansas, and Indian Territory. The Caddo and Kichai have undoubtedly been removed from their priscan habitats, but the Wichita, judging from the survival of local names and the statement of La Harpe in 1719, are now in or near one of their early abodes. Sibley locates the Caddo habitat 35 miles W. of the main branch of Red river, being 120 miles by land from Natchitoches, and they formerly lived 375 miles higher up. The Wichita probably migrated from Northwestern Louisiana and Southwestern Arkansas to the Indian Territory.

Among the tribes which are included in this group is one known as the Adai. This name is from a Caddo word, *hadai*, meaning brushwood. From an examination of Dr. Sibley's vocabulary of about 250 words (gained at the beginning of this century), Gallatin reached the conclusion that the Adai language was distinct from any other known, an opinion accepted by most later authorities. The researches of the Bureau of Ethnology have assigned the Adai to the Caddoan family, instead of regarding them as constituting a distinct stock, which was before called the *Adaizan*. The first historical mention of the Adai appears to be by Cabeça de Vaca, who in his *Naufragios*, referring to his stay in Texas, about 1530, called them Atayos. In 1792 there was a partial emigration of the Adai to a site S. of San Antonio de Bejar, Southwest Texas, where they probably amalgamated with the surrounding Indian population, as they have disappeared. The Adai who remained in their old homes numbered 100 in 1802, according to Baudry de Lozières. According to Sibley, in 1809 there were only 20 men of them remaining, but more women. In 1820 Morse mentions only 30 survivors.

After comparing the recorded statements about the several tribes, it would appear that the original habitat of the southern group of the Caddoan Indians was a section of country now embracing Northeastern and part of Eastern Texas, and adjacent territory in Arkansas and Louisiana, its boundaries being the Red, the Sabine, and the Brazos rivers.

The principal divisions of this family are: A. Pawnee, Grand Pawnee, Tapage or Tappas, Republican Pawnee, Skidi (Pawnee Loup); B. Arikara (Ree, Ricara); C. Wichita (a confederacy); D. Kichai; E. Caddo (Kädo, a confederacy).

Population.—The present number of the Caddoan Indians is 2,123, of whom 416 are on the Fort Berthold reservation, North Dakota, and the rest are in the Indian Territory, some on the Ponca, Pawnee, and Otoe reservations, the others on the Kiowa, Comanche, and Wichita reservation. The population of the tribes officially recognized, taken from the *Indian Report for 1892*, is as follows: Arikara, 416; Pawnee, 798; Wichita (the leading tribe of the Wichita confederacy), 151; Towakarehu (a Wichita tribe, the Tawakoni) 133; Waco (a Wichita tribe), 41; Kichai, 51; Caddo, 530: total, 2,123.

Authorities.—Buschmann, *Spuren der aztek. Sprache*, pp. 424, 426, 441, 448 (1859); Gallatin, in *Trans. and Coll. Am. Antiq. Soc.*, ii., pp. 116, 117, 128, 306 (1836); Gallatin, in *Trans. Am. Eth. Soc.*, ii., pt. 1, pp. xcix., 77 (1848); Gallatin, in Schoolcraft, *Ind. Tribes*, iii., p. 402 (1853); Gatschet, *Creek Migration Legend*, i., pp. 41, 52 (1884); Hayden, *Contr. Eth. and Philol. Missouri Inds.*, pp. 232, 345 (1862); Keane, in Stanford's *Comp. Cent. and So. Am.*, p. 478 (1878); Latham, in *Trans. Philol. Soc.*, ii., pp. 31–59 (London, 1846); Latham, *Nat. Hist. Man.*, pp. 338, 342, 344, 349 (1850); Latham, in *Trans. Philol. Soc.*, pp. 101, 103 (London, 1856); Latham, *Opuscula*, pp. 290, 293, 366, 368 (1860); Latham, *El. Comp. Philol.*, pp. 470, 477 (1862); Prichard, *Phys. Hist. Mankind*, v., pp. 406–408 (1847); Turner, in *Pac. R. R. Rept.*, iii., pt. 3, pp. 55, 65, 70 (1856).

J. Owen Dorsey.

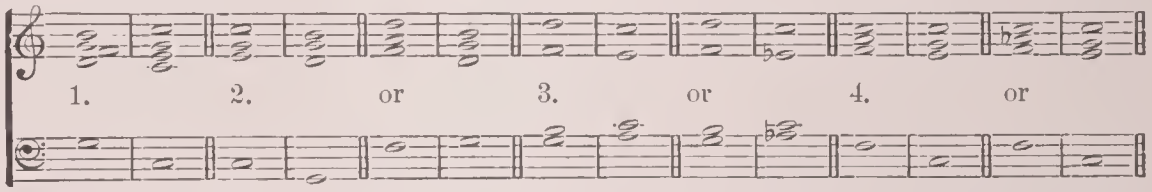
Cade, Jack: an Irishman who called himself Mortimer; the leader of an insurrection which broke out in Kent in June, 1450. He marched with about 16,000 insurgents toward London, and encamped on Blackheath. Among their motives for rebellion was oppressive taxation. Having defeated a royal army which was sent against him, he entered London, in which he maintained strict order, but he caused Lord Say, a royal favorite, to be put to death. Many of his followers were induced to disperse by a promise of pardon. Cade fled, but was pursued and killed in Sussex, near London, July 12, 1450.

Cade, Oil of (in Fr. *huile de cade*): a thin tar distilled from the wood of *Juniperus oxycedrus*; used in the medical treatment of diseases of the skin.

Cadell, Francis: Australian explorer; b. at Cockenzie, near Edinburgh, in Feb., 1822; entered the service of the East India Company in 1836; became commander of a vessel in 1844. In 1848 he visited Australia, became convinced that the Murray river was navigable, and in 1850 returned to ascend that stream in a boat for several hundred miles. A navigation company was formed, and in 1853 and 1855 he made more extended explorations in a steamer, reaching a point 1,740 miles from the river's mouth. In 1858 he explored the Murrumbidgee river for a distance of 2,000 miles; in 1859 navigated the Darling river as far as Mt. Murchison. The company failed, and he took up farming, but returned to the business of trading, and during a voyage was murdered by a mutinous crew in June, 1879.

Cadence [Fr., from Ital. *cadenza* < Lat. **cadentia*, the proper Fr. representative of which is *chance*]: a fall, a decline, a state of sinking; a fall of the voice at the end of a sentence; a sound or tone. In horsemanship, an equal measure or proportion observed by a horse in all his motions.

Cadence: in music, "a harmonic formula or sequence of chords that expresses conclusion, finality, repose, occurring at the end of a phrase or period, and involving a clear enunciation of the tonality or key in which a piece is written." (*Century Dict.*). Cadences, in music, are four in number: 1. The complete (or perfect); 2. The half (or imperfect);



3. The interrupted (or deceptive); 4. The plagal (or ecclesiastical).

The appropriate use of these forms, in their various inversions, is to the composer what correct punctuation is to the literary workman. Popularly speaking, the perfect cadence (1) may be said to correspond to the "period"; the half or imperfect to the "comma" (2); and the deceptive (3) to various uses of "colons" and "semicolons," even including analogy with points of exclamation and interrogation. Technically, the perfect cadence, or complete close, is produced by the progression from the dominant to the tonic; the imperfect by progression to the dominant, and the deceptive by the unexpected rising of the bass a major or minor third instead of falling to the tonic a fifth below, or rising to it a fourth above. The plagal cadence in its two forms (4) is to be classified as another form of complete cadence. We have retained it from the ancient church modes. It is not common in modern secular music, unless some peculiar shade of feeling is to be expressed. It will be noted that the progression of the plagal cadence is from the fourth of the key (subdominant) to the tonic.

Dudley Buck.

Cadency: in heraldry, the method of distinguishing the escutcheon of one person from that of others who are entitled to bear the same escutcheon, as with the different sons of one father. No one of these would be entitled during the father's lifetime to bear exactly the same escutcheon as he, and their escutcheons are accordingly *differenced by marks of cadency*. During the early Middle Ages cadency, like other differencing, was often effected by a complete change, as in the tincture of the field or of the bearing. In later times it became customary to add some small bearing, and this system is still in force. The shield of the Black Prince is his father's shield charged with a label, and that of his younger brother, John of Gaunt, is the same shield, but with the label charged in its turn with ermine spots.

The differences used by the British royal family are found in some peerages. The label of the Prince of Wales is plain, while those of the other princes and princesses are charged with crosses, fleurs-de-lis, hearts, or other figures for the sake of distinction. Labels, crescents, mullets, martlets, etc., are the usual marks of cadency, and the rules governing their use are complicated and fanciful.

Caden'za: in music, an ornamental succession of notes in the nature of a flourish, introduced just prior to a final close. In a larger sense the cadenza appears in concertos and concert pieces for piano, violin, etc., at considerable length as a display point for the solo performer, making use of the principal themes of the work. This was formerly expected to be impromptu. Since Beethoven, most composers have written their own cadenzas, leaving nothing to the will of the performer. DUDLEY BUCK.

Cadet' [Fr. *cadet*, fem. *cadette*: Proven. *capdet*, as if from Lat. **capitettum*, inferior head, i. e. younger son; dimin. of *caput*, head; *cadee* and *caddie* are variants, and *cad* a clip-form of the same]: a younger son, younger brother; a military officer who is junior to another is a cadet in respect to him. The term is also applied in France and other countries to a student of the art of war and military science. The students of the Military Academy at West Point, N. Y., are called cadets, as are those of the Naval Academy at Annapolis. There are also medical cadets, recognized as of a distinct rank in the U. S. Army Regulations. See MILITARY ACADEMY (U. S.).

Cadet, Naval: the lowest grade of officer in line of promotion in the British navy. Cadets enter the naval service at thirteen to fourteen and a half years of age, and are nominated by the Admiralty, subject to the regulations for examination. They first pass two years on the training-ship in port to learn the rudiments of seamanship, and are thence transferred to sea-going ships. After the cadet has served one year at sea he is eligible for promotion to the rank of midshipman. By the act of Aug. 5, 1882, it is provided that all undergraduates at the U. S. Naval Academy shall "be designated and called 'naval cadets.'" See NAVAL ACADEMIES.

Ca'di, or **Kadi**: an Arabic word signifying judge or jurist; the title of an inferior judge among the Mohammedans. He must be chosen from the ranks of the priesthood, as the precepts of the Koran constitute the code of laws.

Cadillac': city; capital of Wexford co., Mich. (for location of county, see map of Michigan, ref. 5–H); on Gr. Rap. and Ind. and Tol., Ann Ar. and N. M. R. Rs.; 96 miles N. of Grand Rapids; has 9 churches, 5 schools, electric lights, water-works, and good sewerage. It is situated between two beautiful lakes (Big and Little Clam Lakes), in the midst of the largest belt of hard-wood timber in the U. S. In 1871 its site was a lumbering-camp. Pop. (1880) 2,213; (1890) 4,461; (1900) 5,997.

EDITOR OF "NEWS AND EXPRESS."

Cadiz (Sp. pron. kaa'dĕth): a province which forms the southwest extremity of Spain; bounded N. by Seville, E. by Malaga, S. by the Strait of Gibraltar, and W. by the Atlantic and Huelva. Area, 2,809 sq. miles. Capital, Cadiz. Pop. (1887) 429,872.

Cadiz (anc. *Gades*): an important city and seaport of Spain; capital of province of same name; on the Atlantic Ocean and northwest extremity of the isle of Leon; about 94 miles by rail S. by W. of Seville; lat. 36° 32′ N., lon. 6° 18′ W. (see map of Spain, ref. 20–C). Its site is a long, narrow isthmus or tongue of land surrounded by water on three sides, having on the N. and N. E. an inlet called the Bay of Cadiz, which forms a good and capacious harbor. It is accessible from the mainland by a tongue of land, which in some places is only 200 yards wide, and is strongly defended by several forts. The houses, built of white freestone, present a bright appearance from the sea. The streets are narrow, but well paved and regular. Among the principal edifices are two cathedrals, an old and a new, the lighthouse of San Sebastian, 172 feet high, and a hospital called Casa de Misericordia. The convent of the Capuchins possesses two excellent pictures by Murillo. The city contains two theaters, a medical school, a botanic garden, and an academy of fine arts. Cadiz is one of the first commercial cities of Spain, but is probably inferior to Barcelona in the value of its imports. The chief articles of export are sherry wine, olive oil, salt, metals, and fruits. Among the imports are tobacco, sugar, coffee, hides, indigo, cotton, dyewoods, fish, and coal. The commerce of this port is much less extensive than it was formerly. Cadiz is the southern terminus of a railway which connects it with Seville. The isle of Leon is separated from the mainland by a narrow channel, which is crossed by a bridge. Here are manufactures of mantillas, fans, glass, soap, cotton and silk stuffs, hats, etc. Cadiz, which is one of the most ancient towns of Europe, was founded by the Phœnicians, probably before the foundation of Rome. The Carthaginians became masters of it during the first Punic war, but the Romans obtained possession of it in 206 B. C., after which it became a city of great wealth and importance. It was taken and pillaged by the Earl of Essex in 1596, and was blockaded in 1656 by Admiral Blake, who captured two rich galleons. It was besieged by the French from Feb., 1810, until Aug., 1812, when the victories of Wellington rescued it. Pop. (1887) 62,531.

Cadiz: village; on railroad; capital of Harrison co., O. (for location of county, see map of Ohio, ref. 4–I); about 22 miles N. W. of Wheeling; 76 miles W. of Pittsburg. A branch railroad 8 miles long connects it with the Pan Handle route from Pittsburg to Cincinnati. It is the commercial center of a great wool-growing district. It has four national banks, doing a business of over $2,000,000, and is a noted money-lending center. Pop. (1880) 1,817; (1890) 1,716; (1900) 1,755. PUBLISHER OF "REPUBLICAN."

Cad'mium: a white metal having a slight bluish cast; discovered in 1817 by Stromeyer; also independently by Hermann; named from *cadmia fossilis*, a name given to an ore of zinc mentioned by Dioscorides and Pliny. The name is said by some to have come from that of Cadmus. Symbol, Cd.; atomic weight, 112; sp. gr. after fusion, 8·6; hammered, 8·7 (nearly). Cadmium is lustrous, takes a fine polish, and possesses a fibrous fracture. It tarnishes very slightly in the air, and only burns at a high heat. It is more tenacious than tin, though, like that metal, a bar of it gives a "cry" when bent. It melts below 260°, and volatilizes at about 360° C. It occurs in nature as the sulphide "greenockite" at Bishopstown, Renfrewshire, Scotland, and incidentally as a constituent of various zinc ores, as the carbonate, silicate, etc., as well as the sulphide in several localities. The zinc flowers in the flues of zinc-reducing furnaces contain even as much as 11 per cent. of cadmium. Commercial English zinc often contains cadmium. The metal is readily soluble in nitric acid, and but slightly so in other acids, except at a boiling temperature. It forms the oxide CdO. This varies in color from brownish to blackish yellow, according to the mode of preparation. It is infusible and not volatile. Its salts are mostly colorless, and when taken into the stomach act as emetics; their taste is disagreeably metallic. Cadmium is prepared by collecting the first products of distillation from the zinc ores containing it, and subjecting them, when mixed with charcoal, to two successive distillations in iron retorts at a low red heat. Instead of the last distillation, solution in acid and purification in the wet way are resorted to. The demand for cadmium is, however, so small that the working up of the furnace products containing considerable amounts of that metal has been discontinued in some places in Silesia. It is necessary, however, to remove it from the zinc, as it renders that metal brittle when 3 per cent. or more is present. Cadmium finds its chief application in the arts in the form of the sulphide, which has an intense yellow color, and is used for coloring soaps, and in paints, etc. It is known as cadmium yellow and *jaune brillant*. The iodide and bromide of cadmium are used in photography. The metal is used for forming a fusible alloy with lead, tin, and bismuth for filling teeth.

Revised by IRA REMSEN.

Cad'mus (in Gr. Κάδμος): in classical mythology, a son of Agenor, King of Sidon; a brother of Europa. After Europa had been carried off by Jupiter, Cadmus was sent in quest of her. According to tradition, he founded the city of Thebes, originally called Cadmeia, in Bœotia; sowed the dragon's teeth that sprang up into armed men; invented sixteen letters of the Greek alphabet, or introduced them from Phœnicia into Greece. He was the first who worked the mines of Mt. Pangæon.

Cadoudal, GEORGES: a leader of the Chouans; b. near Auray, in Brittany, Jan. 1, 1771. Taking up arms against the republic, he was captured in 1794 and imprisoned at Brest, whence he soon escaped to form an army in Brittany which withstood that of Hoche until 1796. After heading

an unsuccessful Bourbon conspiracy and revolt there in 1799–1800, he refused all Bonaparte's tempting offers, and escaped to England, where he plotted with Pichegru. Proceeding to Paris in 1803, he was condemned and executed June 25, 1804.

Cadu'ceus: in classic mythology, the symbol and winged staff of Mercury (Hermes), to whom it was presented by Apollo. From this staff Mercury derived the surname of *Caducifer*. The term caduceus was also applied by the ancients to a staff or rod of laurel or olive which was carried by ambassadors and heralds as a symbol of peace. It had the figures of two serpents twisted around it. Among the moderns the caduceus is used as an emblem of commerce, over which Mercury was supposed to preside. Still more frequently it is the emblem of health and of the healing art.

Cadwal'ader, Gen. George: b. in Philadelphia in 1804; practiced law; served as a brigadier-general in the Mexican war; was breveted major-general for services at Chapultepec. He was major-general of Pennsylvania troops 1861–62, and in 1862 became major-general of U. S. volunteers. D. in Philadelphia, Feb. 3, 1879.

Cadwalader or **Cadwallader**, John: soldier; b. in Philadelphia, Jan. 10, 1742. He served as a brigadier-general at the battles of Princeton, Brandywine, and Monmouth (1778); challenged and wounded Thomas Conway for conspiring against Washington's chieftainship. D. in Shrewsbury, Pa., Feb. 10, 1786.

Ca'dy, Daniel: b. in Chatham, Columbia co., N. Y., Apr. 29, 1773; admitted to the bar in 1795; practiced with great distinction for over sixty years; was several times a member of the Legislature of New York and of Congress; for eight years judge of the Supreme Court and the court of appeals of New York. His wife was a daughter of Col. James Livingston, an officer in the army of the Revolution, and one of his five daughters is Elizabeth Cady Stanton. D. at Johnstown, N. Y., Oct. 31, 1859. A sketch of his life by his son-in-law, Henry B. Stanton, is contained in vol. xviii. of Barbour's *S. C. Reports*.

Cæcil'idæ [deriv. of Lat. *cæcilia*, a kind of lizard (*caecus serpens*, Pliny); so named from smallness of its eyes; Lat. *caecus*, blind]: a family of *Batrachia* occurring in the tropics of both the Old and the New Worlds. They have an elongate, snake-like body, frequently ringed by the production of folds in the integument, and they differ from all other Batrachia in the recurrence of minute scales in the skin. The head is small, and the small size of the eyes gave rise to the name which implies that they are blind. Between the nose and eyes is a peculiar "tentacle," which is really the duct of certain glands. The habits and life-history have been most thoroughly studied by the cousins Sarasin in the Ceylonese species, *Epicrium glutinosum*. This lives a burrowing life in the earth, feeding upon earthworms, etc. It lays long strings of eggs, which the female keeps coiled about the body; and the young in the egg possesses rudimentary hind legs and three pairs of external gills, the latter of which are lost upon hatching. As soon as the larva escapes from the egg it takes to the water, where it lives for some time before beginning its subterranean life. The Cæcilians are good examples of Degeneration (*q. v.*), as their characters clearly show that they have descended from more typically constituted forms. They are sometimes referred to as *Gymnophiona*. J. S. Kingsley.

Cæcil'ius (in Gr. Καικίλιος), of Calacte, in Sicily: literary critic; friend and coadjutor of Dionysius of Halicarnassus about the beginning of our era; an important theorist, whose work is cited and criticised by (pseudo-) Longinus *On the Sublime*. B. L. G.

Cæcilius Sta'tius: a Roman comic poet of high reputation; a native of Milan, and a friend of Ennius. He wrote nearly forty comedies, of which only small fragments are extant. D. in 168 B. C. He was regarded by ancient critics as a comic poet of the first rank. See O. Ribbeck's *Comicorum Romanorum Fragmenta* (pp. 35–81).

Cæci'na Alie'nus, Aulus, or **A. Licinius Cæcina**: a Roman general who entered the service of Vitellius in 68 A. D., and obtained command of an army. In the year 69 Cæcina and Valens defeated the army of Otho at Bedriacum. He soon deserted Vitellius, and became an officer of Vespasian, but he formed a conspiracy against the latter, and was put to death in 79 A. D.

Cæcum [neut. of Lat. *caecus*, blind, sc. *intestinum*]: literally the "blind intestine"; a sac or branch of an intestine having only one opening. In man there is only one cæcum, not very large, at the beginning of the colon, being that portion into which the small intestine opens. It terminates in the *appendix vermiformis*. In the herbivorous Mammalia it is greatly developed, being extended from the lower end of the colon. The cæcum is wanting in the bear and weasel families. Birds have two cæca, generally long and capacious in those that are omnivorous or granivorous. Reptiles seldom have a cæcum. Fishes have the cæca attached to the intestine at its uppermost part. The number of these is extremely various; sometimes there are only two, and sometimes more than a hundred. The number is different even in nearly allied species. In some fishes, as the cod, the cæca divide into smaller branches.

Revised by D. S. Jordan.

Cædmon, kăd'mon: an ancient Anglo-Saxon poet; originally a cowherd attached to the monastery of Whitby, in England; when somewhat advanced in life he suddenly revealed poetic powers, became a monk in Whitby, and composed, professedly under divine inspiration, poems on religious subjects and (it is said) paraphrases of portions of Genesis, Exodus, and Daniel, which are thought to have influenced Milton in the composition of *Paradise Lost*. Some of these are the oldest extant specimens of Anglo-Saxon metrical composition. D. in Whitby about 680 A. D. Cædmon's works were first published by Franciscus Junius (Amsterdam, 1655); best edition by C. W. M. Grein, in *Bibliothek der angelsächsischen Poesie* (Göttingen, 1857; 2d ed. 1888); Eng. trans. by W. H. F. Bosanquet (London, 1860). His story is told by Bede, *Eccl. Hist.*, iv., 24.

Cæ'lius Aurelia'nus: medical writer who belonged to the school of Methodici; b. at Sicca, in Africa. The period in which he lived is uncertain. His diction is rugged and obscure. He wrote two Latin works, *De Morbis Chronicis* (On Chronic Diseases) and *De Morbis Acutis*.

Caen, kăn (Lat. *Cadomus*, or *Cadomum*): a city of France; capital of the department of Calvados; situated on the river Orne; 10 miles from the sea, and 148 miles by rail W. N. W. from Paris; lat. 49° 11′ 12″ N., lon. 0° 21′ W. (see map of France, ref. 3–D). It was formerly the capital of Lower Normandy. It has wide, regular, and clean streets, several fine public squares, and many noble specimens of ancient Norman architecture. The houses are generally built of an excellent cream-colored freestone which is quarried in the vicinity and is called Caen stone. Caen is connected with Paris by a railway, and with the sea by a navigable canal. Among its remarkable edifices are the Cathedral of St. Étienne, founded by William the Conqueror; the Church of La Trinité, or Abbaye-aux-Dames, founded by Queen Matilda in the eleventh century; and the Church of St.-Pierre, the tower or spire of which is much admired. The castle, commenced by William the Conqueror and finished by his son, Henry I., was partially destroyed in 1793. This city contains a large public library, a museum, a botanic garden, a custom-house, the hôtel of the prefecture, an academy of arts and sciences, a medical school, a normal school, and an asylum for deaf-mutes. It has manufactures of lace, crape, linens, cotton fabrics, porcelain, cutlery, flannels, hats, and gloves. Caen has long been celebrated for its manufacture of Angora and woolen gloves. This was an important place as early as 912, when it became subject to the Normans. It was the residence of William, Duke of Normandy, before he conquered England. In 1346 it was taken and pillaged by Edward III. of England. The poet Malherbe and Auber the composer were born here. Pop. (1891) 45,201; (1896) 45,380.

Cænogen'esis [from Gr. καινός, recent + γένεσις, origin, birth]: in biology, the changes which may occur in the embryological development of an animal by which this development differs from its ancestral development, these changes being adaptations to new conditions. The term is used in contradistinction to *palingenesis*, the repetition in the individual development of the stages of ancestral development caused by inheritance.

Caerleon, kĕr-lec'on (anc. *Isca Silurum*): an old town of England; in Monmouthshire; on the river Usk, here crossed by a bridge; 2 miles N. E. of Newport (see map of England, ref. 12–F). It is supposed to have been the capital of the Roman province *Britannia Secunda* (modern Wales), and, according to tradition, was a residence of King

Arthur. Many Roman antiquities and relics have been found here, as baths, altars, statues, coins, inscriptions, and aqueducts. Here is also a ruined amphitheater 222 feet in length by 192 feet in width, which indistinctly shows the tiers of seats. The remains of a Cistercian priory are still visible. Pop. (1891) 1,411.

Cæsalpin'ia: a genus of trees of the family *Leguminosæ*; the type of the sub-family *Cæsalpinieæ*. This sub-family is characterized by irregular flowers which are not papilionaceous, and mostly separate stamens. It comprises numerous species, some of which have purgative properties, as senna (*Cassia*). Others bear edible fruits, as the tamarind and the carob. Among the products of the sub-family are Copaiba, Logwood, and Barwood (*q. v.*). They are mostly natives of warm climates. The genus *Cæsalpinia* has pinnate or bipinnate leaves, and ten stamens in each flower. The red dyewood called sappan-wood is obtained from the *Cæsalpinia sappan*. Other species yield the Brazil-wood of commerce. Among the species of the above sub-family that grow wild in the U. S. are the redbud (*Cercis canadensis*), the honey locust (*Gleditsia triacanthos*), and the Kentucky coffee-tree (*Gymnocladus dioicus*).

Charles E. Bessey.

Cæ'sar [Lat., appearing in Germ. as *Kaiser*, Russ. *Tsar*]: the cognomen of a patrician Roman family of the Julia gens; one of the most ancient in the state; claimed a descent from Iulus, a son of Æneas. The first member of the family mentioned in history is Sextus Julius Cæsar, who was prætor in 208 B. C. After the family had become extinct (at the death of Nero), the succeeding Emperors of Rome assumed the name of Cæsar as a title. It subsequently became the title of the heir-presumptive to the throne.

Cæsar, Julius; or, more fully, **Caius Julius Cæsar**: soldier and emperor; one of the most remarkable men that ever lived; b. in Rome, July 12, 100 B. C.; belonged to the Julian tribe (gens Julia), which boasted its descent from Iulus (or Julus), son of Æneas. In 83 Cæsar divorced Cossutia and married Cornelia, the daughter of Cinna. This act offended Sulla (then in the height of his power), who commanded Cæsar to divorce the latter. He refused to obey and was proscribed. He was under the necessity of concealing himself for a time, but on the intercession of mutual and influential friends the dictator reluctantly pardoned him. Sulla is reported to have said, to some of his friends who interceded for him, that Cæsar would some day be the ruin of the aristocracy, adding, "In that young man there are many Mariuses." (Marius had proved himself the most formidable enemy that the aristocratic party had ever encountered.) Soon after, Cæsar went to Asia Minor, and served with distinction in the Roman army. Afterward, while on his journey to Rhodes with a view to study oratory under Apollonius Molo, he was taken by pirates. While detained by them he often threatened (in jest, as they supposed) that he would put them to death when he got his liberty. The required ransom having at last been paid, he manned some vessels, pursued and took the pirates, and crucified them all.

Having returned to Rome, he became a candidate for popular honors. He was elected quæstor in 68 B. C. This same year his wife Cornelia died, and the next he married Pompeia, a relative of Pompey the Great and a granddaughter of Sulla. This was done to ingratiate himself with Pompey, who, since the death of Sulla, was all-powerful at Rome. He was made an ædile in 65 B. C., and sought to render himself popular by the exhibition of public games which are said to have surpassed in magnificence everything of the kind ever before seen at Rome. He was elected pontifex maximus in 63 B. C. In 63 occurred the conspiracy of Catiline, and many suspected Cæsar of being accessory to it. When Cicero asked the opinion of the senate respecting the punishment which ought to be inflicted on the conspirators, all the senators gave judgment in favor of their death, until it came to Cæsar's turn to speak. He maintained that it was contrary to justice and highly inexpedient to put men of their rank to death without a full trial. His argument had great weight with the senators. But Cato followed in a powerful speech, accusing Cæsar of complicity with the conspirators, and carried a large majority of the senate with him. The conspirators were condemned to death; Cæsar himself narrowly escaped.

In 62 B. C. he was made prætor, and was sent the next year as proprætor to Spain, where he greatly distinguished himself both as a magistrate and general, and was saluted as *imperator* by the army. In 60 he was elected consul, L. Calpurnius Bibulus being his colleague. One of his leading measures was to propose an agrarian law, by which a considerable tract of the public land was to be divided among the poorer citizens, particularly those who had a number of children. This measure was carried, in spite of the opposition of Bibulus. With a view to strengthen his interest with Pompey, Cæsar gave him in marriage his daughter Julia, though she had already been affianced to S. Cæpio. He formed in 60 B. C., with Pompey and Crassus, a secret alliance known in history as the first triumvirate. Supported by such powerful influence, Cæsar was enabled to carry through the senate whatever laws or measures he pleased. The government of Cisalpine and Transalpine Gaul having been decreed to him for five years, he left Rome in the spring (of 58 B. C.), and before the ensuing winter he had ended successfully two important wars in Transalpine Gaul—one with the Helvetii, a nation inhabiting what is now Switzerland; the other with Ariovistus, the king of a powerful German nation who had a few years before crossed the Rhine (for his bridge, see Bridges), and established themselves in Gaul. In the next seven years he not only subdued the greater part of Gaul, but crossed over (55 B. C.) into Britain, defeated Cassivelaunus, one of the kings of that country, took hostages, and fixed the tribute the Britons were to pay to Rome.

Cæsar's daughter Julia, whom he had given in marriage to Pompey, had died in 54 B. C. The triumvir Crassus had been killed in the war with the Parthians. A coolness gradually arose between Cæsar and Pompey. The latter appears to have become jealous of the new favorite of fortune, since all his own exploits, splendid and unparalleled as they were at the time they were performed, had been eclipsed by the more recent and more glorious achievements of his great rival. Pompey had succeeded to the position of Sulla as the leader of the aristocracy, while Cæsar's policy had been from the first to cultivate the favor of the common people. The two parties became more and more hostile to each other. Some of the more violent of the patricians were determined to crush Cæsar at all hazards. It was at length proposed in the senate, in 50 B. C., by Marcellus, that Cæsar, the Gallic war having been brought to an end, should lay down his command and disband his army; but Curio, a tribune whom Cæsar had gained over to his interests, vetoed the decision of the senate; Cæsar, however, was deprived of two of his legions. But desirous, by the moderation of his conduct, to fasten upon his opponents the responsibility and odium of beginning the quarrel, he sent a proposition to the senate that he would agree to dismiss his army if Pompey would do the same. But the senate even refused to consider the proposal. It was afterward decreed that Cæsar should disband his army by a certain day or be considered a public enemy. This was virtually a declaration of war, for no one could believe that Cæsar would thus tamely abandon the contest. On learning the decision of the senate, Cæsar assembled his army, and in an eloquent harangue inspired them with his own indignant spirit. Accompanied by only 5,000 infantry and 300 cavalry (for his other troops were beyond the Alps), he advanced to the river Rubicon, which then marked the limit between Italy and Cisalpine Gaul. After revolving in his mind for some time his perilous enterprise, he at length exclaimed, "The die is cast!" He instantly crossed the river, and proceeded with rapid strides through Ariminum, Arretium, and Ancona toward Rome. Every town seemed ready to open its gates as he approached. In the general consternation, Pompey, with the two consuls and many of the senators, fled from the city toward Brundisium, closely pursued by Cæsar. He passed over into Greece, whither Cæsar, for want of ships, was unable to follow him. Cæsar soon after set out for Spain, where Afranius and Petreius, Pompey's lieutenants, had a formidable army under their command. Having compelled them to sue for and accept peace on his own terms, and captured Massilia (Marseilles), he returned to Rome, whence he proceeded to Brundisium. After some delay he evaded the vigilance of Pompey's fleet, and succeeded in transporting his army into Greece. In his first engagement with Pompey, near Dyrrhachium, Cæsar was worsted, and was obliged to retreat. He withdrew, pursued by Pompey, to Thessaly. At length the two armies met on the plains of Pharsalia. Cæsar had only 22,000 foot-soldiers and 1,000 horse, while the army of Pompey amounted to 45,000 infantry and 7,000 horse. The latter sustained a disastrous defeat; 15,000 men fell in battle, and upward of 24,000 were taken prisoners. Pompey escaped to Egypt, where he was basely assassinated. (See Pompey.) The power of his enemies having been utterly

broken in Greece, Cæsar followed Pompey to Egypt, where he was detained for a time, captivated by the charms of Cleopatra, whose pretensions to the throne of Egypt he supported against those of her brother Ptolemy. He next marched against Pharnaees, a son of Mithridates the Great, King of Pontus. Having defeated and destroyed the army of Pharnaces, he wrote to the senate his eelebrated letter of three words only—*Veni, vidi, vici*. He next turned his arms against the Pompeians in Afriea, who were under the eommand of Cato and Scipio, whose forees were defeated and almost exterminated at Thapsus, not far from Carthage (46 B. C.). Cæsar returned to Italy the undisputed master of the Roman world. But he had seareely time to eelebrate his recent triumphs when word was brought that the sons of Pompey, Cneius and Sextus, had eollected a formidable army in Spain. Cæsar advaneed to meet them with his usual eelerity. After a severe and bloody battle he gained a complete victory. He said afterward to his friends that he had often fought for vietory, but then only for his life.

Having thus risen to power on the ruins of the republic, Cæsar appears sincerely to have sought to promote the true interests of his country. He proeured the enaetment of several salutary laws. One of the subjeets whieh elaimed his earnest attention was the regulation of the calendar. His improvements have been adopted, with some modifieations, by all the European nations. (See CALENDAR.) He is said to have contemplated the preparation of a complete digest of the Roman laws, the draining of the Pontine marshes, and other important public works, when death put an end to all his sehemes. The senate had conferred upon him the title imperator (whenee our emperor), for life; he was also made dictator and præfeetus morum (ehief or ruler of manners or eustoms), and pontifex maximus. To these dignities he wished to add that of king, that he might transmit his power to his suecessor. Having no legitimate children of his own, he had adopted his grandnephew, Oetavius, the son of Attia, who was a daughter of Cæsar's sister Julia. On a certain public festival, the Luperealia (sometimes called in English the Lupereal), Antony, a zealous adherent of Cæsar, publiely offered him a regal erown, but he, pereeiving that it displeased the people, refused it, but very reluctantly, aeeording to some aeeounts. From the time of Tarquin the Proud the name of king had always been partieularly odious to Romans of every elass. Cæsar's evident desire to be a king stimulated the hostility of his enemies, who were encouraged to hope that the taking of his life would be approved even by many of the people. A conspiracy in which sixty persons were implieated was formed. Cæsar had many warnings, it is said, of his approaching fate, but as he scorned to live in constant terror of death, he disregarded all the admonitions of his friends, saying it was better to die at once than to suffer the anguish of death many times by constantly fearing it. It had been planned that when Cæsar came into the senate on the ides of March, Cimber, one of the conspirators, should present a petition to him, and that while the paper was being read the others should crowd around, as if very anxious that Cimber should obtain his request, and make an attack upon their victim all at once. At first Cæsar resisted with great spirit, but when he perceived the number of his enemies he resigned himself to his fate, and, wrapping his toga about him, fell at the foot of Pompey's statue, the base of whieh was bathed in Cæsar's blood. One account states that he resolutely defended himself until he saw the dagger of M. Brutus among those of the other conspirators, when, exclaiming "Thou, too, Brutus!" he yielded without any further struggle. He was assassinated 44 B. C., in the fifty-sixth year of his age. In person, Cæsar was tall and of a commanding presence. His eonstitution was naturally delicate, but by exercise and exposure he became so hardy that none of his soldiers could better bear the fatigues and privations incident to a military life. He was sometimes, though rarely, subject to attacks of epilepsy.

As a general, Cæsar was probably superior in genius to every other commander of whom history makes mention, excepting, perhaps, Hannibal alone. (See HANNIBAL.) In the fertility of his resources, indeed, he appears to have surpassed all other generals that ever lived. It has been said that Napoleon taught his enemies how to eonquer him, but Cæsar's enemies never learned how to conquer him, because he had not a mere system of tactics, but a new stratagem for every new emergency. He was not only a great general, but a pre-eminent statesman, and the greatest orator of his age except Cicero. Cæsar was also distinguished as a historian; he wrote the first seven books of the eommentaries treating of the Gallic war, and three books relating to the civil war. His style is remarkable for ease, clearness, and simplicity, and for its pure Latinity. A few fragments of his grammatieal work, entitled *De Analogia*, have been preserved.

Referring to those remarkable men in history who have compelled "nations unaeeustomed to control" to bow obedient to their will, Maeaulay observes: "In this class three men stand pre-eminent—Cæsar, Cromwell, and Bonaparte; the highest plaee in this remarkable triumvirate belongs undoubtedly to Cæsar. He united the talents of Bonaparte to those of Cromwell, and he possessed also what neither Cromwell nor Bonaparte possessed—learning, taste, wit, eloquence, the sentiments and manners of an aeeomplished gentleman." See Merivale's *Fall of the Roman Republic*; Mommsen's *History of Rome*, vol. iv.; Froude's *Julius Cæsar*; and Long's *Decline of the Roman Republic*, vols. iii.–v. Revised by C. K. ADAMS.

Cæsare'a (in Gr. Καισαρεία; anciently ealled *Turris Stratonis*): an aneient eity and seaport of Palestine, now in ruins; situated on the Mediterranean; about 37 miles N. of Jaffa, and 55 miles N. N. W. of Jerusalem (see map of Palestine, ref. 7–C). It was rebuilt by Herod the Great (22 B. C.), who ereeted here several magnifieent edifiees, and proteeted its port by a semieireular mole, whieh is said to have been one of the most wonderful works of antiquity. Cæsarea was the seene of several events reeorded in the book of Aets, espeeially that of Paul's Syrian imprisonment. (See Aets, chaps. ix.–xii., xxiii.–xxvii.) It was taken by the crusaders in 1101. The site is now eovered with shapeless ruins. Here Eusebius and Origen lived.

Cæsarean Operation: See HYSTEROTOMY.

Cæsare'a Philip'pi, or **Pa'neas**: an aneient town of Palestine; situated about 20 miles N. of the Sea of Galilee, and 45 miles W. S. W. of Damaseus (see map of Palestine, ref. 4–E). It is mentioned in Matthew xvi. 13. This site is now oeeupied by the village of Banias, in whieh some ancient ruins are visible. Inseriptions found here show that the god Pan once had a sanetuary in this plaee. It was embellished by Herod and his son Philip; was once the seat of a bishop, but is now a miserable village.

Cæ'sium [neut. of Lat. *cae'sius*, bluish gray]: an alkali metal diseovered with the spectroseope by Bunsen and Kirehhoff in 1860 in the water of some saline springs in Germany. Its chemieal symbol is Cs, and its atomie weight 132·7. The salt spring of Dürkheim contains 0·17 parts of the ehloride in 1,000,000. The hot spring of Wheal Clifford was found to contain 0·12 grains of the ehloride in a gallon. Cæsium is widely diffused in nature, though in exeeedingly small quantities; it has been found with rubidium in lepidolite (as at Hebron, in Maine), petalite, and some feldspars, and has never been isolated. The mineral *pollux* of Elba is reported to contain 34 per cent. of cæsium. In its chemieal relations cæsium is closely analogous to potassium and rubidium. A fused mass of cæsium chloride may be decomposed by the eleetric current, but the eæsium rises to the surfaee and burns with a reddish flame. Bunsen obtained it as an amalgam with mercury, but even in amalgam or alloy it absorbs oxygen with great rapidity. The platinochloride is more insoluble than that of potassium, and this fact has formed the basis of its separation from that element. The speetrum of eæsium is charaeterized by two blue lines. Revised by IRA REMSEN.

Caf'feine: an alkaloid existing in coffee, tea, Paraguay tea (*Ilex paraguayensis*), and guarana (*Guarana officinalis*, or *Paullinia sorbilis*); called also **Theine** and **Guaranine**. Chemieal formula, $C_8H_{10}N_4O_2$. It was diseovered by Runge in 1820, and almost simultaneously by Pelletier, Caventou, and Robiquet. Oudry in 1827 extraeted an alkaloid from tea which he supposed to be a distinet eompound, and called it theine, but in 1838 Jobst proved caffeine and theine to be identical. Stenhouse extracted eaffeine or theine from the leaves and twigs of Paraguay tea, while Martius extracted it from the dry pulp of the *Paullinia sorbilis* or guarana, and called it guaranine, but afterward proved the alkaloid to be identieal with eaffeine. Van Corput first showed that the leaves of the eoffee-plant, as well as the berries, contained caffeine. It probably also exists in other plants.

Caffeine occurs in the raw and also in the roasted coffee, the amount varying with the variety of coffee, the ripeness

of the sample, the season of the harvest, etc. The mean amount of caffeine, as determined by Stenhouse in samples of various coffees, was 0·8 to 1 per cent. Domingo coffee contains the least and Martinique coffee the most caffeine. Tea contains somewhat more caffeine than coffee, 2·5 to 3·4 per cent. It has been found in hyson tea, 2·2 to 4·1 in gunpowder tea, and 0·9 to 2·1 per cent. in various black teas. (*Stenhouse.*) Mean, about 2 per cent. The Paraguay tea used in several South American countries to prepare the drink known by the natives as *maté* contains 1·1 to 1·2 per cent. of caffeine. The guarana, which is a sort of chocolate, the seeds of the plant being roasted and ground to a paste with water, contains about 5 per cent. of caffeine. Guarana is used by the Brazilians to counteract dysentery, retention of urine, etc. Caffeine is supposed to exist in coffee-berries and tea-leaves, combined with tannic acid and potassa—i. e. as potassium caffeo-tannate.

When pure, caffeine appears in white silky needles having no odor, containing 8·4 per cent. of water of crystallization, which it parts with at 302° F.; sparingly soluble in cold water, and much more so in hot; less soluble in alcohol, and still less so in ether. It acts as a weak base, dissolving in acids, from which it may be crystallized by evaporation. Boiled with fixed caustic alkalies, it decomposes, giving methylamine. Heating with basic hydrate alters it to a stronger base—caffeidine. Boiled with an excess of nitric acid, and then evaporated at a gentle heat, it gives a red color, resembling that obtained from murexide, on the addition of ammonia, which is quite characteristic. Caffeine is used in medicine as a powerful stimulant to the respiration and circulation, and it increases the rapidity of thought. It is valuable as a drug in certain cases of cardiac and renal disease, and in opium-poisoning.

Revised by H. A. Hare.

Caffraria: See Kaffraria.

Caffres: See Kaffirs.

Cage-birds: See articles on the various birds, especially Parrot, Cockatoo, and Canary-bird. Birds have in all ages been kept in captivity for their song and plumage. They are favorite household pets everywhere, but should be kept in well-ventilated and uniformly heated rooms, and not exposed to draughts.

Cagliari, kaal′yăă-rĕĕ: one of the two provinces into which the island of Sardinia is divided; bounded N. by the province of Sassari, and E., S., and W. by the Mediterranean Sea. Area, 5,257 sq. miles. The ground is marshy and the climate unhealthy. The chief articles of export are grain, oil, almonds, sugar, molasses, and wine. Chief town, Cagliari. Pop. (1890) 447,807.

Cagliari (anc. *Calaris*, or *Caralis*): a city of Sardinia; capital of province of same name; on a spacious bay on the south coast; lat. 39° 13′ N., lon. 9° 7′ E. (see map of Italy, ref. 8–B). It has a large and secure harbor, which is defended by several forts, and is the emporium through which nearly all the foreign trade of the island passes. It contains a cathedral, about thirty churches, numerous convents, a public library, several hospitals, an arsenal, a mint, and a college. Here are manufactures of cotton fabrics, soap, gunpowder, leather, and furniture. Among the articles of export are grain, wine, oil, salt, saffron, and rags. Pop. 39,300.

Cagliari, Paolo: See Veronese.

Cagliostro, kăăl-yōs′trō, Alexander, Count: Italian charlatan and impostor, whose proper name was Giuseppe Balsamo; b. at Palermo, June 8, 1743. He learned a little chemistry and medicine in a monastery, where he was assistant apothecary. Having assumed the title of count and become a Freemason, he traveled through many countries, professing to be a physician and alchemist, and raising money by quackery and other forms of imposture. In some of his adventures he was attended by his wife, and traveled in his own coach in an ostentatious style. About 1780 he visited Paris, where he made many dupes among the higher classes, and revived an old Egyptian Masonic order, of which he became grand kophta. He was patronized by Cardinal de Rohan, with whom he was implicated in the affair of the "diamond necklace," and was imprisoned in the Bastile in 1785. Having been liberated in 1786, he visited England, where he obtained little success. He afterward went to Rome, where he was arrested in 1789 as a Freemason, and condemned to imprisonment for life. D. in the fortress San Leone, near Urbino, Aug. 25, 1795. See Carlyle, *Miscellanies*, vol. iv.

Cagnola, kăăn-yō′lăă, Luigi, Marquis: architect: b. in Milan, Italy, June 9, 1762. He became president of the Institute of Milan. His greatest works are two triumphal arches at Milan—viz., the Porto del Ticino (once called Porta di Marengo) and the Arco della Pace or Porta del Sempione, commenced in 1807 and finished about 1837. The latter is built of white marble, and is 78 feet high. D. in Inverigo, Aug. 14, 1833.

Cagots, kăă′gō′ [Fr., of uncertain etym., perhaps connected with Breton *cacadd*, leprous. The explanation from *ca* (= *canis*) + *got*, i. e. Gothic dog, is only a folk-etymology. Its mod. Fr. signif., hypocrite, is influenced by *bigot*]: a despised race of social outcasts (resembling in some respects the gypsies) who have wandered over parts of France for centuries, and were considered descendants of the Visigoths, whom Clovis nearly annihilated in battle in the fifth century. Before the great French Revolution they were bound by law to wear a peculiar dress, to live apart, to labor in none but menial occupations, and only to enter churches by a special door in each. The Revolution relieved them from all legal disabilities, but could not release them at once from social outlawry and general detestation. Of late, however, they would seem to have sunk out of sight, being either absorbed into the lower class of the peasants or dwindled to a handful. See Michel, *History of Outcast Races* (1847); J. Hack Tuke, in *Journal of the Anthropological Society*, vol. ix. (1880).

Cahors, kăă′ōr′ (anc. *Divona*): a town of France; capital of the department of Lot; on a rocky eminence on the river Lot: 57 miles N. of Toulouse (see map of France, ref. 8–E). It contains a large cathedral, a college, a theater, a public library, and a normal school; and has manufactures of glass, paper, woolen goods, etc. Here are remains of a magnificent Roman aqueduct. Pop. (1896) 14,502.

Caibarien, kī-baa-ri-en′: a Cuban port, on the north coast of Santa Clara province. The harbor is good. Pop. 5,000.

Caïcos Islands: the southeasternmost of the Bahama islands; associated, with Turk's island, with the government of Jamaica. Total area, 212 sq. miles. Pop. with Turk's island, about 5,000. Caïcos island proper is the easternmost of the larger Bahama islands; lon. 71° 50′ W., lat. 21° 45′ N.

Cailletet, Louis Paul: See the Appendix.

Caillié, kăă′ĕĕ′yā′, or **Caillé**, kăă′yā′, René: traveler: b. in Deux-Sèvres, France, Sept. 19, 1799. He gained a prize of 10,000 francs which the Geographical Society of Paris offered to the first traveler who should visit Timbuctoo. He performed the journey from Sierra Leone to Timbuctoo in 1827–28, and published a narrative of his adventures (1830). D. near Paris, May 20, 1838.

Cain: the eldest son of Adam and Eve; a cultivator of the soil; slew his brother Abel in a fit of jealousy, caused by the rejection of his own sacrifice and the acceptance of his brother's; was condemned to be a fugitive on the earth. He then retired to the land of Nod, and built there a city which was called Enoch, after the name of his eldest son.

Cain, William: civil engineer; b. at Hillsboro, N. C., May 14, 1847; graduated at North Carolina Military and Polytechnic Institute; practiced civil engineering eight years; after that was made Professor of Mathematics and Civil Engineering at the University of North Carolina. He is the author of *Theory of Voussoir, Solid and Braced Arches* (1874); *Maximum Stresses in Framed Bridges* (1878); *Solid and Braced Elastic Arches* (1879); *Symbolic Algebra* (1884); *Practical Designing of Retaining Walls* (1888); and of papers in Van Nostrand's *Engineering Magazine* and the *Transactions of the American Society of Civil Engineering*, among which may be mentioned *Theorem of Least Work* (1891) and *Transition Curves* (1892).

Caine, Thomas Henry Hall: novelist; b. of Manx parents at Runcorn, Cheshire, England, May 14, 1853; educated in Liverpool, and at fifteen was apprenticed to an architect and surveyor there. While still a youth he wrote much for the press, and contributed leading articles on building, land surveying, and architecture to the *Builder* and *Building News*. At twenty he returned to the Isle of Man and taught school for six months, but soon returned to Liverpool, where he worked until twenty-four. He then went to London and lived with Dante Rossetti until the poet's death in 1882. Has published *Sonnets of Three Centuries* and *Recollections of Rossetti* (1882); *Cobwebs of Criticism* (1883); *The Shadow of a Crime* (1885); *A Son of Hagar* (1886); *The Deemster* (1887); *The Bondman* (1890);

The Manxman (1894); *The Christian* (1897); and *The Eternal City* (1901). *The Deemster* was dramatized, as *Ben-my-Chree*, in 1889, *The Manxman* in 1895, and *The Christian* in 1898. In 1890 he traveled in Iceland, in 1892 in Russia, and in 1895 and 1898 in the U. S. and Canada. Ambassador of Authors' Society to negotiate Canadian copyright, 1898. He lived for a time at Bexley Heath, in Kent; later at Keswick, Cumberland, and now makes his home at Peel, Isle of Man.

Cain'ites, or **Cain'ians**: a Gnostic sect of the second century, who maintained that Cain was superior to Abel, since the latter was easily overcome by him. They also professed reverence for Judas and all the worst characters mentioned in the Bible.

Cainozoic: See CENOZOIC.

Caird, EDWARD, LL. D.: b. at Greenock, Scotland, 1824; educated at Oxford University; fellow in Merton College, Oxford; became Professor of Moral Philosophy in Glasgow University 1866; and succeeded Prof. Jowett as Master of Baliol College, Oxford, in Nov., 1893. He published in 1877 *A Critical Account of the Philosophy of Kant*; in 1883 a volume on Hegel in Blackwood's Philosophical Classics; in 1892 *Essays on Literature and Philosophy*, 2 vols.; in 1893 the *Evolution of Religion*. W. T. HARRIS.

Caird, Sir JAMES: agriculturist; b. at Stranraer, Scotland, in 1816; educated at the High School and University of Edinburgh; published in 1849 a treatise on *High Farming as the Best Substitute for Protection*, which attracted much attention; devoted himself to the investigation of questions connected with agriculture, and was engaged in many Government missions. As member of Parliament in 1864 he secured the passage of the bill providing for the collection of agricultural statistics in the United Kingdom. Author of *English Agriculture* (1852); *The Landed Interest*; *India, the Land and the People*, etc.; member of the new Board of Agriculture 1889. D. in London, Feb. 10, 1892.

Caird, JOHN, D. D., LL. D.: brother of Edward; b. at Greenock, Scotland, Dec. 15, 1820; graduated at the University of Glasgow 1845; ordained minister of Newton-on-Ayr 1845; and, after short pastorates in Edinburgh and Perthshire, settled over Park church, Glasgow, 1857. He was appointed Professor of Divinity in University of Glasgow 1862; principal of the university 1873. He published *Introduction to the Philosophy of Religion* (Glasgow, 1880; 2d ed. London, 1889); *The Religions of India, Brahmanism and Buddhism* (1881); *Spinoza* (Edinburgh, 1888). D. in London, July 30, 1898. W. T. HARRIS.

Cairn [Mod. Scotch < Gael. *carn*, heap]: applied to artificial and conical heaps of unhewn stones, which are frequently found in Europe on tops of hills. Many cairns are found near the circles of unhewn stone pillars which are sometimes called Druidical. In some cases the heaps of stones are girdled round by large unhewn stones set upright in the ground. It appears that the majority of them were raised as sepulchres and monuments for the dead. Human bones are often found buried under them, together with stone hammers, flint arrow-heads, flint axes, bronze weapons, etc. In Scotland and Ireland occur large cairns called "chambered cairns." The most remarkable of these is at New Grange, on the river Boyne, near Drogheda. It is 400 paces in circumference, about 80 feet high, and is supposed to contain about 180,000 tons of stones. It presents the appearance of a grassy hill partially wooded, but on examination the coating of earth is found to be superficial. An opening accidentally discovered is the external entrance of a gallery leading to a large cruciform chamber containing three granite basins or urns. The sides or walls of the chamber are formed of immense blocks of stone, some of which are covered with carved figures, supposed to be symbolical.

Cairnes, JOHN ELLIOT: economist; b. in Drogheda, County Louth, Ireland, Dec. 26, 1823; son of a brewer, in whose counting-room some of his youth was passed; graduated at Trinity College, Dublin, in 1848; was called to the bar; through Archbishop Whately's influence became in 1856 Professor of Political Economy in Trinity College; in 1857 published *Character and Logical Method of Political Economy*, expanding therein some of J. S. Mill's *Unsettled Questions*, and fixing the definition of law in economics; in 1861 became Professor of Economy and Jurisprudence in Queen's College, Galway; in 1865 was injured by a fall from his horse while hunting, and was made an invalid for life; in 1866 Professor of Political Economy in University College, London; retired as *emeritus* in 1872; d. in London, July 8, 1875. His *Logical Method* is the key-note to his speculations, and expands Ricardo's doctrine of rent (2d ed. 1875). He wrote for reviews on the depreciation of gold, showing that the losses would fall chiefly on raw materials and on labor; also on slave-labor, forecasting truly (1861) the issues of the civil war in the U. S.; produced *Political Essays* (1873) largely concerned with Irish problems. His remaining works are *Essays on Political Economy, Theoretical and Applied* (1873); *Political Economy and Laissez-Faire*; and his largest work, *Leading Principles of Political Economy Newly Expounded* (1874). He was one of the most acute and original thinkers of the English orthodox school. He insisted on the concrete-deductive method of economic studies, representing laws as only approximately true and in need of testing by facts; developed the incidence of the cost of production, expanding Senior's postulates; defined the limits within which competition was free by a real contribution to the progress of economics; and defended Mill's wages-fund theory earnestly, after its author had abandoned it.

C. H. THURBER.

Cairngorm Stones: a name given by jewelers to brown or yellow quartz or rock-crystal found at Cairngorm, in Aberdeenshire, Scotland. The color is produced by a little oxide of iron, or manganese. The yellow variety is often called topaz, but it is inferior to the true topaz in hardness and brilliancy.

Cairns, HUGH MCCALMONT, Earl: orator and lawyer; b. in Cultra, near Belfast, Ireland, in 1819. He was returned to Parliament for Belfast in 1852; appointed Attorney-General by Lord Derby in 1866. He was Lord Chancellor of England from Feb., 1868, until December of that year, and was leader of the Conservative party in the House of Lords in 1869; again Lord Chancellor from 1874 till 1880. D. in Bournemouth, Apr. 2, 1885.

Cairns, JOHN, D. D., LL. D.: Scotch theologian; b. near Ayton, Scotland, Aug. 23, 1818; educated in the universities of Edinburgh and Berlin; minister of United Presbyterian church at Berwick-on-Tweed 1845–76; became Professor of Apologetics and Systematic Theology in the United Presbyterian Theological Hall, in Edinburgh, 1867. He was the author of *Life of John Brown, D. D.* (Edinburgh, 1860); *Unbelief in the Eighteenth Century* (1881); and of numerous tracts, reviews, and encyclopædia articles. D. in Edinburgh, Mar. 14, 1892.

Caï'ro (called by the Arabs *Al Masr* or *Musr*; also *Al Kahireh* (or *Qahera*), i. e. the victorious): a famous city; capital of modern Egypt; situated in a sandy plain on the right (east) bank of the Nile; 5 miles S. of the Delta; lat. 30° 3′ N., lon. 31° 18′ E. (see map of Africa, ref. 2–F). Elevation, 40 feet above the level of the sea. The climate is warm, dry, and healthy, with a mean annual temperature of about 72° F. The mean temperature of summer is 85°, and that of winter 58°. Cairo is bounded on the E. by the ridge of Mokattam, and surrounded by stone walls with antique battlements. The old streets are narrow, crooked, and ill-paved. The houses, which are built mostly of brick, are substantial buildings of two or three stories, have flat roofs, and are famous for their window-lattices of extraordinary richness in *moucharabiyé*, or turned-work. The city is divided into quarters, occupied respectively by the Mussulmans, the Jews, the Christians, etc. These quarters are separated by gates, closed at night. Cairo is connected with Alexandria and Suez by railroad.

The architectural interest of Cairo centers in its mosques and tombs. Of the former, numbering some 350, the most ancient is that of Toulûn, built 879 A. D., although parts of the still older mosque of Amrû still stand. These two mosques are of the columnar type, with many aisles of columns and pointed arches. Another type, represented by the mosque of Sultan Hassan, consists of a huge open, vaulted chamber on one side of the great court, flanked by smaller chambers, schools, etc. The later mosques, from the fifteenth century down, are domed structures, executed sometimes in stone and sometimes in lath and plaster; but almost invariably of great beauty, and adorned with one or two minarets of singular grace and elegance. The mosque of Kaït-Bey is one of the finest of this type. The "tombs of the caliphs" and "of the mamelukes," in the same general style of architecture, are admirable specimens of Arab art. There are handsome public gardens with groves of orange, citron, and palm trees. Among the remarkable objects in

the vicinity of Cairo are the palace of the viceroy, the obelisk of Heliopolis, the old and celebrated Nilometer on the island of Rodah, a graduated column indicating the height of the inundations of the Nile, and most important of all, the Great Pyramids of Gizeh, about 15 miles S. W. of this city. (See PYRAMIDS.) Cairo has long been celebrated as a seat of Oriental learning and Mohammedan theology. It has a university or college which was attended in 1885 by about 7,700 students. There are numerous iron-foundries, calico-printing works, and extensive manufactures of cotton and silk fabrics. The Arabs are the most numerous of the races which compose the population. Cairo, which is supposed to occupy the site of the ancient *Latopolis*, was founded by the Arabs about 970 A. D., and was ruled by the Fatimite caliphs until 1171, when Saladin became master of Egypt. It was the capital of the Sultans of Egypt until it was captured by the Turks in 1517. Between the west side of the older city and the river Nile most of the ground has been laid out into building-lots, and much of it covered with regular rows of houses, forming the district of Ismaileeyah. New streets have been cut through the crowded districts of the city, and the Ezbekeeyah, its principal square, transformed into public gardens. The boulevard Mehemet Ali traverses the city nearly N. and S. Pop. (1897) 570,062.

Revised by A. D. F. HAMLIN.

Cairo, kā′rō: city, railroad center, and river-port of Illinois; capital of Alexander County (for location of county, see map of Illinois, ref. 12–E); situated at the southern extremity of the State, upon the point formed by the junction of the Ohio and Mississippi rivers, 175 miles below St. Louis. It is a market for the supply of a large portion of Southern Illinois, Southeast Missouri, and Western Kentucky, and is an important dépôt for the products of Northern Illinois, Iowa, and Wisconsin seeking Southern markets. Over 4,000 steamboats touch at its wharf annually. It has a considerable manufacturing industry, costly public-school buildings, and a fine custom-house. Pop. (1880) 9,011; (1890) 10,324; (1900) 12,566.

EDITOR OF "ARGUS."

Cairoli, kī-ro′lĕe, BENEDETTO: Italian statesman; b. at Pavia, Jan. 28, 1825; educated at the University of Pavia; fought against Austria in 1848 and 1859; wounded at siege of Palermo 1860; deputy and leader of the Left 1868; president of the ministry 1878 and 1879–81. On Nov. 17, 1878, he was severely wounded in preventing the assassination of King Humbert, who was riding in a carriage with him. D. in the royal villa, Lago di Monte, near Naples, Aug. 8, 1889.

Caisse: a French word, the primary meaning of which is a chest, box, case, or coffer. It has important applications in commerce, finance, etc. In mercantile business it signifies cash or cash-box. In anatomy, caisse is the drum of the ear. In financial affairs the term is applied to a fund; also to the pay-office. *Caisse d'épargne* signifies a savings-fund or savings-bank.

Caisson [Fr., large chest, deriv. of *caisse*, chest]: in architecture, a coffer, a sunken panel in a flat or vaulted ceiling, or in the soffit of a cornice. In civil engineering, an inclosure or large vessel in which the foundations of the piers of a bridge are built and gradually lowered to the bottom of a stream. Caisson is also a name given to a tumbril or ammunition-cart used in the artillery service. In maritime affairs it is applied to an apparatus for lifting a vessel out of the water for repairs or inspection. It is usually a hollow structure which contains an air-chamber, and is sunk by letting water into it. After it has been placed under the vessel the water is pumped out, and the caisson rises with the vessel. See BREAKWATER and FOUNDATIONS.

Caite: See BRAGANZA.

Caith'ness: the northernmost county of Scotland; bounded W. by the county of Sutherland; by the ocean on the other three sides. Area, 697 sq. miles. The seacoast is bold and rocky, with many inlets or bays. The surface is nearly level, except a mountain-range formed of granite and gneiss, which extends along the western border, and rises to the height of 2,300 feet. A large part of the county is moorland, destitute of trees. The staple products of the soil are oats, potatoes, and turnips. Many of the inhabitants are employed in the herring, cod, and salmon fisheries, and over 150,000 barrels of cured fish are annually exported from this county. Chief towns, Wick and Thurso. In the Middle Ages the Kings of Norway ruled over this part of Scotland. Pop. (1901) 33,619.

Caithness Flagstones: a local name of the Old Red Sandstone as developed in Northern Scotland. The formation, which is about 16,000 feet thick, consists chiefly of argillaceous rocks, but includes also flaggy sandstones of considerable economic importance.

Ca'ius: See GAIUS.

Caius, keez (Lat. for *Kaye*, *Key*, or *Cay*), JOHN, M. D.: a learned physician; b. at Norwich, England, Oct. 6, 1510; educated at Gonville Hall, Cambridge, and at Padua in Italy; practiced medicine in Cambridge and London; was appointed physician successively to Edward VI., Queen Mary, and Elizabeth. In 1557 he obtained permission to enlarge Gonville Hall into Caius College, of which he became master in 1559. He wrote a *Treatise on the Sweating Sickness* (1552), etc. D. in London, July 29, 1572.

Caius Julius Cæsar: See CÆSAR, JULIUS.

Caivano, kī-vaa′nō: a town of Italy; province of Naples; 8 miles N. of Naples; was fortified in the Middle Ages. It has remains of its old walls and towers. It has a trade in wine, olives, cereals, and all sorts of fruit. Pop. 11,700.

Cajamarca, kăă-*kh*ăă-maar′kăă, or **Caxamarca** (i. e. a place of frost): a department of Peru; bounded N. by Ecuador, E. by Amazonas, S. by Libertad, and W. by Lambayeque and Piura. The department, with the exception of the extreme N., is crossed by mountain-ranges, in consequence of which the climate is cool and pleasant. It is irrigated by the Marañon, which flows along its eastern boundary. All products of the tropics and the temperate zones are raised here, as wheat, barley, potatoes, tobacco, etc. Chief town, Cajamarca. Area, 14,188 sq. miles. Pop. 244,895.

Cajamarca, or **Caxamar'ca**: town of Peru; capital of a department of same name; near the eastern foot of the Andes; about 83 miles N. N. E. of Trujillo (see map of South America, ref. 4–B). It has several churches, manufactures of cutlery and woolen cloth. Silver mines have been opened in the vicinity. Cajamarca is celebrated in the history of the Spanish conquest. The ruined palace in which Pizarro confined the inca Atahualpa is still to be seen. Pop. 12,000.

Caj'etan (It. *Cajetano* or *Caietano*; Lat. *Caëtanus*): the surname of THOMAS DE VIO; an Italian prelate; b. at Gaeta (Caieta), Feb. 20, 1469; entered the order of St. Dominic in 1484, and became its thirty-ninth general in 1508. He was made a cardinal in 1517, and was employed on various political and religious missions of importance. He was papal legate in Germany when Leo X. commissioned him to invite Luther to retract. The meeting took place at Augsburg in Aug., 1518, but was fruitless. In 1519 he became Bishop of Gaeta, and died in Rome, Aug. 9, 1534. He was a man of fervent piety and stainless life. He procured the election to the papacy of the Hollander, Adrian VI. Cajetan was a voluminous writer. His views on the interpretation of Scripture and the future condition of unbaptized infants met with much contradiction. Some eighty of his essays and theses were published in 1581 at Lyons, and in 1612 at Antwerp. The best known and most durable of his works is the famous commentary on the *Summa Theologiæ* of St. Thomas Aquinas, which appeared between 1496 and 1509 at Brescia and Rome; one of the best ancient editions is that of Venice, 1596. The last reprint is found in the Leonine (Leo XIII.) edition of the works of St. Thomas (Rome, 1882).

JOHN J. KEANE.

Caj'uput-tree (spelled also **Cajeput**): a tree 15 to 20 feet high of the genus *Melaleuca*, of the family *Myrtaceæ*. While there are about 136 species in the genus, the name is mostly restricted to *M. leucodendron*, a native of Australia and the adjacent islands. It bears spikes of white flowers on pendulous branches, and its leaves are narrowly lanceolate and somewhat curved. From the latter a valuable oil is obtained, known in pharmacy as oil of cajuput. It is highly stimulant, and is much esteemed in the East, being regarded as a panacea by the Malays. In the U. S. it is used for many disorders—e. g. toothache, rheumatism, gout, dyspepsia, etc. On account of its high price, it is sometimes adulterated by the addition of oil of rosemary, turpentine, etc. The addition of iodine to the unadulterated oil results in the formation of a coagulum, which may be dried into a greenish-brown, brittle mass, thus distinguishing it from that which has been adulterated.

C. E. B.

Cakchiquels: See INDIANS OF CENTRAL AMERICA.

Cake-urchin, or **Sand-dollar**: the test of the very much flattened forms of the group of sea-urchins, of the order

Clypeastridæ. *Echinarachnius parma* is the common sand-dollar of the Atlantic coast, while *E. excentricus* is the common cake-urchin of the Pacific coast from Monterey Bay to Alaska.

Calabar Bean: the seed of the *Physostigma venenosum*; a twining, half-shrubby leguminous plant; native of Western Africa. It belongs to the sub-order *Papilionaceæ*, and is nearly allied to the kidney bean. The bean is used as an ordeal among the Africans. It is very poisonous: fifteen of the beans have produced death in an hour. It is used by surgeons, in small amounts, to cause contraction of the pupil of the eye, the opposite of the effect of belladonna. It is also sometimes given in tetanus and some other diseases. It is a powerful depressant to nervous action.

Calabash: See Bottle Gourd.

Calabash-tree: an evergreen tree of the *Bignoniaceæ* or Bignonia family and genus *Crescentia*. It is notable for its large fruits, which are a foot in diameter, reminding one of the calabash or Bottle Gourd (*q. v.*). The common species (*C. cujeti*) is a native of tropical America, where the hard shells of the fruits are used as domestic utensils or carved into ornamental vessels, while its tough wood is useful for various purposes. The genus *Crescentia* contains fourteen species, all natives of tropical America. Some of these are occasionally grown in the larger conservatories. C. E. B.

Calabo'zo: city of Venezuela; in the state of Miranda, on the plains bordering the left bank of the river Guarico. Pop. in 1893 about 6,000. It is 327 feet above sea-level, and has a warm but not unhealthy climate. It is the center of a large grazing district, and has an important commerce in hides, cattle, mules, and horses. The exports are mainly by way of the Orinoco. Calabozo was founded in 1730.

Herbert H. Smith.

Cala'bria: the ancient name of the southeastern part of Italy, coinciding nearly with the modern province of Lecce. It was bounded N. E. by the Adriatic, S. W. by the Sinus Tarentinus (Gulf of Taranto), and N. W. by Apulia. Among its chief towns were Brundisium and Tarentum.

Calabria (anc. *Bruttium*): a region of Southern Italy; forming the southern part of the former kingdom of Naples; a long peninsula inclosed by the sea on all sides except the N.; separated from Sicily by the Strait of Messina. Area, 6,663 sq. miles. It is divided into three provinces, Cosenza, Reggio Calabria, and Catanzaro. It is traversed by the Apennines through its whole extent. These mountains, which are here nearly 4,000 feet high, are partly covered with forests of pine, oak, and beech trees. Between the Apennines and the sea are fertile and beautiful valleys, which produce wheat, cotton, rice, sugar, oranges, figs, grapes, and olives. This region is subject to earthquakes. Calabria has considerable fisheries of the tunny, swordfish, anchovy, and mullet. Agriculture is in a rude and barbarous state. Chief towns, Cosenza, Reggio, and Catanzaro. Pop. (1890) 1,309,554.

Calahorra, kăă-lăă-ōr'răă (anc. *Calagurris*): a town of Spain; province of Logroño; on the river Ebro; 19 miles E. S. E. of Logroño (see map of Spain, ref. 13–G). It has an old cathedral and some ancient remains. It is the seat of a bishop. Quintilian was born here. *Calagurris* was taken by Pompey or Afranius about 78 B. C., after a long and famous siege. The sufferings of the inhabitants were extreme; hence the Romans gave the name "Calagurritan famine" to any severe famine. Pop. about 8,200.

Calais, ka-lā' [Lat. *Caletum*, from the ancient tribe *Caleti*]: a fortified seaport-town of France; department of Pas-de-Calais; on the Strait of Dover; 122 miles by rail N. N. E. of Amiens, 19 miles N. E. of Boulogne, and 26 miles E. S. E. of Dover; lat. of the lighthouse, 50° 57′ 45″ N., lon. 1° 51′ 18″ E. (see map of France, ref. 1–E). The town and harbor are defended by a castle and several forts, and can be rendered inaccessible by land by flooding the adjacent ground, which is low and marshy. The harbor, which is formed by two moles, is nearly dry at ebb-tide. The town is regularly built, mostly of brick, and has wide, well-paved streets. It has a Gothic cathedral, a public library, and a theater. A large portion of the English tourists who visit the Continent pass through Calais, which has daily communication with Dover by steamboats. Calais is the terminus of a railway which connects it with Amiens and Paris. Here are flourishing manufactures of bobbinet, hosiery, soap, leather, etc. In 1347 this town was taken after a long siege by Edward III. of England, who was then persuaded by his queen, Philippa, to spare the lives of six devoted citizens of Calais. It remained in the power of the English until 1558, when it was taken by the Duke of Guise. It is connected with Great Britain by submarine telegraph. The terminus of the proposed tunnel beneath the English Channel is near the village of Sangatte, 6 miles W. of Calais. Pop. (1886) 58,969; (1896) 56,940.

Calais, kal'is: a city, port of entry, and capital of Washington co., Me. (for location of county, see map of Maine, ref. 7–G); on railroad and St. Croix river; at the head of navigation; 28 miles N. by W. from Eastport, and 264 miles N. E. of Portland. Bridges across the river connect it with St. Stephen's in New Brunswick. Calais derives its prosperity from the lumber-trade and ship-building. It has a public library, an academy, an opera-house, a dry dock, marine railways, machine-shops, foundries, and several shipyards. It is the southeast terminus of the St. Croix and Penobscot R. R. to Princeton. The river, which affords water-power, is part of the eastern boundary of the U. S. Pop. (1880) 6,173; (1890) 7,290; (1900) 7,655.

Calaman'der-wood: a valuable cabinet-wood which resembles rosewood, but is far more beautiful and durable. It is produced by the *Diospyrus hirsuta*, a tree of the family *Ebenaceæ*; native of Ceylon and Southern Hindustan; belongs to the same genus as the ebony and persimmon tree. This wood is very dense, takes an exquisite polish, and exhibits great richness and variety of colors, among which is chocolate or fawn color. It is said to be so hard that it can not be worked with edge tools. The tree has become rare in consequence of the wasteful operations of the Dutch and British. Several similar species are found in the Indian Archipelago.

Calamary: a cuttlefish of the order *Dibranchiata*. The term is also applied to the pen or cuttlebone, the internal shell of the cuttlefish. See Cuttlefish and Cephalopoda.

Calamat'ta, Luigi: a French engraver of Italian birth; b. at Civita Vecchia, June 12, 1802; engraved after Raphael, da Vinci, and Romano; was Professor of Engraving in Brussels and Milan. D. in Milan, Mar. 8, 1869.

Calamia'nes: a group of islands between Palawan and Mindoro in the Philippine Archipelago; extends between the parallels 11° 39′ and 12° 20′ N. and 119° 47′ and 120° 23′ E. They are mountainous and abound in valuable timber, are fertile and sparsely inhabited. Rice, wool, cacao, beeswax, and edible birds'-nests are the chief products. The climate is generally hot and unhealthy. The chief islands are Busuanga, Calamian, and Linacapan. Total area about 3,000 sq. miles. Pop. (1887) 14,291.

Calamich'thys [Gr. κάλαμος, reed + ἰχθύς, fish]: a ganoid fish found in the rivers of Western Africa. It takes its name from its slender, cylindrical form; is closely allied to the *Polypterus* of the Nile.

Cal'amine (*Lapis calaminaris*): an important and abundant ore of zinc; a native carbonate, containing, when pure, 52 per cent. of zinc. Crystals of this mineral are rare. It is opaque or translucent, has a vitreous luster, and occurs in kidney-shaped, botryoidal, cellular, and other imitative forms. It is found in veins, beds, and large deposits termed *pockets* in metamorphic limestone and in the Devonian and carboniferous formations. Large quantities of it are exported from Spain to the metallurgical districts of Europe. This ore is called Smithsonite by Dana and other mineralogists, who apply the term calamine to the silicate of zinc, the primary form of which is a rhomboid.

Calamint [M. Eng. *calament*, modified by false connection with *mint*; from Gr. καλαμίνθη, plant-name]: a plant of the genus *Calamintha* and family *Labiatæ*. The common calamint (*Calamintha officinalis*) is indigenous in England. It has serrated leaves, with an agreeable aromatic odor, and is used in domestic practice as a pectoral medicine. The U. S. have several species.

Calamite: the general name for certain great, tree-like fossil plants composing the order *Calamarieæ*, of which the principal genus is *Calamites*. They belonged to the class *Equisetinæ*, and were nearly related to the modern *Equisetum*, the horse-tails or joint-rushes. The remains of many species have been observed, chiefly in carboniferous strata (none later than the Permian) in both continents. These plants must have contributed largely to the production of coal.

Charles E. Bessey.

Calamus (Gr. κάλαμος): a Latin word signifying a reed, a stalk (of a plant); was used by the ancient Romans to denote an arrow, a musical pipe, and a pen which was made of a reed. This reed is supposed to have been the *Arundo donax*. Calamus also denotes the golden tube through which, in some church services, the eucharistic wine is taken.

Calamus: the sweet-flag. See ACORUS.

Calamus: a genus of *Palmaceæ* which yields a great part of the canes and rattans used in Europe and the U. S. for the seats of chairs and other purposes. Among the species of this genus are *Calamus rotang* and *Calamus viminalis*, which are natives of the warm or tropical parts of Asia. The *Calamus rudentum* has been found 500 feet long (Humboldt). *Calamus draco* yields the best dragon's-blood. Several species are climbers.

Cal'amy, EDMUND: an English divine; b. in London in Feb., 1600; educated at Cambridge; became an eloquent Presbyterian minister; in 1626 was appointed lecturer at Bury St. Edmunds, but when the order to read the *Book of Sports* was enforced (1636) he resigned; preached in London from 1639 till 1662. He was one of the authors of a famous treatise called *Smectymnuus*, from the initials of its authors, *S. M*arshall, *E. C*alamy, *T. Y*oung, *M. N*ewcomen, and *W. S*purstowe (1641), intended as a reply to Bishop Hall's *Divine Right of Episcopacy*. He took middle ground during the civil war; opposed the execution of the king; kept as private as he could under Cromwell. He promoted the restoration of the monarchy, and was offered the bishopric of Coventry and Lichfield. He declined, and soon afterward (1662) was ejected for Nonconformity. D. in London, Oct. 29, 1666.

Calamy, EDMUND: grandson of the preceding; divine; b. in London, Apr. 5, 1671; educated by various ejected divines; became Dissenting pastor in London 1692; d. there June 13, 1732. His fame will endure as the great biographical historian of Nonconformity. His first venture in the field which he made his own was by editing Baxter's *Narrative* (1696). This he abridged (1702), but in it he inserted his memorable account of the ministers and others who were ejected or silenced by the Act of Uniformity. This he afterward separately issued in revised and enlarged form (1713, 1727). See his *Historical Account of my own Life* (London, 1829, 2 vols.; 2d ed. 1830). Revised by S. M. JACKSON.

Calancha, FRAY ANTONIO, de la: Peruvian Augustinian friar; b. in Chuquisaca, 1584. He was rector of the College of San Ildefonso in Lima, where he died Mar. 1, 1654. He wrote the *Crónica moralizada del orden de San Agustin en el Peru*, which is essentially a chronicle of his order for the whole of South America, and is of great value for civil and geographical history. It was published in Barcelona in 1638. H. H. S.

Caland, kaa'lănt, PIETER: an engineer of Holland: b. in Zierikzee in 1826. His father, A. Caland, was an engineer-in-chief of the Waterstaat of Holland, and author of a work on dike-construction, embracing the methods of Dutch engineering as exhibited in the works of protection against the encroachments of the ocean and the inundations of rivers, etc. The son was educated at the Royal Military Academy at Breda; appointed a sub-engineer of the Waterstaat in 1845; passing through successive grades, became engineer-in-chief of the second class in 1867; in 1873 promoted over the intermediate grade to be inspector (the highest grade, of which there are but two) of the Waterstaat. He is author of a work (in French), *Étude sur l'Effet des Marées dans la Partie Maritime des Fleuves*; also (in Dutch) of a work on the protection of the coast against the encroachments of the sea, and of numerous reports; Knight of the order of the Netherlands Lion; vice-chairman of the Royal Institution of Engineers of Holland. He was a member of a commission on the "improvement of the water communication from Rotterdam to the sea," and the executive engineer of the work by which an existing mouth of the combined Rhine and Meuse was closed and another made, and a channel navigable for ships of the greatest draught created where before naught but light-draught vessels (10 to 12 feet) could venture under favorable circumstances of wind and tide. M. Caland's highest claim to fame as an engineer will be founded on the great seaport of Rotterdam, through the works giving an easy and direct water communication with the sea, in place of the tedious and circuitous ones before available. For this important work he received from the Vienna Exposition the first prize—a certificate of honor.

Calan'do [Ital., slackening; deriv. of *cala're* < Lat. *chala're*, *cala're*, slacken, from Gr. χαλᾶν, loosen]: an Italian musical term. It signifies diminishing gradually from forte to piano, and differs from *decrescendo* and *diminuendo*, as the tempo at the same time is slightly retarded, but not so much as in *ritardando*.

Cala'nus (in Gr. Κάλανος): an ancient Hindu philosopher; one of those whom the Greeks called Gymnosophists. According to Plutarch, his proper name was SPHINES. He passed some time in the camp of Alexander the Great in India. Having become sick at Pasargadæ, he was at his own request burned alive.

Calapooya Indians: See KALAPOOIAN INDIANS.

Calas, kă'laa', JEAN: a French Protestant victim of religious fanaticism; b. in Languedoc, Mar. 19, 1698. He was a merchant in Toulouse when, on the evening of Oct. 13, 1761, his eldest son committed suicide by hanging in his father's warehouse. Accusation was made that some one of the family had murdered the young man to prevent his conversion to Catholicism. Calas was sentenced to torture and death on the wheel, and the sentence was executed on Mar. 9, 1762, and the family were dispersed abroad, their property being confiscated. The widow interested Voltaire in the matter, and he proved that Calas was innocent, which was afterward officially declared, and Louis XV. gave the family 30,000 livres. See Coquerel's *Calas et sa Famille* (2d ed. 1870).

Calascibet'ta: a town of Sicily, about 60 miles S. E. of Palermo; on an isolated hill which rises nearly 2,500 feet above the sea. It is said to have been founded in 1080. Pop. about 5,000.

Calasio, kăă-laă-see'ō, MARIO, de: an Italian theologian and Hebrew scholar; b. in Calasio, Naples, 1550; d. in 1620. He studied Hebrew and biblical literature in a Franciscan convent, and was made a doctor of theology and professor of Hebrew in Rome. He wrote a Hebrew grammar and dictionary. He spent forty years in making his great work *Concordantiæ Sacrorum Biblorium Hebraicæ*, published in Rome in 1621, a less accurate edition of which was published in London 1747–49.

Calatabellota, kăă-laa'tăă-bel-lō'tăă: a town of Sicily; province of Girgenti; 25 miles N. W. of the city of Girgenti. It is very near the site of the ancient *Tricala*, and is on the ancient river *Crimisus*. Here is a fine mediæval church. Pop. 5,500.

Calatafimi, kăă-laa'tăă-fee'mĕc: a town of Sicily; province of Trápani; in a fertile valley 5 miles S. W. of Alcamo. Here in 1860 Garibaldi defeated the royalist troops. Pop. 10,964.

Calatanazor': a small town of Spain, in Old Castile, 10 miles S. W. of Soria. Here Al-Mansoor gained a great victory over the Christians in 1101.

Calatayud': a town of Spain; province of Saragossa; on the river Jalon; 45 miles S. W. of Saragossa (see map of Spain, ref. 14–H). It has an episcopal palace, a noble old castle, and several churches, convents, and hospitals; also manufactures of linen and woolen fabrics, paper, leather, etc. About 2 miles E. of this place is the site of the ancient *Bilbilis*, from the ruins of which Calatayud was mostly built. Pop. 11,512.

Calatrava, kăă-laă-traa'vaă, JOSÉ MARIA: Spanish statesman and eloquent lawyer; b. in Mérida, Feb. 26, 1781. He was a leader of the Liberal party and a member of the Cortes. He passed many years in exile between 1814 and 1830. D. Jan. 24, 1846.

Calatrava la Viega, -laă-vĕe-ay'*k*haă, or **Old Calatrava**: a ruined city of Spain; on the Guadiana river; about 12 miles N. E. of Ciudad Real: a strongly fortified place in the Middle Ages, but only a single tower now remains. Its defense against the Moors in 1158 is famous on account of its having originated the order of the Knights of Calatrava.

Calatrava, The Order of: founded in 1158 by Sancho III. of Castile, and confirmed by Pope Alexander III. in 1158. After the death of Sancho the knights elected as grand master Don Garcías de Redon. For a long period the war against the Moors was carried on almost entirely by the Knights of Calatrava. In 1197 the order was nearly exterminated through rashness in war; transferred its seat to Salvatierra, and grew to opulence. The influence exercised by the grand master in public affairs at length excited the jealousy of the king, and in 1523, by papal bull, the

grand-mastership was united to the crown, and the knights permitted to marry. Since 1808 the order has been one of merit.

Calave'ras: a small river in the north central part of California; rises at the foot of the Sierra Nevada, in Calaveras County; flows nearly southwestward, and enters the San Joaquin river about 15 miles below Stockton.

Calbur'ga, or **Kulburga**: a town of India; in the Nizam's Dominions; on an affluent of the Beemah; 110 miles W. of Haidarábád. It is now unimportant, but was formerly the capital of several Hindu and Mohammedan sovereigns.

Calcar, kăăl-kaar', Jean Stephan van: a Flemish painter; b. in Calcar, duchy of Cleves, in 1499. He was a pupil of Titian in Venice, and afterward studied Raphael. Some of his work has been ascribed to Titian. Among his best works is a *Mater Dolorosa*. D. in Naples in 1546.

Calcareous Spar, or **Calc-spar** [*calcareous* is from Lat. *calca'rius*; deriv. of *calx*, lime]: a common name of crystallized carbonate of lime; composed, when pure, of 44 per cent. of carbonic acid and 56 of lime. It is one of the most abundant of all minerals, and is found in every part of the world. The primary form of its crystals is a rhomb or rhombohedron. Its secondary forms are more numerous than those of any other mineral, and are said to amount to 700 or more. In a pure state this mineral is colorless and transparent, but it often contains impurities which render it red, green, brown, yellow, etc. Andreasberg, in the Hartz, and the Derbyshire lead mines are noted for fine large crystals. Some very fine crystals are from the Rossie lead mine of New York. The purest and most limpid variety of this crystal is called Iceland spar, which is found in Iceland, and exhibits double refraction in a remarkable degree.

Calcareous Tufa: See Limestone.

Calcasieu, kăl'ka-shoo: a river of Louisiana; rises in the western part of the State; flows in a general S. S. W. direction through Calcasieu parish, and enters the Gulf of Mexico. At its mouth stands an iron lighthouse 53 feet high; lat. 29° 45′ N., lon. 93° 17′ E. Length of river estimated at 200 miles, including Calcasieu Lake, which is an expansion of the river. The lake is about 18 miles long and 5 wide, and the foot of it is nearly 5 miles from the Gulf of Mexico.

Calceola'ria [deriv. of Lat. *calce'olus*, little shoe; dimin. of *cal'ceus*, shoe]: a genus of plants of the family *Scrophulariaceæ*, which comprises numerous species, natives of South America. They grow mostly on that part of the Andes which is more than 9,500 feet above the level of the sea; are herbaceous plants or shrubs with beautiful flowers. The corolla is two-lipped, and the lower lip is inflated, so as to form a bag which has some resemblance to a slipper. They are so abundant in some parts of Chili and Peru as to give a peculiar aspect to the scenery. Many species are cultivated by florists in Europe and the U. S., and are easily propagated by cuttings. Some of the species are used in South America for dyeing.

Cal'chas (Gr. Κάλχας): a Greek soothsayer who was present at the siege of Troy and demanded the sacrifice of Iphigenia. He is said to have died from vexation because Mopsus, another soothsayer, surpassed him in prophecy.

Calcite [from Lat. *calx*, lime + suffix *-ite*]: a general term under which are comprised all the varieties of carbonate of lime.

Calcium [mod. deriv. (Sir H. Davy) of Lat. *calx*, lime]: a very widely distributed and abundant metal (symbol Ca, and atomic weight 40). Among the more common substances containing it are limestone, calcite, chalk, marble, calcium phosphate, gypsum, or calcium sulphate. It was isolated by Sir Humphry Davy in 1808 in his great investigation on the action of the electric current on chemical compounds, in the course of which he discovered the metals potassium and sodium. It is a yellowish-white, malleable metal. Among the compounds of calcium that find extensive application are lime, made by heating the carbonate, and plaster-of-Paris, made by heating the natural sulphate.

Ira Remsen.

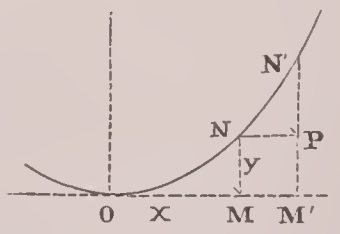
Calc-spar: See Calcareous Spar.

Calculating-machine: a machine for performing arithmetical operations, or for computing logarithmic or other mathematical tables in which the successive results are to be obtained by substituting, in an invariable formula, the consecutive numbers of a simple series, uniformly increasing. The two kinds of work here mentioned are essentially different, and require different machinery. For simple arithmetic the most successful machine yet constructed is that of M. Thomas, of Colmar in Alsace-Lorraine. For tabular numbers the computations are made by the "method of differences"; and the machines are called "difference-engines." Such are those of Babbage (which was never finished) and of the Messrs. Scheutz, of Stockholm, of which there is an example at the Dudley Observatory, Albany, and another in the office of the registrar-general, London. See Mechanical Calculation.

Calculus [Lat., pebble; stone used in reckoning, calculation; dimin. of *calx*, stone]: The term is derived from the ancient use of pebbles as *counters* or for making computations, and it, in general, denotes some particular method of performing mathematical investigations. Those, e. g., of arithmetic, algebra, logarithms, etc., have received the name of *Calculus*, as the *Arithmetical*, the *Algebraic*, the *Exponential*, the *Trigonometrical* (which latter, according to De Morgan, "contains that of *undulating magnitude*," or of *Circular Functions*). In modern usage it is applied to mathematical methods of peculiar power involving unusual refinements of reasoning, or reference to relations of magnitude, which may be styled "transcendental." Among such are the *Antecedental Calculus* of Mr. Glenie,* the *Calculus of Derivations* of M. Arbogast, the *Calculus of Probabilities* (*q. v.*), and the more modern creation of Sir William Rowan Hamilton, *Quaternions*. But, pre-eminently, by the word calculus is denoted the Infinitesimal Calculus, including under this head the complementary branches of "Differential and Integral," of the Leibnitz system of symbolization, or the "Fluxions" and "Inverse Method of Fluxions" of the Newtonian.

The calculi of Leibnitz and Newton are essentially the same, though the logical basis on which Newton places his method appears quite different from that of Leibnitz. The method of Leibnitz made its appearance before the public in 1684, earlier than that of Newton; but Newton's method of drawing tangents (wherein the method of fluxions was sufficiently explained) was communicated in a letter to a Mr. Collins in 1682. Upon the allegation that Leibnitz had seen this letter was based the charge (sustained by the Royal Society of London) that Leibnitz had plagiarized therefrom. This charge is now considered unfounded, and the glory is conceded to him of having been a contemporaneous discoverer of a calculus that has been styled "one of the greatest, most subtle, and sublime discoveries of this or perhaps of any age; opening a new world to us and extending our knowledge, as it were, to infinity, and carrying us beyond the bounds that seem to have been prescribed to the human mind; at least, infinitely beyond those to which ancient geometry was confined."

The logic on which the operations of the calculus rest is so intricate that even mathematicians were slow in accepting it, and the methods were sometimes objects of ridicule. Bishop Berkeley published a long paper criticising the method, and suggesting that differentials might be called the ghosts of departed quantities. At the present time, however, there is no real difference of opinion between professional mathematicians on the subject. We shall confine ourselves to such an outline of the first principles as may make them clear to the student.



Let O N N′ be a curved line of any form—a parabola, for example. Let N and N′ be two points upon the curve. If we take the horizontal and vertical lines going out from the point O as axes of co-ordinates, then, in the language of co-ordinates, O M will be the abscissa of the point N, and M N its ordinate. See Co-ordinates.

O M′ will also be the abscissa of the point N′, and M′ N′ its ordinate. If, as usual, we represent abscissas and ordinates respectively by the symbols x and y, then we may put

x = abscissa O M,
y = ordinate M N.

* James Glenie, F. R. S., of London and Edinburgh, invented this calculus in 1774; it was published in 1794. According to the writer in Rees's *Encyclopædia*, "both the differential and fluxional calculi may be derived from the doctrine of proportions (therein expounded) in a manner altogether unexceptionable."

We also put

$\triangle x$ = excess of abscissa O M′ over x = M M′;
$\triangle y$ = excess of ordinate M′ N′ over y.

Now, suppose the point N′ to move toward N, and let us study the ratio $\triangle y : \triangle x$. By trigonometry this ratio is the tangent of the angle which the straight line through N and N′ makes with the axis of abscissas O M. It is evident that the nearer N′ approaches to N, the more nearly the line N N′ will approach the position of the tangent at N. We might say that if the point N′ coincides with N, the secant N N′ will coincide with the tangent at N. But when the two points coincide we can have any number of lines through them, because they will form but one point. The difficulty then is simply this: so long as N′ is different from N, the secant will be different from the tangent; while if the two points coincide the secant will be indeterminate. To meet this difficulty the idea of an infinitesimal was introduced. It was supposed that the point N′ might be so near N that the distance between them would be smaller than any finite quantity whatever, while the two points would still be distinct. Then the secant would be considered as coinciding with the tangent. This idea of infinitesimal quantities as smaller than any finite quantities whatever is no longer entertained by the best writers, but in lieu thereof the idea of a limit is introduced.

The relation of the secant and tangent may be expressed as follows by the method of limits:

Let α be any angle whatever, as small as we please. Then the point N′ may be taken so near the point N that the angle between the secant and tangent shall be less than α. This completely determines the tangent, because there is only one line of which this can be true. For if any other line passed through N, making an angle β with the tangent on the opposite side from the secant, then the latter would always make an angle greater than β with this line, and in consequence we could not make α less than β, and so could not make it as small as we please. We are thus led to the method of reasoning adopted by Euclid to prove the equality of a cone to one-third of the circumscribing cylinder. If the cone differs from one-third the cylinder, he might say, let h be that difference. Take any value you please for h, and I will show that the difference is less than h; therefore, if you suppose the two quantities to differ at all, you are led to the absurdity of saying that the difference is equal to h and less than h at the same time; therefore the cone and one-third the cylinder do not differ at all.

Algebraically the matter may be expressed as follows:

Suppose the relation between x and y to be given by the algebraic equation

$$y = mx^2.$$

We then have

$$y + \triangle y = m\,(x + \triangle x)^2.$$

By developing the square and subtracting we easily find for the quotient $\frac{\triangle y}{\triangle x} = 2mx + m\triangle x$.

Now, it is evident that by making $\triangle x$ smaller and smaller we can bring this quotient just as near as we please to the value $2mx$. We express this fact by substituting the letter d for $\triangle$, and writing the equation in the form

$$\frac{dy}{dx} = 2mx,$$

which, when properly interpreted, is a rigorous equation, although $\triangle x$ is dropped out entirely. It is rigorous because it is regarded not as an equation between any actual values of $\triangle y$ and $\triangle x$, but only as expressing a limit toward which the ratio of these quantities approaches as they become smaller and smaller.

Besides the direct solution of problems, the calculus has been the most effective and indispensable of agents in widening the sphere of mathematical investigation, and in enhancing its power as an instrument. Most of the modern methods of analysis depend on it for their development.

The Calculus of Variations, originating with Lagrange, is but an extension of the methods of the calculus to the discovering of functions, in cases in which, instead of the law of growth, some condition (such as that of producing a maximum or minimum under certain conditions), which the function when found must fulfill, is given.

The Calculus of Operations is but an extension of algebra to the *symbols of operation* of the calculus: algebra itself being really a calculus of operations, since it deals only with symbols with a view to reduce the operations they indicate to their simplest expression.

The Calculus of Functions is a branch of modern mathematics concerned with the laws of functions of an imaginary variable.

The Calculus of Finite Differences, invaluable in the practical application of analytic formulæ to numerical calculations, for the summation of infinite series, and for Interpolation, is concerned with relations between finite increments or "differences," and is defined by Lacroix to have for its object "the determination of the values of increments, by deducing them not merely from the analytic expression of the functions, but also from their numerical (or particular) values, when that expression fails or is too complicated." Except a general similarity in notation and terms employed, it has little in common with the Differential Calculus: the fundamental element of the latter—the Differential Coefficient—having no place in it. Revised by S. Newcomb.

Calculus, or **Stone**: a hard concretion formed from the deposition of saline or other substances in various parts of the body. The most frequent position for calculi is the urinary tract, either in the pelvis of the kidney or in the bladder; but they are also found quite commonly in the gall-bladder or biliary ducts, and more rarely in other hollow tubes or viscera.

Urinary calculi are especially common in advanced life, and are more frequent in the male sex. A life of ease and luxury and sedentary habits strongly predisposes, and it is supposed that the character of water drunk in certain localities accounts for the greater frequency of stone in these places than elsewhere. Stone in the kidney is especially common in old men of gouty habit, and they are usually composed of uric acid or oxalate of lime. There may be merely small gritty particles which are passed from time to time, causing great pain and blood-stained urine. The terms renal sand and gravel are applied to this form. Larger stones are apt to lodge in the pelvis of the kidney and may set up inflammatory disturbances, and from time to time as they attempt to escape they may cause attacks of intense renal colic.

Stone in the bladder occurs in cases in which there is some inflammatory disturbance of the bladder-walls, or in which there is repeated or constant retention of urine. These stones most frequently are composed of phosphate of lime or ammonia-magnesium phosphate. They may occasion no symptoms at all, but more frequently there is great pain, especially during urination. Calculi of various other kinds occur in the kidney or bladder, but are comparatively rare and unimportant.

Biliary calculi are formed in the gall-bladder, where they may remain without producing disturbances for a long period of time. Sooner or later they tend to escape through the duct of the gall-bladder and occasion sharp pain in the right side with jaundice (hepatic colic). The stone may lodge in the gall-ducts and occasion permanent jaundice and great disturbances of the general health. Gall-stones are more common in women than in men, and are more frequent after the age of forty than in younger persons. They are composed of thickened bile, around which cholesterin crystals (one of the components of bile) gather.

Salivary calculi are small concretions formed in the ducts of the salivary glands. They may cause obstruction and cystic dilatation of the ducts. A similar form of calculi occurs in the pancreatic duct and generally leads to similar results.

Enteroliths or *intestinal stones* are formed in cases of constipation or catarrhal diseases of the intestines, and are composed of mucus and earthy constituents derived from the food. They are especially common in the vermiform appendix, where they are likely to play a part in causing appendicitis.

Lung-stones are formed in the bronchial tubes. *Phleboliths* are calcareous masses occurring in a vein as a result of clotting of the blood and secondary calcification of the clots. Stones are also found in the nasal chambers, in the tonsils, and even in the chambers of the heart.

In cases of calculi in any of the abdominal organs (kidney, gall-bladder, pancreas) attacks of severe pain or colic denote the attempt at escape of the stone, and such attacks are designated as colics. The pain is of great severity and prostrates the patient in a short time, and the appearance may be that of extreme collapse.

Opiates, chloroform, and hot baths may be required as relaxants and anæsthetics. The stone may escape through

the duct in which it is lodged, or may recede to its place of origin. Surgical treatment becomes necessary when a stone is too large to escape, or when serious results are imminent from its lodgment. There is little reason to believe that remedies or waters vaunted as having powers to dissolve stones often act in this way. Occasionally they may do so, but stones occasionally break up and disintegrate spontaneously. The formation of stones may, however, frequently be prevented. WILLIAM PEPPER.

Calcut'ta [Sanskrit, *Kalikâta*, dwelling of Kali, an Indian deity]: the capital of British India; province of Bengal; on the east bank of the Hugli, an arm of the Ganges; about 75 miles from the sea; lat. 22° 34′ N., lon. 88° 20′ E. (see map of North India, ref. 8–I). The city extends along the river about 6 miles, and has an average breadth of 1½ miles. The river, here a mile wide, is constantly full of shipping. In the southern part of the city, called Chowringhi, are the residences of the Europeans, which in a great part are finely built in Grecian style, and many of them surrounded by groves of fruit-trees. A quarter of a mile to the S. W. is Fort William, built at a cost of £2,000,000, the largest fortress in the British dominions, octagonal in form, requiring a garrison of 10,000 men and mounting 619 guns. Its usual garrison consists of one British and two native regiments. Between the fort and the city is the Maidân or glacis, a handsome park, and the Esplanade, on which is the Government House, a magnificent building surmounted by a dome, and in a line with it a row of handsome dwellings. The principal buildings of Calcutta are, besides the Government House, the mint, the town-hall, the cathedral, the Hindu college, and the hospital. Beyond Chowringhi is the native or "Black Town," mostly consisting of mud or bamboo cabins and narrow, dirty streets, here and there adorned with an idol of painted wood or plaster. On the other side of the river are situated the botanic garden, opposite Fort William, and the suburb Howrah, with the terminus of the East India Railway, opposite the Black Town. The river is crossed by a floating bridge constructed on pontons, forming a permanent connection between the city and the railway terminus, and affording a continuous roadway for passengers and vehicles. It was finished in 1874, and cost £222,000.

Down to 1686 Calcutta was nothing but a miserable Hindu village, but in that year the English merchants of Hugli, having been compelled by the Mogul chiefs to abandon their factories, moved 26 miles farther down the river and settled at the village of Sutánati, which now forms a part of Calcutta. In 1690 the Bengal servants of the East India Company took up their headquarters at Sutánati; in 1696 Fort William was built; and in 1700 the three villages of Sutánati, Calcutta, and Gobindpur were bought by the company and formed into one settlement. But half a century later, in 1756, the fort was captured and the city was sacked by the Nawab of Bengal. Most of the English residents escaped by vessels to the mouth of the Hugli, but those who remained (146 persons) were soon compelled to surrender, and were locked up in the guard-room, the "Black Hole," a chamber hardly 20 feet square, from which only twenty-three persons came out alive the next morning. In Jan., 1757, a British expedition from Madras, under the command of Clive, again took possession of the city, and a new and much stronger fort (the present Fort William) was built. From that time the history of Calcutta has been one of uninterrupted progress and prosperity. It is now one of the greatest commercial centers of Asia and the seat of the supreme administrative, judicial, and military authorities of the British-Indian Government.

The site of the city was admirably chosen so far as it affords excellent anchorage, the port extending for 10 miles along the bank of the river, and having easy water communication with the whole basin of the Ganges and the Brahmapûtra. Its disadvantages arose from its deltaic location, the insalubrity of the ground, and the possible silting up of the river. The drainage was found very difficult, as in many cases the surface of the ground is considerably below the level of the water. The works, however, though not yet completed, have proved very effective, the underground sewers discharging their contents by means of a gigantic pumping apparatus, operated at an annual cost of £3,000; and Calcutta is now not only the healthiest city of India, but compares well in this respect with the great cities of Europe and America. The mean temperature of the place is 79° F., with extreme temperatures of about 106° and 52°. The average rainfall is 66 inches. The cyclones are frequent, and often dangerous. The annual death-rate is 25.82 per thousand. Though the Hugli river has long ceased to be the main channel of the Ganges, it is still navigable for vessels of the largest tonnage, and immense exertions are made to prevent its silting up, which, of course, would be the death of the city. Its chief articles of export are opium, raw cotton, jute, grain, hides, etc.; of import, cotton fabrics, hardware, etc. In 1890 the University of Calcutta had 2,727 matriculated students. Pop. in 1891 (with suburbs), 840,130.
Revised by C. K. ADAMS.

Caldani, kaăl-daa′nĕe, LEOPOLDO MARCO ANTONIO: anatomist and physician; b. in Bologna, Italy, Nov. 21, 1725; studied in his native city, making a specialty of anatomy, and became Professor of Anatomy in the university there in 1755. He made a series of experiments to prove the insensibility of the tendons, publishing the results in 1757, under the title *Lettera sulla insensibilità ed irritabilità di alcune parti degli animali*, which work made him professionally famous throughout Europe. He met with great opposition in Bologna, however, and about 1760 he went to Venice. He afterward became Professor of Theoretical Medicine in the University of Padua, and in 1771 Professor of Anatomy, which professorship he held until his death, Dec. 30, 1813. He published, besides the work already named, a number of anatomical and physiological treatises, the most important being *Icones Anatomicæ* (4 vols., Venice, 1801–14), in the preparation of which he was assisted by his nephew, Florian.

Caldara, kaăl-daa′raă, ANTONIO: Italian composer; b. in Venice in 1678. He wrote a successful opera when he was only eighteen years old, and for many years was engaged in operatic composition. For a while he was instructor in music to the emperor Charles VI. in Vienna. His opera *Themistocles* failed in 1736, and thereafter he confined himself to the composition of sacred music. D. in 1763.

Caldara, POLIDORO (often called CARAVAGGIO): Italian painter; b. in Caravaggio in 1492. He studied in Rome under Maturino, and was employed by Raphael to paint friezes in the Vatican. His best work was in landscape, and he executed many historical pieces, the most noted being *Christ Bearing His Cross*. He was murdered by his servant in Messina in 1543.

Cal'das, or **Calde'tas** [from Lat. *ca'lidus*, *caldus*, warm]: a Spanish term applied to warm springs, and forming part of the name of many places in Spain. Among these the most noted is Caldas de Mombuy, 18 miles N. of Barcelona. Here are thermal baths and some antiquities.

Caldas Barboza, DOMINGOS: Brazilian poet; b. in Rio de Janeiro, 1740; d. in Portugal, Nov. 9, 1800. His mother was a Negro slave, and his color was always a source of pain to the poet. After serving in the Brazilian army until 1762, he went to Lisbon, where he became acquainted with the two Vasconcellos, great patrons of poetry. Through them he entered the best society, and became noted for his improvisations and songs accompanied by the viol (whence his appellation *cantor de viola*). He was elected to the Roman Arcadia, and was one of the founders of the Academy of Belles-Lettres (Nova Arcadia) of Lisbon. His success brought upon him many envious attacks—from Bocage among others. Of his works may be cited *A Doença* (1777); *Recopilação da Historia Sagrada* (3d ed. 1819); *A Vingança da Cigana, drama joco-serio* (1794); *Cántigas* (1806–07). A. R. MARSH.

Caldas, FRANCISCO JOSÉ, de: naturalist; b. at Popayan, Colombia, in 1771. He traveled with Humboldt in New Granada and Quito, and made many valuable botanical and geographical studies. Subsequently he was director of the astronomical observatory at Bogotá. His most important publications appeared in the *Semenario de la Nueva Granada*. When the revolution broke out he took service as an engineer in the patriot army; was captured and shot at Bogotá by order of Gen. Morillo Oct. 29, 1816.

Caldas Pereira de Souza, ANTONIO: poet; b. in Rio de Janeiro, Brazil, Nov. 23, 1762; studied at the University of Coimbra, Portugal, and spent most of his life in Europe, returning to Brazil in 1808. His writings were published in Paris in 1821, under the title *Poesias sagradas e profanas*, with a commentary by Gen. Stockler. They have a highly moral tone, most marked in an ode on *Man in the State of Barbarism*. A new edition was published in Coimbra in 1836. D. in Rio de Janeiro, Mar. 2, 1814.

Caldecott, kawl'de-cot, Randolph: artist; b. at Chester, England, Mar. 22, 1846. A bank clerk at Whitchurch 1861–67, and at Manchester 1867–72; was induced by his successful sketches in the London illustrated papers to remove to the metropolis and devote his life to the new calling. He excelled in depicting country life and in sketching animals; contributed to *Punch* and the *Graphic*; illustrated a series of *Caldecott's Picture-books*; Irving's *Old Christmas* (1875), and *Bracebridge Hall* (1877); Blackburn's *Breton Folk* (1880); Mrs. Ewing's *Daddy Darwin's Dovecote*, and *Jackanapes* (1884). D. at St. Augustine, Fla., whither he had gone in search of health, Feb. 12, 1886.

Cal'deron, Francisco Garcia: lawyer and statesman; b. in Arequipa, Peru, 1834. He was admitted to the bar before he came of age, and at twenty-one was professor of jurisprudence; soon after began to publish his important *Dictionary of Peruvian Legislation*; elected to Congress 1867; Minister of the Treasury in 1868. After the Chilians occupied Lima, Peru was left without a government. The citizens therefore made Calderon provisional president (June 6, 1883), and empowered him to treat with the enemy. The Chilians, however, seized him, and sent him as a prisoner to Valparaiso, where he was kept until the end of the war. During his captivity he was confirmed as president by the Peruvian Congress, but his term had expired before he could return. He was afterward (1886) president of the Senate, and was influential in arranging the Grace contract.
Herbert H. Smith.

Calderon, Philip Hermogenes: painter of figure subjects and portraits; b. at Poitiers, France, May 3, 1833; of Spanish descent, but a British subject; pupil of J. M. Leigh, of London, and of Picot, in Paris; Royal Academician 1867; first-class medals, Paris Expositions, 1867 and 1868; third-class medal, Paris Exposition, 1889; Legion of Honor 1878. First exhibited at the Royal Academy in 1853. Studio in London, at Burlington House. William A. Coffin.

Calderon, Serafin Estebanez, de: Spanish poet and novelist; b. in Malaga, 1801; educated at the University of Granada; appointed Professor of Rhetoric and Belles-Lettres there 1822; for a time practiced law; civil governor of Logroño 1836; of Seville 1837. Author of *El Solitario* (1830); *Cristianos y Moriscos* (1836); *Escenas Andaluces* (1847). D. at Madrid, Feb. 7, 1867.

Calderon de la Barca, kaăl-dā-rōn' de-laă-baar'kaă, Pedro: the most eminent representative of the national drama of Spain; b. at Madrid, Jan. 17, 1600. After having studied mathematics, philosophy, and jurisprudence in the University of Salamanca he entered the army in 1625, and served in several campaigns in Italy and the Netherlands. As early as 1630 Lope de Vega mentions him as the author of many popular plays. In 1635 Philip IV. called him to Madrid to supply the plays for the entertainments at court, and as a reward for such services made him Knight of the Order of Santiago. In 1650 he entered a religious confraternity; in 1653 he was made one of the chaplains of the "Chapel of the Kings" at Toledo; and in 1663 he returned to Madrid as one of the king's honorary chaplains. In the same year he was elected a member of the Congregation of St. Peter. D. May 25, 1681. His distinction among the Spanish dramatists lies in the novelty and ingenuity of his plots, the fervor of his emotions, the richness of his imagery, and the copiousness of his productions. While he is behind his predecessors, especially Lope de Vega, as regards the variety of metrical forms, he surpasses them in the melodious flow of his verse. Contrary to the more realistic Lope de Vega, Calderon was an idealist, and his plays are an idealized expression of the religious and chivalrous elements of Spanish life, characterized throughout by great purity of thought. The 400 plays of Calderon may be divided into the following six classes: (1) Religious dramas, e. g. *The Wonder-working Magician*, *The Constant Prince*, *Life is a Dream*; (2) mythological dramas, e. g. *Echo and Narcissus*, *The Bridge of Mantible*; (3) historical dramas, e. g. *The Alcalde of Zalamea*; (4) comedies of intrigue, e. g. *A House with Two Doors is Hard to Keep*; (5) romantic dramas; and (6) *The Autos Sacramentales*, a dramatic form which had grown out of the mediæval miracle-plays, and used to teach a moral or religious lesson by way of allegory. A convenient edition of Calderon's works is that of Hartzenbusch: Madrid, Rivadeneyra, 1872–74 (4 vols., containing 122 comedies and 75 autos); the best translation is one in German, *Schauspiele von D. Pedro Calderon de la Barca*, Uebersetzt von J. D. Gries (9 vols., Berlin, 1862). The most recent biography is by the Spaniard, Don F. Picatoste y Rodriguez. Henry R. Lang.

Calderón y Beltrán, kaăl-dā-rōn'ĕe-bel-traan', Fernando: Mexican poet and dramatist; b. July, 1809; regarded by Mexicans as one of their best lyric writers. His dramas also have been successful. His works have been published (1844; 2d ed. 1849), and are widely read in Mexico. D. Jan., 1845. A. R. Marsh.

Calderwood, kawl'der-wŏŏd, David: Presbyterian minister and historian; b. in Dalkeith, Scotland, in 1575; educated in the University of Edinburgh; became minister in Crailing 1604. He was banished for his opposition to episcopacy, and in 1619 retired to Holland, where he published a controversial work called *The Altar of Damascus* (on the polity of the Church of England), which was the great storehouse of Presbyterian arguments (Leyden, 1621; Latin trans., Leyden, 1623; 2d ed. 1708). He returned to Scotland in 1625; became minister in Pencaitland, East Lothian, 1640; and wrote a *History of the Kirk of Scotland*, published by the Wodrow Society (Edinburgh, 1842–49, 8 vols.). D. in Edinburgh, Oct. 29, 1650. See his life by T. Thomson, in his *History*.

Calderwood, Henry, LL.D.: b. in Peebles, Scotland, May 10, 1830; studied in Edinburgh University 1847–52, and in United Presbyterian Theological Hall 1852–56; was minister in Greyfriars church, Glasgow, 1856–68; Examiner in Mental Philosophy to the University of Glasgow 1861–64; conducted the class of Moral Philosophy in Glasgow University in 1866; in 1868 was appointed to the chair of Moral Philosophy in Edinburgh University; was chosen a Fellow of the Royal Society of Edinburgh, 1869; d. Nov. 19, 1897. Author of *The Philosophy of the Infinite* (London, 1854; 3d ed. 1874); *Handbook of Moral Philosophy* (1872; 14th ed. 1888); *On Teaching* (1874; 3d ed. 1881); *Relations of Mind and Brain* (1879; 2d ed. 1884); *The Parables of our Lord Interpreted in view of their Relations to each other* (1880); *The Relations of Science and Religion* (1881); *Evolution and Man's Place in Nature* (1893). Revised by S. M. Jackson.

Caldicott, Alfred J.: See the Appendix.

Caldwell: city; Sumner co., Kan. (for location, see map of Kansas, ref. 8–G); on Atch., Top. and S. Fé, Ch., Rk. I. and Pac., and St. L. and San Fran. R. Rs.; 53 miles S. by W. of Wichita; in a stock-raising region. Pop. (1880) 1,005; (1890) 1,642; (1900) 1,574. Publisher of "Journal."

Caldwell: village; on railroad; capital of Noble co., O. (for location of county, see map of Ohio, ref. 6–11); situated 35 miles N. of Maricttа; in the center of the Duck Creek oil-region. The vicinity yields coal and iron. Pop. (1880) 602; (1890) 1,248; (1900) 927.

Caldwell, Lake George P.-O.: on railroad; capital of Warren co., N. Y. (for location of county, see map of New York, ref. 3–J); situated near the head of Lake George; 62 miles from Albany. It has several hotels, and is a place of summer resort. Steamers ply upon the lake. Fort William Henry and Fort George were situated within the limits of this township. Pop. of township (1880) 1,223; (1890) 1,377; (1900) 1,465.

Caldwell: town; on G. C. and S. Fé R. R.; capital of Burleson co., Tex. (for location of county, see map of Texas, ref. 4–I); 85 miles E. by N. of Austin; has a male and female academy, good public schools, and four churches. It is in a fine farming region. Pop. (1880) 301; (1890) 1,250; (1900) 1,535. Editor of "Chronicle."

Caldwell, Charles, M. D.: physician; b. in Caswell co., N. C., May 14, 1772. He was for many years Professor of Medicine in Transylvania University in Kentucky. He wrote, besides other works, a *Life of General Greene* (1819). His last work was a report on mesmerism. D. in Louisville, Ky., July 9, 1853. See his *Autobiography* (Philadelphia, 1855).

Caldwell, Charles Henry Bromedge: commodore U. S. navy; b. in Hingham, Mass., June 11, 1828; entered the navy as a midshipman Feb. 27, 1838. In 1858, while attached to the sloop Vandalia, Caldwell had charge of an expedition against a tribe of cannibals inhabiting Wega, one of the Fiji islands, which he conducted with ability, defeating the Wegans in a pitched battle and burning their town. While commanding the steamer Itasca he took part in the bombardment of Forts Jackson and St. Philip, Apr. 24, 1862, but was unable to pass the forts with the rest of the fleet, "owing to a 42-pound shot entering the boiler, the steam

from which filled the fire and engine-room, driving every one up from below, and almost suffocating those on the quarter-deck." He participated in the action with the Grand Gulf batteries, Mississippi river, June 9, 1862, and in command of the ironclad Essex took part in all the operations at Port Hudson during the spring and summer of 1863. D. at Boston, Mass., Nov. 30, 1877.

Caldwell, MERRITT, A. M.: author and educator in the Methodist Episcopal church; b. in Hebron, Me., Nov. 29, 1806; graduated at Bowdoin College in 1828; became principal of the Maine Wesleyan Academy at Readfield in 1828; Professor of Mathematics and vice-president of Dickinson College, Pa., in 1834; Professor of Metaphysics and English Literature there in 1837. D. in Portland, Me., June 6, 1848. He was author of a *Manual of Elocution* (1846); *Philosophy of Christian Perfection* (1847); *Christianity Tested by Eminent Men*; *The Doctrine of the English Verb*; and of a large number of reviews.

Caldwell, SAMUEL LUNT, D. D., LL. D.: b. in Newburyport, Mass., Nov. 13, 1820; graduated at Waterville College (now Colby University), Me., 1839; teacher Hampton Falls Academy, New Hampshire, and Newburyport 1839–42; graduated at Newton Theological Institution 1845; pastor, Bangor, Me., 1846–58; First Baptist church, Providence, R. I., 1858–73; Professor of Church History Newton Theological Institution 1873–78; president of Vassar College, New York, 1878–85. D. in Providence, R. I., Sept. 26, 1889.

Cal'edon, EARL OF (1801): Viscount Alexander (1797), Baron Caledon (1789), all of the Irish peerage.—JAMES ALEXANDER, fourth earl, was born July 11, 1846, and succeeded his father in 1855.

Caledo'nia (in Welsh *celydd*, a woody shelter; but Isaac Taylor derived the name from Gael.): the name given by the Romans in the first century to that part of the island of Britain which lay to the N. of the Friths of Forth and Clyde, It included, of course, only the highlands of modern Scotland. Very obscure is the ethnology of the people, and various hypotheses have been applied to the fact, though it seems most probable that the Caledonians belonged to the hill Gaelic family. Pliny is the first author who mentions Caledonia. Tacitus describes the natives as having red or sandy hair, as living in tents without cities, as addicted to predatory warfare, and fighting in chariots. The Romans made several unsuccessful efforts to subdue these barbarians, who not only repulsed the invaders but harassed the Roman colonies in Britain by frequent inroads. The first Roman general who penetrated into Caledonia was Agricola, the lieutenant of Domitian and the father-in-law of Tacitus. He defeated the Caledonians under Galgacus at Mt. Graupius, a place of uncertain location, in 84 A. D. Galgacus is said to have lost 10,000 men in the battle. Nevertheless, in the following year Agricola was recalled to Rome, and soon after the Caledonians again began to harass the Roman colonies. To defend themselves against these inroads the Romans built in 139 A. D. the Wall of Antonine from the Frith of Forth to that of the Clyde, 31 miles across, a substantial work which can not have been without due effect in a war with barbarians. In 208 the Emperor Severus entered Caledonia with a great armament and fully determined to subdue the country. He also succeeded in reaching the northern extremity of the island—which, however, most probably meant nothing more than the coast of Aberdeenshire—but by disease, fatigue, and the perpetual guerrilla warfare waged against him he is said to have lost about 50,000 men, and was compelled to retreat southward. A league was then formed between the Caledonians and their southern neighbors, the Moata; but while preparing himself for a new campaign against the league, the emperor died at York in 210. A century later on the Picts are heard of for the first time, and in 367 Valentinian I. sent his lieutenants into Britain to defend the Britons against the Caledonians and the Picts. He succeeded, and once more laid the country between the Wall of Antonine and that of Hadrian under Roman rule. See SCOTLAND.

Caledonian Canal, THE: a canal in Scotland; connects the Atlantic Ocean with the North Sea near Inverness; built by TELFORD (*q. v.*); opened in 1823. It is 61½ miles in length, and is formed by cuts 120 feet broad at the surface, 50 feet at the bottom, and 17 feet deep, connecting the Lochs Ness, Oich, Lochy, and Eil. The combined length of the artificial portions is 23 miles. This canal saves vessels the stormy passage by the Hebrides, which takes nine or ten days longer. Ships of 600 tons can pass through. The highest part is Loch Oich, 94 feet above the sea-level.

Caledonia Springs: in Caledonia township, Prescott co., province of Ontario, Canada; 40 miles from Montreal, and 9 miles S. W. of L'Orignal. They are resorted to especially for the cure of cutaneous, scrofulous, and rheumatic diseases. There are four principal springs, all strongly alkaline, one with considerable iodine and bromine in its waters.

Cal'endar [from Lat. *calenda'rium*, account-book; deriv. of *calendae*, first of month, the day on which accounts were payable]: any systematic and comprehensive method of dividing, distributing, and reckoning time; also, a book or table exhibiting such a method. There are two natural divisions of time, or regularly recurring periods, which all calendars must recognize—the day and the year. The month seems to have been suggested by the period of the moon's revolution (29½ days nearly), to which in some calendars (as the Jewish and the Greek) it has been made closely conformable. The week is, approximately, one quarter of a lunation. It is found in the Oriental and Egyptian calendars, and in that of the Israelites, from whom we have received it, but it was not known to the Greeks or the Romans. The Greeks instead employed *decades* of ten days each, and the Romans periods of *eight* days, the last of which was called *nundinae* (*novem*, nine; *dies*, day), or ninth day; the count including both the nundine at the beginning and that at the end of the period. In the ancient calendars the nundine periods were distinguished by setting opposite the successive days the first eight letters of the alphabet (A to H inclusive), repeating these letters throughout the year. From this usage was derived that of the Christian calendar of marking the days by the first seven letters (A to G), similarly repeated. The manner of denoting days of the month was peculiar. The first day was always called *kalendae*, calends; the fifth or seventh, *nonae*, nones; and the thirteenth or fifteenth, *idus*, ides. The nones were the seventh, and the ides the fifteenth in March, May, July, and October, the first, third, fifth, and eighth months of the Roman year (easily remembered by associating them with the notes of the common chord in music); in the remaining months they fell on the fifth and thirteenth. Any other day was denoted by its distance counted backward from one of these points of reference, the reference-day itself counting one. Thus Mar. 31 is *Pridie* Kal Apr., or II. Kal Apr.; Mar. 30 is III. Kal Apr.; July 6 is Pridie Non. Jul.; the 5th, III. Non. Jul., etc. It is difficult to understand how so cumbrous a system as this could have maintained itself for centuries among a cultivated people.

In the regulation of the year we find the calendars of different peoples materially differing. The Egyptian year had 12 months of 30 days each, and counted five unallotted days at the end. It was too short by nearly a quarter of a day; and hence the beginning of the year went backward through the seasons once in 1,460 natural years or 1,461 Egyptian years. This was known as the SOTHIC PERIOD (*q. v.*). Because of this incessant movement the Egyptian year is called *vague* or wandering. The Greek year consisted of 12 lunar months of 30 and 29 days alternately. This made the length of the year 354 days, or 11¼ days too small. To compensate for the deficiency, an intercalary month of 30 or 29 days was introduced every alternate year, which made the average length seven days too great; for which reason the intercalary month was omitted once in about eight years. The earliest Roman year, attributed to Romulus, had only ten months, of which the first, third, fifth, and eighth (those in which, as above mentioned, the nones fell on the seventh and the ides on the fifteenth) had 31 days, and the rest 30 each. This year of only 304 days was shorter than the natural year by about one-sixth. Each Romulian year therefore began two months earlier in the season than the last, and the sixth came to an end at the same time with the fifth natural year. This circumstance, according to Niebuhr, determined the period of the lustrum. See LUSTRUM.

The months of the original Roman year were named Martius, Aprilis, Maius, Junius, Quintilis, Sextilis, September, October, November, December. Numa Pompilius, second King of Rome, added, according to Solinus, Januarius to the beginning and Februarius to the end of the year. This year was a lunar year of 354 days, but it was made a day longer, or 355, because there was supposed to be luck in odd numbers. To prevent displacement, an intercalary month of 22 and 23 days, alternately, was introduced every

second year. This made the year to consist in effect of 366¼ days. About the year 450 B. C. the decemvirs regulated the calendar once more, and placed February between January and March, both at the end of the year. The months were now—whether so settled by Numa or the decemvirs is uncertain—Martius, 31 days; Aprilis, 29; Maius, 31; Junius, 29; Quintilis, 31; Sextilis, 29; September, 29; October, 31; November, 29; December, 29; Januarius, 29; Februarius, 28. The intercalary month was inserted between the 23d and 24th days (as we count them) of February, or, in the Roman manner of speaking, before the sixth calends of March. The reason for so placing it was that the seventh calends of March, or Feb. 23, was the last day of a round year of 360 days, and was celebrated as the festival of Terminus, the god of limits, under the name Terminalia. The Romans, like the Egyptians, seem to have regarded the remaining five days as hardly belonging to the year, but as being a sort of interval between two years. The odd day added to the 354 for luck was not, however, intercalated in this place, but was introduced wherever it might be necessary to prevent the *nundinae* from falling on the calends of January or the nones of any month—such a coincidence being deemed inauspicious. The year on this system being, as we have seen, a day too long, added twenty-four days too much in twenty-four years. It was provided, therefore, that during the last eight years of this period these twenty-four days should be deducted in making the intercalations. The pontiffs, however, who had the control of the intercalation, used their powder capriciously for personal ends—sometimes to lengthen or shorten the term of a magistrate, sometimes to benefit or injure the farmer of the public revenues. As a natural consequence, the calendar fell into extreme confusion; so that in the time of Julius Cæsar the civil differed from the astronomical equinox by nearly three months. This powerful ruler resolved on a thorough reform. Under the advice of the astronomer Sosigenes he abolished the lunar year. He readjusted the months to their proper seasons by making the year 708 A. U. C. 445 days long, extending from Oct. 13, inclusive (according to our present count), to the 31st day of the second ensuing December. This year is known in chronology as the year of confusion. He reconstructed the months, giving 31 days each to the first, third, fifth, seventh, ninth, and eleventh, and 30 days each to the rest, except February, which had 29 only, but every fourth year received an intercalary day, making 30. The intercalation took place, for a reason already given above, immediately after the feast of Terminalia, and was made by repeating the *sexto Kalendas Martias*; whence the year in which it occurred came to be called bissextile. Finally, the beginning of the year was transferred from Mar. 1 to Jan. 1. To flatter the vanity of Octavius after he had secured the supreme power and had received the title of Augustus, a day was taken from February by a sycophantic senate and given to August, which had been named from him, for the frivolous purpose of giving to his month no less dignity in point of numbers than July, which had received its name from the first Cæsar. The lengths of the later months were then altered to prevent three long months from occurring consecutively.

The Julian year consisted of 365¼ days, and consequently differed in excess by 11 minutes 13·95 seconds from the true solar year, which consists of 365 days 5 hours 48 minutes 46·05 seconds. In consequence of this difference the equinox, in the course of a few centuries, fell back sensibly toward the beginning of the year. In the time of Julius Cæsar it corresponded to Mar. 25; in the sixteenth century it had retrograded to the 11th. The correction of this error was one of the purposes sought by the reformation of the calendar effected by Pope Gregory XIII. in 1582. By suppressing ten days in the calendar, Gregory restored the equinox to Mar. 21, the day on which it fell at the time of the Council of Nice in 325. This council determined that the Eastern churches should celebrate Easter at the same time as the Western—i. e. on the Sunday following the Paschal full moon, and not on the fourteenth day of the Paschal moon. The Gregorian rule of intercalation may be expressed as follows: Every year of which the number is divisible by 4 without a remainder is a leap-year, excepting the centesimal years, which are only leap-years when divisible by 4 after suppressing the two zeroes. Thus 1600 was a leap year; 1700 and 1800 were common years; 1900 will be a common year, 2000 a leap year, and so on. The length of the mean year thus fixed is 365·2425 days, or 365 days 5 hours 49 minutes 12 seconds, which exceeds the true solar year by 25·95 seconds, an error which amounts only to one day in 3,325 years. The intercalations might be so made as to make the calendar year correspond even more closely than it does now with the solar year, but no other method could be as convenient as the Gregorian.

The new calendar was received immediately or shortly after its promulgation by all Roman Catholic countries. The Protestant states of Germany and the kingdom of Denmark adhered to the Julian calendar till 1700; and in England the alteration was successfully opposed by popular prejudices till 1752. In that year the Julian calendar, or *old style*, as it was called, was abolished by act of Parliament, and the date used in all public transactions rendered coincident with that followed in other European countries, by enacting that the day following Sept. 2, 1752, should be called the 14th of that month. When the alteration was made by Gregory it was only necessary to drop ten days; the year 1700 having intervened, which was a common year in the Gregorian, but a leap-year in the Julian calendar, it was now necessary to drop eleven days. The old style is still adhered to in Russia and the countries following the communion of the Greek Church; the difference of date in the present century amounts to twelve days. For fuller information on this subject, see Delambre's *Astronomie Théorique et Pratique*, tom. iii., chap. xxviii.; Ideler's *Lehrbuch der Chronologie*; and Anthon's *Greek and Roman Antiquities*.

Ecclesiastical Calendar.—The adaptation of the civil to the solar year is attended with no difficulty, but the church calendar for regulating the movable feasts imposes conditions less easily satisfied. The festival of Easter commemorates the resurrection of our Lord, which momentous event having occurred near the time of the Jewish Passover was naturally associated in the minds of the early disciples with that anniversary, and its annual returns were made dependent upon the same calendar regulations. The Passover was observed on the fourteenth day of the moon—that is, near the full moon. The question what day is most proper for the observance of Easter became early a subject of warm controversy. In order to put an end to an unseemly contention, the Council of Nice ordered that Easter should be celebrated on the Sunday which immediately follows the full moon that happens upon or next after the vernal equinox. In order to determine Easter according to this rule for any year, it is necessary to reconcile three periods—namely, the week, the lunar month, and the solar year. To find the day of the week on which any given day of the year falls, it is necessary to know on what day of the week the year began. In the Julian calendar this was easily found by means of a short period or cycle of twenty-eight years, after which the year begins with the same day of the week. In the Gregorian calendar this order is interrupted by the omission of the intercalation three times out of four in the last year of the century. But, to render calculation unnecessary, a table is given in the prayer-books, showing the correspondence of the days of the year and the week for the current century. The connection of the lunar month with the solar year is an ancient problem, for the resolution of which the Greeks invented cycles or periods, which remained in use with some modifications till the time of the Gregorian reformation. See Delambre's *Histoire de l'Astronomie Moderne*, tom. i., liv. i.; De Morgan's *Companion to the British Almanac* (1845); Barnard's *How to Find the Church Festivals* (1872).

A new reform of the calendar was introduced in France during the Revolution by a decree of the National Convention passed Nov. 24, 1793. This took for its epoch the midnight next preceding the autumnal equinox of 1792, from which point of time the successive years were numbered I., II., etc., "of the French republic, one and indivisible." The year was divided into twelve months, each of thirty days, leaving, in ordinary years, five days necessary to complete the year, and in leap-year six. These days were placed at the end of the last month, and under the name *jours complémentaires* were celebrated as festivals. As during these celebrations the ordinary occupations of life were suspended, and the population were expected to give themselves up without restraint to pleasure in every form, they obtained the name of *sans-culottides*. Each period of four years terminating in a leap-year was also called a *Franciade*. The leap-year was also called an Olympic year. The names of the *jours complémentaires* were the following, with the dates as they occur in a leap-year: Primidi (dedicated to Virtue), Sept. 16; Duodi (dedicated to Genius), Sept. 17; Tridi (dedicated to Labor), Sept. 18; Quartidi (dedicated to Opinion), Sept. 19; Quintidi (dedicated to Rewards), Sept. 20; Sextidi,

á Jour de la Revolution, Sept. 21. On this last day every Frenchman was required to renew the national oath, *to live free or die*. In order that the corrections found necessary by the mathematicians of Pope Gregory might be embodied also in the new calendar, it was further provided that the Franciade terminating the century should have no Olympic or leap year except in the fourth century and in all subsequent centuries whose numbers are divisible by four, which latter were to retain the Olympic year until the fortieth century, which was to end without an Olympic year.

The months received names derived from their prevailing meteorological characteristics, or from the products of the earth maturing in them, the several seasons being distinguished by the peculiar terminations of the names, as follows:

Autumn.	Vendémiaire,	22 Sept.—21 Oct.,	inclusive,	Vintage month.
	Brumaire,	22 Oct.—20 Nov.,	"	Foggy month.
	Frimaire,	21 Nov.—20 Dec.,	"	Sleety month.
Winter.	Nivose,	21 Dec.—19 Jan.,	"	Snowy month.
	Pluviose,	20 Jan.—18 Feb.,	"	Rainy month.
	Ventose,	19 Feb.—20 Mar.,	"	Windy month.
Spring.	Germinal,	21 Mar.—19 Apr.,	"	Budding month.
	Floréal,	20 Apr.—19 May,	"	Flowery month.
	Prairial,	20 May—18 June,	"	Pasture month.
Summer.	Messidor,	19 June—18 July,	"	Harvest month.
	Thermidor,	19 July—17 Aug.,	"	Hot month.
	Fructidor,	18 Aug.—16 Sept.,	"	Fruit month.

The week was abolished. Instead of this, the month was divided into three *decades* of ten days each. The names of the days of the decade were Primidi, Duodi, Tridi, Quartidi, Quintidi, Sextidi, Septidi, Octidi, Nonidi, Decadi. The decadi thus fell on the tenth, twentieth, and thirtieth days of the month, which were called Decadi I., Decadi II., Decadi III. For distinction the intermediate days were described—rather awkwardly—as "before Decadi I.," "after Decadi I."; "before Decadi II.," "after Decadi II.," etc.

This calendar first went into operation Nov. 26, 1793, and was discontinued Dec. 31, 1805, when, in the second year of the empire, the Gregorian calendar was resumed.

F. A. P. Barnard.

Cal'endering [*calendar*, older *calander*; from Fr. *calandre*, Med. Lat. *calendra*, corruption under influence of folk-etym. of Lat. *cylindrus* = Gr. κύλινδρος, roller]: the process of finishing or of imparting a smooth polished or glazed surface to linen and cotton goods, paper, etc., by passing the material whose surface is to be finished between two or more closely set rolls or cylinders which are caused to revolve by hand or by the application of steam or other motive power. The domestic mangle in use in Great Britain is perhaps the simplest form of calendering-machine.

The finish given is of different kinds, according to the manner in which the machine is used. The first object of calendering is to smooth out and eradicate creases, lumps, knots, etc. With greater pressure the threads are deprived of their roundness and the material acquires an appearance of closeness and a silky luster. When to pressure is added friction, obtained by making the cylinders revolve with different velocities, an additional polish called glazing is imparted. If two folds of the material are passed through together a wiry appearance results, caused by the impression of the threads of one fold on the other. If a cylinder with a pattern is used the effect known as "watering" is produced.

The machine consists of several cylinders, generally from three to twelve in number, arranged vertically in a strong framework. The cylinders are connected with a long lever loaded with weights at the farther extremity, by which, or by means of screws, great force may be applied. Hollow cylinders of iron, brass, or steel are used when heat as well as pressure is required. They are heated by steam passed through the interior, or by gas, or by red-hot heaters. It is of importance that some of the cylinders should combine considerable hardness with elasticity. For this purpose cylinders made of solid paper or compressed cotton are used. Wood is also used, but it is liable to crack and warp.

Cal'ends [Lat. *kalendae*, deriv. of *cala're*, call; cf. Gr. καλεῖν, call; the day on which the pontiff proclaims the nones, fixing the calendar]: the first day of each Roman month, because, according to Macrobius, before Cn. Flavius the scribe, against the will of the patricians, made the *fasti* (propitious days—days when courts were open) known to all the people (about 300 years B. C.), it was the duty of one of the minor priests, on the first appearance of each new moon, to summon the plebeians to a place in the Capitol near the Curia Calabria, and there to announce the number of days before the nones (always five or seven, *including the day of calling and the day of the nones itself*), by so many times repeating the word *calo*. If the part of this statement which makes the beginning of each month dependent on direct observation of the moon is correct, it is impossible that the months of the early Roman calendar should have had the fixed and rather arbitrary lengths usually assigned to them. As to this question historians differ, some asserting that the Roman months were strictly lunar down to A. U. C. 448; others, as Censorinus, that their lengths were fixed by Numa, the second king. See Calendar.

Cal'enture [Lat. *calentura*; from *cale're*, to be hot]: a strange malady, said to occur in the tropics. It is characterized by fever, strong hard pulse, convulsions, and sudden, acute delirium. The patient imagines that he can see in the depths of the ocean green fields, the leafy branches of trees, etc., and he will attempt to throw himself into the waves. This irresistible impulse to cast one's self into the sea may be considered the special characteristic of calenture, in regard to the nature, identity, and even existence of which authorities differ.

Calfa, Guy Ambroise: Prince of Lusignan; Armenian scholar and writer; also known under the name of **Iusuf Bey**; grandson of that Prince Amaury of Lusignan who, under the name of Iusuf Bey, accompanied the French expedition to Egypt in 1799. He was born in Constantinople, Mar. 2, 1830: educated by the Mekhitarists in Venice. In 1848 he was sent to Paris as professor at the Collège Murat; but in 1854, a disagreement having arisen between the Mekhitarist leaders, he resigned his position and founded an independent national school at Grenelle, of which he was director for three years. Compelled by his delicate health to retire into private life, he developed a great activity as a writer, published a *Dictionnaire Arménien-Français* (1860); *Français-Arménien* (1866); translated various French works into Armenian, as, for instance, *Paul et Virginie*, *Télémaque*, etc.; and wrote a *Universal History*; a *Sacred History*; *Lecture pour tous* (1867); *Guides de la Conversation*, for several languages, etc.

Cal'gary: town; capital of district of Alberta, Canada (for location, see map of Canada, ref. 9–F); on main line of C. P. R. R. at junction of line running N. to Edmonton (192 miles), and S. to Macleod; situated on Bow river; 840 miles W. of Winnipeg, and 642 E. of Vancouver on Pacific coast. Calgary has a public school, and a convent school for girls; Anglican, Roman Catholic, Presbyterian, Methodist, and Baptist churches; court-house; two hospitals, one general and one conducted by gray nuns. It is the center of an agricultural and cattle-raching district. Its chief industrial establishments are tannery, soap-works, flour-mill, and brewery. It has electric lights, water-works, a sewer system, and telephone. It was originally a post of the Northwest mounted police, established in 1875; but was organized in 1884 as a town. Pop. (1880) 30; (1891) 3,876.

Editor of "Herald."

Calhoun, kăl-hoon', John Caldwell, LL. D.: statesman; b. in Abbeville district, S. C., Mar. 18, 1782; graduated at Yale College in 1804; studied law; was sent to Congress in 1811. He began his political career as a Democrat and a leader of the war party; supported the tariff of 1816 and the U. S. bank; in Oct., 1817, he became Secretary of War in the cabinet of President Monroe. He approved the Missouri Compromise of 1820; was elected Vice-President of the U. S. in 1824, in which canvass he was supported by the friends of Jackson and those of Adams. Having joined the Jackson party, he was again elected Vice-President in 1828, when Gen. Jackson was chosen President. About this time he became an advocate of free trade and of the doctrine of the sovereignty of the States. He was the author of the *South Carolina Exposition*, which affirmed that any State can nullify unconstitutional laws of Congress. Calhoun and Van Buren having become aspirants for the office of President of the U. S., Gen. Jackson, by promoting the nomination of the latter, incurred the enmity of Calhoun. He resigned the office of Vice-President in 1832, and was then elected a Senator of the U. S. for South Carolina. A convention held in South Carolina near the end of 1832 adopted what was known as the Nullification ordinance. Its object was to test the constitutionality of the protective tariff policy through the instrumentality of the State instead of the Federal courts, and to prevent the collection of duties on imports in that State under the act of Congress of 1832, levied, as was alleged, with a direct view rather to

the protection of the manufactures of the U. S. than the collection of revenue, until the protective principle, so called, should be so tested and decided by the State courts. This was in pursuance of Mr. Calhoun's peculiar doctrines, known as nullification. He held that under the Federal system the judiciary of each State had the reserved sovereign right to decide in the last resort upon the extent of the powers delegated under the Constitution by the States respectively. This ordinance was to go into effect on Feb. 12, 1833. The determined attitude of Gen. Jackson against these nullification doctrines caused general and serious alarm lest a conflict of forces should ensue between the Federal and State authorities. It was in this condition of affairs that Mr. Clay, as a mediator, came forward with his famous "tariff compromise" of 1833, which was founded upon the avowed principle of an abandonment of the protective policy after 1843. To this measure Mr. Calhoun gave his cordial support, and in this way the anticipated perils of the crisis were averted.

As a debater, Mr. Calhoun occupied the foremost rank among U. S. Senators, and was scarcely equaled by any of his contemporaries, except Mr. Clay and Mr. Webster. These three were known as "the Great Trio." The debate between Mr. Calhoun and Mr. Webster on the nature of the Federal government and the doctrine of nullification, so called, in Feb., 1833, was one of the most noted for ability and eloquence in the annals of this country. Mr. Calhoun retired from the Senate in Mar., 1843, and was appointed Secretary of State by Mr. Tyler in Mar., 1844. It was under his auspices that the "Tyler treaty," as it was called, for the annexation of Texas, was negotiated in the same year. He was re-elected to the Senate in 1845, and opposed the Mexican war in 1846. He continued in the Senate until his death at Washington, Mar. 31, 1850. His mind was eminently metaphysical, and his private character was without reproach. Among his writings are two posthumous works—one, a *Disquisition on Government*, and the other, *A Discourse on the Constitution and Government of the United States*. These are both held in high estimation by his admirers and men of his school of politics. See *Calhoun*, by H. Von Holst, in American Statesmen Series.

Revised by C. H. THURBER.

Cali, kaa'lĕe: a town of the state of Cauca, Colombia; 70 miles N. by E. of Popayan; on a western declivity of the Andes (see map of South America, ref. 2–B). It has two fine churches and an active trade. Pop. 12,700.

Calibre, or **Caliber** [viâ Fr., perhaps ultimately from Arab. *qālib*, mold; but deriv. from Lat. *qua libra*—of what weight?—is not impossible]: a French word which is also much used in English; signifies the diameter of the bore of a gun or any firearm. It is usually measured and described in inches or parts of inches. The cannon in which solid shot is used are often denoted by the weight of each shot, as a 24-pounder, but mortars which throw shells or hollow shot are usually designated by such terms as a 13-inch mortar, etc.

Calico: a kind of cotton cloth; said to be so named from Calicut, a city of India, where it was first manufactured. It was imported into England by the East India Company in 1631. See CALICO-PRINTING.

Calico-bass: a species of sunfish (*Pomocis sparoides*) found in the rivers of the Eastern U. S., so called from the coloration.

Calico-printing: the art of producing patterns on cotton cloth either by printing in colors, or in mordants which become colors when subsequently dyed. Cloth made from cotton and wool, when similarly printed, is known as mousseline de laine. Calico-printing originated in India in very ancient times. Pliny describes the art as practiced by the Egyptians. For a long time chintz counterpanes were imported into England from India. The art spread westward to Asia Minor and the Levant. It was imported into Holland by the Dutch East India Company, and spread into Germany. At the close of the seventeenth century Augsburg in Bavaria was noted for its printed linens and cottons. Calico-printing was introduced into England during the seventeenth century, but the development of the art was for a long time seriously retarded by the opposition of the silk and woolen weavers. At their instigation the importation of chintz from Calicut was prohibited, and a heavy revenue tax was placed upon English calicoes. Finally, in 1720, a law was enacted prohibiting the wearing of any printed calicoes whatever, whether of foreign or domestic origin. This law was repealed in 1736, but a duty of 6*d*. per yard was still levied. In 1831 all duties were repealed. Great Britain is now the largest producer of calicoes; the U. S. stand second. The finest calicoes are made in Alsace, at Mühlhausen. Calico-printing involves a variety of operations, some of which are peculiar to certain styles, while others are common to all.

Singeing.—The first operation is the removal from the surface of the cloth of the fibrous nap or down, which, if not removed, would seriously interfere with the uniform application of the colors. The removal of the nap is effected either by passing the cloth rapidly over a red-hot plate (Fig. 1) or between lines of gas-jets. A shearing-machine is also in use for this purpose.

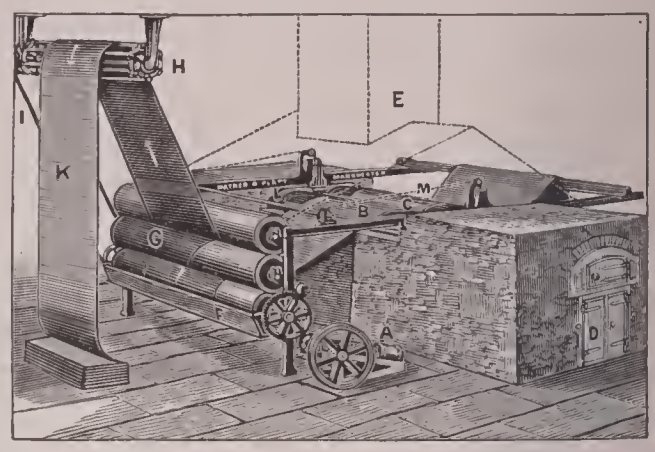


FIG. 1.—Hot-plate singeing: A, driving-engine; B C are semi-cylindrical red-hot plates of copper or iron; D is the furnace door; E is the ventilator; F, a wooden box filled with water, through which the cloth runs after singeing; G are three rollers which remove the excess of water from the singed cloth; H is the folding-reel, driven by a belt, I, from the lower roller, G; K is the cloth; L M is an arrangement of levers and steel chains to lift the cloth from the plates in case of stoppage.

Bleaching is then effected by boiling the cloth with lime, souring with sulphuric acid, boiling with soda-ash and rosin, boiling with soda-ash alone, treating with bleaching-powder, souring again, and finally washing thoroughly with water. See BLEACHING.

Calendering is sometimes resorted to in order to make the cloth smooth and even. It is effected by passing it between very heavy rolls.

Fixing the colors upon the cloth is effected (1) by the aid of mordants, substances which have an affinity for both fiber and color, as madder, logwood, Brazil-wood, artificial alizarine, etc., fixed by alumina, oxide of iron, oxide of chromium, etc., aniline colors, fixed by albumen, gluten, arsenite of alumina, tannate of antimony, etc. Sumach and cutch, which produce drabs and blacks with oxide of iron by the action of the tannic acid they contain, belong to this class. It is impossible to make a distinction between the action of true mordants and of agents which simply produce insoluble colors in the tissue of the cloth, as the two classes pass into each other by insensible gradations. These insoluble colors are produced by double or simple decomposition, by the successive treatment of the cloth with the necessary reagents. Thus Prussian blue is fixed on the cloth either by first applying an iron salt and then treating it with ferrocyanide of potassium, or it is produced by the decomposition of ferrocyanide of potassium alone, under the influence of certain acids. Chrome yellow is produced by the successive application of a lead salt and bichromate of potassa. Indigo is fixed by applying it in solution as colorless reduced indigo, and developing it as insoluble blue pigment by oxidation in the air. Brown oxide of manganese is formed by applying sulphate of manganese, withdrawing the sulphuric acid by an alkali, and oxidizing to a brown oxide by hypochlorite of lime. Aniline black is produced by the oxidation of an aniline salt in the cloth. (2) Colors are fixed by agents which, being first mixed with the color, are applied to the cloth and then rendered insoluble, when they hold the color upon the fibers either mechanically, as ultramarine blue, Guignet green, chrome yellow, madder lake, or mechanically and chemically, as aniline colors, fixed by albumen coagulated by heat.

Patterns are produced (1) by printing the mordant in figures, and subsequently producing the colors in the dye-liquors: *madder styles*; (2) by printing one component of the color, and then passing the cloth through a solution of

the other component, or of the agent necessary to develop the color: *padding*, *bronzing*, *indigo*, *pencil blue*, and *China blue styles*; (3) by printing the color together with the mordant or fixing agent, and rendering it insoluble, or developing it by air or steam. This is called topical or surface printing, and forms the most important branch of calico-printing: *steam colors*, *spirit colors*, *aniline black*, *aniline colors by albumen*, *pigment printing*, *metallic printing*; (4) by printing resist or reserve pastes, which protect certain portions of the cloth, and prevent the fixing of the color in the subsequent dyeing operations: *resist styles*; (5) by discharging the color from portions of the cloth previously dyed: *discharge styles*.

The *colors* most frequently employed in calico-printing are (1) the dyestuffs proper—madder in its various forms,

Fig. 2.—Block-printing by hand.

which at one time was one of the most important dyewares, and has been completely displaced by artificial alizarine; alizarine-orange, alizarine-blue, gallocyanine, alizarine-yellow, anthracene-brown, which are all artificial dyes prepared from coal-tar; logwood, Brazil-wood, sandal, cam, and bar wood, and fustic; quercitron bark, indigo, Persian berries, cochineal, and an almost endless array of aniline colors; (2) the astringents which contain tannic acid, catechu, sumach, nutgalls, etc.; (3) the pigments chrome yellow and orange, Prussian blue, Guignet green, ultramarine, Scheele's green, oxide of iron, oxide of manganese. For details, see each under its own name; also Dyeing and Dyestuffs.

The *mordants* most frequently used are salts of alumina, iron, chromium, tin, nickel, calcium, magnesium, caseine, albumen, gluten, tannic acid, and other astringents.

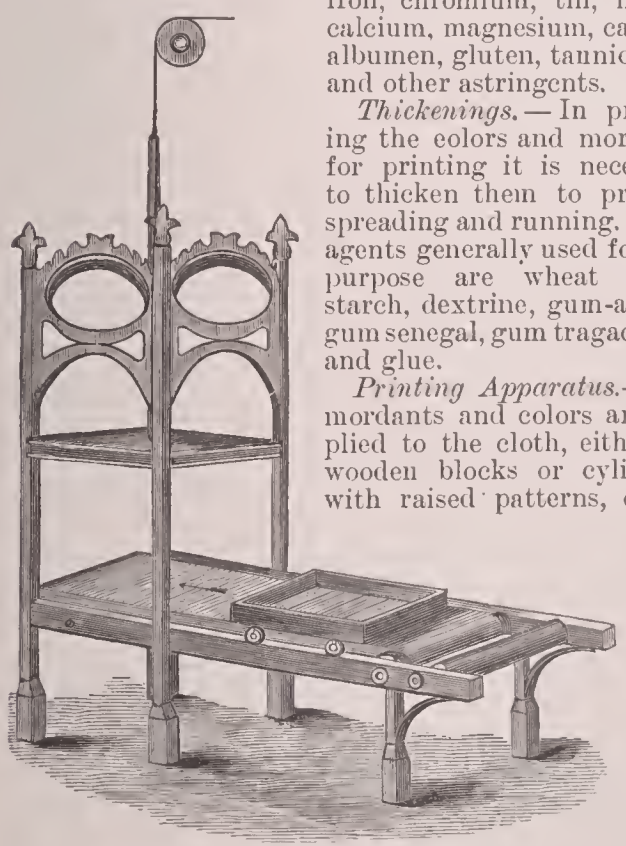


Fig. 3.—Press for block-printing.

Thickenings.—In preparing the colors and mordants for printing it is necessary to thicken them to prevent spreading and running. The agents generally used for this purpose are wheat flour, starch, dextrine, gum-arabic, gum senegal, gum tragacanth, and glue.

Printing Apparatus.—The mordants and colors are applied to the cloth, either by wooden blocks or cylinders with raised patterns, or by copper plates or cylinders with sunken patterns, the copper cylinders being most generally used for common calicoes. Each color or tint requires a separate block, plate, or cylinder. In the printing of cloth very nearly the same principles apply as in the printing of paper. Blocks are applied by hand (Fig. 2) or by presses (Fig. 3). The Perrotine is a machine for applying three blocks successively; it was invented by M. Perrot, of Rouen. The plombine (Fig. 4) was a machine invented by Ebinger, of St.-Denis, for the printing of calico by a continuous process with wooden relief cylinders. The introduction of copper cylinders or rolls upon which the pattern is engraved has led to a wonderful expansion of the calico-printing industry, and has almost entirely displaced all other modes of printing. Figs. 5 and 6 exhibit the disposition of the more essential parts in printing with engraved cylinders. The cloth, F, passes over a huge drum, B, against which the rolls, A, are pressed. Each roll is supplied with thickened mordant or color by a wooden cylinder, C, which dips into a vessel, E, containing it. A sharp-edged blade, D, called the *color doctor*, scrapes off the superfluous mordant or color from the unengraved portion of the roll; another blade, called the *lint doctor*, cleanses the roll as it leaves the cloth. By enlarging the drum the capacity of the machine may be increased from one to twenty colors by adding to the number of rolls. Fig. 7 exhibits a three-color machine; Fig.

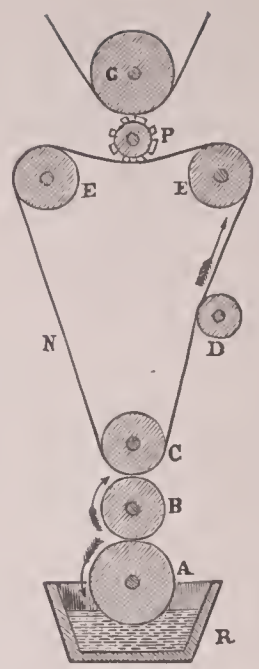


Fig. 4.—Plombine printing: R is the color-trough. The roll A applies the color to the roll B, which transfers it to the endless web N, by which it is applied to the relief cylinder P, which prints it upon the cloth as it passes over the drum G.

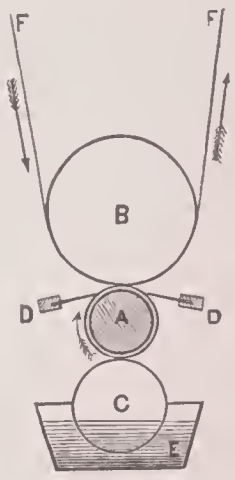


Fig. 5.—Single roll.

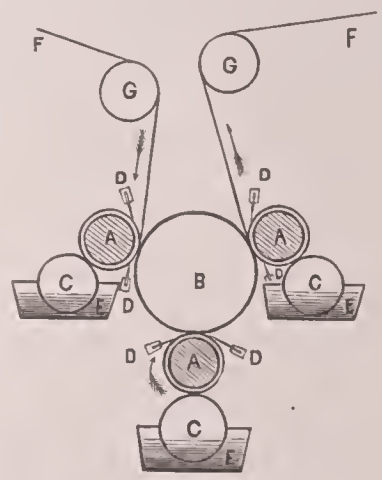


Fig. 6.—Three roll.

8 a twelve-color machine. The pieces of cloth, measuring each about 40 yards, are stitched together, and the process becomes continuous, miles of calico being printed without stopping the machine. A similar machine is now em-

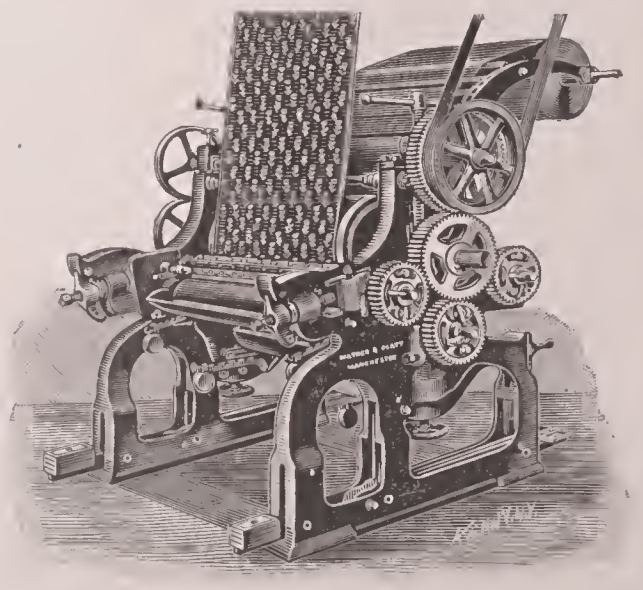


Fig. 7.—Three-color machine.

ployed in printing wall-paper. As each roll prints only a portion of the pattern, it is of course very important to regulate the tension of the cloth to secure the proper location of the parts of the figure. It is found that the cloth stretches in length, and consequently diminishes in width, in the machine, so each roll must be made to print a slightly narrower pattern than those which precede it. To prevent the running of the mordants or colors, the cloth passes directly from the machine to a heated drying-room or over steam-heated copper cylinders.

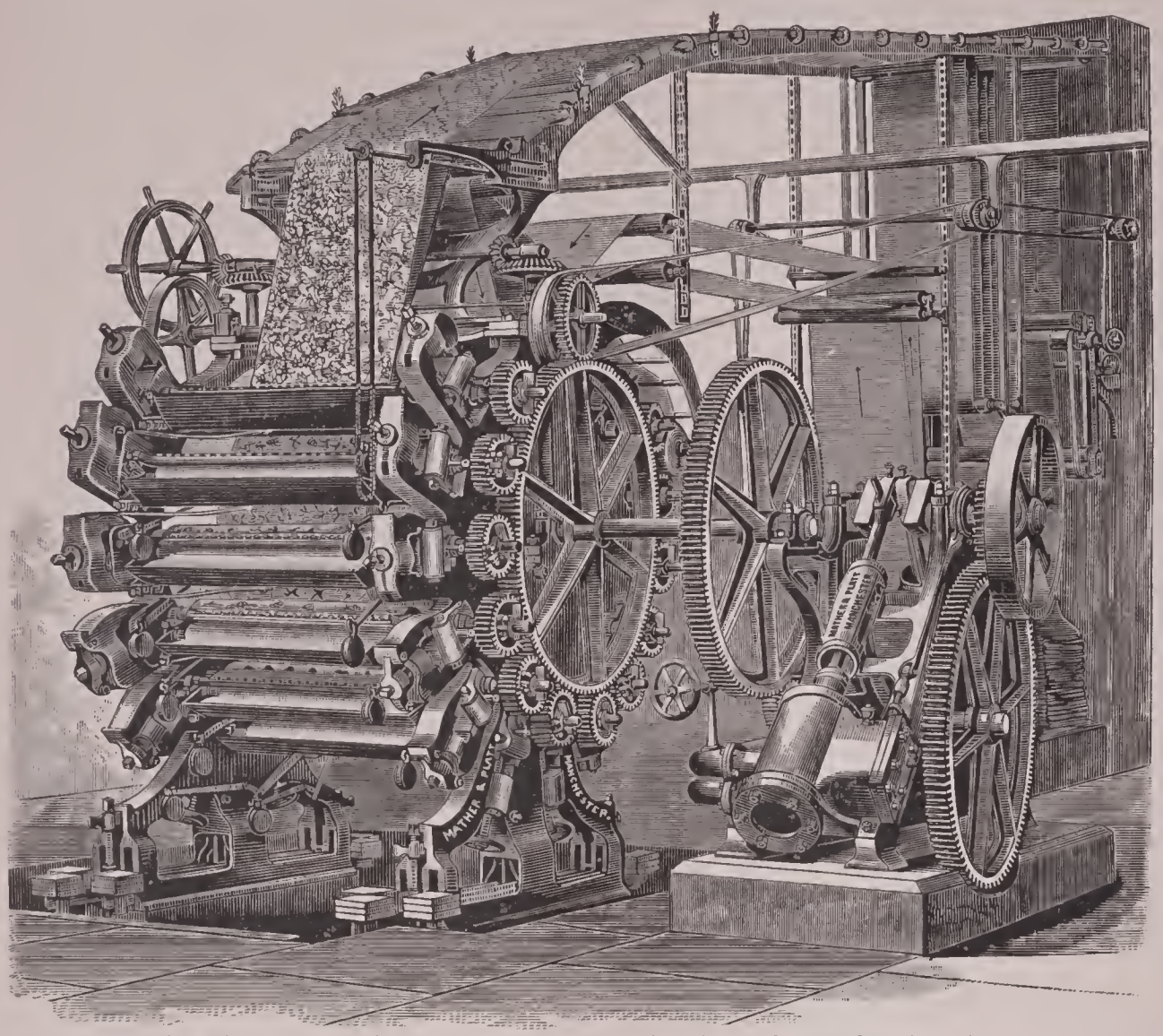


Fig. 8.—Twelve-color machine, with double-cylinder diagonal engine, and patent hot-air drying apparatus.

Madder Style.—Before the introduction of steam colors this used to be the most important and extensively practiced style of calico-printing, applicable not only to the coloring-matter from which it derives its name, but to nearly all organic coloring-matters which are soluble in water and capable of forming insoluble compounds with mordants. The thickened mordants are printed on the cloth, and the colors are produced by passing the cloth through the dye-beck, which contains the dyestuffs and water. For pinks the mordant employed is acetate of alumina; for reds, the same, more concentrated, with an addition of chloride of tin; for purple, acetate of iron; for chocolate, acetate of alumina, with a little acetate of iron; for brown, catechu, with a little nitrate of copper; for drab, catechu, with a little nitrate of copper and chloride of iron; for black, a strong solution of acetate of iron; for blues, grays, heliotropes, a chromium mordant; for orange, acetate of lead, chloride of ammonium, and chloride of tin. After the mordants have been printed on the cloth, it is run into the drying-room, and then exposed to the process of *ageing*. This has for its object the setting or rendering insoluble of the mordants. It is effected by hanging the cloth in a room where it is exposed to air, warmth, and a certain degree of moisture. The alumina loses most of its acetic acid, and passes into the condition of an insoluble basic salt; the iron loses acetic acid and takes up oxygen, passing into the condition of an insoluble basic salt of the sesquioxide. The goods are next exposed to a cleansing process called *dunging*. Formerly cow-dung was used for this purpose; it was mixed with water, and the goods were passed through the mixture and subjected to a kind of scouring. Phosphate of soda, arseniate of soda, and silicate of soda have now almost entirely displaced the dung. The effect of the treatment is to remove the excess of mordant, render what is left quite insoluble, and clear the unmordanted portions of the cloth. The next step is the dyeing, which is effected in the dye-beck. Water and the proper coloring-matters are introduced, and by means of steam the whole is heated to the proper temperature. The dyestuffs employed depend somewhat upon the tints to be produced. Alizarine alone is used for pinks; for reds, purples, chocolates, etc., a portion of the alizarine is replaced by Brazil-wood; for orange, Persian berries are added, with quercitron and fustic; for blacks, logwood; for a myrtle green, dinitroso-resorcinol. In order to brighten the colors, to render them more permanent, and to clear the whites, the cloth is next subjected to the *clearing* process. This consists in exposing it to a bath containing bran and soap, and then to a very weak solution of bleaching-powder, hypochlorite of lime. If the colors employed include Persian-berry orange, the cloth is passed through a very weak bath of chloride of tin. The cloth is then washed, starched, and calendered, when it is ready for market. Calico dyed in madder styles is the most durable, resisting the action of light and soap better than any other style. *Garancine styles* are mordanted in the same manner, but are dyed with garancine—madder which has been treated with sulphuric acid. (See Madder.) This is a more economical way of using madder. It is preferred for dark, heavy colors where the cloth is much covered. The soaping operation is omitted, and the colors are not as fast as those dyed with madder. Carbonate of lime, whiting, is added to the dye-beck, to neutralize the free acid in the garancine. Artificial alizarine is now extensively manufactured from anthracene, a hydrocarbon obtained from coal-tar. It has entirely displaced the various preparations of the madder root, both in the dye-beck and in topical printing. (See Alizarine.) *Padded styles* are specially adapted to mineral colors. Sometimes padding is resorted to for the production of a ground of a uniform tint, the figures to be subsequently applied by topical printing. In this case the cloth is first passed through a mordant, then dried, and passed through the dye. To produce a pale-blue ground the cloth is first passed through a weak iron solution, then dried, passed through chalk suspended in water to fix the iron, then through ferrocyanide of potassa to produce Prussian blue. To produce a design in chrome yellow the cloth is printed with a thickened solution of acetate of lead, dried, passed through a solution of carbonate of soda to fix the lead, and then through a solution of bichromate of potassa. A common padded style is iron buff, produced by passing through an iron solution and fixing by an alkaline bath. *Manganese bronzes* were once a favorite style. They were prepared by padding with chloride of manganese, then through caustic soda, and finally through hypochloride of lime. A uniform brown ground was thus produced. By printing figures with protochloride of tin mixed with pigments or decoctions the brown color was discharged, and colored patterns on a

brown ground were produced. *Topical printing* has displaced to a considerable degree the old madder styles. The colors and the mordant or fixing agent being applied to the cloth together, the operations of dunging and dyeing are rendered unnecessary, and a much greater variety of colors and shades can be employed; and as the colors do not come in contact with the whites, there is a great economy of materials. Woolen fabrics and de laines are always printed in this manner, as they are not well adapted for mordanting and dyeing in the madder style, owing to the affinity which wool possesses for most coloring-matters. *Steam colors* are produced by printing upon the cloth alizarine colors and dyewood extracts, mixed with the mordants, to fix them and to produce the desired tints, and properly thickened. On exposing the dried cloth to steam, an intimate union of the color, mordant, and fiber is effected. Such goods are very brilliant and permanent to light, and withstand hot soap-solution, which barely alters the shades. For steam reds, alizarine and various dyewood extracts, especially Brazil-wood, are employed. For reds and pinks, alizarine is mixed, in the form of paste, with solutions of acetate of alumina, acetate of lime, oxalate of tin, and a thickening composed of wheat starch, acetic acid, gum tragacanth, and olive oil boiled to a paste with water. For purples, pyrolignite of iron is used in place of acetate of alumina; for heliotrope, acetate of chromium replaces the alumina; for an orange, nitro-alizarine is used, and the print-color prepared otherwise as for a red with alizarine; for a yellow, alizarine yellow fixed with alumina, or a decoction of Persian berries with alumina and tin as mordant, or a decoction of quercitron bark with alumina as mordant. Alizarine blue with acetate of chromium gives a fine blue; alizarine green with the same mordant, a beautiful gray-green; gallocyanine and chrome, a fast violet; naphthazarine and chrome, a handsome gray, and mixtures of these an infinite variety of shades. Logwood and its preparations, fixed with acetate of chrome, give blacks; for chocolate, catechu, extracts of logwood, Persian berries, and acetates of chrome and alumina give a good steam color. *Aniline black* is a topical style, which has almost entirely displaced logwood and other blacks for certain kinds of styles. It is produced by printing a thickened mixture of aniline salt with a powerful oxidizing agent, such as chlorate of potassa, with chloride of ammonium, sulphate of copper, etc. The color is developed by ageing or a short steaming, and the goods are finally passed through a weak solution of carbonate of soda. When applied to large surfaces this black injures the strength of the fabric; its use is consequently restricted to light patterns showing a large proportion of white; for goods with a small proportion of white and consequently a heavy black the print-color has a different composition, the mineral acid of the aniline salt being neutralized by an addition of ferrocyanide of potassium or sodium. This black is also specially adapted for use with other topical styles. It is practically indelible. By substituting naphthylamine for the aniline salt the beautiful naphthylamine violet is produced.

Aniline Styles.—While the different aniline colors are more especially adapted to wool and silk dyeing and printing, they are nevertheless employed to a large extent in calico-printing, either in the dye-beck or by topical application as steam colors. In the former case the cloth is printed with (1) albumen, casein, gluten, or chloride of tin, followed by a nutgall decoction to produce insoluble tannates, and then passed through an acid solution of the aniline color; or the cloth is mordanted with either of the above-mentioned substances, the nutgall decoction printed on, and then passed through the acidulated color. Single tints are thus produced. For use as topical colors, to be fixed by steam, the aniline colors are mixed with albumen, gluten (either putrid or dissolved in soda-lye, weak acid, or saccharate of lime), caseine in lye or weak acid, glue, tannate of glue, tannic acid, oleo-sulphuric acid, shellac in borax, arsenious acid in glycerine (method of Alfred Paraf), or with a solution of arsenite of alumina in acetate of alumina. The last process, devised by Perkin and Schultz, is more extensively employed than any other, except perhaps that with tannin. Of course in topical printing any desired number of aniline colors may be used at the same time. *Pigment printing* involves the application of the pigments used in painting to the surface of the cloth by means of some cementing agent. Caoutchouc dissolved in naphtha was first employed with excellent results, but the danger of fire attending the use of naphtha has caused the substitution of albumen, caseine, or gluten for the caoutchouc. The pigments generally used are ultramarine, chrome yellow and orange, Guignet green, and lampblack for drabs. *Metallic precipitates*, as tin precipitated by zinc, are sometimes printed on cloth.

Indigo Styles.—Indigo is in some respects a very peculiar dye; it is insoluble in its ordinary blue form, $C_{16}H_{10}N_2O_2$, but is changed by reducing agents, such as grape-sugar in soda-lye, or protoxide of iron, produced by the action of lime on copperas, to colorless, soluble, hydrogenized indigo, $C_{16}H_{12}N_2O_2$. By passing the cloth through such a solution, and exposing it to the air, the indigo is oxidized and becomes blue again, being fixed as an insoluble pigment in the fabric. By repeating the treatment any desired shade is obtained. By the use of reserve pastes or discharges, with topical printing, white or colored figures on a blue ground are produced. *Pencil blue* is a name given to a style of calicoes which were prepared by printing on by hand, with a piece of wood called a pencil, the colorless reduced indigo. On oxidizing it produced figures in fast blue. *The China blue or pottery style* (so called from its resemblance to old china) was once very popular, but, owing to its cost and the ease of imitating it with Prussian blue, is now almost obsolete. The blue indigo was printed on the cloth, forming blue figures on a white ground. To render the color fast the indigo was worked into the cloth by treating it alternately with lime and copperas. *Resist styles* involve the use of a resist or reserve which protects the cloth in mordanting, dyeing, padding or covering, so that the mordant or color does not adhere. Some resists act mechanically, as clay, fat, oil, resin, wax, and sulphate of lead. Others act chemically, as citric, tartaric, or oxalic acid, or bisulphate of potassa, which are printed on cloth mordanted with alumina or iron to remove them and prevent the fixing of the color. Sulphate of zinc, sulphate and acetate of copper, and chloride of mercury are special resists used in indigo styles. *White resist*, for cylinder printing, consists of a mixture of acetate or sulphate of copper thickened with gum or dextrine. It is printed on the white cloth and allowed to dry. When the cloth is handled in the indigo vat containing the soluble colorless indigo it is dyed a uniform blue, the insoluble indigo being precipitated as insoluble blue pigment in the fibers, except where the resist has been applied. Here the copper salt having been changed to oxide of copper by the alkali of the vat, the colorless indigo is oxidized by the oxide of copper (which becomes sub-oxide), and deposited on the surface. On subsequently passing the dyed goods through dilute sulphuric acid, the sub-oxide of copper is dissolved and the indigo detached, leaving white figures on a blue ground. Often the resist is mixed so as to contain a mordant for some other color; thus the resist applied to cloth to be dyed in the indigo vat may contain an iron or alumina mordant; so that after the ground with the white figures is produced, the white becomes colored red, purple, or black in the dye-beck with madder, woods, or bark. This style is sometimes called *lapis*, from a remote resemblance to *lapis lazuli*.

Discharge Style.—After cloth has been uniformly dyed of one color, agents called discharges are sometimes employed to remove the color and produce a white pattern, or by adding to the discharge certain agents the original color is not only removed, but another color takes its place. By printing a mixture of tartaric acid with pipe-clay and gum on a piece of cloth dyed red or purple with madder or woad, or blue with indigo, and passing it through weak hypochlorite of lime, the color will be discharged, leaving a white pattern. Were a salt of lead added to the mixture, it would be fixed by the hypochlorite of lime, and on subsequently passing the cloth through bichromate of potassa, would develop chrome yellow in place of the whites. A modification of this style is the well-known bandanna style for handkerchiefs. Several folds of cloth dyed Turkey red with madder are placed between perforated lead plates, and firmly squeezed together in a hydraulic press. A solution of chlorine is forced through the perforations, destroying the color. This is followed by water, and on removing the cloth from the press it is found to present white figures on a red ground. Indigo is oxidized to soluble isatine ($C_{16}H_{10}N_2O_4.H_{20}$), which is removed by washing, by the action of chromic acid (applied in the form of bichromate of potash), or by a mixture of potash and ferricyanide of potassium. Reducing agents are also employed as dischargers, especially the protochloride of tin, or *tin salt*. When this compound comes in contact with oxide of iron, a soluble protochloride

of iron is formed, which is readily removed by washing, while at the same time the sesquioxide of tin (SnO,SnO_2) is fixed upon the cloth, and is ready to fix red or yellow dyes on the spots treated.

Combination Styles.—By combining two or more of the above styles the greatest variety of result may be obtained. Some of the finest French and English *cretonnes* exhibit the most elaborate designs and most pure and brilliant colors, and are really works of art. For further details, see Ure's *Dictionary of Arts, Science, and Manufactures*; Muspratt's *Dictionary*, especially the last German edition; Schützenberger's *Traité des Matières Colorantes*, especially the German edition; O'Neill's *Dictionary of Dyeing and Calico-printing*; and Krieg's *Theorie und Practische Anwendung von Anilin in der Färberei und Druckerei*; the annual volumes of Wagner's *Jahresbericht über die Fortschritte der Chemischen Technologie*. The following periodicals are especially devoted to dyeing and calico-printing: *Moniteur de la Teinture*; *Bulletin de la Société Industrielle de Mulhouse*; Reimann's *Färberzeitung*; *Die Musterzeitung für Färberei, Druckerei*, etc. See also Mousseline de laine and Silk-printing.

Revised by J. S. Ludlam.

Cal'icut, or **Kalikat**: a seaport-town of British India; presidency of Madras; on the Indian Ocean; 102 miles S. W. of Seringapatam, and about 570 miles S. S. E. of Bombay; lat. 11° 15′ N., lon. 75° 46′ E. (see map of South India, ref. 6–D). It was the first place in India visited by Vasco da Gama, who arrived here in May, 1498. It was then a populous and important city, and it continued to be for nearly two centuries a flourishing emporium. Its prosperity then declined, but has more recently revived; the anchorage is a roadstead. This town gave name to calico through the Portuguese. Pop. (1891) 65,700.

Califor'nia: the largest of the Pacific States; extending from 32° 28′ to 42° N. lat., and from 114° 30′ to 124° 45′ W. lon. It is bounded N. by Oregon, E. by Nevada and Arizona, S. by Lower California, and W. by the Pacific. It has a coast-line of more than 700 miles, and an average breadth of 200 miles. Area by the twelfth census (1900) 155,980 sq. miles, or 99,827,200 acres, nearly equal to New England, New York, and Pennsylvania.

Seal of California.

California, by census of 1890, ranked twenty-second among the States in population, twelfth in value of agricultural products, first in vine culture, and high in the second rank in value of manufactures.

Topography: Mountains, Lakes, and Rivers.—The topography consists of two mountain-ranges more than 100 miles apart, running from N. W. to S. E. through the whole length of the State, and with a broad valley, mostly fertile, lying between. These mountain-ranges are of varying width, sometimes consisting of three, two, or a single chain, and with spurs and outliers extending at some points nearly from one to the other. The name of the W. range is the Coast Range—not always appropriate—and its branches have many local names; the best known of these is the San Diablo range, 150 miles long by 50 broad; between this and the coast are lower ranges, as the Palo Scrito, Santa Lucia, San Rafael, and Santa Inez mountains. In Southern California this Coast Range spreads out in a confused mass of mountains extending across the State—the San Bernardino, San Jacinto, and other chains. The great E. range is the Sierra Nevada or Snowy Mountains, forming a boundary between California and Nevada for a part of the distance, but about the thirty-eighth parallel turning due S. and dividing into three parallel chains, and further S. uniting with the Coast Range in masses of mountains and hills in a wild, rugged, and desert region. There are many lofty peaks in both ranges, though the highest are in the Sierra Nevada—Shasta, Spanish Peak, Mts. Dana, Lyell, Brewer, Tyndall, Whitney, Lassen's Butte, Pyramid Peak, and others. Some of these have been, and perhaps still are, volcanoes. What is known as the California Valley, about 400 miles long and from 40 to 100 miles in width, lies between these mountain-ranges. There are also other large valleys, rich and fertile, as well as some which are waterless, barren, and deadly in their mephitic vapors. The most picturesque and remarkable of the valleys of California are the Yosemite (see Yosemite) and the Tuolumne Valley, which much resembles it. East of the Sierra is a series of lakes extending nearly the whole length of the State—Klamath, Goose, Honey, Owens, and others, some of them being alkaline, others salt, others dry most of the year, and Tahoe, one of the deepest, sweetest, purest, and most elevated lakes on the continent. In the S. E. and S. S. E. there are deep depressions (former lakes) like the Death Valley, 400 feet below the sea, and the bed of an ancient estuary, 600 feet below. In the California Valley are several important lakes, of which Clear, Tulare, and Kern are the largest. There is only one navigable river which discharges its waters directly into the ocean, the Salinas, at the Bay of Monterey; other mountain-torrents of moderate length, not navigable, are numerous. Two important navigable rivers—the San Joaquin from the S. E. and the Sacramento from the N. E.—as well as several smaller navigable streams, flow into the San Pablo, Suisun, and San Francisco Bays. Tulare Lake receives King, Kern, White, and Tule rivers. The harbors of California are San Francisco (the best on the Pacific coast), San Diego, San Pedro, San Luis Obispo, Monterey Bay, etc. There are numerous islands near the coast, some of them inhabited and cultivated.

Minerals.—Gold and silver have been found in paying quantities in many places—the gold pure, in scales, fine dust, nuggets, crystals, and combined with copper, silver, lead, zinc, cinnabar, arsenic, iron, sulphur, tellurium, iridosmine, etc.; silver native, in combination with lead, copper, sulphur, iron, etc.; copper native and in many forms; quicksilver abundantly as cinnabar, and occasionally native; platinum and tin not in large quantity; lead and iron almost everywhere; arsenic, tellurium, graphite, borax, salt, soda in several forms; sulphur, gypsum, barytes, antimony, ocher, alabaster, fluor-spar, corundum, and cobalt; diamonds, tourmalines, zircon, garnets, chrysolites, etc.; coal of fair quality, petroleum, and bitumen. The gold-mining is of three kinds—common placer-mining, now nearly abandoned; hydraulic mining, which is placer-mining on a large scale; and mining in quartz veins or lodes. The silver is mined only in veins; copper may be found native, but is generally an ore and in veins or lodes.

Irrigation.—The great Merced, Kern County, Fresno, and Tulare irrigation canals, which have cost $5,000,000, irrigate 1,000,000 acres of fertile land and furnish water-power, receiving an inexhaustible supply of water from the Kern, King, and Merced rivers. Other areas irrigated are in the Mohave and Colorado valleys of San Bernardino County, and Lassen and Butte Counties of the N. W. In these canals $30,000,000 are estimated to have been already expended, and the system is widely extended every year; about one-tenth part is done by artesian wells of an average depth of less than 300 feet.

Soil and Vegetation.—Most of the arable lands of California have a rich deep soil of wonderful fertility. Some of it requires to be quickened into activity by irrigation, but is then astonishingly productive. There are 48 genera and 105 species of forest-trees already known in California, mostly not only indigenous, but peculiar to the Pacific slope. Forty species are evergreens, including the two sequoias or giant redwoods (see Sequoia), the sugar and 15 other species of pine, 6 species of true fir, 12 of oak, white cedar, 4 species of cypress, manzanita, wild nutmeg, California laurel, chinecapin, maples, etc. There are many valuable shrubs and small fruits, only one native grape, but all the European and Eastern species and varieties flourish well, and California is already the vineyard of America. There are many nutritious grasses, but with few exceptions there is no sod, nor grass fit for hay. Alfalfa, wild oats, Hungarian grass, and millet are much used for feeding cattle. The flowers of California are abundant, fragrant, and beautiful.

Animals.—There are 115 species of mammals in California, 27 of which are carnivorous; they include the grizzly, black, and brown bear, raccoon, badger, 2 or 3 species of skunk, the wolverine, fisher, American sable or marten,


CALIFORNIA
Scale of Miles
10 20 40 80 120
Longitude West from 119 Greenwich
123
121
117
OREGON
NEVADA
Great Basin
SISKIYOU
DEL NORTE
HUMBOLDT
MODOC
SHASTA
LASSEN
TEHAMA
PLUMAS
BUTTE
SIERRA
NEVADA
PLACER
EL DORADO
AMADOR
CALAVERAS
TUOLUMNE
MONO
ALPINE
SACRAMENTO
YOLO
COLUSA
GLENN
MENDOCINO
SONOMA
NAPA
SOLANO
MARIN
CONTRA COSTA
ALAMEDA
SAN JOAQUIN
SAN FRANCISCO
SACRAMENTO
STOCKTON
REDDING
RED BLUFF
EUREKA
CRESCENT CITY
YREKA
ALTURAS
SUSANVILLE
QUINCY
OROVILLE
DOWNIEVILLE
NEVADA CITY
AUBURN
PLACERVILLE
MARYSVILLE
YUBA CITY
COLUSA
WILLOW
UKIAH
LAKEPORT
WOODLAND
SANTA ROSA
NAPA
FAIRFIELD
MARTINEZ
SAN ANDREAS
JACKSON
SONORA
MARIPOSA
BRIDGEPORT
RENO
CARSON CITY
VIRGINIA CITY
WINNEMUCCA
ELKO
AUSTIN
EUREKA
HAWTHORNE
BELMONT
STILLWATER
Mt. Shasta
Lassens Peak 10577
Pyramid Lake
Walker Lake
Mud Lake
Alkaline Plains
Root Digger or Piute Indians
Pacific Mail


SAN FRANCISCO
and Vicinity
Scale of Miles
PACIFIC OCEAN
SAN BERNARDINO
LOS ANGELES
SAN DIEGO
RIVERSIDE
ORANGE
VENTURA
SANTA BARBARA
SAN LUIS OBISPO
KERN
TULARE
INYO
FRESNO
KINGS
MONTEREY
SAN BENITO
LOWER CAL.
Longitude West 42 from Washington

mink, weasel, California otter and sea-otter, cougar, jaguar, 2 species of lynx, raccoon-fox or mountain-eat, gray wolf, coyote, 5 species of fox, 3 or 4 of sea-lion, 2 of seal, and the sea-elephant. There are 2 of moles, 2 of shrews, 16 species of bats, 50 species of rodents, some of them (the squirrels) specially destructive to grain; of ruminants, the elk, 3 species of deer, the American antelope, and bighorn; of cetacea, 11 species. There are 350 species of birds native to California, including a great variety of each family, order, and tribe. There are many reptiles, but no saurians, and only one poisonous serpent, the rattlesnake, of which, however, there are 5 species. The fish are of 240 species, of which 185 are edible; 60 mollusks and 8 crustaceans.

Climate.—Prof. E. W. Hilgard classified the climate as follows: 1. Bay and coast climate: characteristics, small range of thermometer, extremes only 53° apart, means of summer and winter only 6° apart; no intense heat; frosts very rare; fogs from the sea in the afternoons of summer; rainfall averages 27·3 inches, of which about 25 are between December and May. 2. Climate of the great interior valley: characteristics, average winter temperature lower than the coast, though minimum temperature about the same; frosts rare; summer heat very high—above 100° F. many days of the season; nights warm, but the dry air is less oppressive than a moist one; extreme annual range, 76°; mean range, 23·6°; rainfall for year 21·50 inches, of which 19·80 is between December and May. 3. Climate of the slope of the Sierra Nevada: characteristics, considerable snowfall and much rain; cool summers, summer thunder-storms; winters often severe; mean winter temperature, 43·5°; mean summer temperature, 57·5°; mean range, 14°; rainfall, 57·24 inches. But, aside from these, there are many local climates. Even in Southern California, on the coast, the heat is not so great as in the interior valley, and the climate of Los Angeles, San Diego, and Santa Barbara is desirable for consumptive invalids.

Agricultural Products.—The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	35,934	52,894	47·2
Total acreage of farms	16,593,742	21,427,293	29·1
Value of farms, including buildings and fences	$262,051,282	$697,116,630	166·0

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1899:

CROPS.	Acreage.	Yield.	Value.
Corn	56,925	1,536,975 bush.	$922,185
Wheat	2,393,185	33,743,909 "	20,921,223
Oats	59,477	1,843,787 "	866,580
Rye	36,472	547,080 "	426,722
Barley	855,376	22,239,776 "	11,119,888
Potatoes	26,543	3,158,617 "	1,989,929
Hay	1,708,087	2,784,182 tons	22,273,456
Totals	5,136,065		$58,519,983

California is admirably adapted as regards both soil and climate for the cultivation of the grape. In 1890 200,000 acres were covered with grape-vines, the product in that year being 274,311 tons of grapes, 14,626,000 gal. of wine, and 1,372,195 boxes (20 lb. each) of raisins. Oranges, lemons, peaches, apricots, pears, plums, etc., superior in size and beauty, though not in flavor, to the fruits of the Eastern States, are shipped in large quantities to all parts of the U. S.

Manufactures.—The census returns of 1890 showed that 7,923 manufacturing establishments reported. These had a combined capital of $146,797,102, employed 83,642 persons, paid $51,538,780 for wages and $120,241,025 for materials, and had products valued at $213,404,096. The products include mining and agricultural machinery, lumber for building purposes and ornamental woods, tanning and dressing of leather and leather manufactures, woolen goods, flouring-mills, silk fiber and fabrics, the production of wine and brandy, refined sugar, sirup, and candies (from Sandwich islands sugar); grain-bags, dynamite, giant-powder, and chemicals for mining purposes. The beet-sugar industry is important, California having 8 establishments, with $10,139,780 capital, and making $3,499,996 worth of sugar in 1899.

Mineral Productions.—The production of gold in 1891 was estimated at 609,525 oz., value $12,600,000; silver, 750,000 oz., value $969,697; quicksilver, 22,904 flasks, value $1,036,386; copper, 3,397,405 lb.; metallic tin, 125,289 lb.; bituminous coal, 93,301 tons, value $204,902; petroleum, 323,600 bbl. (of 42 gal. each); granite, value $1,300,000; sandstone, value $100,000; limestone, value $400,000; and marble, value $100,000. In 1898 the gold production was estimated at $15,637,900. The values of other products in 1899 were borax, $2,000,000; petroleum and bituminous products, $2,976,356; mineral waters, $698,493; salt, $175,000; and building stones, $1,033,295.

Fisheries.—According to census of 1890 there were 5,338 persons employed in the fisheries of California, $2,684,210 invested as capital, and the product valued at $4,463,369. The whale and seal products were valued at $2,490,373; canned salmon at $464,232. The herring-fishery was next in value to the salmon of river and sea-fish, but the oyster trade exceeded both, and its products came to $509,175.

Railways.—The number of miles of railway operated in 1891 was 4,336; in 1899, 5,532·25.

Finances.—The assessed valuation of taxable property in 1900 was, real estate, $669,905,988; improvements, $272,447,321; personal, $184,380,015; railway, $47,711,755; total, $1,174,445,079. The original assessed value of mortgages is $156,444,755; the assessed value of university and other State mortgages, $1,180,985; the total county indebtedness is $3,629,379.40; of which $3,502,700 is funded.

Banking.—On Sept. 5, 1900, there were 38 national banks, with a combined capital of $10,997,610, surplus and profits of $5,398,828.53, and individual deposits of $35,195,139.72; 178 State banks, with combined capital of $26,981,973, surplus and profits of $20,584,066, and individual deposits of $85,881,584; 19 private banks, with capital of $890,142, surplus and profits of $240,107, and individual deposits of $1,629,687; and 53 savings-banks, capital $7,655,705, surplus fund $6,972,879, and $158,167,462 in deposits from 216,534 depositors.

Commerce and Navigation.—The number of American and foreign vessels entered at San Francisco and other ports in the year ending with June 30, 1900, was 1,172; tonnage, 1,153,542. The number cleared, 1,104; tonnage, 1,504,477. The value of the imports from foreign countries into California for the same year was $49,441,831; of exports of domestic merchandise, $42,469,837; of foreign merchandise, $891,241—total imports and exports, $92,802,909. The interstate and internal commerce of the State by railways and steamers is still greater, though exact figures can not be given. Lines of ocean-steamers ply to Alaska, Washington, Oregon, and the Mexican coast, Panama, Chili, Honolulu, China, and Japan.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	249	243	156,846	$2,627,950
Methodist Episcopal	337	351	25,527	2,053,371
Presb. in the U. S. of America	213	199	16,236	1,696,725
Congregational	182	181	11,907	1,014,975
Baptist	163	139	11,204	744,360
Protestant Episcopal	103	96	9,221	1,019,695
Methodist Episcopal South	175	132	7,497	446,010
Disciples of Christ	89	89	7,433	291,250
Jews, Reformed	8	8	3,835	303,000
Jews, Orthodox	7	7	2,344	93,000
Unitarian	16	18	3,819	366,040

Schools.—In the school year ending June 30, 1899, there were 350,124 children of school age, of whom 253,397 were enrolled in the public schools, with an average daily attendance of 203,248. There were 3,565 school-houses; value of school property, $18,682,634; number of teachers, 8,157—male, 1,722; female, 6,435. Average monthly salary of male teachers, $81.08; of female, $64.76. School was held 163·6 days; and the average expenditure per pupil based on the daily attendance was $30.33. The total revenue was $5,869,034, and the total expenditure $6,164,053. There are also the LELAND STANFORD JUNIOR UNIVERSITY (*q. v.*); the UNIVERSITY OF CALIFORNIA (*q. v.*); 5 normal schools and 4 normal departments; 13 other colleges, some of them having business or professional courses attached to them; 7 of these admit women as students, and there are many seminaries of high grade for women alone. There is also a school of engineering, 5 commercial and business colleges, 4 theological schools, 1 school of law and 3 of medicine, and a scientific institution of high character, the San Francisco Academy of Sciences.

Post-offices and Periodicals.—On Jan. 1, 1901, there were 1,659 post-offices, of which 134 were presidential (5 first-class, 32 second-class, 97 third-class) and 1,525 fourth-class, with 1,026 money-order offices and 96 money-order stations. There were 112 daily, 1 tri-weekly, 19 semi-weekly, 460 weekly, 1 three times a month, 1 fortnightly, 8 semi-monthly, and 81 monthly periodicals; total, 683.

Population.—The population of California was (1850) 92,597; (1860) 379,994; (1870) 560,247, excluding tribal Indians; (1880) exclusive of tribal Indians, 864,694; (1890) 1,208,130 (white 1,111,558, colored 11,437, besides including 71,066 Chinese, 1,224 Japanese, and 12,355 Indians). There were 5,020 tribal Indians in 1890. The foreign population in the same year numbered 366,309, of whom 65,129 were German, 63,134 Irish, 46,662 from Great Britain, 26,028 Canadians, 22,389 Scandinavians, 15,495 Italians, 11,855 French, 9,859 Portuguese, 7,164 Mexicans, and 674 Hawaiians. Pop. (1900) 1,485,053.

The principal towns are San Francisco, the largest city, pop. (1900) 342,782; Los Angeles, 102,479; Oakland, 66,960; Sacramento, 29,282; San José, 21,500; San Diego, 17,700; Stockton, 17,506; Alameda, 16,464; Berkeley, 13,214; Fresno, 12,470; Pasadena, 9,117; Riverside, 7,973.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1900.	COUNTY TOWNS.	Pop. 1900.
Alameda	7-C	93,864	130,197	Oakland	66,960
Alpine	6-E	667	509	Markleeville	.....
Amador	6-D	10,320	11,116	Jackson	.....
Butte	5-C	17,939	17,117	Oroville	.....
Calaveras	7-D	8,882	11,200	San Andreas	.....
Colusa	5-B	14,640	7,364	Colusa	1,441
Contra Costa	7-C	13,515	18,046	Martinez	1,380
Del Norte	2-B	2,592	2,408	Crescent City	699
El Dorado	6-D	9,222	8,986	Placerville	1,748
Fresno	8-D	32,026	37,862	Fresno	12,470
†Glenn	5-B	.....	5,150	Willow	893
Humboldt	4-A	23,469	27,104	Eureka	7,327
Inyo	9-G	3,544	4,377	Independence	.....
Kern	10-E	9,808	16,480	Bakersfield	4,836
†Kings	9-E	.....	9,871	Hanford	2,929
Lake	6-B	7,101	6,017	Lakeport	726
Lassen	3-D	4,239	4,511	Susanville	.....
Los Angeles	11-E	101,454	170,298	Los Angeles	102,479
†Madera	8-D	.....	6,364	Madera	.....
Marin	7-B	13,072	15,702	San Rafael	3,879
Mariposa	7-E	3,787	4,720	Mariposa	.....
Mendocino	5-A	17,612	20,465	Ukiah	1,850
Merced	8-D	8,085	9,215	Merced	1,969
Modoc	2-D	4,986	5,076	Alturas	.....
Mono	7-F	2,002	2,167	Bridgeport	.....
Monterey	9-C	18,637	19,380	Salinas	3,304
Napa	6-B	16,411	16,451	Napa	4,036
Nevada	6-D	17,369	17,789	Nevada City	3,250
Orange	12-F	13,589	19,696	Santa Ana	4,933
Placer	6-D	15,191	15,786	Auburn	2,050
Plumas	4-D	4,933	4,657	Quincy	.....
†Riverside	12-H	.....	17,897	Riverside	7,973
Sacramento	6-C	40,339	45,915	Sacramento	29,282
San Benito	9-C	6,412	6,633	Hollister	1,315
San Bernardino	11-H	25,497	27,929	San Bernardino	6,150
San Diego	13-H	34,987	35,090	San Diego	17,700
San Francisco	7-B	298,997	342,782	San Francisco	342,782
San Joaquin	7-C	28,629	35,452	Stockton	17,506
San Luis Obispo	10-D	16,072	16,637	San Luis Obispo	3,021
San Mateo	7-B	10,087	12,094	Redwood City	1,653
Santa Barbara	11-D	15,754	18,934	Santa Barbara	6,587
Santa Clara	8-C	48,005	60,216	San José	21,500
Santa Cruz	8-B	19,270	21,512	Santa Cruz	5,659
Shasta	3-C	12,133	17,318	Redding	2,946
Sierra	5-D	5,051	4,017	Downieville	500
Siskiyou	2-C	12,163	16,962	Yreka	1,263
Solano	6-C	20,946	24,143	Fairfield	.....
Sonoma	6-B	32,721	38,480	Santa Rosa	6,673
Stanislaus	7-D	10,040	9,550	Modesto	2,024
Sutter	5-C	5,469	5,886	Yuba City	.....
Tehama	4-C	9,916	10,996	Red Bluff	2,750
Trinity	4-B	3,719	4,383	Weaverville	.....
Tulare	9-E	24,574	18,375	Visalia	3,085
Tuolumne	7-E	6,082	11,166	Sonora	1,922
Ventura	11-E	10,071	14,367	Ventura	2,470
Yolo	6-C	12,684	13,618	Woodland	2,886
Yuba	5-D	9,636	8,620	Marysville	3,497
Total	.....	1,208,130	1,485,053		

* Reference for location of counties, see map of California.
† Organized since census of 1890.

History.—Present State of California, discovered by J. R. Cabrillo, a Portuguese navigator in the Spanish service, in 1542; he named Cape Mendoza, now Cape Mendocino, and the Farallones islands. In 1578 Sir Francis Drake discovered and landed at Drake's Bay and took possession of the country, calling it New Albion. It was again explored by the Spaniard S. Viscayno in 1602, but no attempt made at settlement till 1769, when the Franciscan Fathers planted a mission at San Diego, and six others in the next seven years, the last—San Francisco—being established in 1776 as the Mission Dolores. Within fifty years they had founded twenty-one of these missions, had accumulated enormous wealth in live stock, gold and silver, and buildings and lands, and had reduced more than 20,000 Indians to slavery, treating them with the utmost cruelty; the Indians of the interior were left to themselves. With the downfall of the Spanish power in Mexico these missions waned, and were finally abolished and confiscated in 1845. Then came a great rush of immigrants from all quarters. In 1847 Com. Stockton captured California, and drove the Mexican forces out of the country. There was some conflict of authority between Com. Stockton and Gen. S. W. Kearny, but it was soon settled and Col. R. B. Mason appointed Governor. In Oct., 1849, a constitution was framed by a convention, and ratified by the people Nov. 13, 1849. After an angry debate in Congress over the slavery bearings of the Act, lasting from Dec. 22, 1849, the State was admitted to the Union Sept. 9, 1850. Gold was discovered in Feb., 1848, on the estate of Gen. Sutter in Coloma, and there was an instant rush thither, till, four years later, there were 250,000 men in the State, many of them energetic, daring, reckless persons, capable of almost any crime. Gambling, intemperance, licentiousness, theft, and murder were rife. A vigilance committee of the best citizens was formed in 1851, and a few of the worst villains were tried and hanged. In 1855 the ruffians had regained their power, and seized upon the courts and offices. The vigilance committee was reorganized and broke up the gang of villains, hanging four, driving one to suicide, and banishing about twenty. Since that time the State has been quiet and prosperous, though threatened with disorder in 1879 and 1880 on account of the Chinese. It bore an excellent record in the civil war in its contribution of men and means. The Union and Central Pacific R. Rs. were completed in 1869, and now the State is further connected with the East by the Southern Pacific and branches, the Atchison, Topeka and Santa Fé, etc.

GOVERNORS.

Spanish Rule.

Gaspar de Portala	1767–71	José J. de Arrillaga	1792–94
Felipe de Barri	1771–74	Diego de Borica	1794–1800
Felipe de Neve	1774–82	José J. de Arrillaga	1800–14
Pedro Fajés	1782–90	José Arguello	1814–15
José Antonio Roman	1790–92	Pablo Vicente de Sola	1815–22

Mexican Rule.

Pablo Vicente de Sola	1822–23
Luis Arguello	1823–25
José Maria de Echeaudia	June, 1825–Jan., 1831
Manuel Victorio	Jan., 1831–Jan., 1832
Pio Pico	Jan., 1832–Jan., 1833
José Figueroa	Jan., 1833–Aug., 1835
José Castro	Aug., 1835–Jan., 1836
Nicolas Gutierrez	Jan., 1836–Apr., 1836
Mariana Chico	Apr., 1836–Aug., 1836
Nicolas Gutierrez	Aug., 1836–Nov., 1836
Juan B. Alvarado	Nov., 1836–Dec., 1842
Manuel Micheltorena	Dec., 1842–Feb., 1845
Pio Pico	Feb., 1845–July, 1846

U. S. Military and Territorial Rule.

Com. John D. Sloat	July 7, 1846–Aug. 7, 1846
Com. Robert F. Stockton	Aug. 17, 1846–Jan., 1847
Col. John C. Fremont	Jan., 1847–Mar. 1, 1847
Gen. Stephen W. Kearny	Mar. 1, 1847–May 31, 1847
Col. Richard B. Mason	May 31, 1847–Apr. 13, 1849
Gen. Bennet Riley	Apr. 13, 1849–Dec., 1849

State Government.

Peter H. Burnett	Dec., 1849–51	George C. Perkins	1879–83
John McDougall (acting)	1851–52	George Stoneman	1883–87
John Bigler	1852–56	Washington Bartlett	1887
J. Neely Johnson	1856–58	R. W. Waterman	1887–91
John B. Weller	1858–60	H. H. Markham	1891–95
Milton S. Latham	1860	James H. Budd	1895–99
John G. Downey	1860–62	Henry T. Gage	1899–
Leland Stanford	1862–63		
Frederick F. Low	1863–68		
Henry H. Haight	1868–72		
Newton Booth	1872–75		
William Irwin	1875–79		

Revised by AINSWORTH R. SPOFFORD.

California: city; on railroad; capital of Moniteau co., Mo. (for location of county, see map of Missouri, ref. 4–G); 150 miles W. of St. Louis. It is the geographical center of the State; has fine county buildings, 9 churches, graded schools, public library, a woolen-mill, and 2 flouring-mills; is surrounded by a rich agricultural district, which also abounds in lead and other minerals. Pop. (1880) 1,427; (1890) 1,772; (1900) 2,181. EDITOR OF "DEMOCRAT."

California: borough; Washington co., Pa. (for location of county, see map of Pennsylvania, ref. 5–A); on Pa. R. R. and on Monongahela river; has a normal school, coal mines, etc. Pop. (1880) 1,009; (1890) 1,024; (1900) 2,009.

California, Gulf of, or **Sea of Cortes** (Sp. *Mar Bermejo*): an arm of the Pacific Ocean; separates the peninsula of Lower California from Sinaloa and Sonora. It is about 700 miles long, and 40 to 100 miles wide.

California, Lower or **Old**: a long, narrow peninsula; a territory of Mexico; bounded N. E. by the Gulf of California and S. W. by the Pacific Ocean. It is about 750 miles long, and varies in width from 30 to 150 miles. Its most southern point, Cape Lucas, is in lat. 22° 52′ N., from which it extends in a N. N. W. direction to lat. 32° 30′ N. It is a mountainous, arid region of volcanic formation, having a sparse population. Its pearl fisheries in the gulf and whale fisheries on the west coast have some value. Its other industries are silver-mining, salt from Carmen island, orchil from the interior, and the wines of El Patronicio. Capital, La Paz. This peninsula was discovered by Grijalva in 1534. Area, 58,328 sq. miles. Pop. (1890) 31,167.

California, University of: established by an act of the State Legislature approved Mar. 23, 1868. It was an outgrowth of the College of California, which was chartered in 1855, and maintained on a non-sectarian basis. Prof. Henry Durant opened its preparatory school at Oakland, and thus became one of the earliest pioneers of education in the State. In 1860 the college admitted its first class, and it graduated classes yearly, 1864–69. It had no president. Rev. S. H. Willey (Dartmouth, 1845) was vice-president 1863–69. Finding the college fettered by its want of endowments, and wishing to see a larger and stronger institution, the trustees in 1867 offered all their property to the State. This included a new, unoccupied site of 160 acres at Berkeley, 5 miles N. of Oakland and 9 miles from San Francisco. The State had accepted the Congressional provision for an agricultural college. A proposition to unite all interests in a university adequate to the wants and worthy of the name of the State was agreed to. The first board of regents, appointed in 1868, kept the college in existence another year. In 1869 the university received its first class, and in 1891 numbered 529 students at Berkeley and 918 including the professional colleges at San Francisco. A State tax supplements the income from its funds.

The first president of the university, elected in 1870, was Henry Durant, LL. D. President Daniel C. Gilman resigned in 1875, and was succeeded by John Le Conte, LL. D. In 1881 W. T. Reid became president; he was succeeded by Prof. E. S. Holden, later director of the Lick Observatory. Horace Davis, LL. D., was president from 1888 to 1890. Prof. Martin Kellogg, acting president from 1890 to 1893, president 1893–1900; Benjamin Ide Wheeler became president in 1900. Revised by Horace Davis.

Calig'ula, Caius Cæsar: Roman emperor; b. at Antium in 12 A. D.; son of Germanicus. His mother was Agrippina, a granddaughter of the Emperor Augustus. He succeeded to the throne 37 A. D., on the death of Tiberius, which he was suspected of hastening and against whose cruel jealousy he had guarded himself by habitual dissimulation. His reign was at first mild and popular, with an ostentation of generosity, squandering in one year the £5,625,000 accumulated by Tiberius; but he soon showed himself a monster of cruelty, banishing or murdering most of his kindred, making a paramour of his sister Drusilla, taxing, robbing, and executing his subjects with capricious frequency. He built a bridge of boats 3 miles long at Baiæ, and celebrated its opening by throwing many of his guests into the sea. His horse he invested with the priesthood and a consulship, and his palace he filled with prostitutes, whose embraces he had hawked upon the streets. He expressed a wish that all the Roman people had but one head, that he might decapitate them at one blow. He ordered that sacrifices should be offered to himself as a god. On Jan. 24, 41 A. D., he was assassinated in Rome by conspirators, four months after his return from a plundering expedition into Gaul.

Ca'liph [from Arab. *khalīfah*, successor]: the "commander of the faithful," the spiritual and temporal head of orthodox Mohammedanism—so called as being the "successor" of Mohammed. The caliphs are usually classed as follows: (1) The four "Arabian caliphs" of Medina, A. D. 632–661; (2) the fourteen "Ommyiades" of Damascus, 661–750; (3) the thirty-seven "Abbasides" of Bagdad, 750–1258; besides these there were rival caliphates; (4) in Egypt the "Fatimites," fourteen in number, 909–1171; and (5) in Cordova, 756–1031, there were twenty-two successive caliphs (Ommyiades) who had authority in Spain and Northwest Africa. The caliphate of Persia, representing the Shiite, or protestant, wing of Mohammedanism, dates from 1502; the caliphate of the Sultan of Turkey dates from 1517. Besides these caliphates there were, between the ninth and thirteenth centuries, thirteen Mohammedan dynasties—eight in Central Asia, three in Western Asia, and two in Africa.

Calisaya, Calisaya Bark: See Cinchona.

Calispel Indians: See Salishan Indians.

Calisthenics: See Callisthenics.

Calix'tines: the name given to a party of the Hussites, because they insisted on giving the cup (calyx) in the Eucharist to all who were not guilty of mortal sins. They defeated the Taborites (the other branch of the Hussites) in a battle at Lippau (1434). The Calixtines had been reconciled to the pope in 1433. The term Calixtines has also been applied to the adherents of G. Calixtus, a Lutheran Professor of Theology at Helmstedt. See Calixtus.

Calix'tus, originally **Callisen,** George: Lutheran theologian; b. at Medelbye, in Schleswig, Dec. 14, 1586. He studied at Helmstedt; became Professor of Theology there in 1614; was the first theologian to effect the separation of Christian ethics from dogmatics, and was especially distinguished for the attempts which he made to unite all Christian communions upon the basis of the Apostles' Creed. (See Syncretism). D. in Helmstedt, Mar. 19, 1656. See W. Gass, *George Calixt and Syncretism* (Breslau, 1846); E. Henke, *George Calixtus und seine Zeit* (Halle, 1853–60); W. C. Dowding, *Life of Calixt* (London, 1864).

Revised by Henry E. Jacobs.

Calixtus I. (Pope), Saint: succeeded Zephyrinus 219 A. D. D. 223.—Calixtus II. (Guido, Count of Burgundy); succeeded Gelasius II. in 1119. He concluded the concordat of Worms with the Emperor Henry V., which ended the difficulty with respect to investitures. D. Dec. 13, 1124. See his *Life* by U. Robert (Paris, 1891), who has also edited his *Bulls* (1891, 2 vols.).—Calixtus III. (Alonzo Borgia); b. in Valencia in 1379; succeeded Nicholas V. in 1455. He attempted to institute a crusade, without success. D. Aug. 6, 1458. An antipope created by Frederick Barbarossa set up in 1168 under the name of Calixtus III., and opposed Alexander III. for nine years.

Call, Wilkinson: U. S. Senator; b. in Russellville, Ky., Jan. 9, 1834; went to Florida in early life; elected U. S. Senator in 1865, but not allowed to take his seat; again elected in 1879, and served till 1897.

Cal'la: a genus of plants of the family *Araceæ*; characterized by a flat spathe, within which is a cylindrical spadix covered with naked flowers, appearing as a mere mixture of stamens and pistils, the latter with one-celled ovaries. The *Calla palustris* is a native of Europe and the U. S., growing in swamps and bogs. It has cordate leaves, a white spathe, and very acrid rhizomes, which are cooked for food by the Laplanders. The common "calla" of the greenhouses, often called *C. æthiopica*, is properly *Richardia africana*, a native of South Africa.

Cal'lander: village in Perthshire, Scotland; on the left bank of the Teith; 16 miles N. W. of Stirling (see map of Scotland, ref. 11–G). It is beautifully situated among mountains and lakes, and is much frequented by Highland tourists. From it Ben Ledi, the Trossachs, Bracklin Falls, and Lochs Lubnaig and Katrine are easily reached. Pop. 1,600.

Callao, kăăl-yaa'ō: a fortified town of Northern Peru; on the Pacific Ocean; 6 miles W. of Lima, of which it is the port; lat. 12° 4′ S., lon. 77° 13′ W. (see map of South America, ref. 5–B). It is connected with Lima by a railway, and has a commodious quay and a fine fortress. The harbor or roadstead, which is sheltered by the island of San Lorenzo, is the best on the coast of Peru. The chief exports are specie, copper, cotton, hides, and bark. The town was destroyed by an earthquake in 1746. Pop. 35,492.

Callcott, kawl'kot, Sir Augustus Wall: painter of the English school, who at first painted portraits and figure subjects, but afterward devoted himself to landscape, and is chiefly known by his work in that branch of art. He was often spoken of as the English Claude, and his pictures of English scenery were much admired and bought by British collectors at high prices. B. in Kensington, Feb. 20, 1779; d. there Nov. 25, 1844; Royal Academician 1810; knighted in 1837. Nine landscapes by him are in the National Gallery, London. William A. Coffin.

Callcott, John Wall, Mus. D.: English composer; b. in Kensington, Nov. 20, 1766; brother of Sir Augustus. He

composed many anthems, glees, and other pieces of music. He published a *Musical Grammar* (1805). D. near Bristol, May 15, 1821.

Callic'rates (in Gr. Καλλικράτης): an eminent Greek architect who flourished about the middle of the fifth century B. C. He was a contemporary of Pericles, and assisted Ictinus in the erection of the Parthenon at Athens. See ARCHITECTURE, ICTINUS, and PERICLES.

Callicrat'idas (in Gr. Καλλικρατίδας): a Spartan general who obtained command of the fleet in 406 B. C. He defeated the Athenian general Conon, and blockaded him at Mitylene. The Athenians soon sent to the relief of Conon another fleet, which defeated the Spartans at Arginusæ in 406 B. C. Callicratidas was killed in this action.

Callig'onum: a genus of thirty to thirty-five species of (mostly) evergreen shrubs of the Buckwheat family (*Polygonaceæ*), natives of dry regions in Western Asia and Northern Africa. *Calligonum pallasia*, the "pretty-face" of English gardens, is a shrub 3 to 4 feet high, with simple deciduous leaves, white flowers, and succulent acid and edible fruits. It is a native of the Caspian region.

Callig'raphy [Gr. καλλιγραφία; κάλλος, beauty + γράφειν, write]: the art of beautiful writing. The scribes who copied manuscripts before the invention of printing have been termed calligraphers or calligraphists. Their art consisted not merely in writing, but also in embellishing their work with ornamental devices. (See ILLUMINATION.) Some extant manuscripts, written in the early part of the Middle Ages, exhibit admirable specimens of the art, with letters of gold, vermilion, etc.

Callim'achus (in Gr. Καλλίμαχος): a Greek artist, whose exact epoch is unknown. Stories are told by Pliny, Pausanias, and other ancient writers, about his work, and he is especially celebrated as the supposed inventor of the Corinthian capital.

Callimachus: Greek poet and grammarian; native of Cyrene; lived 310–235 B. C.; was chief librarian of the Alexandrian Library under Ptolemy Philadelphus and Ptolemy Euergetes. He was a prolific writer of poetry and prose, an eminent teacher, author of the saying, μέγα βιβλίον μέγα κακόν, A big book, a big bore. He cultivated the epigram and the love elegy. Quintilian calls him *elegiæ principem*, and he was diligently translated and copied by the Roman poets, notably by Catullus in the *Coma Berenices* and Ovid in the *Ibis*. Extant are only six hymns and sixty-four epigrams. The epigrams are clever, sparkling, airy; the hymns are stiff with archaic words and learned allusions, and the meter is heavy. The hymns have been edited by Meineke (1861), Wilamowitz (1882). See Couat, *La Poésie Alexandrine*, pp. 111 foll., 191 foll. B. L. GILDERSLEEVE.

Calli'nus (in Gr. Καλλῖνος) **of Ephesus**: earliest of Greek elegiae poets; lived about 700 B. C. His one elegy extant is martial, and anticipates Tyrtæus. See Bergk, *Poetæ Lyrici Græci*.

Calli'ope (in Gr. Καλλιόπη): one of the Nine Muses; presided over epic poetry; was said to be the mother of Orpheus and Linus. She was represented as holding a tablet or closely rolled parchment in her hand.

Callippic Period. a correction of the Metonic cycle proposed by Callippus. The Metonic cycle was a period of nineteen solar years, at the end of which the new moons return again on the same days of the year. The period contained exactly 6,940 days. Now, 6,940 days exceed 235 lunations by only seven hours and a half. At the end of four cycles, or seventy-six years, the accumulated excess of seven hours and a half amounts to one day and six hours. Callippus proposed to quadruple the period of Meton, and to deduct a day at the end of it. It began 331 B. C.

Callip'pus, or **Calippus** (in Gr. Κάλλιππος or Κάλιππος). an ancient Greek astronomer; b. at Cyzicus; lived about 330 B. C. at Athens. He associated with Aristotle. He invented the cycle adopted by astronomers called the CALLIPPIC PERIOD (*q. v.*).

Calliseu, GEORGE: See CALIXTUS, GEORGE.

Callis'thenes (in Gr. Καλλισθένης): historian; b. at Olynthus, in Thrace; about 365 B. C.; was a relative and pupil of Aristotle. He accompanied Alexander the Great in his expedition against Persia in 334 B. C., and gained the favor of that prince, but afterward offended him by his boldness of speech, and was put to death on a charge of treason in 328 B. C. He left a history of Alexander's expedition against Persia, of which only fragments remain.

Callisthen'ics, or **Calisthenics** [modern formation, as if from Gr. *καλλισθενικά; κάλλος, beauty + σθένος, strength]: a system of exercises designed to promote beauty and strength; in other words, to impart grace of movement and physical strength at the same time. These exercises are better adapted to girls than ordinary gymnastics, as they do not subject the muscles to so violent a tension. The apparatus used in these exercises consists of a light wooden staff about 4 feet long, a pair of light dumb-bells, parallel bars, two square weights, and a short roller fixed in sockets near the top of an open doorway. See GYMNASTICS.

Callis'tratus (in Gr. Καλλίστρατος): an eloquent Athenian orator who lived about 380–360 B. C., and whose success is said to have excited the emulation of Demosthenes and induced him to cultivate the art of oratory.

Callis'tratus, Scolion of (see SCOLION): famous song in honor of the tyrannicides Harmodius and Aristogiton (*q. v.*), recorded in *Athenæus* XV. 695 A. It begins: ἐν μύρτου κλαδὶ τὸ ξίφος φορήσω, In a myrtle bough I will wear my falchion.

Cal'litris: a genus of trees of the family *Coniferæ*. *Callitris quadrivalvis*, a large tree of Barbary, called arar, yields a very hard, almost indestructible, fragrant wood, and the aromatic gum-resin called sandarach. The timber is highly prized, and is used for floors of mosques.

Callot, kăăl'lō', JACQUES: engraver; b. in Nancy, France, in 1592, of a noble family, who greatly opposed his pursuit of art as a profession. He studied at Rome, and attained great excellence, chiefly as an etcher and designer; was patronized by Richelieu and Louis XIII., for whom he executed battle-pieces. Among his works is notable the series of etchings *Les Misères de la Guerre*. His drawings are highly esteemed, and were executed with great care. D. in Nancy, Mar. 24, 1635.

Calluna: See HEATH.

Callus: the inflammatory exudation by which fractures of bones are repaired. Very soon after the formation of a fracture a varying amount of gelatinous material is exuded from the ends of the bone and unites the fragments at the point of fracture. In the case of long bones the cavity within is filled with callus, and there is a more or less abundant deposit exteriorly. If irritation occur from friction of the fractured surfaces the amount of callus may be considerably increased, and large tumor-like swellings may result at the seat of fracture. The complete healing of the fracture occurs by the conversion of the callus into true bone, and to this process the common expression "knitting" is applied. The name callus is also given to hardened portions of cuticle resulting from friction or pressure.

Calmar: See KALMAR.

Cal'met (Fr. pron. kăăl'may'), AUGUSTINE: a learned Benedictine commentator on Scripture; b. in Mesnil-la-Horgne, near Commerey, in Lorraine, Feb. 26, 1672. He became a Benedictine monk 1689; in 1728 Abbot of Senones, where he resided for many years. He published, in French, besides other works, a *Commentary on the Bible* (23 vols., Paris, 1707–16); a *Historical and Critical Dictionary of the Bible* (2 vols. folio, 1722; supplement 1728), which was translated into several languages (Eng. trans. London, 1732, 3 vols.; 6th ed. 1837, 5 vols.; latest abridged and revised edition 1856), a valuable book, long serviceable, but now superseded; and *Ecclesiastical and Civil History of Lorraine* (Nancy, 1728, 4 vols.; 2d ed. 1745–47, 6 vols.). See his autobiography in the last volume of his *History*, and the *Life* by A. Fangé (Senones, 1762). D. in Senones, Oct. 25, 1757.

Calms: *Equatorial Calms.*—A belt of calms, variable winds, sudden squalls, and tornadoes, and almost daily thunder-showers, situated about and somewhat N. of the equator, 4° to 6° of latitude in breadth, and separating the two bodies of N. E. and S. E. trade-winds. This is the region where the heated air at the equator ascends to return from the height of the atmosphere toward the poles.

Calms of the Tropics of Cancer and Capricorn.—Two belts of calms and light winds, almost rainless, situated in the neighborhood of, but outside, the tropics. They are found at the polar limit of the trade-winds, which they separate from the region of variable winds of the temperate zones. Each belt occupies but a few degrees in latitude, but the position and limits of both are less defined than those of the equatorial belt. The region of the calms of Cancer, in the

Atlantic, is called by mariners the *horse latitudes*. It is said that in colonial times the numerous vessels freighted with horses from New England for the West Indies were often long detained in these dreaded calms, under the burning rays of the sun of these latitudes, causing a great mortality among their living freight. Hence the name. See WINDS.

Revised by M. W. HARRINGTON.

Cal'mucks, or **Kalmucks** (called by the Tartars *Khalimick*, renegades): the largest of the Mongolian peoples; inhabiting large regions of the Chinese and Russian dominions. There are four tribes: the Choshots, ruled by descendants of Gengis Khan; the Sungars, in the seventeenth and eighteenth centuries the masters of the other races; oppressed by the Chinese, they migrated in great numbers in 1758 to Russia, but, finding the new yoke still more grievous, returned in 1770 to Sungaria; the Derbets, who dwell in the valleys of the Don and Ili; the Torgots, formerly united with the Sungars. The former in 1616 removed to the plains of the Volga, but a large part sought their native regions again. The Calmucks are a nomadic race. Their wealth consists in herds of horses, camels, sheep, and cattle. In Russia there are at present about 85,000, the greater part of whom are found in Astrakhan, and are Lamaists in religion. The European Calmucks are mostly Buddhists, but some are Mohammedans and some are Christians.

Calochor'tus: See MARIPOSA LILY.

Calogeri: See CALOYERS.

Calomar'de, FRANCISCO TADEO, Count: a Spanish minister of state; b. at Villel, Aragon, in 1775. He studied law; joined the Absolutist party; became in 1823 Minister of Grace and Justice. He persecuted the Liberals; favored the Jesuits; abused his power with cruelty. In 1833 he was disgraced and exiled in consequence of his abortive intrigues to raise Don Carlos to the throne. D. in Toulouse, France, 1842.

Calomel: the *Hydrargyri chloridum mite*, the mild chloride of mercury, of the U. S. Pharmacopœia: sometimes called the subchloride of mercury or mild mercurous chloride. It consists of a white, impalpable powder, which is without taste or odor, and which is permanent on exposure to the air. It is insoluble in alcohol, ether, or water, and in dilute acids which are cold. By strong heating it is entirely volatilized without melting, and when heated with dried sodium carbonate in a dry test-tube it yields metallic mercury. It is used in medicine chiefly for the purpose of stimulating the liver, especially in respect to its secretion of bile; also in the treatment of syphilis, by internal medication, by sublimation, or by hypodermic injection. In the condition called "biliousness," it affords one of the best means of producing relief. The dose varies greatly according to the object to be attained. Ordinarily, 1 grain, divided into powders of $\frac{1}{10}$th or $\frac{1}{6}$th of a grain, particularly if added to a little bicarbonate of sodium, is sufficient for ordinary individuals; but in the South, where, owing to the high range of temperature, there is apt to be greater torpidity of the liver, doses ranging even as high as 30 or 40 grains are frequently administered. Persistent administration of calomel will speedily result in excessive salivation, with tenderness of the mouth and gums. H. A. HARE.

Calophyl'lum [from Gr. *καλός*, fair + *φύλλον*, leaf]: a genus of evergreen large-leaved trees of the family *Guttiferæ*. They are natives of warm climates, where some of the species are of economic importance for their resin (tacamahac), heavy durable timber, and edible fruits. Two species, *C. calaba* and *C. inophyllum*, are grown in conservatories.

Calopo'gon [Gr. *καλός*, fair + *πώγων*, beard, in allusion to the bearded lip]: a genus of very pretty orchids, containing four or five species, confined to North America. *C. pulchellus* grows in bogs in the Northern U. S., and has large pink-purple flowers. C. E. B.

Caloric Engine: See HOT-AIR ENGINE.

Calorie, or **Calory**: the amount of heat necessary to raise 1 kilog. of water from 0° C to 1° C. For measurements of small quantities of heat, the *gramme-calorie*, or lesser calorie, is used. This is $\frac{1}{1000}$th part of the above, being the heat which will raise 1 gramme of water from 0° C to 1° C. See CALORIMETER, ENERGY, and HEAT.

Calorim'eter [from Lat. *calor*, heat + Gr. *μέτρον*, measure]: an instrument for the measurement of heat. To measurements involving differences of temperature merely, the term thermometry is applied. Calorimetry has to do with the quantity of heat developed when energy is expended, or with the quantity of heat which disappears when work is done. The following are the best-known types of calorimeters:

(1) Ice calorimeters (the ice-block calorimeter of Black, Bunsen's ice calorimeter, etc.). In these the heat of fusion of ice affords the means of measurement.

(2) Water calorimeters, in which the change of temperature of a known mass of water measures the heat developed or expended in the operation under investigation.

(3) Steam calorimeters, in which the heat of vaporization of water or of some other liquid furnishes the determination in question.

Instruments for the measurement of the heat generated in an electric circuit are called electro-calorimeters. See ENERGY and HEAT. E. L. NICHOLS.

Calorimetry: measurement of heat. See CALORIMETER.

Calorimo'tor [Lat. *calor*, heat + *motor*, mover]: a form of voltaic cell invented by Dr. Hare (1822). It is a zinc-copper element with very large plates compactly rolled together, as in the secondary batteries of Planté. On account of the small internal resistance marked heating effects could be produced in short wires; whence the name.

Calottistes (*Le Régiment de la Calotte*): an association of wits and satirists under the reign of Louis XIV. They were so called from their custom of sending to a public character who had made himself ridiculous a "patent," authorizing him to wear the *calotte*, a small cap, to protect the weak part of his head. The society was dissolved under the ministry of Cardinal Fleury.

Caloy'ers, or **Caloge'ri** [viâ Fr. from Ital. *caloiers* < Eccles. Gr. *καλόγηρος*, of fair old age; *καλός*, fair + *γῆρας*, old age]: a name applied to the monks of the Greek Church. They mostly follow the rule of St. Basil, but those at Mt. Sinai and Mt. Lebanon follow the rule of St. Anthony; from the caloyers the bishops and patriarchs are chosen. Among their numerous monasteries those of Mt. Sinai in Asia and Mt. Athos in Europe are the most celebrated.

Calpi, or **Culpee**: a town of India. See KALPI.

Calpur'nia: fourth wife of Julius Cæsar; married to him in 59 B. C. She was a daughter of L. Calpurnius Piso, who was consul in 58 B. C. She urged her husband not to leave home on the day of his assassination, the ides of March, 44 B. C.

Calpur'nius: a Latin poet, surnamed SICULUS, who, about the beginning of Nero's reign (54–68), wrote seven eclogues in imitation of Theocritus and Vergil, which are extant, and have some merit. The events of his life are unknown. See *Calpurnii et Nemesiani Bucolica*, rec. H. Schenkl (Leipzig, 1885); also edition with commentary by C. Keene (London, 1887); and translation by E. Scott (London, 1890).

Caltagirone, kăăl-tăă-jĕĕ-rō'nā (anc. *Calata Hieronis ?*): a city of Sicily; province of Catania; on the slope of a hill about 32 miles S. W. of Catania (see map of Italy, ref. 10–F). It is the see of a bishop, and has a college, a hospital, and several convents; also manufactures of cotton fabrics and pottery. The inhabitants are esteemed the best workmen in Sicily in the useful arts. Pop. about 34,000.

Caltaniset'ta: a province in the central part of Sicily; bounded N. by Palermo, E. by Catania and Siracusa, S. by the Mediterranean, and W. by Girgenti. Area, 1,455 sq. miles. Pop. (1881) 266,006; (1890) 304,444.

Caltanisetta: a fortified town of Sicily; capital of province of same name (see map of Italy, ref. 10–F). Here are mineral springs and extensive sulphur-works. This place is supposed to be the site of the ancient *Nissæ*. Pop. 32,000.

Caltha: the genus to which the marigold belongs. *Caltha palustris* is the systematic name of the marsh marigold, often called in U. S. "cowslip"; a plant of the family *Ranunculaceæ*, which grows in swamps and wet meadows in Asia, Europe, the U. S., and even in Alaska. It is boiled and eaten in the spring as a potherb, the poisonous properties which it is said to possess being destroyed by cooking.

Caltrop: a low herb of the genus *Tribulus*, growing in the south of Europe; its burs are armed with strong spines, which inflict wounds upon the feet of men and beasts if trodden upon.

Cal'umet [Norm. Fr. form of Fr. *chalumet*, parallel of *chalumeau*, pipe < Lat. *calamel'lus*, dimin. of *ca'lamus*,

reed]: the pipe of peace used by the North American Indians in the ratification of treaties. It is a tobacco-pipe, having a long stem made of hollow reed and ornamented with feathers. Some tribes of the aborigines appear to think that a treaty is not valid or complete until both parties have smoked the calumet together. See INDIANS OF NORTH AMERICA.

Calumet: township of Houghton co., Mich. (for location of county, see map of Michigan, ref. 1–E). It is traversed by the Mineral Range R. R.; about 15 miles northerly from Houghton; on Keewenaw peninsula; near one of the richest copper-lodes in Michigan. It contains the two villages of Laurium (pop. in 1900 5,643) and Red Jacket (pop. in 1900 4,668). Business is mining. Pop. of township (1880) 8,299; (1890) 12,529; (1900) 25,991.

Calusa Indians: See TIMUQUANAN INDIANS.

Calvados, kăăl'va'-dōs': a maritime department of France; formed of part of the old province of Normandy; bounded N. by the English Channel, E. by Eure, S. by Orne, and W. by Manche. Area, 2,132 sq. miles. The southern part is hilly, but extensive plains occur in other portions. The soil is fertile. The chief rivers are the Orne, Dromme, and Vire. Among the mineral productions are iron, coal, marble, and slate. Many horses, cattle, and sheep are raised here; the fisheries on the coast are extensive. Principal port, Honfleur; capital, Caen. Pop. (1881) 439,830; (1896) 417,176.

Cal'vart (Fr. pron. kăăl'vaar'), **Calvaert**, or **Calvert**, DENIS: known also as Dionisio Fiamingo; b. in Antwerp in 1555; went to Italy in his youth; studied with Fontana and Sabbatini, and established a school of painting at Bologna, which afterward became very celebrated. His best paintings are *St. Michael* and *Purgatory*. Guido, Domenichino, and Albani were among his pupils. D. in Bologna in 1619.

Calvary: a carved representation of the crucifixion of our Lord Jesus Christ between the two malefactors, or an artificial rock or hill on which three crosses are erected to bring to mind the hill of Calvary.

Calvary, Mt.: the scene of Christ's crucifixion. The word occurs but once in our authorized version of the New Testament (Luke xxiii. 33), the term in the Greek being Κρανίον, which means skull; the Hebrew word *Golgotha* has the same meaning. Monkish traditions place it in the Church of the Holy Sepulchre within the city. The identification of the spot is a matter of great difficulty. Of six hypotheses, the one now most favored is that which puts the crucifixion on the hill outside of the present Damascus Gate, on the north side of Jerusalem. The Greek name very well describes the hill. Recent explorations likewise help the hypothesis.

Cal'verley, CHARLES STUART: poet and humorist; b. at Martley, Worcestershire, England, Dec. 23, 1831. He was educated at Balliol College, Oxford, and Christ College, Cambridge, of which he became a fellow. His name was properly Blayds, which he changed to Calverley on leaving Oxford. He published several volumes of verse-translations, humorous poetry, and very clever *vers de société*, including *Verses and Translations* (1862), *Fly-leaves* (1871), and a metrical translation of *Theocritus* (1869). D. in Folkestone, Feb. 17, 1884. HENRY A. BEERS.

Cal'vert: on railroad; a city; former capital of Robertson co., Tex. (for location of county, see map of Texas, ref. 4–I); 130 miles N. N. W. of Houston; has first-class system of water-works, excellent public schools, etc. Pop. (1880) 2,280; (1890) 2,632; (1900) 3,322. EDITOR OF "COURIER."

Calvert, GEORGE and CECIL: See BALTIMORE, LORD.

Calvert, GEORGE HENRY: journalist; b. in Baltimore, Md., Jan. 2, 1803; a descendant of Lord Baltimore and of the painter Rubens. He graduated at Harvard in 1823; studied at Göttingen; became a journalist in Baltimore, and settled at Newport, R. I., in 1843. Besides many dramas, translations, and poems, he published *Scenes and Thoughts in Europe* (1846–52); *An Introduction to Social Science* (1856); *Life of Rubens* (1876); and *Biographic Æsthetic Studies* of Shakspeare, Goethe, Wordsworth, Coleridge, etc. D. in Newport, R. I., May 24, 1889.

Calvert, Sir HENRY: a descendant of the Calverts of Hertfordshire, England; served in North America under Clinton, Howe, and Cornwallis; was taken prisoner at Yorktown, Va., in 1781. He also served in the Netherlands in 1794 as aide-de-camp to the Duke of York; was made adjutant-general in 1799; aided in organizing the military colleges at High Wycombe and Marlow; became major-general in 1803, baronet in 1818, and a general about 1821. B. 1763 (christened March, 1763). D. at Claydon Hall, Middle Claydon, Buckinghamshire, Sept. 3, 1826.

Calvert, LEONARD: b. about 1606; d. June 9, 1647; brother of Cecil, second Lord Baltimore; first Governor of Maryland; led an expedition of mixed religionists in two vessels from Cowes (Nov. 22, 1633) to an island in the Potomac river (Mar. 25, 1634); founded St. Mary's City, of which little remains; had obstinate contests with Claiborne, who held possession of Kent island in Chesapeake Bay, and confiscated his property; attempted to found a landed aristocracy, but was defeated by the operation of the democratic features of the charter; went to England in 1643 for instructions; returned the next year to find Claiborne with new adherents in possession; was forced into refuge in Virginia; regained his province in 1647, but survived only a few months.

Calvi, kaal'vĕĕ: a seaport and fortified town of Corsica; on a peninsula of its northwest coast; 38 miles W. S. W. of Bastia (see map of France, ref. 2–J). It has a good harbor and a strong citadel. Calvi was besieged and taken by the English in 1794, but was retaken by the Corsicans in the following year. Pop. (1896) 2,132.

Calvi (anc. *Cales*): a decayed town of Italy; 7½ miles N. N. W. of Capua; a bishop's see (see map of Italy, ref. 6–F). It was formerly important, and was celebrated for its baths. Pop. 2,000.

Cal'vin [from the Latinized form *Calvinus* of the original French *Cauvin*, or *Chauvin*], JOHN: b. at Noyon, 67 miles N. N. E. of Paris, July 10, 1509. His grandfather was a wine-cask cooper in the neighboring village of Pont l'Évêque. His father, Gerard Cauvin, was apostolic notary, fiscal attorney of the county, proctor of the cathedral, and secretary of the Bishop of Noyon. His mother, Jeanne Le Franc, of Cambray, was noted for her personal beauty, as also for great religious fervor and strictness. John was the second of her four sons and six children. She died while John was quite young. His father destined him to the priesthood. He was kindly permitted to share in the lessons given by an able tutor to the sons of the noble family of De Mommor. When twelve years of age, his father's income being small, provision was made for him by securing a part of the revenue of the Chapel de la Gesine, in the cathedral at Noyon. He then (May 15, 1521) received the tonsure, but was never ordained. In 1523 he went with the young De Mommors to Paris, entering first the College of La Marche, where he studied Latin with Mathurin Cordier, and, shortly after, the College of Montaigu, where a Spaniard trained him in dialectics, and where, some years later, Ignatius Loyola also studied. He was an ardent and precocious scholar, bright, sharp, sedate, severe. His companions called him the *Accusative Case*, on account of his censoriousness. In 1527 he got the curacy of Marteville, which was exchanged in 1529 for Pont l'Évêque, where he sometimes preached. Near the close of 1527 he went to the University of Orleans, and the year after to the University of Bourges, to study law. At Orleans he heard the eminent jurist Pierre de l'Étoile, and was intimate with his relative Olivetan, whose French Bible appeared in 1535. At Bourges he was a favorite pupil of Andreas Alciati, then the most distinguished law professor in Europe, and came in contact with Melchior Wolman, a learned German Lutheran, who both taught him Greek and opened to him the Gospel. He so distinguished himself that he was often called upon to lecture in the place of his masters. In the summer of 1531, his father having died May 26, he returned to Paris, and in 1532 published there, with a commentary, the *De Clementia* of Seneca, aiming as yet at nothing higher than a reputation like that of Erasmus. In Nov., 1533, a speech prepared by him for his friend Nicholas Cop, rector of the university, upon the necessity of the reformation of the Church upon the basis of the New Testament, drove him out of Paris. Befriended by Margaret of Navarre, sister of Francis I., he lived for nearly a year in Angoulême, and there began the preparation of his *Institutes*. He returned to Paris toward the close of 1534, but only to flee again, and finally to leave the country, going to Strassburg in 1534 (Dec.), to Basel in 1535. Meanwhile what he calls his "sudden conversion" occurred in 1533. In 1534 he resigned his two benefices, and published in Paris his first theological work, *Psychopannychia*. His greatest work, the *Institutes* (1536), was at first only a catechism. He revised it for the last time in 1559. In Geneva he arrived

in the latter part of July, 1536, intending merely to stop over night, but Farel laid hold of him, and solemnly adjured him to remain as pastor of the feeble evangelical church there lately gathered, and he consented. Perceiving the imperative need of a strong moral government, he proceeded to give one, but the discipline he set up was too stern to be endured. He was banished Apr. 22, 1538; went first to Bern, then to Zurich, and then to Basel. In Sept., 1538, he settled as pastor in Strassburg, and there in 1540 he married the widow Idelette de Bure, with whom he lived happily nine years. In 1541 he returned in triumph to Geneva, being recalled by the united voice of the secular and religious authorities, with the general assent of the people. He arrived Sept. 13, went at once at work, and never ceased his beneficent activity. He ruled the city with an iron hand, and by his writings exerted a dominant influence upon the Reformed Church in all lands. His reform met with vigorous opposition from the so-called Patriots and Libertines, and for ten years he kept up the fight. He conquered at last. He opposed heresy as well, and his opponents, as Bolsec, Curio, Ochino, and above all Servetus, felt his resistless power. He was great as a preacher, unrivaled as a clear and profound thinker. He corresponded with the Protestant leaders in all lands. With Melanchthon he enjoyed peculiarly friendly relations. The French language owes him a debt like that which the German language owes Luther. Civil liberty the world over is likewise his debtor. He is the father of Presbyterianism, and the greatest of all Protestant commentators and theologians. There is but one blot upon his memory. The burning of Servetus for heresy (Oct. 27, 1553), though sanctioned even by Melanchthon, was a shocking tragedy. Calvin died in Geneva, May 27, 1564. The standard edition of Calvin's works is that of Amsterdam (1671, 9 vols. fol.). The exhaustive edition by G. Baum, E. Cunitz, and E. Reuss (Brunswick, 1863, *sqq.*, vol. xlviii., 1892) is not yet complete. There is an English translation nearly complete (Edinburgh, 1843–53, 52 vols.). Most accessible are his *Institutes* and *Correspondence*, 4 vols. (both pub. Presbyterian Bd., Phila.). The best biographies are by T. Beza, in Latin and French (Geneva, 1564); Paul Henry, in German (Hamburg, 1835–44, 3 vols.; partially translated, London and New York, 1881, 2 vols.); Henry abridged his book (Hamburg, 1846); T. H. Dyer, in English (London, 1850); E. Stähelin, in German (Elberfeld, 1863, 2 vols.); cf. especially Schaff, *Hist. Chr. Ch.*, vol. vii. (Reformation in Switzerland, pp. 223–844). The Roman Catholic scholar F. W. Kampschulte left unfinished at his death an excellent study of Calvin's Genevan activity (Leipzig, 1869). See the article Calvinism.

Revised and enlarged by S. M. Jackson.

Cal'vinism: Calvinism (like Pelagianism and Lutheranism) is a term used to designate, not the opinions of an individual, but a mode of religious thought or a system of religious doctrines, of which the person whose name it bears was an eminent expounder. It is synonymous therefore with what is technically called "the Reformed Theology." There have from the beginning coexisted in the Christian Church three specially well-marked and generically distinct systems of doctrine, or modes of conceiving and adjusting the facts and principles understood to be revealed in the Scriptures, under one or the other of which nearly every form of theological thought may be subsumed. One of these is the Pelagian, which denies the native guilt, pollution, and moral impotence of man, and makes him independent of the supernatural assistance of God. At the other pole is the Calvinistic system, which emphasizes the guilt and impotence of man, exalts God, and refers salvation absolutely to the infinite love and undeserved favor of God working in harmony with his justice, sovereignly selecting its objects, and saving them by the almighty power of grace. Between these comes the manifold and elastic system of compromise known in one of its earlier forms as Semi-Pelagianism, and in a more modern type as Arminianism, which admits man's original pollution but denies his native guilt, regards redemption as a compensation for innate and consequently irresponsible disabilities, and refers the moral restoration of the individual to the co-operation of the human with the Divine energy, the determining factor being the human will. The system to which this article is devoted was known historically, in its opposition to Pelagianism and Semi-Pelagianism, and is now designated more generally and indefinitely, by the title *Augustinianism*, from its earliest champion, the illustrious Augustine, Bishop of Hippo Regius in Northern Africa (395–430 A. D.); while the more modern and specific title is *Calvinism*, from the fact that it was developed into a perfect form, and infused into the creeds of the Reformed Churches, and into the life of modern nations, through the instrumentality of John Calvin, the Reformer, of Geneva (1509–1564). The authentic statement of its constituent doctrines is not to be drawn exclusively from the writings of either of the great men mentioned, but from the public confessions of those Churches which have professed this form of doctrine, and from the classical writings of their representative theologians.

The Reformed Confessions are very numerous—more than thirty in number—but they substantially agree in the system of doctrine which they teach. Those which have been most widely accepted as of symbolical authority are the Second Helvetic Confession, prepared by Bullinger, 1564, and adopted by all the Reformed Churches of Switzerland (with the exception of Basel) as well as by the Reformed Churches of Poland, Hungary, Scotland, and France; the Heidelberg or Palatinate Catechism, prepared by Ursinus and Olevianus, 1562, indorsed by the Synod of Dort, and accepted as a doctrinal standard by the Reformed Churches of Germany and Holland, as well as by their representatives in America; the Thirty-nine Articles of the Church of England; the Canons of the Synod of Dort, 1618–19, an Œcumenical Synod of the Reformed Churches; and the Westminster Confession, with its accompanying Larger and Shorter Catechisms, prepared by the famous Westminster Assembly, 1644–47, and accepted as a doctrinal standard by the Presbyterian Churches and by British Calvinists in general. The Canons of Dort are not so much a complete confession as a supplement to the previous confessions of the Reformed Churches, which was necessitated by the rise of the Arminian controversy. The Westminster Confession is the only Reformed creed of wide acceptance which was framed after this controversy; it was prepared with the intention of exhibiting the harmony of the Reformed Churches, and with œcumenical purpose and breadth; and it presents "the fullest and ripest symbolical statement of the Calvinistic system of doctrine" (Schaff, *Creeds of Christendom*, i., 788).

John Calvin remains the most representative theologian of Calvinism. Perhaps a list of representative theologians after him would include especially Bullinger, Aretius, Ursinus, Zanchius, Polanus, of the first age, with such others as Amesius, Voetius, Witsius, Heidegger, Turretin, and among English writers John Owen, John Howe, and Jonathan Edwards for the next age. Modern Presbyterian Calvinism "is best represented by the theological systems of Charles Hodge, W. G. T. Shedd, and Henry B. Smith" (Schaff, *History of the Christian Church*, vol. vii., p. 544). The *vade mecum* of the Reformed pastors was in early days Bucanus's *Institutiones*; this was supplanted later by Amesius's *Medulla*; and it in turn by Marck's *Compendium*; perhaps no handbook is more used to-day than A. A. Hodge's *Outlines*. Attempts more or less successful have been made to present the Calvinistic system from the writings of its representative theologians by, among others, Heinrich Heppe (*Die Dogmatic der evangelisch-reformirten Kirche dargestellt und aus den Quellen belegt*, Elberfeld, 1861); Alexander Schweizer (*Die Glaubenslehre der evangelisch-reformirten Kirche dargestellt und aus den Quellen belegt*, Zurich, 1844–47); and J. H. Scholten (*Leer der Hervormde Kerk, in hare grondbeginselen uit de bronnen voorgesteld en beoordeeld*, 1848–50).

It is proposed in this article to present, in necessarily meager outline, a statement (I) of the fundamental characteristics of the system; (II) of the history of its development and prevalence both before and after Calvin; and (III) of its practical moral influence upon individuals and upon communities.

I. *Statement of Principles.*—There is a very important distinction between the central, formative, or root principle of a system and its distinguishing features, which is not attended to when it is said, as it is sometimes said, that the "principle" of Calvinism is "the metaphysical principle of predestination." Predestination is rather a logical consequence of, and an essential element in, than the determining principle of, Calvinism. This is rather the glory of the Lord God Almighty. The formative idea of Calvinism is the conception of God; and it is its determination that God shall be and remain God in all its thought—to embrace God in the wholeness of His nature, and to do full justice to God in all His relations—which itself determines all those doctrines which have from time to time been mistaken for its "prin-

ciple." On the practical side this is equivalent to saying that it is the effort of Calvinism to do full justice to the essence of religion. "Since all religion springs from the relation in which God the Creator has placed us, His creatures, to himself, it follows that the greatest religious height will be reached by him who at every point of his horizon views God as God, by honoring Him in all things," as the Almighty Being who has created all things for His own sake, who is bound by nothing out of himself, and who determines for every creature both its being and the law thereof, both now and for eternity. And "as religion on earth finds its highest expression in the act of prayer," "Calvinism in the Christian Church is simply that tendency which makes a man assume the same attitude toward God in his profession and life which he always exhibits in his prayer. . . . Whoever truly prays ascribes nothing to his own will or power except the sin that condemns him before God, and knows of nothing that could endure the judgment of God except it be wrought within him by the Divine love. But while all other tendencies in the Church preserve this attitude so long as their prayer lasts, to lose themselves in radically different conceptions as soon as the amen has been pronounced, the Calvinist adheres to the truth of his prayer in his confession, in his theology, in his life, and the amen that has closed his petition re-echoes in the depths of his consciousness and throughout the whole of his existence." A. Kuyper, *The Presbyterian and Reformed Review*, ii., 378–382.

Those teachings which distinguish the Calvinistic from other systems of theology are simply the outgrowth of this fundamental attitude of mind. The Synod of Dort defined the distinguishing doctrines of Calvinism as over against Arminianism in five propositions, which have therefore since been called "the five points of Calvinism," though they are rather the Calvinistic response to "the five points of Arminianism" than an independent statement of the differentiating elements of Calvinism. These five points affirmed absolute predestination, particular redemption, total depravity, irresistible grace, and the perseverance of the saints. If a single distinguishing principle is to be discriminated among these, it will not be found in "predestination," but rather in "irresistible grace." Predestination is acknowledged by both parties, and is indeed a necessary postulate of natural religion; the difference between the parties here lies in the conception of the *ground* of the predestinating decree. The distinguishing mark of Calvinism as over against all other systems lies in its doctrines of "efficacious grace," which, it teaches, is the undeserved, and therefore gratuitous, and therefore sovereign, mercy of God, by which He efficaciously brings whom He will into salvation. Calvinism is specifically the theology of grace; and all are properly Calvinists who confess the absolute sovereignty of God in the distribution of His saving mercy. Two modifications of typical Calvinism have been attempted within the limits of the system, and have had considerable temporary and local influence. One of these, called Salmurianism from its place of origin (the theological school of Saumur, in France), sought to reconcile the sovereignty of grace with the doctrine of a universal atonement, which had been taught previously only by Pelagians and Arminians; this involved a modification of the doctrine of "particular redemption," and with it of the nature, purpose, and effect of the atonement, but left the doctrine of "irresistible grace" unaffected. The other modification sought to reconcile the sovereignty of grace with the Pelagian theory of the will and of man's power to the contrary; in its highest form (as taught by Bellarmine and certain Jesuit theologians) it has received the name of "the doctrine of congruity," and teaches that God adapts the amount and time of the persuasive influences of His Spirit to the foreseen state of mind of those whom He elects to salvation, and thus secures their free acceptance of His offers of mercy. This modification affects directly the doctrine of "irresistible grace," but remains Calvinistic so long as it makes God's selection of the recipients of the saving mercy entirely sovereign, and His application of grace to them certainly efficacious. Typical Calvinism, which remains the faith of the great body of those who hold this type of doctrine, teaches that "efficacious grace" is the creative efficiency of the Holy Spirit operating beneath consciousness, not by moral suasion but "physically," the soul remaining passive therein until it has been quickened and renewed by the Holy Spirit and thereby enabled to act in the powers of its new life.

The following is an exposition of the chief features of Calvinism as a system of doctrine.

A. *The Relation of the Creator to the Creation.*—There are three generically distinct views as to the relation of the Creator to the creation, each, of course, embracing many specific varieties under it. 1. The Deistical view, which admits a creation *ex nihilo*, and an original endowment of the elements with their active powers, and the subjection of the whole system of things to certain general laws, adapted to the evolution of certain fixed plans. The general plan and order of the creation is attributed to the Creator, and all events are referred to Him in a general sense as the indefinitely remote First Cause, who inaugurated the ever-onflowing line of second causes. This view, however, denies the continued immanence of the Creator in the creation, and the immediate dependence of the creature on the Creator for the continuance of its substance, the possession of its properties, and the exercise of its powers. 2. The opposite extreme is the Pantheistic mode of thought, which identifies God and the universe as His existence-form, or at least so confines Him to it as to deny His transcendence beyond the universe as an extra-mundane Spirit and conscious Person whose actions are rationally determined volitions. 3. Between these extremes stands Christian Theism. It emphasizes at once the transcendence of God beyond, and the immanence of God within, the world. He remains ever a conscious personal Spirit, without and above the world, able, in the exercise of His free volitions, sovereignly to exercise a supernatural influence (*potestas libera*) upon any part of that system of nature which He has established, ordinarily working through second causes, "yet free to work without, above, and against them at His pleasure." At the same time He continues to interpenetrate the inmost being of every element of every creature with the infinite energies of His free intelligent will, and His creatures momentarily continue absolutely dependent upon the energy of that will for substance and for the possession of the powers communicated to them as second causes in all their exercises.

All Christians, of course, are Theists in the sense thus defined; but the different schools of Christian theology take their points of departure here, as, on the one hand, they press the essential dependence of the creature upon the Creator in substance, properties, and actions, or as, on the other hand, they press the self-active power of second causes, and by consequence their self-sufficiency and independence. Here we have the ultimate antithetical grounds of Pelagianism and Augustinianism. Pelagius, who was characterized by a rationalistic habit of thought and a superficial religious experience, believing that power to the contrary is an inalienable attribute of every act of free will, necessary to render it responsible and therefore moral, maintained, in the supposed interests of morals, that every free agent is so adequately endowed by God as to be inalienably self-sufficient for action, each in a manner appropriate to his kind. Augustine, on the contrary, held that every creature exists and acts only as its substance is momentarily sustained, and its action conditioned, by the omnipresent and omnipotent energy of God. While affirming the free self-determining power of the human soul, he referred the moral character of the volition to the disposition which prompted it, and the persistence of the moral nature of man to the immanent influences of the Spirit of God. Even anterior to apostasy, therefore, the spirit of man depended for spiritual life and moral integrity upon the *concursus* of the Spirit of God, and the withdrawal of this would be the immediate cause of spiritual death and moral impotence. This Divine influence, in one degree and in one mode or another, is common to all creatures and all their actions. This view of Augustine was subsequently elaborated by his disciples into the theory of the "previous," "simultaneous," and "determining" *concursus* of the Thomists and Reformed theologians. See the *Summa* of Thomas Aquinas, 2. 1. 10., and Turretin, 6. 6. 6. and 7.

B. *The End or Design of God in Creation.*—Every intelligent Theist must regard the universe as one system, and must therefore believe that the Creator had from the beginning one general end, for the accomplishment of which the whole and all its parts were intended. This general end must have determined the Creator in every step he has taken in the evolution of the universe, and hence our conception of it will give shape to any speculations we may form with respect to the relations of God and His works. It is evident that no solution of this transcendent question can be reached by reasoning from *a priori* principles, or by generalizations drawn from the comparatively few facts at present accessible to our observation, and that it can be rationally sought

for only in a direct revelation. For the most part, this general end has been referred to the essential benevolence of God, prompting Him to confer the greatest possible amount of blessedness, in the highest forms of exeellence, upon innumerable objects of His love. Leibnitz, in his *Théodicée* (1710), which has exerted a wide influence on all modern speculation, lowered this view by emphasizing the "happiness" of the creatures as the great end of the creative goodness. The Scriptures, on the contrary, emphatically declare that the manifestation of His own glorious perfections is the actual and most worthy possible end of the great Designer, in all His works of creation, providence, and redemption; and hence likewise the final end of all His intelligent creatures in all moral action. The recognition of this great principle, and its application to the interpretation of all God's dealings with man, and of all man's duties to God, has always been an essential characteristic of Calvinism. Pelagians and Semi-Pelagians, with more or less decision, place the general end of the system of things in the well-being of the creature: Calvinists place it absolutely in the glory of the Creator, which carries with it, not as a *co-ordinate* design, but as a *subordinate* yet certain effect, the blessedness of all loyal creatures.

C. *The Relation which the Eternal Plan of God sustains to the Actual Evolution of Events in Time.*—Every Theist believes that the eternal and absolutely perfect intelligence of the Creator must have formed from the beginning a plan comprehending the entire system of creation and providence in reference to the great end for which they were designed. Pelagius himself admitted that the absolute foreknowledge of God embraced the future volitions of free agents, as well as all other classes of events, while he denied their foreordination. The Socinians, who have developed Pelagianism into a complete system, more consistently deny foreknowledge, as well as foreordination, since, if it is essential that a volition should be purely contingent in order that it should be responsible, it must be indeterminate before the event, and while indeterminate it can not be certainly foreknown. The Arminians (though not without exceptions, such as Adam Clarke and the late Dr. McCabe) admit foreknowledge, but deny foreordination. The Calvinists argue that, in an intelligent being, prevision implies provision; and that the admission of God's infinite foreknowledge therefore necessarily involves the admission of His eternal foreordination.

In this matter they maintain the following positions: 1. In the case of an infinitely wise, powerful, and free Creator of all things *ex nihilo*, it is obvious that the certain foreknowledge of all events from the absolute beginning virtually involves the predetermination of each event, without exception; for all the causes and consequences, direct and contingent, which are foreseen before creation are, of course, determined by creation. As Sir William Hamilton asserts (*Discussions*, Appendix 1, A), "the two great articles of foreknowledge and predestination are both embarrassed by the selfsame difficulties." 2. Since all events constitute a single system, the Creator must embrace the system as a whole, and every infinitesimal element of it, in one all-comprehensive intention. Ends more or less general must be determined as ends, and means and conditions in all their several relations to the ends which are made dependent upon them. Hence, while every event remains dependent upon its causes and contingent upon its conditions, none of God's purposes can possibly be contingent, because in turn every cause and condition is determined in that purpose, as well as the ends which are suspended upon them. All the decrees of God are hence called absolute, because they are ultimately determined always by "the counsel of His own will," and never by anything exterior to Him which has not in turn been previously determined by Him. 3. This determination, however, instead of interfering with, maintains the true causality of the creature, and the free self-determination of men and angels. The eternal and immutable plan of God has constituted man a free agent, and consequently can never interfere with the exercise of that freedom of which it is itself the foundation. However, according to the principles above stated, this created free will is not independent, but ever continues to have its ground in the conserving energies of the omnipresent Creator. Since the holiness of the created moral agent is conditioned upon the indwelling of Divine grace, and its turning from grace is the cause of sin, it follows that all the good in the volitions of free agents is to be referred to God as its positive source, but all the evil (which *originates* in defect, privation) is to be referred simply to His permission. In this view, all events, without exception, are embraced in God's eternal purpose; even the primal apostasies of Satan and of Adam, as well as all those consequences which have flowed from them. It is in view of these principles that Calvinism has been so often confounded with fatalism. It is, however, the antipodes of fatalism, preserving the real efficiency of second causes while subjecting their action to intelligent control. It teaches that the all-penetrating and all-energizing will of the personal Jehovah, who is at once perfect Love and perfect Light, constitutes and conserves our free agency, and through its free spontaneity works continually the ever-blessed counsel of His own will, weaving even rebellious volitions into the instrumentalities of His purpose, and making every consenting soul a conscious coworker with himself.

As to the bearing of this prineiple upon the question of the design of God in the application of redemption (predestination), see below.

D. *The Manner in which the Divine Attributes of Benevolence, Justice, and Grace are illustrated in the Scheme of Redemption.*—Arminians have generally held, with Leibnitz, that "justice is benevolence acting according to wisdom"—i. e. inflicting a lesser pain in order to effect a greater or more general happiness. The necessity for punishment therefore lies not in the essential and inexorable demands of righteousness, but in its being the best means to secure the moral reformation of the sinner, and the best motive to restrain the community from disobedience. Grotius maintained that the moral law is a product of the Divine will, and therefore capable of being relaxed by that will. In the gospel scheme, therefore, God, in the exercise of His sovereign prerogative, relaxes His law by forgiving sinners upon repentance and reformation, while as an administrative precaution He makes an exhibition of severe suffering in the person of His Son, in order that all other subjects of His moral government may be deterred from making the impunity of repentant men an encouragement to disobedience. The atonement, therefore, was an exhibition solely of the Divine benevolence, but not of justice in the ordinary sense of that word.

Calvinists, on the eontrary, hold that justice in the strict sense, as well as benevolence, is an essential and ultimate property of the Divine nature, and hence lies back of, and determines the character of, all the Divine volitions. By the perfection of God's nature He is always both benevolent and just in all His actions. The atonement accordingly was an act of infinite love, seeking and finding a way to be both just and yet the justifier of the sinner; it provides a Divine substitute for the sinner, who undertakes for him and bears his penalties, and works out a perfect righteousness in his stead, with regard to which God may accept the person of the sinner as (judicially) righteous in His sight. While Arminians in their view of the gospel emphasize benevolence, Calvinists in their view emphasize justice and grace.

E. *The Degree of Guilt and Moral Damage entailed through the Apostasy of Adam upon his Posterity.*—The answers respectively given to this question impose form and character upon all the various systems of theology.

1. Pelagius held that free will (*liberum arbitrium*), in the sense of an absolutely unconditioned power of choice between good and evil, is essential to responsible moral agency, and henee inalienable from human nature. Since, then, all men continue after the apostasy to be responsible moral agents, their nature in this essential respect must remain in the same condition in whieh it was created. The moral agency of a man at any one moment can not determine the character of his moral agency at any other moment, and he possesses throughout his entire existence ability to will and to do all that God has any right to require of him. Henee Pelagians deny—(1) All original sin or corruption of nature, because sinfulness can be predicated only of free acts, and man in order to be responsible must always possess plenary ability to will aright. (2) All original guilt or desert of punishment common to the raee, and prior to the actual transgression of the individual, since it would be a violation of justice to hold one moral agent responsible for the wrong volitions of another. (3) Hence men need redemption through Christ only to deliver them from the guilt of actual and personal transgression, and only those need it who have thus sinned. Those dying in infancy are therefore worthy of neither reward nor punishment, and can be benefited by Christ only by being raised to a higher plane of blessedness than that belonging to nature—to the *regnum cœlorum* as distinguished from the *vita æterna*.

2. Augustinians and Calvinists, on the contrary, maintain —(1) That the entire soul, with all its constitutional faculties and acquired habits, is the organ of volition, the agent willing. (2) That this soul possesses the inalienable property of self-determination, the moral character of which determination always depends upon the moral condition of the soul acting. (3) That the holy moral condition of the soul, and hence its spontaneous disposition to will that which is right, depends upon the indwelling of the Divine Spirit. The free agency of God is an absolute self-existent and self-sufficient perfection, self-determined to good and incapable of evil. The freedom of saints and angels confirmed in holiness is dependent upon Divine assistance, but, like that of God himself, it is the very opposite to the "liberty of indifference" or "power to the contrary," being a *non posse peccare*, a *felix necessitas boni*. Adam was created in fellowship with God, and hence with a holy tendency of heart, with full power not to sin (*posse non peccare*), but also, during a limited period of probation, with power to sin (*posse peccare*). He did sin. As a punishment the Holy Spirit was withdrawn from the race, and he and his descendants lost the *posse non peccare*, and retained only the *posse peccare*, which thus became the fatal *non posse non peccare*.

This *theological* doctrine of total moral inability has nothing whatever to do with the *psychological* theory of "philosophical necessity" as an attribute of voluntary action, which, since the time of President Edwards, has been too frequently regarded essential to the defense of Calvinism. It has been conclusively shown by Principal Cunningham (*Theology of the Reformers*, Essay IX.) that this metaphysical doctrine is not essential to Calvinism; while Sir William Hamilton (*Discussions*, Appendix 1, A) and Sir James Mackintosh (*Dissertations on the Progress of Ethical Philosophy*, Note O) propose to prove that it is absolutely inconsistent with Calvinism as historically taught. The phrases "bondage of the will," etc., so frequently used by all classes of Augustinian theologians, and above all by Luther in his treatise *De Servo Arbitrio*, are intended to apply only to the corrupt spontaneous tendency of fallen man to evil, which can be reversed only by a new creating energy from above. At the same time, every Calvinist holds devoutly to the free self-determination of the soul in every moral action, and is at liberty to give whatever psychological explanation of that fact may seem to him most reasonable. See *Confession of Faith*, ch. ix., and Calvin's *De Servitute et Liberatione Humani Arbitrii*.

Hence Calvinists hold—First: as to original guilt. (1) Human sin, having originated in the free apostatizing act of Adam, deserves God's wrath and curse, and immutable justice demands their infliction. (2) Such, moreover, was the relation subsisting between Adam and his descendants that God righteously regards and treats each one, as he comes into being, as worthy of the punishment of that sin, and consequently withdraws His life-giving fellowship from him. Some refer this responsibility of Adam's descendants for his apostatizing act to a purely sovereign "divine constitution" (New England view); others hold that we all were in our generic essence guilty coagents with him in that act (Realistic view); while the common opinion is that God, as the guardian of our interests, gave to us all the most favorable probation possible for beings so constituted, in Adam as our covenant representative (Federal view). The whole race, therefore, and each individual it embraces, is under the just condemnation of God, and hence the gift of Christ, and the entire scheme of redemption, in its conception, execution, and application, are throughout and in every sense a product of sovereign grace. God was free to provide it for few or many, for all or none, just as He pleased. And in every case of its application the motives determining God can not be found in the object, but only in the good pleasure of the will of the Divine Agent.

Calvinists also hold—Secondly: as to original sin. (1) Since every man thus comes into the world in a condition of antenatal forfeiture because of Adam's apostasy, he is judicially excluded from the morally quickening energy of the Holy Ghost, and hence begins to think, feel, and act without a spontaneous bias to moral good. (2) But since moral obligation is positive, and the soul is essentially active, it instantly develops in action a spiritual blindness and deadness to divine things, and a positive inclination to evil. This involves the corruption of the whole nature, and absolute impotency of the will to good; is, humanly speaking, without remedy; and necessarily tends to the indefinite increase both of depravity and of guilt. It is therefore said to be total. Some Calvinists hold original guilt to be conditioned upon original depravity (e. g. the advocates of mediate imputation). Others, including the large majority, of all ages, hold original depravity to be the penal consequence of Adam's apostatizing act, and therefore to be conditioned upon original guilt (hence immediate imputation).

3. The advocates of the middle scheme have, of course, varied very much from the almost Pelagian extreme occupied by many of the Jesuits and of the Remonstrants, to the almost Augustinian position of the Lutherans and of the great Wesleyan Richard Watson. The Semi-Pelagians admitted that the nature of man was so far injured by the fall that he could do nothing in his own strength morally good in God's sight. But they held that man is able to incline himself unto good, though he is not able to effect it; so that in every case of spiritual reformation the *first* movement toward good may be from the soul itself, while the performance of it is the result of the co-operation of Divine grace with the human will. They consequently denied the *gratia præveniens*, but admitted the *gratia co-operans*. The modern Protestant Arminians (Limborch, Episcopius, etc.) admit original *sin*, while they deny original *guilt*, and regard innate corruption rather as a vice or fault of nature than as a sin in the full sense of that term. Dr. D. D. Whedon (*Bibliotheca Sacra*, Apr., 1862) admits—1. That Adam and Eve by the apostasy morally corrupted their own nature and that of all their descendants; 2. That every child of Adam is born with an inherent tendency to sin which he can not remove by his own power; 3. That Adam and Eve were fully responsible for their apostasy, because they sinned in spite of possessing power to the contrary, and therefore might justly have been damned; 4. Nevertheless, their descendants, although corrupt and prone to sin from birth, are neither responsible nor punishable until there has first been bestowed upon them redemptively a gracious ability to the right; 5. After Adam sinned, therefore, only one alternative was open to Divine justice—either that Adam should be punished at once without issue, or that he should be allowed to generate seed in his own moral likeness, when equity required that an adequate redemption should be provided for all; 6. Hence Christ died for all men, and sufficient grace (including *gratia præveniens* and *gratia co-operans*) is given to all men, which is essential to render them responsible, and they become guilty only when they abuse (by failing to co-operate with) that gracious power to the contrary (*posse non peccare*) which has been conferred on them in the gospel. Quoting the dictum of President Edwards (*Will*, pt. 4, § 1), "The essence of the virtue or vice of dispositions of the heart and actions of the will lies not in their cause, but in their nature," Whedon says: "To this we oppose the counter-maxim, that in order to responsibility for a given act or state, power in the agent for a contrary act or state is requisite. In other words, power underlies responsibility." The only limit he allows to this principle is in the case of that moral inability which results from the previous abuse of freedom by the agent himself. This he declares is the fundamental ground upon which all the issues between Arminianism and Calvinism depend. Thus while Calvinism exalts the redemption of Christ, in its execution and in each moment of its application, as an adorable act of transcendent grace to the ill-deserving, Arminianism, in its last analysis, makes it a compensation brought in by the equitable Governor of the world to balance the disabilities brought upon men, without their fault, by the apostasy of Adam. This difference is the practical reason that Calvinism has such a strong hold upon the religious experience of Christians, and that it finds such frequent irrepressible expression in the hymns and prayers of evangelical Arminians.

F. *The Nature and Necessity of that Divine Grace which is exercised in the Moral Recovery of Human Nature.*—Grace is free sovereign favor to the ill-deserving. It is the motive to redemption in the mind of God. It is exercised in the sacrifice of His Son, in the free justification of the believing sinner on the ground of that Son's vicarious obedience and sufferings, and in the total change wrought in that sinner's moral character and actions by the energy of the Holy Ghost. While the word *grace* applies equally to the objective change of relations and the subjective change of character, it is used in this connection to designate that energy of the Holy Ghost whereby the moral nature of the human soul is renewed, and the soul, thus renewed, is enabled to act in compliance with the will of God.

Pelagius found in his system neither need nor room for

this Divine energy, and confined the conception of grace to objective revelations and educational and providential influences.

Semi-Pelagians admitted its necessity to help man to complete that which he had himself power to commence, and held that it is actually given to all those who had thus prepared themselves for it and made themselves worthy of it.

Arminians admit that it is necessary in order that the corrupt will shall be even predisposed to good; but they regard it as a universal compensation for the irresponsible defects of an inherited nature, which restores the native power for either good or evil; and they make all further effects depend wholly upon the use made of it by the soul in which it acts. This is styled the theory of Co-operation as held by the Arminians, and of "Synergism" as held by the followers of Melanchthon in Germany. Regeneration is the result of the coworking of two energies, but the determining factor is the human will. Hence grace is *sufficiens* in every case, and *efficax ab eventu vel congruitate*.

Augustinians and Calvinists, on the other hand, hold—1. That, for Christ's sake, and in spite of all human demerit, a gracious influence is exerted on the minds of all men of various intensities. This is "common grace," and is a moral and suasory influence on the soul, tending to good, restraining evil passions, and adorning the soul with the natural virtues; it may be resisted, and is always prevailingly resisted by the unregenerate. 2. But at His pleasure, in certain cases, God exerts a new creative energy, which in a single act changes the moral character of the will of the subject, and implants a prevailing tendency to co-operate with future grace in all forms of holy obedience. This is *gratia efficax*, "effectual calling," which is always effectual because it consists in effecting a regenerative change in the moral nature of the will itself. The change which this grace effects is the "new heart" of Scripture, the *conversio habitualis seu passiva*, of which God is the agent and man the subject, which as a new habit of soul lays the foundation for all holy activities. Augustine has been generally followed in styling this grace "irresistible," because it can not be resisted. Yet this is as incongruous a designation as it would be to call the creation of the world or the generation of a child "irresistible." Effectual calling consists in a new creative energy within the soul, making it willing, upon which it spontaneously embraces Christ and turns to God (the *conversio actualis seu activa*). It merges itself into the very spontaneity of the will, and enfranchises it from the corruption which had hitherto held it in bondage, and restores it to its normal equilibrium, in harmony with reason and conscience and the indwelling Spirit of God. 3. Afterward the Divine Spirit continues to support the soul, and prepare it for, and to concur with it in, every good work. This grace is now prevailingly co-operated with by the regenerated soul, and at times resisted, until the status of grace is succeeded by the status of glory.

Calvinists hold that this "grace" in all its stages is purely undeserved favor, and therefore sovereignly exercised by God upon whom and at what time He pleases; hence it is called *gratia gratuita et gratis data*, otherwise grace would be no more grace. It also works in its various stages progressively, except in the single regenerative act. It is at first the *gratia prævenians*, then the *gratia operans*, then the *gratia co-operans*, and finally the *gratia perficiens*, including the *donum perseverantiæ*, infallibly securing perseverance in faith and obedience, unto the complete redemption of soul and body in glory.

G. *The Relation which the Eternal Plan of God bears to the Application of Redemption to Individuals.*—Since the eternal plan, decree, or purpose of God includes all things that come to pass, none of which comes to pass without His prevision and provision, it includes also the destinies of all creatures. Predestination, in its restricted sense, is the term employed to express the purpose of God in relation to the salvation of individual men. Arminians maintain that this purpose of God is with reference to each man conditioned upon God's foresight of his possession or lack of faith and repentance; but Calvinists insist that since faith and repentance are the gifts of God and the fruits of His Spirit, their presence or absence can not be the condition of predestination, but must be rather its predetermined and graciously effected result. The primary efficient cause of predestination is therefore God Himself; the discriminating cause lies in the hidden counsels of His own will. Predestination therefore is the eternal, inscrutable, and unchangeable decree of God concerning the salvation of individual men; it consists of two parts—eternal election on the one side and eternal preterition on the other. It thus includes both the selection of one portion of the race to be saved and the leaving the rest to perish in sin. This act of discrimination is necessarily absolutely sovereign, and can find its cause on neither side in aught in the creature moving God to elect or pass him by; *ex hypothesi*, all stand in like condition before God prior to this act of discrimination, and what is common to the whole can not be the ground of discrimination between the parts. But the subsequent treatment to which each section is subjected is not sovereign, but is conditioned on the one side on God's purpose of love to His elect, and on the other on the guilt of the sin in which the non-elect are left. The decree of election to eternal life is followed therefore by the foreordination of all the means thereto. And the purpose to pass by the rest and leave them in their sin is followed by the ordination of them to dishonor and wrath for their sin. A discrimination is thus drawn between the sovereign act of preterition and the judicial act of reprobation; or, as they are otherwise called, between the sovereign act of "negative reprobation" and the judicial act of "positive reprobation." So far all historical schools of Calvinism agree. Adherents of what is known as the school of Saumur are equally explicit and decided in these points with typical Calvinists. (See e. g. Amyraldus, *Defense of Calvin*, ch. xiii., *Declaration against the Errors of the Arminians*, 1646, p. 6; and in this country James Richards, *Lectures on Mental Philosophy and Theology*, 1846, pp. 332, *seq.*; Henry B. Smith, *System of Christian Theology*, 1886, p. 508.) Accordingly the Œcumenical Reformed Synod of Dort (1619) and the broadly Calvinistic Assembly of Westminster (1644–47) so define the doctrine.

In the further development of the subject, however, diverging schools of thought emerge within the limits of Calvinism. The great majority of Calvinists have always been what has come to be known as Infra- or Sublapsarians—that is, they hold that God's predestinating decree contemplates man as already fallen and resting under the curse of the broken law. God is conceived of as, moved by ineffable love for man, selecting out of the mass of guilty sinners a people in whom to show forth the glory of His grace, and then as providing redemption for them in order to carry out His loving purpose in election. The "order of decrees," as it is technically called, stands in this view thus: Creation, fall, election, redemption by Christ, application of redemption by the Holy Spirit. A few Calvinists, whose inconsiderable number is balanced by their considerable learning and logical power, have always contended that on logical grounds it would be better to place the decree of election in the order of thought before that of the fall; they are therefore called Supralapsarians, and give the "order of decrees" thus: Creation, election (or even election, creation), fall, redemption, application. This question did not come into discussion until the close of the sixteenth century, so that the position upon it of Calvinistic writers before that date is usually in dispute. There seems no good reason to doubt, however, that Augustine and Calvin were essentially Infralapsarian in their fundamental conceptions. On the other hand, the Supralapsarian scheme was adopted by men of such mark and influence as Beza, successor to Calvin in Geneva; Gomarus and Voetius, the great opponents to the Remonstrants in Holland; Twisse, the prolocutor of the Westminster Assembly. Œcumenical Calvinism ranged itself explicitly as Infralapsarian in the Canons of the Synod of Dort (1619), and with less explicitness but no less reality, in the Westminster Confession (1644–47). The difference between the two views is, however, almost entirely a logical one, and has little or no theological importance. (See Twisse, *The Riches of God's Love*, etc., p. 35; Cunningham, *The Reformers*, etc., pp. 359–362; Dabney, *Syllabus on Systematic Theology*, p. 233.) On the other hand, a departure from typical Calvinism was proposed by the school of Saumur in the first half of the seventeenth century, in the opposite direction. In the effort to conceive of the work of Christ as having equal reference to all men indiscriminately, they proposed to place the decree of election subsequent in the order of thought to that of redemption, making the "order of decrees" the following: Creation, fall, redemption by Christ, election, application of redemption by the Holy Spirit to the elect. This change is of greater theological importance, as it involves an entirely different view of the nature of the atonement from that taught by typical Calvinism. It has exercised far more influence than

Supralapsarianism; but has left the great majority of Calvinists unaffected, chiefly on account of its inability to coalesce with a truly substitutionary doctrine of the atonement.

In all its forms alike Calvinism makes God the sole arbiter of the destiny of His creatures. But in no form does it make Him the author of sin, or the condemner of man irrespective of his sin. In all forms alike man is made the author of his own sin, and sin is made the ground of his condemnation. God positively decrees grace, and thus produces all that is good. He only determines the permission of sin, and punishes it because He forbids and in every way morally discountenances it. He elects of free grace all those He purposes to save, and actually saves them, while those whom He does not elect are simply left under the operation of the law of exact justice, whatever that may be in their case. Archbishop Whately, himself an Arminian, in his essays on *Some of the Difficulties in the Writings of the Apostle Paul*, honorably admits that the apparent harshness of Calvinism lies in the *facts* of the case as admitted by all Christians. It is obvious that all who are born sin and die, that all do not believe, and that all are not saved. Calvinistic "particularism" embraces the actual results of salvation in their widest scope, and refers all to the gracious purpose and power of God, but does not restrict it one iota within the limits determined by the facts themselves.

II. *The History of Calvinism.*—The Christian doctrines of sin and grace were, like other doctrines, brought to clear definition only through controversy. The intellectual energies of the Church were at first absorbed in the realization and definition of the doctrines of God and of the Person of Christ; and it was only after four centuries of controversy had brought these doctrines to clear expression that the Church could turn its attention to the more subjective side of truth. In the meantime all the elements of the composite doctrine of man were everywhere confessed: the evil consequences of the fall and the necessity of Divine grace for salvation were as universally recognized as the freedom of the will and the complete responsibility of man for sin. But the prevalent Gnostic and Manichæan heresies, which represented sin as a necessity of nature, led necessarily to a very special emphasis being thrown upon human freedom and responsibility by the Church teachers of the time. In necessary antagonism to these fundamental heresies, the early Fathers, especially Origen and his colleagues and followers of the Alexandrian school, were led to insist in a very unqualified manner upon the independent, self-determining power of the human will, and to maintain that sin is the product of that freedom abused. They universally held that human nature was morally ruined by Adam's sin, and that it was redeemed by the blood and restored by the Spirit of Christ; but they conceived of these great principles in a crude and indefinite manner, without determining their relations to each other. But in the special attention to the defense of human self-determining power as the basis of responsibility, which all were in a manner forced to give, it was inevitable that sooner or later some one would arise who should so one-sidedly emphasize this element of the truth as consciously to deny its other hemisphere. As a general fact, the Greeks were especially distinguished for emphasizing the autocracy of the will, though without denying the need of grace. And the anthropology of the Greek Church has continued to preserve the same characteristics to the present day (Athanasius, *Expos. in Psalmos*, Ps. l. 7; *Orthodox Confession of Peter Mogilas*, 1642). On the other hand, there was, during the third century, a marked tendency in the Latin Church to more profound views as to the moral and spiritual nature and relations of man. This characteristic was developed most obviously in Tertullian of Carthage (220 A. D.), who taught the propagation (*ex traduce*) of a corrupt nature from Adam to each of his descendants; in Hilary of Poitiers (368); and in Ambrose of Milan (397), the most explicit defender in that age of the sovereignty of God and the moral impotence of man, and the immediate teacher of Augustine.

The inevitable heresiarch came at the opening of the fifth century in the person of Pelagius (Morgan), a British monk, a man of pure life, clear, practical intellect, and earnest zeal for the moral interests of human life. He was the moral author of the system which bears his name, while its intellectual constructor was Cœlestius, a youthful Roman advocate; and its most effective advocate was Julian, the deposed Bishop of Eclanum in Campania. The central and formative principle of Pelagianism was the inalienable plenary ability of man to do all that can righteously be demanded of him; from this principle it inferred that men are fully capable in their own powers to attain and maintain entire perfection of life, that they come into the world without entailment of moral weakness or sin from the past, and that they need and receive no divine aid in the sense of inward renewal and sustaining grace, to enable them to do their full duty. It was this denial of the necessity and reality of the inward operations of God's grace which most outraged Christian hearts, and Augustine lays the chief stress in the controversy on the reality of grace, and its necessity as arising out of original sin. In opposition to Pelagianism, the distinctive features of the theology of grace were developed out of the Scriptures and his own deep experience by this profound thinker, Augustine (354–430), a native of Tagaste, in Numidia, the son of a heathen father and of the sainted Monica, in turn a prodigal, unbeliever, Manichæan, Platonist, disciple of Ambrose, Christian of profound experience, preacher and teacher of transcendent genius, Bishop of Hippio Regius from 395 to 430, and the greatest theologian of all time. The result of the controversy was not doubtful. The opinions of Pelagius were universally condemned by the whole Church, Eastern and Western, at the councils held at Carthage 412 and 418 A. D., at the Council at Mileve, 416 A. D., by the popes Innocent and Zosimus, and by the Œcumenical Council held at Ephesus, 431 A. D. This rapid and universal condemnation of Pelagianism, after making all due allowance for extraneous influences, proves that, however indefinite the views of the ancient Greek Fathers may have been, nevertheless the system taught by Augustine was in all essentials the common and original faith of the Church. In the history of the entire Church to the present moment, Pelagianism has never been adopted into the public creed of any ecclesiastical body except that of the Socinians (*Racovian Catechism*, 1605), and it has prevailed practically only among Rationalists, whose Christianity was disintegrating into Deism.

But Pelagianism did not so die as to leave no "remainders" behind it. Already in Augustine's lifetime (as early as 428) we hear of a body of monastic leaders in Southern Gaul seeking a middle ground between Augustinianism and Pelagianism by admitting inherited sin and the necessity of grace, but denying that this grace is either inevitable or necessarily prevenient. John Cassian, a disciple of Chrysostom, abbot of the monastery at Marseilles, was the leader of this middle system of compromise, whose advocates were at first styled Massilians, but during the Middle Ages and at present in the Romish Church Semi-Pelagians. His most influential supporters and followers were Vincentius of Lerinum (434), Faustus, Bishop of Rhegium (475), Gennadius, and Arnobius; and his opinions prevailed in France for a long time, and were confirmed by the provincial synods of Arles (472) and of Lyons (475). Against this party Augustine wrote his great works *De Prædestinatione Sanctorum* and *De Dono Perseverantiæ*, and he was ably represented by Prosper and Hilarius, and the unknown author of the great work *De Vocatione Omnium Gentium*, ascribed to Pope Leo I. (461); by Avitus, Archbishop of Vienna (490–523); Cæsarius, Archbishop of Arles (502–542); and by Fulgentius of Ruspe (1533). Semi-Pelagianism was condemned by the decree of Pope Gelasius (496), and finally in the synods of Orange and Valence (529), which were confirmed by the edict of Pope Boniface (530); from which time a modified and softened form of Augustianism became the recognized orthodoxy of the Western Church. It was taught by Gregory the Great, and held by the Emperor Charlemagne, the two persons who exerted the greatest influence in the reconstruction of Europe at the commencement of the Middle Ages. It was held throughout those ages by all the greatest Church teachers and ornaments, as the Venerable Bede (673–735), Alcuin (804), and Claudius of Turin (839). The history of the persecution and condemnation of Gottschalk, under the influence of Rabanus Maurus and Hinckmar, with which Scotus Erigena was involved (about 850), show, however, how deeply the ever-increasing Semi-Pelagian leaven was affecting the whole Church. All the most illustrious teachers of the scholastic age, making allowance for the extravagance of many of their speculations, preserved, however, more or less of the tone of Augustinian thought, as, for example, Anselm, Archbishop of Canterbury (910); St. Bernard, Bishop of Clairvaux (1140); Peter Lombard, *Magister Sententiarum*; Hugo de St. Victor; and, above all, Thomas Aquinas, *Doctor Angelicus* (1247); and Thomas Bradwardine, Archbishop of Canterbury (1348).

Thomas Aquinas fairly represents the result of the driftage of the Augustinian orthodoxy toward Semi-Pelagianism: his system is almost exactly intermediate between these two great types—with the one he affirmed that man since the fall had lost all ability to anything spiritually good, and without grace he could do nothing acceptable to God or which secured salvation; while with the other he represented original sin as rather a languor and a disease, and affirmed the power of fallen man to co-operate with grace. The distinctive point of Semi-Pelagianism is the denial of prevenient grace; the distinctive point of Thomism is the denial of "irresistible" grace—i. e. of prevenient grace conceived of as a *creative* energy of God. The Dominicans as a class followed Aquinas, while the Franciscans followed their champion, Duns Scotus (1265), *Doctor Subtilis*, and in that age the ablest advocate of pure Semi-Pelagianism.

The controversies then revived have continued to agitate the Romish Church up to the present time. The Council of Trent (1546) attempted to satisfy both parties by indefinite decrees, and accordingly both Augustinians and Semi-Pelagians, Thomists and Scotists, have claimed that their respective views were sanctioned. The Jesuit society, whose doctrines and casuistry were ventilated in the *Provincial Letters* of Pascal, has always advocated Semi-Pelagianism. The illustrious thinkers of Port Royal, Paris, called Jansenists from Jansenius, Bishop of Ypres (Tillemont, Arnauld, Nicole, Pascal, Quesnel, etc.), were at the same time devout Catholics, and in the matters of grace and predestination earnest Augustinians. They were persecuted by the Jesuits, and finally outlawed by the bulls of Popes Innocent X. and Alexander VII. (1653 and 1656 A. D.), and of Clement XI. (1713). The present pope, Leo XIII., has thrown the weight of his influence for Thomism, which indeed is as nearly as may be the doctrine of the decrees of Trent. This may be held, therefore, to be the formal doctrine of the Church of Rome.

The great evangelical teachers and forerunners of the Reformers in the century immediately preceding the Reformation were prevailingly decided Augustinians (Neander's *Hist. Doc.*, vol. ii., p. 609). This is most conspicuously true of Wickliffe (1384), Jerome of Prague, John Huss (1415), John of Goch (1475), John of Wesalia, Jerome Savonarola, a Dominican (1498), John Wessel (1499), "the Light of the World," and his disciple, the great Grecian, John Reuchlin, in his turn the teacher of Melanchthon, and Staupitz, vicar-general of the Augustines and the spiritual teacher of Luther.

The Reformation was in all its leaders and in all its centers as much a reaction from the growing Semi-Pelagianism as from the tyranny of the Papal Church. Zwingle of Switzerland, Luther of Germany, Calvin of France, Cranmer of England, and Knox of Scotland, although each movement was self-originated and different from the others in many permanent characteristics, were alike strictly Augustinian in doctrinal position. So that the Reformation was before everything else a great Augustinian revival—the forerunner in this of nearly all the great revivals which have refreshed the Church since. Melanchthon, in the earliest editions of his *Loci Communes* (1521), took extreme ground as to the moral impotence of the human will and absolute predestination, which, however, he gradually and radically modified in subsequent editions, until he finally assumed synergistic ground. The personal followers of Melanchthon excited the strong opposition of the stricter Lutherans, and the struggle came to an explosion in the Weimar Confutation (1558). The result was that grandest monument of Lutheran symbolism, the *Formula Concordiæ* (1580). This symbol sought to find a middle ground on the matter of predestination by teaching absolute predestination unto life (election), but denying predestination unto death (preterition): thus making the single predestination, as distinguished from the *prædestinatio duplex* of Augustinianism, confessional orthodoxy in the Lutheran Church. (See C. Hodge, *Syst. Theol.*, ii., 721, *seq.*; Francis Pieper, *Lehre und Wehre*, 36. 3.) In this illogical position the theologians of the Lutheran Church could not remain, and therefore, since Gerhard († 1637), they have cast off all remainders of Augustinianism and teach that predestination is based on foresight. A reaction led by a great theologian, C. F. W. Walther († 1887), has in our own day led the large Lutheran "Synodical Conference of America" (commonly called the "Missourians") back to the position of the *Formula Concordiæ*. In most other respects, as to the guilt, pollution, and helplessness of the condition into which all children are born, as to justification, and the necessity and the efficacy of regenerating and sanctifying grace, the *Formula Concordiæ* and Lutheran orthodoxy are at one with Calvinism.

By far the greatest of the Reformers, viewed either as a theologian, an interpreter of Scripture, as a social organizer and founder of churches and republics, was John Calvin. His *Institutes* (1530), written when he was twenty-seven years old, the greatest work of systematic divinity the world has seen, has recast Augustinianism in its final Protestant form, and handed it over to the modern world stamped with its great author's name. His *Commentaries* are acknowledged by the most advanced modern scholars of every school to be the ablest exegetical work achieved in his generation. His *Tractatus* consist of various controversial treatises in defense of the truth, and his *Epistolæ* consist of his voluminous correspondence with princes, nobles, and commoners, statesmen and churchmen in every part of the Protestant world, concerning the important movements then revolutionizing Europe, both in Church and state. By him Calvinism and its correlates, Presbyterianism in the Church and republicanism in the state, were not invented, but advocated and disseminated with transcendent ability and success. His doctrines have been most consistently developed and illustrated in the writings of such men as Bullinger, Martin Bucer, Theodore Beza, Diodati, Heidegger, Turretin, Witsius, Vitringa, Markius, De Moor, Pictet, John Owen, and Jonathan Edwards; in the deliverances of the international Synod of Dort (1618–19), of the national Assembly of Westminster (1648), of the French synods of Charenton and Alez, and in such creeds and confessions of the Church as the following: The Creed of the Waldensian pastors at Angrogne (1532), the two Helvetic, the Gallic, Belgic, and Scotch Confessions, the Thirty-nine Articles of the Church of England, the Lambeth Articles (1595), the Articles of Religion of the Dublin Convocation (1615), the Heidelberg Catechism, the Savoy Confession of the English (1658), and the Boston Confession (1680) of the American Independents. Calvinism is professed by all those Protestants of Germany who embrace the Heidelberg Catechism, the national (Protestant) churches of France, Switzerland, Holland, England, and Scotland, together with most of the Free Churches which have grown up in these lands, and the Reformed Churches of Hungary and Bohemia, the Independents and Baptists of England and America, as well as the various branches of the Presbyterian Church in England, Ireland, and America.

From the time of Archbishop Laud (1644) a large proportion of the clergy and influential writers of the Episcopal Churches have been Arminian, and it has even been disputed whether the Church of England was originally Calvinistic or not. The fact that the founders and leading ministers of that Church were thorough Calvinists during the first hundred years of its history, and that its creed (the "Thirty-nine Articles") remains such to this day, is as certain and as conspicuous as any other fact in history. The seventeenth article, "On Predestination," corresponds in spirit, design, and expression with all the other Calvinistic creeds. Tyndal, Frith, Barnes, who suffered under Henry VIII.; Hooper, Latimer, Ridley, who suffered under Mary; Cranmer, the real author, and Jewel, who gave the finishing touch to the Thirty-nine Articles, were all Calvinists. "The same is proved by the whole history of the proceedings connected with the Lambeth Articles, the cases of Baro and Barret (1595), the Irish Articles (1615), and the Synod of Dort (1619)." (*Cunningham.*) The sources of information, and the arguments on both sides of this controversy, may be found in the *Works of the Parker Society*, Richmond's *Fathers of the English Church*, the *Zurich Letters*, the works of Heylin, Winchester, Daubeny, Tomline, and Lawrence on the Arminian side, and the works of Prynne, Hickman, Toplady, Overton, Goode, Principal Cunningham, and Alex. F. Mitchell on the Calvinistic side.

Over this vast area of time, and under all these various conditions of national and ecclesiastical life, Calvinism preserves its essential identity as a system of theological principles. It has, of course, undergone within these limits very various modifications as to details of structure and modes of statement. In Germany it has been rendered less thorough and definite through the influence of the compromising school of Melanchthon, and more lately under the modern tendencies brought in by Schleiermacher. In Holland, England, and Scotland it has been modified in form by the "Federal Scheme" introduced by the West-

minster divines (1650) and the Dutch school of Cocceins. In France it was temporarily modified by the *Universalismus Hypotheticus*, or the universal impetration and limited application of redemption (1642), as held by Amyraldus, Daillé, and Placens on the Continent, and by Baxter, Davenant, and in modern times by Wardlaw and others, in England. In America it has been coerced through more radical and more transient transformations in the speculations of Hopkins, the younger Edwards, Emmons, N. W. Taylor, and others of the New England school. But its vitality is ever exhibited by its power to take upon it various forms, and to live through periods of depression, and to enter the hearts of men as a power and new life after long epochs of religious death. It was the inherent power of Calvinism which revived religious life in Switzerland in the early part of this century, in the humble teaching of Haldane and the powerful preaching of Malan, Gaussen, Merle d'Aubigny, and other colaborers. And our own days have seen a new exhibition of its power to awake to new life in Holland, through the steady testimony of the Christian Reformed Church and the great leadership of Dr. Kuyper. The history of Calvinism exhibits it not merely as a system with great inherent vitality, but as the system of truth in which abides the springs of religious life.

III. *The Practical Effects of Calvinism on Personal Moral Character, and upon the Social and Political Interests of Men.*—From the time of Cœlestius and Julian, in the fifth century, to that of Heylin (1659) and Tomline (1811), the *a priori* objection has been brought against Calvinism that its principles should lead either to licentious liberty or to abject subserviency, to discouragement in the use of means, and to undue disparagement and neglect of human reason. It is argued that the doctrine of the absolute moral impotence of man's will should destroy all sense of accountability, and that the doctrine of absolute decrees should cause the use of means to appear either unnecessary or ineffectual, and lead to despair upon the one hand or to licentiousness upon the other.

But the moral character of Calvinism is abundantly vindicated in two ways: 1. On the ground of reason. The recognition of the true (i. e. actual) condition of man's nature and relations to God, as this is revealed in Scripture and experience, must be more moral in its effect than the most skillful misrepresentation possible of that actual condition can be. The historian Froude, himself held by no trammels of sect or party, says in his well-known address at St. Andrews (1871): "If Arminianism most commends itself to our feelings, Calvinism is nearer to the facts, however harsh or forbidding those facts may seem." Archbishop Whately, himself an Arminian (in his essay on *Some of the Difficulties in the Writings of St. Paul*), acknowledges that the ordinary objections against the moral attributes of Calvinism are in effect objections to the open *facts* of the case. That standard of morals which places the ground of obligation in the supreme will of the All-perfect, instead of in a tendency to promote happiness, and which utterly condemns fallen man, is obviously higher, and therefore more moral, than a more self-pleasing one which either justifies or excuses him. The system which teaches the total depravity and guiltiness of human nature from birth, its absolute dependence upon Divine grace, together with the universal sweep of God's absolute decrees, at once maintaining the free agency of man and the infallibility of the Divine purpose, must of course empty man of self, make all men equal before the law, and exalt the all-wise and all-powerful Father to the control of all events; such a system must make the highest attainments the condition and the fruit of God's favor, and must raise even the weakest believer to the position of an invincible champion for God and the right, "a coworker together with God." 2. In the second place, Calvinists claim that on the ground of an illustrious and unparalleled historical record they can show that their system has been eminently distinguished by the effects produced by it upon all the communities which have embraced it in its purer forms, as to the following particulars: (*a*) the general standard of moral character practically realized in personal and social life; (*b*) the amount of rationally regulated liberty realized both in Church and state; (*c*) the standard of popular intelligence and education actually attained; (*d*) the testimony yielded to the power of the truth by the number and illustrious character of its martyrs; and (*e*) the zeal and devotion expressed in sustained missionary efforts for the extension of the kingdom of Christ.

1. As to the influence of Calvinism on the moral character of individuals, it is only necessary here to quote Mr. Froude's citation of the names of "William the Silent, Luther, Calvin, Knox, Andrew Melville, the regent Murray, Coligny, Cromwell, Milton, John Bunyan—men possessed of all the qualities which give nobility and grandeur to human nature." As to its effect upon the general moral character of communities, it will be sufficient to cite the Waldenses; the little radiant state of Geneva, whose Protestant reconstruction began with the establishment of a Court of Morals; the Huguenots as compared with their Catholic fellow-citizens; the Jansenists as compared with the Jesuits; the Dutch Protestants of their heroic period; the Scotch Covenanters; the English Puritans, whose very name signalizes their eminent moral character, in contrast with the corruption brought in at the Restoration (see Macaulay's *Essays on Milton* and Hallam's *Constitutional History*); and finally, all those sections of America settled by English Puritan New Englanders, by the Scotch and Scotch-Irish, and by Presbyterians from France and Holland. Mr. Froude (*Address*, p. 7) says: "The first symptom of its operation, wherever it established itself, was to obliterate the distinction between sins and crimes, and to make the moral law the rule for states as well as persons." Pascal, the sublime avenger of the persecuted religionists of Port Royal, shows in the first nine of his *Provincial Letters* the connection between the infamous morality of the Jesuits and their Semi-Pelagian views as to sin and grace. Sir James Mackintosh, in vol. xxxvi. of the *Edinburgh Review*, vindicates at length the morality of the theological doctrine of predestination by a general review of the history of its most conspicuous professors.

2. It appears superfluous to prove the tendency of Calvinism to promote freedom and popular government, both in Church and state. Its principles strip the ministry of all sacerdotal powers; they make all men and all Christians equal before God; they make God absolute and supreme over all, and the immediate controller and disposer of human affairs. Hence all Churches accepting Calvinism, unless prevented by external conditions, have immediately adopted popular constitutions, either Presbyterian or Independent. This is true of all the Churches of Switzerland, France, Holland, the Palatinate, Scotland, America, and the Free Churches of England and Ireland. The apparent exception is the English Establishment. The history of its political relations explains its prelatical character. Cranmer and the other Calvinistic founders of that Church held, as did Archbishop Usher, a very moderate theory of the episcopate, and submitted to the constitution actually established only for state reasons. Afterward, as Calvinism became more thoroughly incorporated in the public faith, Presbyterianism was established by the Long Parliament, and Independency by the Puritan army and Protector. It is a conspicuous fact of English history that high views as to the prerogatives of the ministry have always antagonized Calvinistic doctrine.

The political influence of Calvinism was at an early period discerned by kings as well as by the people. The Waldenses were the freemen of the ante-Reformation period. The republic was established at the same time with Presbytery at Geneva. The Hollanders, grouped around the sublime figure of William the Silent (*Calvus et Calvinista*), performed deeds of heroism against odds of tyranny unparalleled in all foregoing and subsequent history. This battle was fought by Calvinistic Holland, and the victory won (1590) completely, before the Arminian controversies had commenced. Add to these the French Huguenots, the Scotch Covenanters, the English Puritans in the Old and in the New World, and we make good our claim that Calvinists have been successful champions of regulated freedom among men.

Bancroft, the historian of the U. S., attributes the modern impulse to republican liberty to the little republic of Geneva and to its Calvinistic theology (vol. i., 266; ii., 461–464). He credits the molding of the institutions of North America chiefly to New England Independents, and to Dutch, French, and Scotch-Irish Presbyterians. "The Mecklenburg Declaration, signed on May 20, 1775, more than a year before that of July 4, 1776, signed in Philadelphia, was the first voice publicly raised for American independence. And the convention by which it was adopted and signed consisted of twenty-seven delegates, nine of whom, including the president and secretary, were ruling elders, and one, Rev. H. J. Balch, was a Presbyterian minister." Tucker, in his *Life of Jefferson*, says: "Every one must be persuaded that one of these papers must have been borrowed from the other"; and

Bancroft has made it certain that the Declaration of Jefferson was written a year after that of Mecklenburg. The correspondence between the representative system and the gradations of sessions, presbyteries, provincial synods, and national general assemblies, developed in the Presbyterian system, to the federal system of State and national governments in the Constitution of the U. S., seems too remarkable to have been accidental.

3. The relation of Calvinism to education is no less conspicuous and illustrious. The little republic of Geneva became the sun of the European world. The Calvinists of France, in spite of all their embarrassments, immediately founded and sustained three illustrious theological schools at Montauban, Saumur, and Sedan. The Huguenots so far surpassed their fellow-countrymen in intelligence and skill that their banishment, on the occasion of the Revocation of the Edict of Nantes (1685) quickened the manufactures and trades of Germany, England, and America, and for a time almost paralyzed the skilled industries of France. (See Weiss's *History of French Protestant Refugees*.) The fragment of marshy seacoast constituting Holland became the commercial focus of the world, one of the most powerful communities in the society of nations, and the mother of flourishing colonies in both hemispheres. The peasantry of Scotland has been raised far above that of any other European nation by the universal education afforded by her parish schools. The common-school system of Puritan New England is opening up a new era of human history. In this country, for the first two hundred years of its history, "almost every college and seminary of learning, and almost every academy and common school even, which existed, had been built up and sustained by Calvinists." See *New Englander*, Oct., 1845.

4. The martyrology of Calvinism is pre-eminent in the history even of the Church. We call to witness John Huss and Jerome of Prague, who perished for their adherence to this faith one hundred years before Luther. The Waldenses, of whom were the "slaughtered saints whose bones lie scattered on the Alpine mountains cold," the victims of the reign of "Bloody Mary," John Rogers, and Bishops Hooper, Ferrar, Ridley, Latimer, and Cranmer, and their fellow-martyrs, were all Calvinists; as well as Hamilton and Wishart, the victims of Claverhouse and the "Killing Time" of 1684 in Scotland, and the victims of the High Commission and of the "Bloody Assizes" of England (1685). Under Charles V. and Philip of Spain, Holland had been made a spectacle to all nations by her sufferings, and had surpassed all other Christian communities with the number and steadfastness of her martyrs. When the Duke of Alva left the Netherlands, Dec., 1573, he boasted that within five years he had delivered 18,600 heretics to the executioner. (Motley's *Rise of the Dutch Republic*, vol. ii., p. 497.) Moreover, Calvinists claim the victims of the Inquisition in Spain and Italy; the history of the Huguenots of France, from the martyrdom of Leclerc (1523) to the promulgation of the Edict of Nantes, 1598; the victims of the unparalleled atrocity of the massacre of St. Bartholomew, Aug. 22, 1572, when some 20,000 princes, noblemen, and commoners perished at one time by the hand of assassins; and all the hundreds of thousands of the very flower of France who fell victims either to the wars which raged with comparatively short exceptions from the Reformation to 1685, or to the dragoonings, the galleys, and the expatriation which preceded and followed that dreadful time.

5. Calvinism has been proved an eminent incentive to all missionary enterprises, domestic and foreign. It is of course acknowledged that several Christian bodies not characterized by what are generally regarded as the peculiarities of Calvinism have been in the highest degree distinguished by missionary zeal and efficiency. The most remarkable instances of this kind have been the Nestorians in Western and Central Asia from the fifth to the ninth century, the Moravians from 1732, and the Wesleyan Methodists from about 1769 to the present time. In the early Church, St. Patrick, the missionary of Ireland, fifth century; Augustine, the missionary of Gregory the Great to England; and Columba and his missionary college at Iona in the Hebrides, and his disciples the Culdees, in the sixth century, as well as the Lollards, the followers of Wickliffe, in the fourteenth century, were all of the general school of Augustine. In 1555, through Admiral Coligny, Calvin sent two ministers to the heathen in Brazil. Cromwell in the next century proposed to appoint a council to promote the Protestant religion, in opposition to the congregation *De Propaganda Fide* in Rome. One of the principal objects of the promoters of the Plymouth and Massachusetts colonies was the conversion of savages and the extension of the Church. The charter of the Society for the Propagation of the Gospel in Foreign Parts was granted by the Calvinistic prince, William III. It is to the Calvinistic Baptists that the impulse to modern Protestant missions is to be traced, and the Calvinistic Churches are to-day behind none in their zeal for a success in missionary work.

IV. Literature.—1. H. A. Niemeyer, *Collectio Confessionum in Ecclesiis Reformatis Publicatarum* (Lipsiae, 1840); Philip Schaff, *Creeds of Christendom* (3 vols., New York, 1877): George Benedict Winer, *Comparative View of the Doctrines and Confessions of the Various Communities of Christendom*, translated and edited by W. B. Pope (Edinburgh, 1873); A. A. Hodge, *A Commentary on the Westminster Confession of Faith* (Philadelphia, 1869); John Macpherson, *The Westminster Confession of Faith* (Edinburgh, 1881); A. A. Hodge and J. A. Hodge, *The Theology of the Shorter Catechism* (New York, 1888).

2. *Augustini Opera Omnia*, Benedictine edition (Paris, 1836–39); Aurelius Augustine, works of, a new translation, edited by Marcus Dods, 15 vols. (Edinburgh, 1871–76. American ed., New York, 1886–88, edited by Philip Schaff, 8 vols.); Bright, *Select Anti-Pelagian Treatises of St. Augustine* (London, 1880); Warfield, *Augustin's Anti-Pelagian Treatises* (vol. v. of American ed. of works of Augustine, above), with full introduction (New York, 1887); Wiggers, *Historical Presentation of Augustinianism and Pelagianism*, translated by Ralph Emerson (Andover, 1846); Mozley, *The Augustinian Doctrine of Predestination* (London, 1855).

3. *Joannis Calvini Opera Omnia*, edn. Baum, Cunitz, and Reuss (Brunswick, 1863——); John Calvin, *The Works of*, translated and published by the Calvin Translation Society (51 vols., Edinburgh, 1844–56); *Joannis Calvini Institutio Christianæ Religionis*, edited by Tholuck (Berlin, 1846); John Calvin, *The Institution of the Christian Religion* (Philadelphia); Cunningham, *The Reformers and the Theology of the Reformation* (Edinburgh, 1862).

4. Cornelius Jansen, *Augustinus, s., doctrina Augustini* (3 vols., Paris, 1641); Moses Amyraldus, *De Prædestinatione*, Saumur, 1658; Bernadini De Moor, *Commentarius Perpetuus in Joh. Marckii Compendium Th. Chr.* (7 vols., Leyden, 1761–64); Francisci Turretini *Institutio Theologiæ Elencticæ* (7 vols., Geneva, 1679); J. H. Heidegger, *Corpus Theologiæ Christianæ* (Tiguri, 1700); Herman Witsius, *The Economy of the Covenant between God and Man* (2 vols., London, 1840); John Owen, *Works*, ed. by W. H. Goold (16 vols., Edinburgh and New York, 1853); John Howe, *Works* (New York, 1835); Jonathan Edwards, *Works* (10 vols., New York, 1829); Charles Hodge, *Systematic Theology* (3 vols., New York, 1872); W. G. T. Shedd, *Dogmatic Theology* (2 vols., New York, 1888); H. B. Smith, *System of Christian Theology*, (New York, 1886); R. L. Dabney, *Syllabus* (1885); A. H. Strong, *Systematic Theology* (New York, 1889, 2d ed.); also Heppe, Schweizer, and Scholten, as given above.

5. Pascal, *Provincial Letters*, translated by Thos. McCrie, D. D.; William Ames, *Anti-Synodalia* (1629); J. Triglandius, *Refutatio apol. Remonstratium* (1664); S. Rutherford, *Examen Arminianismi* (Utrecht, 1668); Amyraldus, *Fidei contra errores Arminianism. Declaratio* (Saumur, 1646); Toplady, *Historic Proof of the Doctrinal Calvinism of the Church of England* (London, 1827); Goode, *Vindication and Defense of the XXXIX. Articles*; Dickinson, *The Scripture Doctrine concerning some Important Parts of Christian Faith* (Boston, 1741); Girardeau, *Calvinism and Evangelical Arminianism Compared* (New York, 1890).

6. E. P. Humphrey, *Our Theology and its Development* (Philadelphia); *New Englander*, Oct., 1845, art. *Comparative Influence of Calvinism and Arminianism on Civil Liberty*; W. M. Paxton, *The Mission of the Presbyterian Church* (New York, 1880); James Anthony Froude, *Calvinism* (London and New York, 1871); A. Kuyper, *Calvinism and Confessional Revision*, art. in *Presbyterian and Reformed Review*, July, 1891; also much relative matter in such histories as Motley's *Dutch Republic*, and succeeding periods; Bancroft's *History of the United States*; Douglas Campbell's *The Puritans in Holland, England, and America*, etc. See Arminianism.

Revised by B. B. Warfield.

Calvinis'tic Methodists: a body of Methodists in Great Britain which originated in a difference between Whitefield and Wesley respecting Calvinistic doctrines, and is in three divisions: (1) "Lady Huntingdon's Connection," dat-

ing from 1748; (2) "Whitefield's Connection," dating from 1741; (3) "Welsh Methodists," from about 1750. See the articles on those denominations.

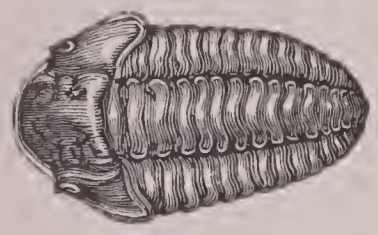
Cal'vus, Gaius Licinius Macer: a Roman orator and poet; b. in 82, d. in 47 B. C. In oratory he was an Atticist; in poetry he followed the Alexandrians, being a kindred spirit with Catullus. Only short fragments are extant. He was of diminutive stature, and feeble in body.

Calycan'thus [Gr. κάλυξ, husk, pod, bud (used here, however, in sense of cup; cf. s. v. *calyx*) + ἄνθος, flower; the bottom of the flower being cup-shaped]: a genus of plants of the family *Calycanthaceæ*; allied to *Ranunculaceæ*. It comprises only a few known species, which are natives of the U. S. and Japan, and are shrubs with square stems. The flowers, bark, and leaves are fragrant and aromatic. The *Calycanthus floridus*, a native of Carolina, called Carolina allspice and sweet-scented shrub, is cultivated in many gardens of the U. S. Its flowers are of a lurid purple or rich-brown color.

Cal'ydon (in Gr. Καλυδών): an ancient and celebrated city of Ætolia; on the river Evenus, a few miles from its entrance into the sea. It is often mentioned by Homer, and continued to be an important city in the historical period.

Calydo'nian Hunt, The: in classic mythology, was a celebrated enterprise against a wild boar which ravaged the dominions of Œneus, King of Calydon. Among the heroes who took part in this hunt were Meleager, Theseus, Jason, Nestor, and the heroine Atalanta, who drew the first blood.

Calym'ene: a genus of trilobites. A species of this genus, *Calymene blumenbachii*, described by Brongniart, is one of the most characteristic fossils of the upper Silurian formations in Europe. Its beauty and abundance led to its receiving a common name, "Dudley locust," suggested by its resemblance to the wingless body of a locust. A closely allied species (*C. senaria*) is found in the Niagara group of America. H. S. Williams.



Calymene blumenbachii.

Calyp'so (in Gr. Καλυψώ): a beautiful nymph and demi-goddess of classic mythology; according to Homer, a daughter of Atlas. She reigned over the island of Ogygia, on which Ulysses landed after he had been shipwrecked. She treated him kindly, and tempted him to marry her with the promise of immortality, which he declined for the sake of Penelope. But she detained him by her arts seven years, bore him two sons, and died of grief at his going away.

Calyp'so borea'lis: a rare and beautiful plant of the family *Orchidaceæ*; growing in cold bogs and wet woods of the Northern U. S. and Canada. The flower is variegated with purple, pink, and yellow. It has a single, nearly heart-shaped leaf.

Calyp'tra [Gr. καλύπτρα, veil, deriv. of καλύπτειν, cover]: the hood which covers the urnlike spore-case of certain mosses. It is the old archegone wall, enlarged, dried, and more or less ruptured.

Calyptræ'a [Gr. καλύπτρα, envelope, cover]: a genus of gasteropod molluscs comprising the forms commonly known as the bonnet-limpets. They resemble the true limpets (*Patellidæ*) in their habits and in the flattened wide-mouthed shells, but there are important structural differences, and hence the bonnet-limpets are placed in a separate group, the *Monotocardia*. (See Gasteropoda.) The shell is a flattened cone with a slight spiral, while on the inside is a small fold. About 12 living species and 30 fossil forms are known. Allied to the bonnet-limpets are the slipper-limpets (*Crepidula*), in which the shell is decidedly slipper-shaped. J. S. K.

Ca'lyx, plu. **Cal'yces** [Gr. κάλυξ, cover, husk, pod, bud, from same root as Lat. *occu'lere*, Germ. *hehlen*, hide. Being adopted into Lat. as *calyx*, it met there *calix*, cup (: Gr. κύλιξ). The blending of the two words in Late Lat. accounts for the modern use of *calyx* in the meaning of cup, flower-cup]: in botany, the flower-cup, or outermost of the proper floral envelopes, or of the circles of modified leaves which surround the organs of reproduction, and along with them constitute the flower. The leaves or separate parts of the calyx are called *sepals*. They are generally green, but in some cases are richly colored and *petaloid*, as in the *Mirabilis*, *Salvia splendens*, and *Fuchsia*. The calyx serves to protect the interior organs of the flower. If it falls off before the corolla, it is called *caducous*, and if it remains until the fruit is ripe it is called *persistent*. When the calyx is adherent to the sides of the ovary it is *superior*, and when quite free from the sides of the ovary it is *inferior*.

Cam, or **Granta**: a river of England; rises in Essex; flows northeastward through Cambridgeshire; enters the Ouse 3½ miles above Ely. Length about 40 miles. It is navigable from its mouth to Cambridge, which derives its name from it. The Cam is considered as a classic stream, on account of its associations with Cambridge University.

Cam [also spelled *camb*; loan-word from Fr. *came* or Dutch *kam*, cognate with Eng. *comb*, Germ. *Kamm* < Teuton, **kambas*, toothed implement; Gr. γόμφος, peg, tooth, Skr. *jambha-s*, same]: in machinery, a contrivance for converting a uniform rotary motion into a varied rectilinear motion. The end of a rod which is free to move only in the direction of its length is held in contact, by the action of a spring or weight, with the edge of an irregularly shaped mass which revolves uniformly upon an axis. A varied motion is thus communicated to the rod, which carries with it the machinery by which the motion is to be applied.

Cam, Diogo: a Portuguese navigator of noble ancestry; lived in the last half of the fifteenth century; and carried on under Alphonso V. the discoveries commenced by Prince Henry in Western Africa. He doubled Capes Gonçalvez and Catharina, and, having acquired great influence over the King of Congo, prepared the way in that country for Christianity. Cam was accompanied on his first voyage (1484) by Martin Behaim, the astronomer and cosmographer, and afterward explored as far as 22° S. lat.

Camaïeu: See Camayeu.

Camalduleu'sians, or **Camal'dolites**: an order of monks founded in 1012 by St. Romuald at Camaldoli, in the Apennines, about 30 miles from Florence. They are divided into two classes—Cænobites and Eremites—and follow the rule of St. Benedict. There are also a few houses of Camaldolite nuns, founded in 1086. The order was primarily noted for its extreme severity, but was after Romuald's death relaxed. It was injured by interior dissensions, and is now well-nigh extinct. The habit was white.

Camanche Indians: See Shoshonean Indians.

Camargue, kăă'maarg', **La**: a populous island of France; department of Bouches-du-Rhône; at the mouth of the Rhône, and inclosed on two sides by the arms of that river. It is an alluvial fertile delta, partly occupied by marshes. Area about 240 sq. miles. Large quantities of salt are obtained here.

Camaril'la [Span. dimin. of *camara*: Ital. *camera*: Fr. *chambre* < Lat. *camara*, *camera* < Gr. καμάρα]: a Spanish word (Span. pron. kăă-măă-reel'yăă), applied to the private chamber or cabinet of the King of Spain, or to his courtiers and confidential advisers, who usually had great power in the government and exerted a pernicious influence. The term is also used in other European countries and languages to denote the influence of courtiers and secret counselors, counteracting the opinions and policy of the legitimate ministers.

Camari'na: a celebrated Greek city of Sicily; on the southern coast; about 20 miles E. of Gela. It was founded by a colony of Syracusans in 599 B. C. It is said that no trace of it now exists.

Camas'sia [Latiniz. form of native Amer. name *camass*, or *quamash*]: a genus of plants of the family *Liliaceæ*; includes two species. *Camassia esculenta*, the quamash of the Nootka Indians, grows in swampy places in the U. S., W. of the Rocky Mountains, and produces bulbs which the savages use as food. *C. fraseri* occurs in the Eastern U. S.

Camayeu, or **Camaïeu**, and **Monochrome** are French terms used to denote a painting in a single color. Pictures of several tints, which do not represent the natural colors of objects, are said to be *en camayeu*. The same term may be properly applied to drawings in india ink and red chalk, as well as to engravings.

Cambacérès, kăăn'băă'sā'res', Jean Jacques Régis: Duke of Parma; French statesman and lawyer; b. at Montpellier, Oct. 18, 1753. He was elected in 1792 a member of the National Convention, in which he acted a cautious and moderate part. After the death of Robespierre (9th Ther-

midor, 1794) he was president of the committee of public safety, and opposed the continuance of the reign of terror. He became a member of the Institute about 1796. About the end of 1799 he was appointed second consul by Bonaparte, of whom he became a faithful adherent. He took a prominent part in the *rédaction* of the civil code. Under the empire he was arch-chancellor and president of the council of state, and in 1808 was entitled Duke of Parma. During the Hundred Days he was Napoleon's minister of justice. He held no office after the Restoration of 1816. D. in Paris, Mar. 5, 1824.

Cambay' (perhaps the *Camanes* of Ptolemy): a seaport-town of Hindustan; at the head of the Gulf of Cambay; 82 miles N. N. W. of Surat (see map of S. India, ref. 1–C). It is the capital of a small native state of the same name, which has an area of 350 sq. miles and a population of 86,000, chiefly Mohammedan. The city has a fine mosque, several Hindu temples, and a curious subterranean Bûddhist temple. Ruined palaces and mosques attest the former magnificence and extent of this town, which was once much more populous than it is now. One cause of its decline was the increasing shallowness of the gulf. It still exports cotton, grain, ivory, etc. Pop. 36,000.

Cambay, Gulf of: an inlet of the Arabian Sea: in the west part of Hindustan. It is about 75 miles long, and extends in a nearly N. and S. direction. The width of the entrance, which is the widest part, is 32 miles or more. It receives the rivers Nerbudda, Tapti, Mahi, and Sabbermutti. The tide here is very rapid, and rises about 30 feet.

Camber (Fr. *cambre*): a term applied by builders to the slight degree of arching which is usually given to beams or other parts of a frame in order to compensate the settlement of the various parts or the subsidence of the joints. Camber in ship-building signifies a curvature upward, or a convexity. A deck is said to be "cambered" when it is higher amidships than at the bow or stern.

Cam'bium: in botany, a supposed mucilaginous, viscid substance secreted between the liber (inner bark) and alburnum (outer wood) of exogenous (dicotyledonous) trees and other plants in early spring. There is, however, no such substance, hence the term is a misnomer. The supposed mucilaginous substance has long been known to be a layer of very thin-walled cells, which are easily ruptured. By their growth they produce on the one hand cells of the new layer of wood, and on the other of the bark. CHARLES E. BESSEY.

Cambo'dia, or **Camboja**: a country known under three different names: first, *Kampootcha*, which is given to it in the sacred books; *Youdra Skan*, the appellation by which it is best known to foreigners; and *Khamain*, the common name used among the natives themselves; a French province, lying on the middle Mekong river, with Siam on the N. and W., Annam on the E., and French Cochin-China and the Bay of Siam on the S. The country between Cambodia and Siam is an inclined plane falling off to the sea, beginning from the Khoa Dong Rêke, or the highland of Korat, which constitutes the first platform of the terraces that gradually ascend to the mountain-chain of Laos. Khoa Dong Rêke, the Cambodian Atlas, includes in its domain a magnificent and extensive forest, Dong P'hya Fai, or "the forest of the Lord of Fire," whence issue many beautiful streams to flow into the Pachim river. Its area is about 32,370 sq. miles. Its population in 1889 was estimated at 1,500,000. The religion is Buddhism, with a small but rapidly growing proportion of converts to Roman Catholicism. It is subdivided into Northern and Southern Cambodia, and the great province of Cancao on the S. E., and it teems with every species of mineral and vegetable wealth. Near the coast the country is covered with woods; a little farther inland, especially along the banks of the rivers and lakes, the land is well cultivated. But in the interior it abounds with impenetrable jungles, where elephants, lions, tigers, and wild buffaloes find shelter and afford excellent sport to the natives, who hunt them in large parties for their ivory and skins. Deer, hogs, goats, and a great many species of wild fowl abound in the forests, as well as in the more cultivated districts. The country abounds in iron, tin, precious stones, teak, sandal, and other wood, gamboge, and numerous other dyestuffs. The finest gamboge is produced by the tree *Garcinia gambogoides*. Bantabang is noted for its gold mines. Saigon annually exports quantities of pepper, rice, cardamoms, cotton, hides, horns, and cocoanut oil.

The climate is warm but wholesome, the scenery varied and beautiful; the navigation of the Gulf of Siam and the China Sea, along with such splendid rivers as the Mekong and the Saikong, magnificent forests of fine woods, endless crops of rice, Indian corn, sugar-cane, and tea, and vast plantations of mulberry trees for the rearing of silkworms, producing the finest article of silk, are some of the prospective advantages of the superb region to which Saigon is the key.

The kingdom of Cambodia was in its day not only independent, but powerful. As to its antiquity, two opinions prevail, one ascribing to it a duration of 1,300 years, the other 2,400. The native historians reckon 2,400 years from the building of the wonderful temples found in the neighborhood of Angkor, near the great lake Talasap. Angkor has even at this day sufficient proof, in its memorable ruins, that it was at some remote period the center of a wealthy, powerful, and highly civilized state. The ruins of Angkor Tom or Nakhon Wat are still in a tolerable state of preservation, and are composed of a central tower surrounded by four turrets and flanked by two other towers, all connected together by extensive galleries. At the top of the central tower are four immense heads in the Egyptian style, and every available space on these buildings is filled with exquisite sculptures in bas-relief. The scenes are drawn from the ancient mythological books of the Cambodians. There are here, also, several gigantic stone bridges of great magnitude and solidity. The bridge of Spean-Tenk is 470 feet in length.

During the reign of His Siamese Majesty Phra-Chow-Maha-Chakraphat, who reigned in Ayodhia, the ancient capital of Siam, in the Siamese civil era 900 (corresponding to 1540 of our Christian era), the Cambodians fitted out an immense army and attacked Siam, marched their forces as far as Bangnah and Phrakanong, ancient seaport-towns of Siam, which they pillaged and destroyed. The Siamese thereupon set out with a powerful army and took possession of Inthapataburee, the ancient capital of Cambodia, and remained masters of the citadel until the Emperor of Cambodia acknowledged himself penitent and willing to become tributary to Siam. During the last part of the eighteenth century dissensions among the reigning family led to weakness, and Cambodia fell under the control of the Annamites, who exacted heavy tribute, and at last, in 1809, unblushingly divided its provinces between themselves and the Siamese.

The name Cochin-China was applied to it by the Portuguese, who thought they saw a likeness in it to Cochin on the coast of Malabar. In 1471 it was reunited to the great province of Tonquin. In the sixteenth century it broke away, and in 1774, after a long and terrific war, Tonquin was reduced to submission and incorporated that fine country with the kingdom of Annam. It was about this time that European influence first began to be felt in this region. The first Christian missionary who entered the country was the Dominican monk Gaspar da Cruz, who labored there in the middle of the sixteenth century, and left some curious notes on the country. At that time not only the Portuguese, but also the Dutch and the English, had factories in the country, but their reciprocal jealousy seems to have left the Cambodian government completely independent of European influence. Meanwhile, the country was sorely pressed on one side by Siam, and on the other by Cochin-China. The Emperor of Cambodia, Chow Ngayen, felt the need of some support, and offered through a Christian missionary, who was a bishop in the country, to place himself under the protection of France. On this many French officers went to the new kingdom in the East, disciplined its armies, and took a share in the government. In 1820 the old-school Buddhists, in order to revenge the indiscriminate pillage of the French officers on the property of the simple inhabitants, instituted a ferocious persecution of the Christians. French fleets were at once sent out to demand indemnities and protect the Roman Catholic missionaries. Cambodia in 1863 agreed by treaty to a French protectorate. Its present status, however, is regulated by a convention dated June 17, 1894. The government is carried on in the name of the king, but the French resident presides over the council of state. See *Cambodia and its Races*, by G. Thomson; *Antiquities of Cambodia*, by J. Thomson; Crawfurd's *Mission to Siam and Cochin-China*; Fergusson's *History of Architecture*, vol. ii.; F. Garnier's *Excursions et Reconnaissances*, vols. viii. and xiii.; and *L'Indo-Chine Française*, by Bouinais and Paulus. Revised by M. W. HARRINGTON.

Cambon, kaăń'bōn, Joseph: statesman and financier; b. at Montpellier, France, June 17, 1754. He was elected to the National Convention in 1792; voted for the death of the king; became a member of the committee of public safety in 1793. He promoted the fall of Robespierre in 1794. As a member of the committee on finance he made several able reports, and is said to have laid the foundation of the modern financial system of France. He procured the adoption of the great book or register of the public debt. He held no office under the empire; was exiled in 1816. D. near Brussels, Feb. 15, 1820.

Cam'borne: a town of Cornwall, England; 11 miles N. W. of Falmouth (see map of England, ref. 15–B). Here is a church which has a stone inscription of the tenth century. Productive mines of copper, tin, and lead are worked in the vicinity. Pop. (1891) 14,700.

Cambray', Fr. pron. kaăń'brā' (in Lat. *Camaracum*): a fortified city of France; department of Nord; on the Scheldt; 45 miles by rail N. N. E. of St.-Quentin (see map of France, ref. 2–F); the seat of an archbishop; celebrated for its fine linens, called *cambrics*. Cambray is an ancient city, with gabled houses, handsome streets, and is surrounded by a wall with ancient towers and gates. It has manufactures of laces, tulles, leather, soap, etc. Pop. (1891) 24,122; (1896) 25,250.

Cam'bria: the ancient and Latin name of Wales, which the Romans called Britannia Secunda. Cambria is derived from *Cymry*, by which name the Welsh people have always called themselves.

Cambrian Period: the earliest division of geologic time characterized by a well-preserved fauna. The title *Cambrian* was first applied by Sedgwick to a system of rocks in North Wales (*Cambria*), and was subsequently adopted for the corresponding time division. It has had two rivals, some writers contending that the name *Taconic* should be used instead, others that the Cambrian period should not be separated from the *Silurian*. The resulting controversies, turning largely on questions of priority in the giving of names, have received attention beyond their deserts. In the U. S. rocks of this period have been found in New England, New York, thence southwestward through the Appalachian mountain-belt, in the States bordering on Lake Superior, in Missouri, in Texas, and at many points in the Cordilleran region. Although the Cambrian faunas are the oldest known, they include highly organized species, and do not exhibit the beginnings of life. Our knowledge of American Cambrian rocks is summarized by C. D. Walcott in *Bulletin No. 81, United States Geological Survey*. See Fossil Invertebrates and Geology, Historic. G. K. Gilbert.

Cam'bridge (anc. *Granta*; in Lat. *Cantabrigia*): a town of England; capital of Cambridgeshire; on both sides of the river Cam, and on the Eastern Counties Railway; 48 miles N. N. E. of London (see map of England, ref. 10–J). The site is level, and the town is embosomed among lofty trees. It is the seat of one of the great universities of England, and contains many noble edifices belonging to that institution. (See Cambridge, University of.) Among the remarkable buildings of the town are Trinity church and the Church of the Holy Sepulchre, which was built in the reign of Henry I., and has a round tower. It is said that Cambridge was destroyed by the Danes in 871 A. D. The Doomsday Book mentions it as an important place under the name of *Grentebrige*. It obtained a charter from King John in 1200. Jeremy Taylor was born here. Cambridge returns one member to Parliament, besides those who represent the university. Pop. (1891) 36,983.

Cambridge: capital of Henry co., Ill. (for location of county, see map of Illinois, ref. 3–C); on Rk. Is. and Peoria R. R., about 160 miles S. W. of Chicago. It is situated in a rich agricultural and stock-raising district, and is an important grain-market. It has excellent schools, a public library, handsome county buildings, and manufacturing establishments. Pop. (1880) 1,203; (1890) 940; (1900) 1,345.
Editor of "Chronicle."

Cambridge: town, on railroad; capital of Dorchester co., Md. (for location of county, see map of Maryland, ref. 4–F); on the south side of the Choptank river; 60 miles S. E. of Baltimore. The river is here about 2 miles wide. Cambridge is the western terminus of the Dorchester and Delaware R. R., which extends 33 miles to Seaford. It has academies for both sexes, excellent public schools, five churches, a flouring-mill, ice, phosphate, underwear, tobacco, and stave factories, and several canning establishments, and an oyster and lumber trade. Pop. (1880) 2,262; (1890) 4,192; (1900) 5,747. Editor of "Chronicle."

Cambridge: a city of Massachusetts; one of the capitals of Middlesex County (for location of county, see map of Massachusetts, ref. 2–H); is on the Fitchburg R. R., and the N. W. bank of the Charles river, which is here about a mile wide, and separates Cambridge from Boston. Cambridge, though incorporated as one city, was formerly divided into several villages, the local names of which still survive; these are Old Cambridge, Cambridgeport, East Cambridge, and North Cambridge. Harvard University is in Old Cambridge. Cambridgeport and East Cambridge contain many mercantile houses and manufactories, mostly of glass, furniture, organs, steam-engines, and boilers. East Cambridge, where the manufactories are chiefly located, is connected with Boston and Charlestown by bridges. West Boston bridge connects Cambridgeport with Boston. Extensive printing establishments exist here, and the first printing-office in America was located in Cambridge. Near Harvard University is a fine soldiers' monument, erected in 1869–70 at a cost of $35,000. The city-hall is in Cambridgeport. Cambridge is beautifully situated on a plain, contains some handsome public buildings, and a great number of elegant private residences, with spacious grounds ornamented with shrubbery and flowering plants. The city was founded in 1631 under the name of Newtown, and was much favored by the General Court, which in 1636 appropriated £400 to locate here a school which became Harvard College. Here Hooker, who founded Hartford, first lived (1633–36) in America. The city is furnished with water from Fresh Pond. In 1890 there were $20,259,747 invested in the manufactures of Cambridge, employing 14,000 persons and producing commodities valued at $35,490,389. Of these the principal industries were foundry and machine-shop products, $2,478,730; printing and publishing, $1,807,425; soap and candles, $1,303,870; musical instruments, $1,552,783; furniture, $756,740; confectionery, $684,875. Here are located the celebrated shops of the Clarks, the astronomical instrument makers. Pop. (1880) 52,669; (1890) 70,028; (1900) 91,886. See Harvard University.

Cambridge: village; Washington co., N. Y. (for location of county, see map of New York, ref. 4–K); on D. and H. R. R.; 28 miles N. E. of Albany. The village is attractively situated in a broad valley, with the Green Mountains on the E., and has excellent drainage, water-works, and electric lights, good public school, and a fine driving-park. There are here a foundry, machine-shop, tanneries, and seed-rooms. The Cambridge Valley Agricultural Society and Stock-breeders' Association have here extensive and well-equipped exhibition grounds, on which is held an annual fair, unexcelled by any other in the State. Pop. (1880) 1,482; (1890) 1,598; (1900) 1,578. Editor of "Washington County Post."

Cambridge: city; capital of Guernsey co., O. (for location of county, see map of Ohio, ref. 5–H); on Balt. and O. (Cent. O. Division), and Clev. and Mar. R. Rs.; 85 miles E. of Columbus, and 55 miles N. of Marietta; has 3 union schools, 8 churches, several mills, manufacture of roofing, and Clev. and Mar. R. R. general offices and shops, and electric lights. It is situated in a good agricultural and mining district, and is the center of an important coal-field; there are deposits of iron ore and limestone formations. There is natural gas for heating purposes. Pop. (1880) 2,883; (1890) 4,361; (1900) 8,241. Editor of "Guernsey Times."

Cambridge, George William Frederick Charles, Duke of: British general; son of Adolphus Frederick, sixth son of George III. (b. Feb. 25, 1774; d. July 8, 1850), and first cousin to Queen Victoria; b. in Hanover, Mar. 26, 1819; became a colonel in the British army in 1837, major-general in 1854; commanded two brigades in the Crimean war, 1854–56; became general in 1862, field-marshal in 1862, and was commander-in-chief of the British army from that year until Nov. 1, 1895, when he retired, and was succeeded by Field-Marshal Lord Wolseley. He was honorary colonel-in-chief to the forces and chief aide-de-camp to Queen Victoria.

Cambridge City: railroad junction; Wayne co., Ind. (for location of county, see map of Indiana, ref. 6–G); on the Whitewater river; 15 miles W. of Richmond. It has the car-shops of the Indiana Car Company and other manufactures. Pop. (1880) 2,370; (1890) 1,782; (1900) 1,754.

Cambridge Platform: a system of church government drawn up by a synod at Cambridge, in the colony of Massa-

chusetts Bay, in 1648. The Congregational churches of New England at that time differed somewhat in regard to discipline, some being inclined to Presbyterianism and others to Independency, while the majority avoided both extremes. The synod reaffirmed the doctrines taught in the Westminster Confession, but recommended a form of church discipline substantially the same as that which now prevails in the Congregational churches.

Cambridge Platonists: epithet given to Peter Sterry, the founder of the school, Ralph Cudworth, Henry More, John Smith, and Benjamin Whichcote, and their followers, who applied in the seventeenth century Platonic ideas to theology. They belonged to Emmanuel College, Cambridge, which was the Puritan college of the university. See Tulloch's *Rational Theology*, vol. ii.

Cam'bridgeshire: a county of England; bounded N. by the river Nen, E. by Norfolk and Suffolk, S. by Essex and Hertford, and W. by Bedford and Huntingdon. Area, 820 sq. miles. Pop. (1891) 188,862; (1901) 185,128. The surface is mostly flat, and about one-fourth of the county is occupied by fens or marshes. The northern portion is part of the Bedford Level (*q. v.*). The soil is fertile, and the inhabitants are mostly engaged in agriculture. Among the staple products are wheat, beans, hay, oats, butter, and cheese. It is intersected by the river Ouse, and also drained by the Cam. In the north part is a tract called the Isle of Ely. The chief towns are Cambridge, Ely, and Newmarket.

Cambridge, University of: one of the two ancient universities of England. In 1110 Joffrid, Abbot of Croyland, sent to his manor of Cottenham, near Cambridge, Gislebert, a professor in divinity, with three other learned monks. They in a short time drew together so great a number of scholars that in the second year no single building was able to contain them. When Alfred of Beverly was there, in 1129 A. D., there were no public halls, but each one lived in his own lodgings. About the year 1257 students began to live together in hostels, under a principal, at their own charges. The hostels were named after saints or the churches which they adjoined, or the persons who built them. Trinity hostel survived to 1540. The hostels were the beginning of the college system which distinguishes the universities of Oxford and Cambridge. In the year 1893 there were 17 colleges and 2 hostels, of which one was public and one private.

Before the close of the sixteenth century nearly all the foundations were endowed which now constitute the university. The predominance of the religious element in the discipline is to be attributed to the usage of the times in which the colleges were founded. There had been, from very early times, "religious houses," which were in many cases united with collegiate foundations, as, for example, the Dominicans, whose house is now Emmanuel College. The friars who lived in these convents kept their "acts" or exercises for degrees like other university men. To the same cause is traced the condition of celibacy, upon which, with scarcely an exception, the fellowships are tenable. With some exceptions, the fellows are obliged to take holy orders within a limited period or to vacate their fellowships.

A new code of statutes for the university was approved by the Queen in council in 1882. The great legislative assembly of the university is called the senate; it is composed of all those who have obtained the degree of doctor or master, and whose names are still on the register. All university laws are approved by the council, consisting of the vice-chancellor and sixteen members of the senate, before they are submitted to the senate. The executive powers are a chancellor, high steward, vice-chancellor, commissary, and assessor. There are three terms—Michaelmas, Lent, and Easter. Dissenters are not excluded from taking degrees, except in divinity.

There are four classes or orders of students—viz., fellow-commoners and noblemen, pensioners, sizars, and scholars on the foundation of their college. The first are so called from their dining at the fellows' table; they wear silk or embroidered gowns and pay heavier fees. The pensioners are the students not on the foundation, who pay for their own commons and for their chambers. The sizars are the poorer students, who are admitted at lower charges than the pensioners, but wear the same dress, and no longer perform menial offices, as they once did. St. John's and Trinity have very liberal endowments for sizars, and pecuniary assistance is given. All students coming to the university are entered in one of the above classes. The scholars are elected by examination from the pensioners and sizars; they have rooms and commons free, and other emoluments. The fellows are generally elected from the scholars. The fellowships are given to members of the college, and are not, as at Oxford, open to the whole university. Before a student can be admitted he must be sufficiently instructed in Latin, Greek, and mathematics.

When the undergraduate comes in he is called a "freshman"; in his second year, a "junior soph"; in his third year, a "senior soph." The degree of bachelor of arts requires usually nine terms, or three years of residence. The master's degree is conferred three years later. The candidates for degrees are called questionists.

The mathematical examination embraces the whole range of mathematics. The successful candidates are arranged in a tripos—i. e. in three classes, called respectively wranglers, senior optimes, and junior optimes; the first mathematician is called the senior wrangler. In the examination for classical honors the candidates are arranged in a tripos, and distinguished as first, second, and third class. The examinations for degrees are called the "great go." The previous examination, which comes in the second year of residence, is called the "little go." There is also a tripos for the natural sciences. The pecuniary value of the first place in either the classical or the mathematical tripos has been estimated at £10,000, for it secures to its possessor high social position, as well as lucrative employment. The next prizes are the fellowships, of which there are 430 tenable for life. The office of tutor is one of great honor and emolument. James I. granted to the university the privilege of sending two members to Parliament, which it has ever since enjoyed.

The following is a list of the colleges and hostels, with the dates of their foundation, etc.:

Founded.	COLLEGES.	Gross income.	Undergraduates.	Members of the senate.	Members on the books.
1473	Catharine	£5,465	59	111	206
1505	Christ's	14,721	139	349	673
1326	Clare	14,974	175	233	540
1352	Corpus Christi	8,799	100	263	464
1800	Downing	7,087	86	101	268
1584	Emmanuel	14,074	161	345	660
1348	Gonville and Caius	22,038	172	414	826
1496	Jesus	11,521	176	213	528
1441	King's	31,022	104	255	500
1519	Magdalene	4,257	62	126	230
1347	Pembroke	11,380	151	234	585
1257	Peterhouse	8,250	69	197	339
1448	Queen's	7,410	88	152	362
1595	Sidney-Sussex	7,837	58	118	241
1511	St. John's	40,713	247	1,045	1,647
1546	Trinity	77,545	614	2,201	3,681
1350	Trinity Hall	9,179	218	209	619
	HOSTELS.				
1882	Selwyn College	... ..	101	24	246
1884	Ayerst's Hostel	.....	25	6	50
1869	Non-college students	.....	107	11	210
	Members of senate not on college boards	.....	....	243	243
	Total (*Cambridge Calendar*, 1893)	.....	2,912	6,852	13,118

The Fitzwilliam Museum is the finest modern addition to the university. Viscount Fitzwilliam bequeathed in 1816 £100,000, the interest of which was to build and support a museum. He bequeathed also a valuable collection of books, paintings, etc. The university library is a fine mass of buildings of different periods, and contains at present more than 400,000 volumes and manuscripts, without reckoning those in the college libraries, some of which are very important. The geological museum contains the collection of Dr. Woodward, with recent numerous and interesting acquisitions. Besides this there are other valuable scientific museums. For full information about the university, see the *Cambridge Calendar*. Revised by C. K. Adams.

Camby'ses [Gr. Καμβύσης; in Old Persian cuneiform inscriptions, *Kabujiya*]: King of the Medes and Persians; a son of Cyrus the Great, whom he succeeded about 530 B. C. He invaded Egypt in 525; defeated Psammenitus, its king, in battle; captured Memphis, the capital of Egypt. Having completed the conquest of that country, he led an army to Ethiopia, but was compelled by famine to retire before he had conquered it. He afterward indulged in violent and capricious acts of tyranny and cruelty in Egypt, so that many believed him to be insane. Cambyses was an epileptic, but a man of strong though very cruel character. By his Egyptian subjects he was utterly detested. D. in Syria in 522 B. C. See Egypt, Ancient.

Camden: capital of Wilcox co., Ala. (for location of county, see map of Alabama, ref. 5–C); is about 4 miles S. of the Alabama river, and 80 miles S. W. of Montgomery. Pop. of Camden township (1880) 3,795; (1890) 2,624, including 545 in village; (1900) 2,139; village, 478.

Camden: railroad junction; capital of Ouachita co., Ark. (for location of county, see map of Arkansas, ref. 5–C); is on the right bank of the Washita river; 110 miles S. by W. from Little Rock. Steamboats ascend the river to this point, which is connected by navigable water with New Orleans, and for two-thirds of the year steamers ascend the river to Arkadelphia. It was once called *Écore à Fabre*. Pop. (1880) 1,503; (1890) 2,571; (1900) 2,840.

Camden: village of Knox co., Me. (for location of county, see map of Maine, ref. 9–D); on the west side of Penobscot Bay; about 8 miles N. N. E. of Rockland. It derives its support from the burning of lime, ship-building, commerce, and manufacture of cars, car-wheels, railroad spikes, and ship's furniture of various kinds. Pop., including Camden township (1880), 4,386; (1890) 4,621; (1900) 2,825.

Camden: city; an important railroad center and river-port of New Jersey; capital of Camden County (for location of county, see map of New Jersey, ref. 6–C); situated on a plain on the Delaware river opposite Philadelphia. Camden contains a court-house, municipal buildings, forty-eight churches, fine schools, including a school for manual training, several iron-foundries, and manufactories of machinery, chemicals, etc., and a large manufactory of steel pens; ship-building is an important branch of industry. Numerous steam ferry-boats connect Camden with Philadelphia. By census of 1890, $9,705,431 were invested in manufactures which employed 7,527 persons and produced goods valued at $15,041,113. Of these the principal products were textile fabrics, $2,632,774; ship-building, $1,132,820; oil-cloth, $973,500; boots and shoes, $814,402; chemicals, $797,200; lumber, $577,032. Pop. (1880) 41,659; (1890) 58,313; (1900) 75,935.

EDITOR OF "DAILY COURIER."

Camden: Oneida co., N. Y. (for location of county, see map of New York, ref. 4–H); on Rome, Wat. and Ogd. R. R., and terminus of Elmira, Cort., and Nor. R. R.; 33 miles from Utica, and 42 miles from Syracuse. There are here six churches, good schools, an academy, extensive furniture and chair factories, large knitting-mill, corn, vegetable, and fruit canning factory. It is in the center of a large agricultural section. Pop. (1880) 1,589; (1890) 1,902; (1900) 2,370.

EDITOR OF "ADVANCE-JOURNAL."

Camden: capital of Camden co., N. C. (for location of county, see map of North Carolina, ref. 2–K); 219 miles E. N. E. of Raleigh; is a port of entry on the navigable Pasquotank river. Pop. of township (1880) 1,987; (1890) 1,684; (1900) 1,453.

Camden: capital of Kershaw co., S. C. (for location of county, see map of South Carolina, ref. 5–E); is on railroad and the east bank of the navigable Wateree river; 33 miles N. E. of Columbia. It contains four academies, numerous churches, and has good water-power. The annual receipts of cotton are about 30,000 bales. Gen. Gates was defeated here Aug. 16, 1780, by Lord Cornwallis, and Apr. 25, 1781, Gen. Greene was defeated by Lord Rawdon at Hobkirk's Hill, near Camden. During the civil war this place was captured, Feb. 24, 1865, by the Federal forces under Gen. Sherman after a lively skirmish; 2,000 bales of cotton and a large quantity of tobacco were destroyed by burning. Nearly all the business portion of the town was also burned at that time. There are ancient Indian mounds near this town. Pop. (1880) 1,780; (1890) 3,533; (1900) 2,441.

EDITOR OF "JOURNAL."

Camden, MARQUESSES OF: Earls of Brecknock (United Kingdom, 1812); Earls Camden (1786); Viscounts Bayham (1836); Barons Camden (1765, Great Britain).—JOHN CHARLES PRATT; b. June 30, 1840; was member of Parliament for Brecon in 1866, and succeeded to the marquisate in the same year. D. 1872, when his infant son, John Charles Pratt, born the same year, inherited the title.

Camden, CHARLES PRATT, First Earl of: English statesman and lawyer; b. in 1713; son of a Devonshire man, Chief Justice Sir John Pratt; was called to the bar in 1738; became attorney-general about 1758; chief justice of the court of common pleas in 1762. His decision against the legality of general warrants, which he gave in the trial of John Wilkes, rendered him very popular. He received the title of Baron Camden in 1765, and was appointed Lord Chancellor, but he resigned that office in Jan., 1770. He afterward distinguished himself as a champion of constitutional liberty, and acted with Lord Chatham in opposition to the American policy of Lord North. In 1783 he became president of the council. He was created Earl Camden in 1786. D. in London, Apr. 18, 1794. "Among the names that adorn the legal profession," says Lord Brougham, "there are few which stand so high as that of Camden." On account of his liberal policy during the Revolutionary war his name became very popular in the U. S., and was given to several counties and many towns and villages.

Camden, WILLIAM: English antiquary; b. in London, May 2, 1551; graduated at Oxford. He went to London in 1571, and there was appointed second master of Westminster School in 1575. His most important work is a description of Great Britain in Latin, entitled *Britannia sive Regnorum Angliæ, Scotiæ, et Hiberniæ, ex intima Antiquitate Chorographica Descriptio* (1586; 6th ed. 1607; Eng. trans. 1610; last 1806). He published several new editions of it, enlarged and improved. Among his works is *Annals of the Reign of Elizabeth* (in Latin), highly commended by Hume. He became head master of Westminster School in 1593, but retired when made Clarenceux king of arms in 1597. His promotion to this position over the heads of all the College of Heralds led to many heart-burnings and recriminations, and embittered many years of the life of this worthy man, who has been called "the judicious Camden" and "the British Pausanias." He refused the honor of knighthood. D. in Chislehurst (afterward the scene of Louis Napoleon's death), Nov. 9, 1623, and was buried in Westminster Abbey. He endowed a professorship of history in Oxford. In his honor the CAMDEN SOCIETY (*q. v.*) was founded.

Camden Society: an association organized in 1838 in London for the purpose of publishing the MSS. of old British authors, historical documents of importance, old records, visitations, both heraldic and ecclesiastical, and other matter of antiquarian, literary, or historical interest relating to England. Some of their materials are not very ancient, but are published for their general interest. The results of their work are contained in about 160 (1893) volumes, which are, as a whole, of very great value.

Camel [from Lat. *came'lus* < Gr. κάμηλος, from the Semitic; cf. Hebr. *gāmāl*]: a common name for the two species of ruminants belonging to the genus *Camelus*, although often used in a restricted sense for the two-humped or bactrian

Bactrian camel.

camel only. Camels are characterized by having the knee free from the body, by large, soft, cushion-like feet, partially cleft and terminating in nails, and by having, according to the species, one or two humps on the back. The upper lip is divided, the nostrils are slit-like and oblique, the ears small, and eyes prominent. The neck is long and curved; legs comparatively long. There is a large callosity on the center of the breast, on which the animal rests when lying down, and the body is clad with soft brown hair, varying in thickness according to season and locality, but longest on the under side of the neck and about the knees. The single-humped camel, or DROMEDARY (*q. v.*), *Camelus dromedarius*, is found in Northern Africa, Syria, and Arabia. The two-humped or bactrian camel, *Camelus bactrianus*, ranges from the Black Sea, northward and eastward, into Siberia, Tibet, and China. Besides having two humps, it is further

distinguished from the dromedary by its slightly larger size. The wall of the first division of the camel's stomach is remarkable for the presence of numbers of large cells, like small pockets, into which water enters when the animal drinks. These cells, which, when full, may be 3 inches wide and as many deep, retain the water for some time, and constitute the "reservoir" which enables a camel to go without drinking for a considerable period. The large surface offered by the sole of the spongy foot adapts it for walking in sand, and this, coupled with the ability to endure long continued thirst, makes the camel particularly fitted for life in sandy deserts. The animal is still further able to undergo privation from the fact that it is able to subsist to some extent on the store of fat laid up in the hump. With these various adaptations it is not surprising that camels have been used as beasts of burden in arid, desert countries from time immemorial, and they are mentioned in Genesis and the book of Job. A camel will carry a load of from 500 to 1,000 lb., or for short distances somewhat more, but at a rather slow rate, from 2½ to 3 miles an hour. Some breeds of dromedaries, which are used only for riding, and are to the others what the race-horse is to the cart-horse, vastly surpass this, making as much as 75 miles in twelve hours. The gait of these animals, which is a pace, both legs on a side moving together, is extremely trying. Moreover, the camel kneels to be loaded, and its motions when rising are very violent. The popular idea of the docility of the camel is erroneous, for the animal complains bitterly when being loaded, each package added to its load calling forth fresh outcries: so far from being docile, the creature is obstinate and malicious. Its intelligence is small and its cowardice extraordinary, for the camel takes fright at any unusual sight or sound. The males are very vicious and fight savagely with one another, inflicting serious wounds with their sharp caniniform teeth. They also possess the very undesirable trait, common to the *Camelidæ*, of spitting upon persons whom they dislike. Camels have been used to a considerable extent in warfare, camel corps being attached to the British army in India, while they proved extremely valuable in the Sudan campaign. Besides being used as a beast of burden, the hair of the camel is woven into cloth, the hide is made into leather, and the dried dung used for fuel. Camels were introduced into Australia with a view to their use on the central deserts, but the experiment was only moderately successful. As early as 1701 a few were brought to Virginia, and in 1856–57 the U. S. Government imported a number with a view to their employment in Texas, Arizona, and New Mexico. They were stationed near San Antonio, Tex., and at the breaking out of the civil war were turned loose, and scattered over the country in twos and threes. In 1867 a few were captured by an enterprising ranchman and sold to showmen, and it is reported that a few are still to be found at large. Wild camels have been taken in Turkestan. See also CAMELIDÆ.

F. A. LUCAS.

Camel: a contrivance by which ships are floated over sandbars and shoals, or sunken ships are raised. A long caisson, or "camel," nearly filled with water, is fastened to each side of the ship; when the water is pumped out the caissons rise and lift the ship with them. The principle is more fully explained in the article DOCK (*q. v.*), for it is essentially the principle of all floating docks. Camels were formerly used at Nantucket and New Bedford, Mass.

Camel'idæ: a family of even-toed, ruminant mammals, containing the camels and llamas, distinguished by having the thigh largely free from the body, the canines of the lower jaw pointed and distinct from the incisors, and two pointed, canine-shaped incisors in the upper jaw. The stomach is imperfectly divided into four compartments, and the placenta is diffuse. See ALPACA, CAMEL, DROMEDARY, GUANACO, and LLAMA.

F. A. LUCAS.

Camel-insect: an insect of the genus MANTIS (*q. v.*).

Camel'lia [in honor of G. J. Kamel, D. D., a German Jesuit missionary to Luzon in the eighteenth century]: a genus of evergreen plants of the family *Ternstrœmiaceæ*, natives of China, India, and Japan; extensively cultivated in greenhouses in Europe and the U. S. for the beauty of their flowers. The most admired species is the *Camellia japonica*, a shrub which has ovate-elliptical, serrate, and shining leaves, and large, polypetalous flowers, which resemble a rose. Many others belong to *Camellia reticulata* and to hybrid varieties. In the wild state it bears red and single flowers, but the flowers of the cultivated varieties are generally double. Among their various colors are red, white, and yellow. Many of the varieties originated in China or Japan, and others have been raised by European and American florists. New varieties of them are annually produced. The value of the camellia is increased by the fact that it flowers in autumn and winter. The single camellia is propagated by seed, and the cultivated or double varieties by grafting, cuttings or layers. The proper soil for these is a loose, black mould. They should be protected from frost and liberally supplied with water, but are liable to be injured with an excess of moisture. It is important that they should receive a free access of fresh air and light. *C. oleifera* and *C. sasanqua* are cultivated in China for their seeds, which yield an oil similar to olive oil. Some writers refer all the camellias to the genus *Thea*, of which *T. sinensis*, the tea-plant, is the type.

Camelopard: See GIRAFFE.

Camelopardalis (the GIRAFFE): a constellation near the celestial pole. It contains only sparsely scattered stars. It is situated between Cassiopeia, Perseus, Ursa Major, etc. It was added by Hevelius to the list of constellations.

Camel's Hair is used by the Arabs and Persians, who weave it into stuff for tents and clothing. A fine quality of camel's hair is imported from Persia, and is used to make pencils for artists. Camel's hair was extensively worn by monastics in the Middle Ages for the mortification of the body. It was harsh and rough. Camel's hair is woven to some extent in Europe, but most of the goods now so called are of wool.

Camel's Hump, or **Camel's Back Mountain**: in Vermont; one of the highest peaks (4,188 feet) of the Green Mountains; 17 miles W. of Montpelier.

Camel's-thorn [Dutch, *kameel-doorn*, so named because camels eat its spring foliage]: the manna-tree, a shrub or undershrub of Western Asia and Northern Africa, belonging to the genus *Alhagi* and family *Papilionaceæ*. These shrubs have jointed pods, and are related to the forage plant sanfoin (*Onobrychis*). Only three species are now recognized by botanists: *A. camelorum*, of the region of the Caucasus; *A. græcorum*, of Greece: and *A. murorum*, of Northern Africa. From the last a gummy exudation takes place in hot weather, to which the name of manna has been given.

C. E. B.

Camenæ: general name of four prophetic nymphs of Roman mythology—viz., Antevorta, Postvorta, Carmenta, and Egeria. The Nine Muses were also called Camenæ by the Latin poets.

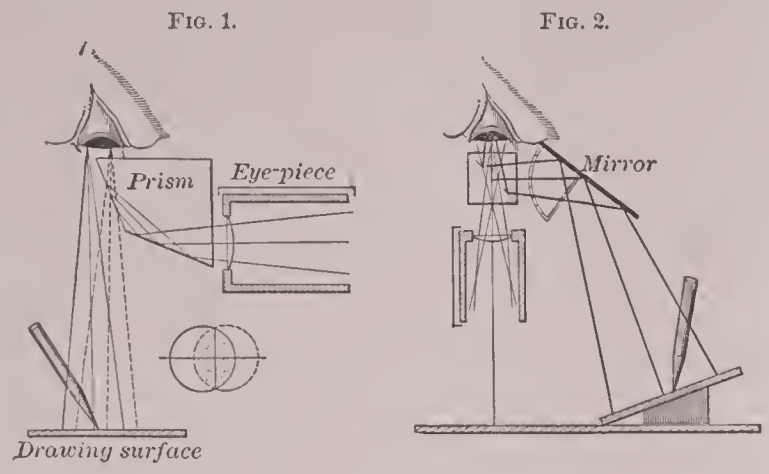
Camenz, kaa'ments, or **Kamenz**: a town of the kingdom of Saxony; on the Black Elster; 20 miles N. E. of Dresden (see map of German Empire, ref. 5–G). It has manufactures of earthenware, tobacco, starch, etc. Lessing was born here in 1729. Pop. (1890) 7,749.

Cam'eo [Ital. *came'o*, explained as from **gammæ'us*, gamma-shaped, cf. Lat. *gamma'tus*; or from **cammæ'us*, deriv. of *gemma*, precious stone, or as a Celtic loan-word]: a term applied to gems carved in relief, especially to diminutive pieces of sculpture, which are often formed of semi-precious stones having two strata or layers of different colors, the uppermost of which is partly removed so as to expose the lower stratum, which forms the background of the figure. The art of cutting cameos is of great antiquity, having been practiced by the ancient Egyptians and Babylonians. It was brought to great perfection by the Greeks, and practiced with success in ancient Rome. The cameos of the ancients were formed mostly of the onyx, agate, and sard, and of glass. The famous Barberini or Portland vase is a beautiful specimen of cameo in glass. The ancients used cameos as personal ornaments, and as cups, vases, and other articles. Many of the antique cameos now extant are marvelously beautiful in design and perfect in execution. Among the finest antique specimens are the Gonzaga cameo, which represents the head of a king and his queen, and is now at St. Petersburg; *The Judgment of Paris*, in the cabinet of Prince Piombino at Rome; and the onyx called *Apotheosis of Augustus*, which is now in Paris. The last is 12 inches high and 10 inches wide. The art revived in Italy in the fifteenth century, and was patronized by the Medici. Some specimens of this period are perhaps as perfect as the antique. The fabrication of cameos, both in *pietra dura* and in shell, has become in Italy an important branch of art.

SHELL CAMEOS are made from such shells as have layers of differently colored materials, such as the conch-shells of

the Bahamas. The art—a modern one—of cutting these shells has been carried to a high degree of perfection. These cameos began to be cut at Rome about 1805, and the best work is done there now; but many shells are cut at Paris, especially for exportation to England and America.

Camera Lucida [Lat., light chamber]: an apparatus for bringing into a single field of view two objects, only one of which is in the direct line of vision, so that they may be observed simultaneously with one eye. It is used chiefly as

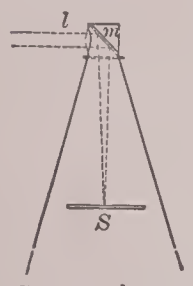


Camera lucida.

an attachment to the microscope to facilitate the drawing of microscopic objects. The original form, which was invented by Wollaston (1812), is shown in Fig. 1. It consists of a triangular prism placed in front of the eyepiece of a horizontally mounted microscope. The observer, looking past the edge of the prism, sees the drawing surface by direct vision and the microscopic image by total reflection from the prism. The image thus appears superimposed upon the drawing surface. Wollaston's camera lucida is not conveniently used with a vertical microscope. Another well-known form is that of Abbe (Fig. 2). In this instrument the microscope is vertical and in the direct line of vision, and the drawing surface is brought into the field of view by means of a mirror and a pair of prisms above the eyepiece. See, further, Gage, *Histology and the Microscope*, p. 47.

E. L. Nichols.

Camera Obscura [Lat., dark chamber]: a device by means of which a real image of distant objects or of a landscape is thrown upon a drawing surface within a darkened chamber for purposes of delineation. The device usually consists of a lens (*l*) of long focus and a mirror (*m*) mounted together in a hood and capable of revolution about a vertical axis. Rays passing the lens are brought to focus upon the plane surface S, where will be seen an image of that portion of the landscape toward which the hood is directed. The instrument is given many forms, according to the especial purpose to be attained. The figure shows a form of camera adapted for field-work. The camera of the photographer, which may be considered a development of the ordinary *camera obscura*, has almost completely supplanted the delineating camera. The name is likewise applied to any dark chamber used for the observation of "pinhole" images. The camera obscura is of early origin; it is usually ascribed to Roger Bacon (1214–92). See the article Photography.



Camera obscura.

E. L. Nichols.

Camera'rius, Joachim: German scholar; b. at Bamberg, Apr. 12, 1500. His proper name was Liebhard. His ancestors were chamberlains to the bishops of Bamberg; hence he took the Latin name Camerarius, which signifies a chamberlain. He was a friend of Melanchthon; president or principal of the University of Tübingen in 1535; rector of the University of Leipzig for many years after 1541. Among his works are a *Life of Melanchthon* (1566); *Commentaries on the Greek and Latin Languages* (1551). See Bursian's *Geschichte der classischen Philologie in Deutschland*. D in Leipzig, Apr. 17, 1574.

Cam'eron: Clinton co., Mo. (for location of county, see map of Missouri, ref. 2–D); on Han. and St. Joseph and Ch., Rk. I. and Pac. R. Rs.: 55 miles from Kansas City, and 29 miles from St. Joseph; is a distributing-point for hogs, cattle, poultry, and other farm products; is well built, with macadamized streets, electric lights, a public park, fine schools, fashionable churches, and the Missouri Wesleyan College. Pop. (1880) 2,109; (1890) 2,917; (1900) 2,979.

Editor of "The Sun."

Cameron, Angus: b. at Caledonia, Livingston co., N. Y., July 4, 1826; studied law in Buffalo; in 1857 removed to La Crosse, Wis.; served two years as representative, being Speaker one year, and four years as Senator in the Legislature of Wisconsin; regent of the University of Wisconsin 1866–75; was U. S. Senator from that State 1875–85. D. at Milwaukee, Wis., Mar. 30, 1897.

Cameron, Sir Charles Alexander, M. D., F. R. C. S.: b. in Dublin, Ireland, July 16, 1830; studied in Dublin and Germany; elected public analyst of the city of Dublin 1862; elected Professor of Hygiene or Political Medicine in the Royal College of Surgeons in Ireland 1867; knighted in 1886 "in recognition of his services in the improvement of public health, and his scientific researches." C. H. T.

Cameron, Donald, **of Lochiel**: a Highland Scottish chief who fought for the Pretender in 1745. He was born at Achnacarrie, Lochiel, perhaps in 1695. He was wounded at the battle of Culloden, and escaped to France in 1746. D. in 1748. He was the subject of Campbell's poem entitled *Lochiel's Warning*.

Cameron, Sir Duncan Alexander: b. about 1808; entered the British army as ensign in 1825; in 1854 became colonel; commanded the Forty-second regiment at the battle of Alma, and the Highland brigade at the battle of Balaklava, in the expedition to Kertch, the siege and fall of Sebastopol and assault of the outworks; was created a C. B.; officer of the Legion of Honor; received a medal with three clasps from his own Government, besides the Sardinian and Turkish medals. He was in command of the forces in New Zealand during the war of 1863–65, with the local rank of lieutenant-general, where he distinguished himself; was appointed colonel of the Forty-second Highlanders in 1863, lieutenant-general in 1868, and general in 1874; governor of the Royal Military Academy at Sandhurst 1868–75; was nominated a K. G. C. B. in 1873. D. June 8, 1888.

Cameron, Henry Clay, Ph. D., D. D.: b. at Shepherdstown, Jefferson co., Va., Sept. 1, 1829; graduated at the College of New Jersey in 1847, and at the Princeton Theological Seminary in 1855; was appointed Adjunct Professor of Greek in 1855, and professor in 1861, at the College of New Jersey; was licensed to preach in 1859, and ordained as an evangelist in the Presbyterian (O. S.) Church Feb. 1, 1863; was appointed a member of the board of visitors of the U. S. Military Academy at West Point in 1876, and has contributed largely to various magazines and periodicals.

Cameron, James: brother of Simon Cameron; b. at Maytown, Pa., Mar. 1, 1801; learned the trade of a printer; subsequently became an editor; studied law. He entered the army at the beginning of the civil war as colonel of the Seventy-ninth New York Highlanders. In the battle of Bull Run, July, 1861, he was killed while gallantly leading his men in a charge.

Cameron, James Donald: eldest son of Simon Cameron; b. at Harrisburg, Pa., May 14, 1833; graduated at Princeton College in 1852; has since been interested and identified with the development of the coal, iron, lumber and manufacturing interests of Pennsylvania; residing at Harrisburg; was cashier, and afterward president, of the Middletown bank; in 1861 was made vice-president, and in 1863 president, of the Northern Central R. R., which position he held until his resignation in 1874, being then succeeded by Thomas A. Scott. This road was of great service to the Government during the war (although several times cut by the Confederates) as a means of communication between Pennsylvania and the national capital viâ Baltimore, and after the war, under Mr. Cameron's administration, it was extended to Elmira, so as to realize its original purpose of forming a direct communication from the lakes to tidewater at Baltimore. He was always an active Republican; on May 22, 1876, was appointed Secretary of War in President Grant's administration, and in 1877 succeeded his father in the Senate; re-elected 1885 and 1890.

Cameron, John: leader of the Cameronites; b. in Glasgow, 1579; educated there; was professor and pastor in Bordeaux, 1600–18; Professor of Theology at Saumur 1618–20; principal of the University of Glasgow 1622; returned to Saumur 1623; Professor of Divinity at Montauban 1624. D. at Montauban, 1625. "He devised a method,"

says Mosheim, "of uniting the doctrines of the Genevans, as expounded at Dort, with the views of those who hold that the love of God embraces the whole human race." His adherents have sometimes been called Hypothetical Universalists.

Cameron, Matthew Crooks: Canadian jurist; b. in Dundas, Ont., Oct., 2, 1822; educated at Upper Canada College, and admitted to the bar in 1849. He was elected to the Assembly in 1861; entered the Sandfield Macdonald cabinet as Provincial Secretary and Registrar in 1863; in 1871 became commissioner of crown lands; and after the fall of the Government he led the Conservative opposition in the House for four years. He was appointed puisne judge, court of queen's bench, in 1878, and chief justice, court of common pleas, in 1884. Neil Macdonald.

Cameron, Richard: a Scottish minister; b. at Falkland; popularly considered the founder of the sect of Cameronians or "Covenanters," i. e. Reformed Presbyterians (*q. v.*), who disown the epithet. He was not a university-trained man, but was gifted with eloquence. His regular occupation was that of teacher till his licensure. He strenuously opposed the measures by which the Government endeavored to establish the Episcopal Church in Scotland, and persisted in preaching in fields, which was prohibited by law. In June, 1680, he, with about twenty armed adherents, entered the town of Sanquhar, and formally renounced their allegiance to Charles II. He was killed in a fight with the royal troops in Ayrsmoss, Ayrshire, July 22, 1680.

Cameron, Simon: a U. S. Senator; b. in Lancaster co., Pa., Mar. 8, 1799. His youth was obscure, but he learned the printer's trade; edited papers in Doylestown and Harrisburg; then became interested in the mineral industries and railway development of the region about him, acquiring great wealth. He was elected Senator of the U. S. by the Democrats in 1845; having joined the Republican party, he was re-elected a Senator in 1856. He was Secretary of War from Mar., 1861, to Jan., 1862, and as such advocated the military employment of slaves; was then sent as minister to Russia, from which he returned in 1863. In 1866 he was again elected to the Senate of the U. S., where he was retained until 1877, when a timely resignation secured the succession to his son, James Donald. His control of his party in Pennsylvania was nearly absolute. D. June 26, 1889.

Cameron, Verney Lovett: traveler; b. in Weymouth, Dorsetshire, England, June 1, 1844; entered the navy in 1857; was made a commander in 1879. From 1872 to 1876 he conducted, under the auspices of the Royal Geographical Society, a comprehensive exploration of the interior of Africa, and made important discoveries in the region of the great lakes. In 1878 he made a journey through Asia Minor and Persia, to ascertain whether a railway could be built from the Mediterranean to India. In 1882, with Sir Richard Burton, he made explorations in the African interior from the Gold Coast. He published *Across Africa* (1876); *Our Future Highway* (1880); *To the Gold Coast for Gold* (1883), with Burton; and books for boys. D. Mar. 26, 1894.

Camero'nians: the followers of Richard Cameron, who in 1680 made a public declaration that Charles II., by his suppression of civil and religious liberty, had forfeited all right to the crown. They were also called Covenanters, from their having demanded the strict observance of the Solemn League and Covenant received by the Parliament in 1643. The Cameronians still exist, both in Great Britain and in America, under the name of Reformed Presbyterians (*q. v.*). See also Presbyterian Church and Covenanters.

Cameronites: See Cameron, John.

Cameroons' (German, *Kamerun*): a colonial district, river, and group of mountains in tropical West Africa, on the Bight of Biafra. The district extends along the coast from Old Calabar in about lon. 7° E. to Cape Campo, about 2° 15′ N., making a coast-line of about 120 miles. On the northwest it joins the English Niger Territory, the boundary running from Old Calabar, or Rio del Rey, N. E. to Yola, on the Benue. The southern boundary follows the Campo river to its extreme southern bend, thence eastward on a parallel. The eastern boundary may be taken at the meridian 15° E. The area included is estimated at 130,000 sq. miles. It has been under German protection since 1884. The population is about 2,600,000. In 1890 there were 105 whites in the district, 65 being German. The country is fertile, and an active trade is carried on in ivory and palm-oil. The Deutsche Plantagen-Gesellschaft has recently established plantations for cacao and tobacco. The revenue for 1890, chiefly derived from a duty on imports, was $72,000. The chief towns are Cameroons (opposite Fernando Po island), Bimbia (near the preceding), and Batanga and Bakundu, farther south. Cameroons river is properly an estuary formed at the common mouths of the Mungo and other smaller streams. It is in lat. 4° N. The principal river of the district is the Mbam, which enters the Bight of Biafra, about one degree farther south. The Cameroons Mountains are an isolated group, the highest in West Africa, standing immediately on the coast to the north of the Cameroons estuary. They are volcanic, and culminate in twin peaks reaching a height of 13,000 or 14,000 feet.

M. W. H.

Camil'la: a fabulous Italian virgin celebrated for swiftness of foot; was said to be a daughter of the Volscian King Metabus, and aided Turnus against Æneas.

Camillus, Marcus Furius: Roman dictator and patrician, who became a tribune in 403 B. C. He was chosen dictator in 396, and soon captured Veii. About 390 he was exiled, and retired to Ardea. When Brennus and the Gauls had captured Rome in 390 B. C., Camillus was recalled and appointed dictator. According to the popular tradition, which is perhaps mixed with fable, he defeated the Gauls, and afterward gained victories over the Volsci and other enemies. In 367 he was chosen dictator for the fifth time. D. in 365 B. C. See Plutarch's *Life of Camillus*; Arnold's *History of Rome*.

Cam'isards: insurgent French Protestants who lived in the Cévennes, the mountain-range in the south of France, in the first decade of the eighteenth century; so named from the *camise* or loose outer garment which they wore. They strove to obtain the religious liberty which had been sacrificed by the Revocation of the Edict of Nantes, and they fought under the pressure of a religious hysteria which made them almost invincible. The plan of the Government was extermination, but the first marshal, Montrevel (1703), was only partially successful; the second, Villars (1704), tried diplomacy with good effect, and induced many to lay down their arms; while the third, Berwick (1705), by overwhelming force, desolated the province and drove the remaining insurgents into exile. The leader of the Camisards was Jean Cavalier, a journeyman baker, b. at Ribaute, Languedoc, Nov. 28, 1681; took command in 1702; after his crushing defeat in 1704 he entered the military service of the Duke of Savoy; lived in Ireland 1709–27, then in England, and died in Chelsea, near London, May 17, 1740. When Louis XIV., in 1715, announced the complete extinction of the heresy, a large portion of Languedoc had been transformed into a desert. See Mrs. A. E. Bray, *Revolt of the Protestants of the Cévennes* (London, 1870).

Camlet: a fabric originally made of camel's hair; in more recent times of the hair of the Angora goat. It is also made of wool, or a mixture of wool with other materials. Camlets are mentioned in Marco Polo's narrative as among the articles manufactured in Tibet.

Camoëns, kăm′ō-ens, or **Camœs**, kăă-moiñs′, Luis, de: Portugal's greatest epic and lyric poet; b. of a noble family, most probably at Coimbra, in 1524. From 1537–42 he studied the classics and modern literatures at the university of his native city, and it was during this time that he first conceived the idea of celebrating in verse the great deeds of the Portuguese nation. From Coimbra he went to Lisbon, where, a few years later, he was received at court, and by his uncommon attainments, his wit, and his poetical talent, bade fair to win for himself rapid advancement. But the enmity engendered by his passion and suit for Donna Catherina de Ataide, a noble lady in attendance upon the queen, caused his banishment from the city. He joined the army of Africa at Ceuta, and it was during this time that he lost the sight of his right eye. He returned to Lisbon in 1550, but owing to his imprudent conduct was forced to embark for India in 1553. A satire against the corruption of the Portuguese in India caused his banishment from Goa to Macao in 1556. While in this latter place he is supposed to have written the first six cantos of his great epic poem *The Lusiads*. In 1560 he was back in Goa, and in 1570, after an exile of seventeen years, during which the lady of his affections had died, he returned to his native land, with no other possession than the precious manuscript of *The Lusiads*.

Though the publication of his poem in 1572 was attended by great success, and his name was on the lips of all, he was allowed to pass his later years in the greatest poverty. D. June 10, 1580.

Camœs's merit as a poet is as great in his lyric productions as in his epic poem *The Lusiads* (Os Lusiadas), but it is by this latter work which, commemorating as it does the great achievements of the Portuguese nationality, constitutes the bond of the moral unity of the Portuguese people, that he has become the principal representative of Portuguese literature. The best edition of his works is by the Visconde de Juromenha, *Obras de Luis de Camœs* (Lisbon, 1860–69, 6 vols.). The best English translation is by Richard F. Burton, *Camœns: His Life and his Lusiads* (London, 1881, 2 vols.); and *Camœns: The Lyricks: Englished by R. F. Burton* (London, 1884, 2 vols.). The latest life is by Wilhelm Storck (Paderborn, 1890). HENRY R. LANG.

Camomile, or **Chamomile**: a name given to several herbs of the family *Compositæ*, but especially to *Anthemis nobilis* and *Matricaria chamomilla*. Both European herbs closely resemble each other, and are nearly identical in order and properties, though the latter is milder, and in Germany is more generally esteemed as a medicine. The one first mentioned is common in gardens in the U. S. Camomile is much used in domestic medicine, has tonic, stimulant, and diaphoretic powers, and was once used as a febrifuge. Its smell is agreeable, and depends upon the presence of a volatile oil. The camomile flowers imported from Great Britain are of the first, those from Germany of the second, species. They are largely, but illegally, used in the British islands in flavoring beer—a practice which is said to be injurious to health.

Camor'ra: the name of a secret society of outlaws and robbers called *Camorristi* who infested the former kingdom of Naples. This society had a rendezvous in every large town. Under the Bourbon dynasty its members openly presented themselves at markets and public spectacles, where they extorted a portion of the money that passed from hand to hand. They were also addicted to violent crimes, and could be hired to commit murder. The society was thoroughly organized and subject to strict discipline. Candidates for membership were not admitted until they had passed through a probation for a year, and given proofs of courage and obedience. They are said to have been tolerated by King Ferdinand II., but Francis II. vainly endeavored to suppress them. They aided the Garibaldians in expelling the Bourbons from Naples, but continued their depredations under the new government of Italy. See Umilta, *Camorra et Mafia* (Neuchâtel, 1878).

Camp [Fr. *camp*, from the Ital. or Picard form of Lat. *campus*, field, training-ground; cf. *Campus Martius*. The inherited Fr. form is *champ*]: in a general sense the ground (constructions included) upon which tents, huts, etc., are erected for the shelter of any collection of human beings; in a military sense, that occupied by an army under tents or temporary shelter in the field. It is usually distinguished from *bivouac* by the use of shelter (such as tents), as distinguished from passing the night in the open air (*à la belle étoile*). More exclusively yet, the ground and shelter of an army in *tents*; but in the *Army Regulations* of the U. S. a camp is the place where troops are established in tents, in huts, or in bivouac. The Roman camp (Lat. *castra*, a word which in the form of the termination *cester* or *chester* indicates the origin of numerous English towns, as arising from a Roman camp, and to which also are due the words *château* and *castle*), described with great detail in most cyclopædias, was in reality an *intrenched camp*. (See Bardin, *Dictionnaire de l'Armée de Terre*). Such were constructed in the heart of invaded countries to secure for the troops a place of retreat, to control the district, to provide secure dépôts for provisions of all kinds, and to protect the communications with the frontier. A Roman army might occupy its camp several winters. In the meantime it sallied forth to resume its operations. Most commonly, when the legions had thus vacated them to undertake long marches, *veterans* remained behind to guard the ramparts, and thus became a kind of permanent garrison, which, by intermarriage, gave origin to a town or colony; e. g. the English "Chesters" and the German Cologne or Köln (*Colonia*).

The Romans necessarily had, besides these, temporary camps, sometimes of huts, but more generally tents of skins of animals. The details of these Roman camps are of little interest (unless to antiquarians); neither indeed, except to soldiers, are those of the modern military camp. Its arrangements (as practiced in the U. S.) are set forth in the *Army Regulations*. Strictly speaking, the arrangements of a camp for a regiment of infantry or cavalry are governed purely by considerations of discipline and administration. The encampment of an army must indeed be sedulously governed by tactical considerations, such as the defense of the position and the formation of line of battle, the character of the issues, the approaches, etc. But these arrangements belong to "Tactics." An INTRENCHED CAMP (*q. v.*) is a fortified position of greater or less extent, usually of field-works to be occupied during a campaign or the duration of a war.

Campan, kăñ'păñ', JEANNE LOUISE GENEST: b. in Paris, Oct. 6, 1752; reader to the daughters of Louis XV., and a companion and friend of Marie Antoinette. After the Revolution she was a teacher, and head of the institution at Ecouen for the daughters of the officers of the Legion of Honor. D. May 16, 1822. She wrote, among other works, *Memoirs of the Private Life of Marie Antoinette* (1823) and *Correspondence with Queen Hortense* (1824).

Campana, FABIO: See the Appendix.

Campanel'la, TOMMASO: Italian philosopher and Dominican monk; b. in Stilo, Calabria, Sept. 5, 1568. He published, in Naples, in 1591, *Philosophy Demonstrated by the Senses*, which opposed the scholastic philosophy and gave offense to the partisans of Aristotle. On a charge of heresy and conspiracy against the Spanish Government he was in 1599 committed to prison in Naples, where he was confined about twenty-seven years, during which he wrote several works. Pope Urban VIII. procured his release in 1626. Campanella, after passing several years in Rome, retired to France in 1634, in order to avoid the renewed persecution of the Spaniards. He was kindly treated by Cardinal Richelieu. Among his important works are *Civitas Solis*, etc. (The City of the Sun, or the Idea of a Philosophic Republic, 1623); *The Five Parts of Rational Philosophy* (1638); and a *Discourse on the Spanish Monarchy* (in Latin, 1640). D. in Paris, May 21, 1639. His complete works were published in Turin 1854, 2 vols. His sonnets were translated by J. A. Symonds (in vol. with Buonarrotti, London, 1878). See his *Life* by M. Baldacchini (Naples, 1840) and L. Amabile (Naples, 1883, 3 vols.).

Campanha, kăăm-paan'yăă: a town of Brazil; in the state of Minas Geraes, about 156 miles N. W. of Rio de Janeiro (see map of South America, ref. 7–G). It has several churches, a hospital, and a theater. Gold is found in the vicinity. Pop. 7,000.

Campa'nia: a province of ancient Italy; bounded N. E. by Samnium, E. and S. by Lucania, S. W. by the Mediterranean, and N. W. by Latium. The Apennines extended along the northeast border. Between these mountains and the sea was an extensive and very fertile plain, which was the *Regio felix* of the Romans. It was traversed by the Appian Way (*Via Appia*), the greatest thoroughfare of ancient Italy. In all its conquests and mutations the basis of population remained Oscan, and hence came the present knowledge of that language. From its town Atella arose a popular form of ancient drama. (See ATELLANÆ FABULÆ.) Its principal cities were Capua, Pompeii, Neapolis (Naples), Cumæ, Salernum, and Herculaneum. Among its physical features was Mt. Vesuvius. It embraces the modern provinces of Benevento, Naples, Principato Citeriore, Principato Ulteriore, and Terre di Lavoro, with an area of 6,948 sq. miles and a population (1890) of 3,045,471.

Campanile, kăăm-pa-nee'lā [Ital., bell-tower, steeple, from Med. Lat. *campa'na*, bell]: a bell-tower; especially a detached belfry adjacent to a church. Italy possesses many such, some of them dating from the eighth century. They are often of brick, square in ground plan and capped by a low spire. Among the finest are the campanile of St. Mark in Venice, the "leaning tower" of Pisa, the exquisite marble tower at Florence, designed, in part at least, by Giotto, and the Giralda at Seville, Spain. A. D. F. HAMLIN.

Campanini, kăăm-pa-nee'nĕe, ITALO: singer; b. in Parma, Italy, in 1846. He was the son of a blacksmith. At fifteen he was a soldier in Garibaldi's army, serving in two campaigns, in which he was badly wounded. After the war he returned to the forge, and worked until he was eighteen years old. A singing-teacher who admired his voice gave him lessons. Campanini studied a year at the Parma Conservatory, and soon after appeared as the Notary in *La*

Sonnambula. He failed, and was laughed off the stage. He joined a traveling company, and saved a little money, which he devoted to taking lessons from Lamperti, the singing-teacher of Milan. He was engaged at La Scala, Milan, and sang in *Faust* with success. He appeared in London in 1872, and in 1873 visited the U. S. with the Nilsson Company, under the management of Strakosch, appearing in November at the Academy of Music in *Lucrezia Borgia*. He sung both in concert and in opera in the principal cities of the U. S. and of Europe, and for some years was considered the greatest of living tenors. Subsequently he suffered from an affection of the throat, which somewhat impaired his voice. He was an ardent, painstaking student. In one season he sang in opera 100 times, took part in a number of rehearsals, besides singing the *Stabat Mater* seven times and assisting at a number of concerts in Boston, New York, and Cincinnati. His voice was of large compass, and of singular purity and sweetness of tone. D. at his estate near Parma, Nov. 23, 1896. B. B. VALLENTINE.

Campanology: See BELL and BELL-RINGING.

Campan'ula [mod. dimin. from Med. Lat. *campa'na*, bell]: a genus of hardy herbaceous plants, the type of the family *Campanulaceæ*. The genus is characterized by a bell-shaped, five-lobed corolla, five stamens, the filaments of which are dilated at the base, and a top-shaped capsule, with two to five cells opening by lateral clefts. It comprises numerous species, with beautiful blue or white flowers, to many of which the common name of bell-flower is given. Among the remarkable species are the *Campanula medium* or Canterbury bell, a native of Europe, and the *Campanula rotundifolia*, or harebell, which is indigenous both in Great Britain and the U. S.

Campanula'ceæ: See BELLWORTS.

Campbell, ALEXANDER: theologian and author; the originator (with his father, Thomas Campbell) of the movement known as the "Disciples of Christ" or "the Current Reformation"; b. in the county of Antrim, Ireland, Sept. 12, 1788. After a course in Glasgow University, Scotland, he migrated to this country in 1809, and settled in Washington, Pa., where his father, who had preceded him two years, had located. Both were ministers of the Presbyterian Church, and united in pleading for Christian union and the restoration of primitive Christianity. By force of his learning and ability, Alexander Campbell soon became the recognized leader of the reformation. His bold renunciation of many of the cherished doctrines of the times brought him into conflict with many of the leading men of his day. He held religious debates with Robert Owen, the skeptical socialist; Archbishop Purcell, of the Roman Catholic Church; Dr. N. L. Rice, of the Presbyterian Church; all of which were reported and are among his published works. Besides these he held other religious discussions with less noted men. From 1823 to 1830 he published a monthly magazine called *The Christian Baptist*, and continued it from 1830 to 1863 as the *Millennial Harbinger*. Bethany College, of which he was president until his death, was founded by him in 1841 at Bethany, West Va. Among his numerous published works are *Christian System*; *Christian Preacher's Companion, or Infidelity Refuted by Infidels*; *Living Oracles*; *The New Testament, with Notes and Introduction*; *Christian Hymn-book*; *Christian Baptism, its Antecedents and Consequents*; *Popular Lectures and Addresses*; *Lectures on the Pentateuch*, etc.—in all, about sixty volumes. D. in Bethany, West Va., Mar. 4, 1866. At the time of his death the religious body which he and his father originated, and of which he was the leading spirit, numbered over 400,000 communicants. For the leading features of this movement, see DISCIPLES OF CHRIST.

J. H. GARRISON.

Campbell, Sir ALEXANDER: Canadian statesman; b. in Yorkshire, England, Mar. 9, 1822; removed to Canada when a boy; was educated at Kingston and the College of St. Hyacinthe; admitted to the bar in 1843, and became dean of the faculty of law in Queen's University in 1860. He represented Cataraqui in the Legislative Council of Canada from 1858 till 1867; was Speaker of that body 1862–63; commissioner of crown lands and member of executive council 1864–67; and a member of the Quebec conference in 1864. He was Postmaster-General from 1867 until 1873, when he became Minister of the Interior, a portfolio which he resigned the same year on the fall of the Macdonald government. He was appointed Postmaster-General in 1878; Minister of Militia and Defense Jan. 16, 1880; Postmaster-General Nov. 8, 1880; Minister of Justice May 20, 1881; and again Postmaster-General 1885–87. He was called to the Senate in 1867, and was leader of the Government in that body from 1879 until his retirement in 1887. He received the honor of knighthood in 1879; was chairman of the commission to consolidate and revise the statutes of Canada in 1883; and was appointed Lieutenant-Governor of Ontario June 1, 1887. He represented Canada in the imperial federation conference in London in 1887. D. in Toronto, May 24, 1892.

Campbell, ARCHIBALD: soldier and engineer; b. 1813 in New York; graduated at West Point 1835; served while in infantry at frontier posts till he resigned Sept. 30, 1836. Civil engineer 1837–44; chief clerk U. S. War Department 1846–49 and 1853–57; commissioner to establish the Northwestern boundary of the U. S. between Washington Territory and British America 1857–69, and to run 49th parallel from Lake of the Woods to Rocky Mountains 1872. D. July 27, 1887.

Campbell, BARTLEY: See the Appendix.

Campbell, CHARLES: See the Appendix.

Campbell, Sir COLIN (*Lord Clyde*): general; b. in Glasgow, Scotland, Oct. 20, 1792. He entered the army in 1808; served in the Peninsular war (1809–14), and was badly wounded at the passage of the Bidassoa. In 1842 he obtained the rank of colonel, having been on garrison duty in many parts of the world. He served with distinction in China 1842; in the Sikh war 1848; on the Peshawur frontier in India; was appointed in 1854 to the command of the Highland brigade, which he led at the battles of Alma and Balaklava in the Crimea, where his brilliant repulses of attacks on his front were of highest tactical value. In 1855 he was raised to the rank of major-general and created a Knight Grand Cross of the Bath. He was appointed in July, 1857, commander of the army in India, then fighting against the mutinous Sepoys. He reached Calcutta Nov. 17, 1857, with 4,700 men, relieved Lucknow on the 22d, and on Dec. 20, 1858, announced the end of the revolt. For his services in India he was raised to the peerage as Baron Clyde in July, 1858. On his return home he was made field-marshal and granted an annuity of £2,000. D. Aug. 14, 1863, and was buried in Westminster Abbey. See his *Life* by Gen. Shadwell (1881).

Campbell, DOUGLAS: lawyer and historical writer; b. July 13, 1840, at Cooperstown, N. Y.; educated at Union College, Andover Theological Seminary, Harvard Law School, and Albany Law School; captain of the 121st New York Volunteers in the Union army; practiced law with success in New York 1865–90, when he was compelled to retire on account of infirmities contracted in the war. His family has resided since 1741 in Cherry Valley, N. Y.; Col. Samuel Campbell commanded at the battle of Oriskany, and, in revenge for his services, the Indians and Tories perpetrated the massacre of Cherry Valley in 1778; William W. Campbell, father of Douglas, was a judge of the Supreme Court and author of *The Annals of Tryon County*. Douglas Campbell inherited a taste for historical study, which he always cultivated, and as the results of which he published in 1892 *The Puritan in Holland, England, and America*. D. in Schenectady, N. Y., Mar. 7, 1893.

Campbell, DOUGLAS HOUGHTON, Ph. D.: botanist; b. in Detroit, Mich., Dec. 16, 1859; educated in the universities of Michigan, Bonn, and Tübingen; Professor of Botany in Indiana University 1888–91; now Professor of Botany in Stanford University. He has written many papers on the structure and development of ferns and their allies, including *The Development of the Ostrich Fern* (1887); *The Development of Pilularia globulifera* (1888); *Development of the Prothallium and Embryo of Osmunda* (1892). In 1890 he published *Elements of Structural and Systematic Botany*.

CHARLES E. BESSEY.

Campbell, Sir GEORGE: statesman; b. in 1824; educated at Edinburgh, St. Andrews, and Haileybury; entered the civil service of India in 1842; has held various offices in connection with the Government of India; has served several terms as member of Parliament. Author of *Modern India* (1852); *India as It May Be*; *Handy Book of the Eastern Question* (1876); *White and Black in the United States*; and *The British Empire* (1889). D. in London, Feb. 18, 1892.

Campbell, GEORGE WASHINGTON: b. in Tennessee in 1768; graduated at Princeton in 1794; member of Congress 1803–

09; U. S. Senator (1811–14 and 1815–18); Secretary of the Treasury in 1815; minister to Russia in 1818. D. in Nashville, Feb. 17, 1848.

Campbell, James Valentine, LL. D.: jurist; b. in Buffalo, N. Y., Feb. 25, 1823; graduated at St. Paul's College, Long Island, 1841; admitted to the bar in 1844. He was elected a judge of the Supreme Court of Michigan in 1857, and continued there by re-elections until his death. For more than twenty years he was Professor of Law in the Law School of Michigan University. He was the author of the *Political History of Michigan*. D. in Detroit, Mich., Mar. 26, 1890. Henry Wade Rogers.

Campbell, John, Lord: Lord Chancellor of England; b. in Fifeshire, Scotland, Sept. 15, 1779; was called to the English bar in 1806; obtained an extensive practice. In 1830 he became a Whig member of Parliament, and in 1834 attorney-general. He was made chancellor of Ireland and a peer of the United Kingdom in 1841; appointed chief justice of the court of queen's bench in 1850; Lord Chancellor of England in 1859. He published *Lives of the Lord Chancellors and Keepers of the Great Seal of England* (7 vols., 1846), which obtained much popularity, notwithstanding that it was full of the author's prejudices and vanity—its inaccuracies were exposed by Sugden (Lord St. Leonards); and *Lives of the Chief Justices of England* (3 vols., 1849–57). D. June 23, 1861. See *Life* by his daughter (1881).

Campbell, John: Canadian Presbyterian minister; b. in Edinburgh, Scotland, June 18, 1840; studied at University of Toronto and at New College, Edinburgh; became minister of the Charles Street church, Toronto, 1868; Professor of Church History and Apologetics in the Presbyterian College, Montreal, 1873. He wrote *The Hittites* (New York, 1891, 2 vols.).

Campbell, John A.: jurist; b. in Washington, Ga., June 24, 1811; son of Duncan G. Campbell, a distinguished lawyer of that State. He was educated in the Georgia University, where he graduated with distinction in 1826, and was admitted to the bar by special act of the Legislature in 1829, some time before his majority. He moved to Alabama, where he soon took high rank in his profession; was appointed associate justice of the U. S. Supreme Court by President Pierce in 1853. This position he resigned in 1861, after the outbreak of the conflict between the two sections. While he had opposed the policy of secession, he yet believed in its rightfulness, and aided its promoters while in office in Washington. He was afterward appointed assistant Secretary of War of the Confederate States. He was one of the commissioners appointed by Mr. Davis to meet Mr. Lincoln and Mr. Seward at the Fortress Monroe conference in Feb., 1865. After the fall of Richmond and the surrender of the Southern arms, he was arrested and imprisoned for some time at Fort Pulaski, but was finally discharged on parole. He subsequently resumed the practice of law. D. in Baltimore, Md., Mar. 12, 1889.

Campbell, John Francis, of Islay: b. Dec. 29, 1822; educated at Eton and University of Edinburgh; held civil service offices; d. in Cannes, France, Feb. 17, 1885. He published *Popular Tales of the West Highlands* (4 vols., Edinburgh, 1860–62), a remarkable contribution to Gaelic folklore, and began in 1872 to issue Gaelic texts as *Leabhair na Feinne*. He was given also to mechanical inventions and experiments in physics, about which he published books.

Campbell, John McLeod: b. at Ardmaddy House, near Kilninver, Argyleshire, Scotland, May 4, 1800; d. at Rosneath, Feb. 27, 1872. He studied theology in University of Glasgow 1811–20: was licensed to preach in 1821; inducted to the parish of Row on Sept. 8, 1825; in 1831 was tried for heresy by the Assembly, convicted, and deposed, having preached the doctrine of unlimited atonement. He returned to Kilninver and preached there for some time, but began in 1833 an independent ministry at Glasgow, which he continued for twenty-six years, to 1859. The last years of his life he spent in studious retirement, partly at Glasgow and partly at Rosneath. His views of the atonement he set forth in his *Christ the Bread of Life* (1851; 2d ed. 1869); and *The Nature of the Atonement* (1856; 4th ed. 1873). He also wrote *Reminiscences and Reflections*, published after his death (1873), and referring to his ministry in the parish of Row. See D. Campbell, *Memorials of John McLeod Campbell* (2 vols., London, 1877). Revised by J. W. Chadwick.

Campbell, Lewis, M. A., LL. D.: professor of Greek; b. Sept. 30, 1830; educated at Edinburgh Academy and Glasgow University, and Trinity and Balliol Colleges, Oxford; at the latter under Dr. Benjamin Jowett; ordained 1857; Professor of Greek in the University of St. Andrews 1863; author of numerous works on classical subjects, the most important of which are *The Theætetus of Plato*; *The Sophistes and Politicus of Plato*; *Sophocles—The Plays and Fragments*; *Sophocles*, in Macmillan's series of Classical Writers (1879). Prof. Campbell is a cousin of Campbell the poet.

Campbell, Thomas: poet; b. in Glasgow, Scotland, July 27, 1777. He was educated at the university of his native city, and became a good classical scholar. He produced in 1799 his excellent didactic poem *The Pleasures of Hope*. During a visit to the Continent he witnessed the battle of Hohenlinden, Dec., 1800, on which he composed a lyrical poem of great celebrity. He soon afterward published short poems entitled *The Exile of Erin* and *Ye Mariners of England*. Having married his cousin, Miss Sinclair, he removed to London in 1803, and adopted literature as a profession, receiving a £200 pension from the Government. In 1809 he produced *Gertrude of Wyoming*, which is generally and greatly admired. He became editor of the *New Monthly Magazine* in 1820, and was elected lord rector of the University of Glasgow in 1827. He published, besides other works in prose, *The Life and Times of Petrarch* and a *Life of Frederick the Great*. Among his finest poems is *The Battle of the Baltic*. D. in Boulogne, June 15, 1844, and was buried in Westminster Abbey. See *Life and Letters of Thomas Campbell*, by William Beattie (3 vols., 1850).

Campbell, William Wilfred: See the Appendix.

Campbell-Bannerman, Henry: English public man; b. 1836; second son of Sir James Campbell of Stracathro; educated at the universities of Glasgow and Cambridge; assumed the name of Bannerman in 1872 in compliance with the wish of his uncle; entered Parliament 1868; financial secretary at the War Office 1871–74 and 1880–82; secretary to the Admiralty 1882; Chief Secretary for Ireland 1884–86; Secretary of State for War in Mr. Gladstone's cabinet in 1886 and again in 1892.

Campbellford: village of Northumberland co., Ontario, Canada; on Belleville branch of Mid. Div. of Gr. Tr. Ry.; 33 miles S. E. of Peterborough (see map of Ontario, ref. 3–F); has five churches, high school, foundry, cabinet-works, large woolen mills, and paper and grist mills. Pop. (1881) 1,418; (1891) 2,424; (1893) estimated, 2,200.

Editor of "Herald."

Campbellites: See Disciples of Christ.

Campbell's Station: on railroad; Knox co., Tenn. (for location of county, see map of Tennessee, ref. 6–I). Here Gen. Burnside's army was attacked Nov. 16, 1863, by the Confederates under command of Gen. Longstreet. The engagement lasted from noon till dark, the Confederates being repulsed. Pop. of dist. (1880) 2,116; (1890) 2,361; (1900) 2,095.

Campbeltown: a royal borough and seaport of Scotland; in the county of Argyle; near the south end of the peninsula of Cantire; 65 miles W. S. W. of Glasgow (see map of Scotland, ref. 13–D); has a good harbor on the east coast of Cantire, sheltered by Davarr island; is the chief town in Argyleshire; a favorite resort in summer. Here are more than twenty distilleries of whisky. Pop. (1891) 8,235.

Campeach'y, or **Campeche**, kăăm-pā'chā: a state of Mexico: bounded N. by Yucatan, E. by the Caribbean Sea, S. by Belize and Guatemala, and W. by the Gulf of Campeachy. Area, 18,087 sq. miles. Many ruins of ancient cities have been found in this province. Chief town, Campeachy. Pop. (1895) 88,121.

Campeachy, or **Campeche**: a city and principal seaport of Yucatan; situated on the Gulf of Mexico and the west coast of Yucatan peninsula; 90 miles S. S. W. of Mérida; lat. 19° 50′ N., lon. 90° 33′ W. (see map of Mexico, ref. 7–K). It contains many good stone houses, a college, about six churches, several convents, and a theater. The harbor is capacious, but shallow. Logwood, wax, cigars, and palm-leaf hats are exported from this port. Pop. 18,000.

Campeachy Wood: a name of Logwood (*q. v.*).

Camper, Pieter: b. in Leyden, May 11, 1722; d. at The Hague, Apr. 7, 1789. He received a liberal education, studied medicine, cultivated the fine arts, especially drawing and painting, and traveled in England, France, and Italy. In 1750 he was appointed Professor of Medicine at Franeker, in 1755 at Amsterdam, and in 1765 at Groningen; but in 1773 he resigned his post and retired into private life, re-

siding first on his estate near Franeker, afterward at The Hague, and devoting himself partly to scientific studies and partly to politics. His papers on anatomy, surgery, obstetrics, and medical jurisprudence are numerous and valuable. In 1761 he discovered the auditory organs of fishes, and in 1771 the presence of air in the bones of birds. He was the first to dissect an orang-outang, and wrote a book on the anatomy of the elephant. Very interesting are also those papers and treatises of his in which he applies his anatomical knowledge to art, more especially his *Dissertation physique*, in which he sets forth his theory of the facial angle, and applies it both to nature and to art.

Cam'perdown (in Dutch *Camperduin*, or *Kamp*): village of Holland; 27 miles N. W. of Amsterdam (see map of Holland and Belgium, ref. 4–E); famous for the victory gained off its coast by the British under Admiral Duncan, over the Dutch, commanded by Admiral de Winter, Oct. 11, 1797.

Campero, Narciso: Bolivian soldier and statesman; b. at Tojo, now in Argentina, 1815. He was educated partly in Europe, and traveled extensively; in the Bolivian army he attained the rank of brigadier, and was Minister of War for a short time in 1872. After the fall of Daza he was elected president of Bolivia, Apr. 9, 1880, and commanded the combined forces of Bolivia and Peru in the Tacna campaign; defeated at the battle of Tacna (May 26, 1880), he fell back with the Bolivian forces to La Paz. Campero's administration was a quiet one internally.

Herbert H. Smith.

Camphene, or **Camphine**: purified oil of turpentine, obtained by rectifying it over dry chloride of lime. Camphene has been burned in lamps for the purpose of illumination, but, many fatal accidents having resulted from its use, it has been superseded by coal oil or rectified petroleum.

Camphilene: a name that has been applied to two different things. One is a compound formed when hydrochloric acid gas is passed into oil of turpentine. This is a solid that resembles camphor in its odor, appearance, and volatility, and is hence called "artificial camphor." The other compound, called camphilene, is one of the "terpenes."

Cam'phogen [from *camphor* + *-gen*, producing (Gr. γεννάω), because obtained from camphor]: a synonym of Camphene (*q. v.*).

Camphor [Lat. form which has displaced the older *camphire*, viâ Fr. from Arab. *kāfūr*]: a stearopten or crude volatile oil possessing the nature of a ketome and obtained from *Cinnamomum camphora*, a handsome laurel from 25 to 30 feet in height, with evergreen, shiny leaves. Every part of the tree possesses a camphoraceous odor and taste, but gum camphor is obtained from the root, trunk, and limbs by hacking the wood into chips and then boiling these chips with water in a covered vessel lined with straw, and on this straw the gum camphor condenses. In commerce Japan or tub-camphor comes in tubs containing about 125 lb. It occurs in white granular masses, and these have a purplish or reddish tint. The camphor which comes from Formosa is usually packed in chests lined with lead. Refined gum camphor occurs in large, somewhat convex cakes with a round hole in the center made by the aperture of the vessel in which it is sublimed. The drug is soluble in alcohol. It is somewhat translucent yet opaque, and contains numerous fine fissures. It is quite tough, and can not be pulverized except it be moistened with alcohol, chloroform, ether, or some one of the volatile oils. Exposed to the air it rapidly evaporates, and if lighted burns with a very dense smoke. If a piece of camphor is thrown upon the surface of water it develops a peculiar rotatory motion, which is probably due to its rapid evaporation and slow solubility in water. Its chemical formula is $C_{10}H_{16}O$.

The word camphor has been applied to other crystallizing stearoptens derived from volatile oils. Under the name of *Oleum camphoræ* there was officinal in the U. S. Pharmacopœia of 1870 a camphor oil of Formosa obtained in the course of the preparation of crude gum camphor. This oil is a dark yellow or light brown in color, tasting and smelling something like camphor itself. Another form of camphor is Borneo or Sumatra camphor, sometimes called Barus camphor, which is found in cracks of the wood of *Dryobalanops camphora*. It differs in odor slightly from ordinary camphor. In order to obtain it the tree is cut down, and owing to the expense thereby incurred through the destruction of the camphor-trees this form of camphor is very costly, and is ordinarily not found in commerce. Under the name of Ngai camphor a camphoraceous substance is obtained from a tall weed of Southeastern Asia, which sells there at a higher price than that of ordinary camphor.

Camphor is sometimes taken internally as a nervous sedative or diffusible stimulant in the dose of from 1 to 3 grains, and generally in pill form. It is popular with some women as a lotion for the soothing of nervous sick headache either in the form of the spirit of camphor, made by dissolving gum camphor in alcohol, or the water of camphor, which is made by taking advantage of the slight solubility of camphor in ordinary water. These preparations are taken internally to relieve wind colic and other painful affections of the bowels and stomach. It is also used to prevent irritability of the genito-urinary organs and allay sexual excitement. H. A. H.

Campidoglio, Palazzo del, pa-laăd'zō del kăăm-pĕĕ-dōl'yō: the central palace of a group of three, designed by Michelangelo and completed by Della Porta, in Rome, on the site of the ancient Capitol, whence probably the name. It is one of the earliest examples of the "colossal order," i. e. very tall columns or pilasters. It is flanked by the palaces "of the Senators" and "of the Conservators," now used as museums of sculpture and painting.

Campimeter: See Recording Apparatus, Psychological, in the Appendix.

Campinas, kăăm-pee'nas, or **Sao Carlos**, sowñ kaar'lōs: a city of Brazil; in the state of Sao Paulo; about 65 miles N. of Sao Paulo (see map of South America, ref. 7–F). Much sugar is produced here. Pop. 35,000.

Cam'pion, or **Campian**, Edmund: a Catholic priest; b. in London, Jan. 25, 1539–40. He had a brilliant career at Oxford; became fellow of St. John's College and deacon in the Church of England, although a Roman Catholic. In 1569 he left Oxford, went to Ireland, and in 1571 was a student at Douay. In 1572 he visited Rome, and in 1573 became a Jesuit. He took part in the perilous English mission 1580, preached with great success, and by his *Decem Rationes*, 1581 (Ten reasons for denouncing the Protestant and embracing the Catholic religion, Eng. trans., n. e. London, 1827), he produced a great effect upon the educated classes. On July 17, 1581, he was arrested on the charge of treason, confined in the Tower, placed on the rack (July 30, Aug. 6, Oct. 31), forced to dispute with able divines in public, while enfeebled and disabled by the torture and without opportunity of preparation; and at last was tried and condemned Nov. 20, and executed at Tyburn, London, Dec. 1, 1581. He was a lovable and eloquent man, and a martyr to his convictions. He is one of England's worthies. Besides the *Ten Reasons*, he wrote a *History of Ireland* (1571; reprinted Dublin, 1809). See his *Life* by Richard Simpson (London, 1867).

Camp-meetings: religious gatherings, with preaching, in the open air, and prayer-meetings during night, generally lasting for several days and held in groves or secluded places, where shelter is provided for the people present, in tents or temporary houses. The first camp-meeting was probably that held in 1790 on the banks of the Red river, Kentucky, and conducted by a Presbyterian and a Methodist minister. The Presbyterian Church afterward abandoned the institution, while the Methodist Church not only retained it, but even developed it by buying suitable grounds and erecting the necessary buildings. In England camp-meetings were first introduced by Lorenzo Dow in 1807. They were disapproved by the Wesleyan Conference of the same year, but the disapproval led to the foundation of the Primitive Methodist denomination. In the U. S. they seem to be more common in the Western than in the Eastern States.

Campoamor y Campoosorio, Ramon, de: Spanish poet and statesman; b. in 1817. He was the first Spanish writer of the nineteenth century to show a reaction from Romanticism. In politics he has always been conservative and royalist in temper, devoted to Queen Christina and to Queen Isabel; and after the restoration of Alfonso XII. he was made counselor of state. As poet he has invented a new *genre*, much imitated by younger poets in Spain and Portugal, called "Doloras," little humorous pieces full of sentiment, and at the same time of moral or philosophic suggestion. The collection of these appeared in 1846, and since then more than sixteen editions have been published. Among his works the following collections of verse are notable: *Ayes del Alma* (1842); *Fábulas morales y políticas* (1842); *Ternezas y flores* (1840); *Colón* (1853), an epic. His

charming romances in verse are also decidedly important, among them: *El drama universal* (1873); *El amor y el rio Piedra* (1882); *El trén express* (1885). Campoamor has written also dramas and works upon philosophy. The former have been not too successful; of the latter several are well known even out of Spain, e. g. *Filosofía de las leyes* (1846); *Lo absoluto* (1865), his profession of philosophic faith; and *El idealismo* (1883). A. R. MARSH.

Campobas'so (formerly called **Molise**): a province of Abruzzi e Molise, Central Italy; bounded N. by Chieti, N. E. by the Adriatic Sea, S. E. by Foggia, S. by Benevento, and W. by Caserta. Area, 1,778 sq. miles. The country is mountainous and sterile, and there is very little industry. Chief town, Campobasso. Pop. (1890) 376,191.

Campobasso: a fortified city of Italy; capital of the province of Campobasso (formerly Molise); on the declivity of a mountain; about 55 miles N. N. E. of Naples (see map of Italy, ref. 6-F). It has a fine cathedral, a ruined castle, a college, several convents, and palaces of the nobility; also celebrated manufactures of cutlery and arms. Pop. 15,500.

Cam'pobel'lo: an island in Passamaquoddy Bay; 2 miles E. of Eastport, Me. (see map of Maine, ref. 7-H); is a part of Charlotte co., New Brunswick; is 8 miles long. Copper and lead ores exist in the island. The inhabitants are engaged in the herring, cod, and mackerel fisheries. On this island are some of the finest summer hotels on the Atlantic coast. Pop. 1,200.

Campoformio, -fōr'mĕē-ō, or **Campoformido**, -mee'dō: a village of Northern Italy; in Friuli; about 66 miles N. E. of Venice and 7 miles S. W. of Udine (see map of Italy, ref. 2-E). An important treaty of peace was concluded here between Austria and the French republic, Oct. 17, 1797. Alarmed by the recent victories gained by Bonaparte in Italy, Austria was inclined to peace, and negotiated with the French general this treaty, by which she ceded the Netherlands and recognized the independence of the Cisalpine republic, including Milan, Mantua, and other parts of Austrian Italy. In return for these concessions the French gave up a part of Venetia, with the capital, Istria, and Dalmatia to Austria. Pop. 2,500.

Campomanes, kaăm-pō-maa'nes, PEDRO RODRIGUEZ, Count; Spanish author and minister of state; b. in the Asturias, July 1, 1723. He gained a high reputation by his writings on political economy, and was distinguished for his probity and enlightened policy. He became president of the royal council of Castile in 1788, and afterward a minister of state. Author of a *Discourse on the Promotion of Popular Industry* (1774) and a *Discourse on the Popular Education of Mechanics* (1775). D. Feb. 3, 1802.

Campos, MARTINEZ: See MARTINEZ CAMPOS.

Campos, kaăm'pōs: a city of the state of Rio de Janeiro, Brazil; on the Parahyba river; 30 miles from its mouth, and 150 miles N. E. of the city of Rio de Janeiro (see map of South America, ref. 6-H). Small steamers ascend the river to the city. It is in a fertile plain, on which is grown much sugar-cane, producing a superior article of sugar. Pop. 40,000.

Camp Point: village of Adams co., Ill. (for location of county, see map of Illinois, ref. 6-B). It has two mills, a manufactory of agricultural implements, and a fine public-school building. Pop. (1880) 1,131; (1890) 1,150; (1900) 1,260. EDITOR OF "JOURNAL."

Cam'pus: a Latin word signifying a plain, an open field, any level surface, as of the sea. It was sometimes used to denote a field of battle, and was applied figuratively to a subject of discourse, a field of debate or speculation. The grounds about college buildings in some places are called the campus.

Campus Mar'tius (i. e. the field of Mars): a celebrated plain and open field of ancient Rome; on the left bank of the Tiber, outside of the walls of the city. It was the place in which the Roman youth performed military exercises and evolutions, and in which the *comitia* assembled for the purpose of enacting laws and electing magistrates. It was subsequently used as a public park or pleasure-ground.

Campveer, kaamp-vayr', **Kampveer**, or **Veer**: a decayed maritime town of the Netherlands; province of Zeeland; on the northeast coast of the island of Walcheren; 4 miles N. N. E. of Middleburg (see map of Holland and Belgium, ref. 8-C). It has a beautiful cathedral, and a townhouse with an elegant tower. The Scotch "Staple-port," owing to a marriage of the Lord of Campveer to a daughter of James I., was transferred from Bruges to Campveer in 1444, after which this town had peculiar trading relations with Scotland for several centuries.

Camwood: See BARWOOD.

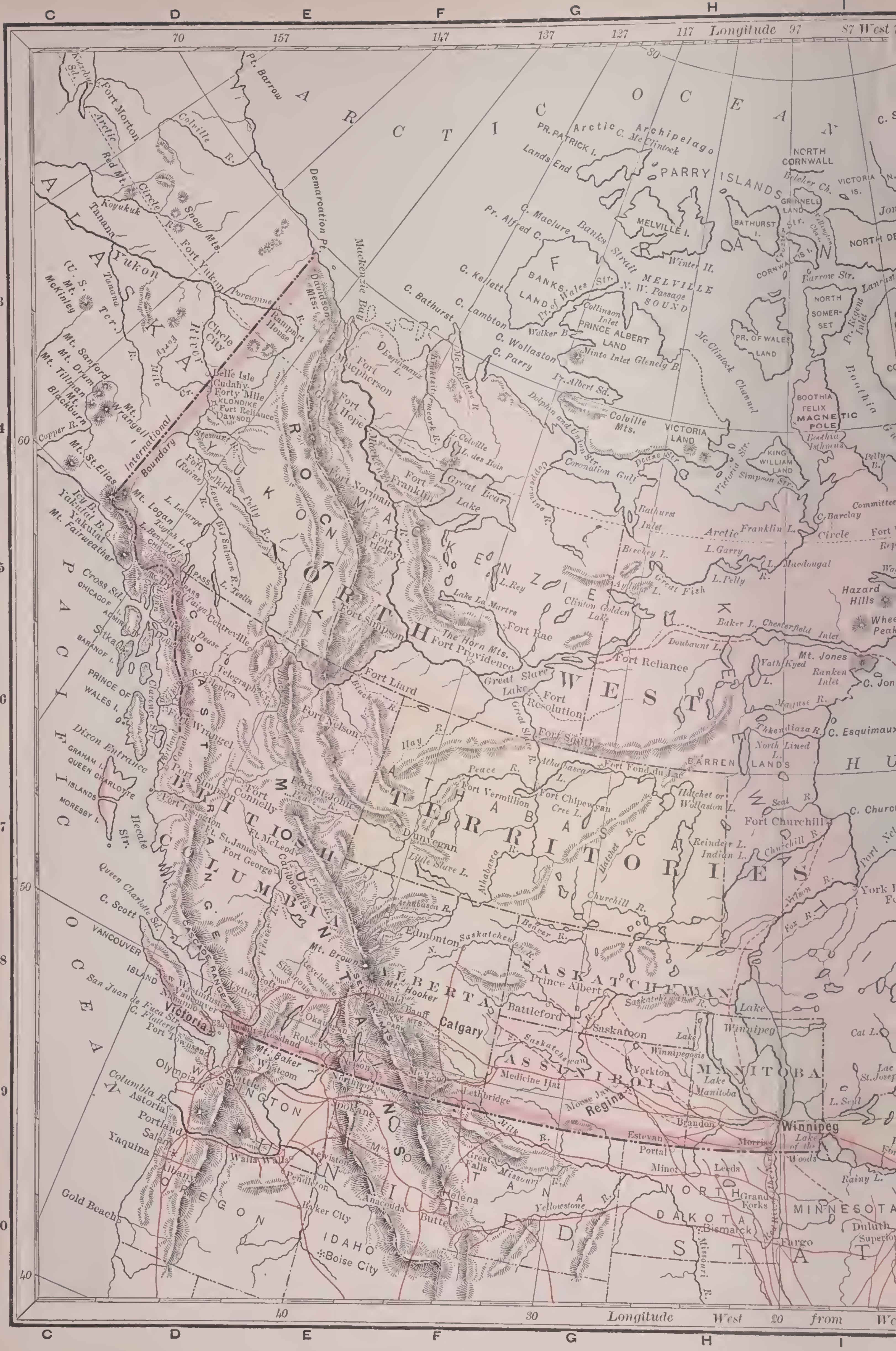
Ca'na: a village of Galilee; the scene of Christ's first miracle (John ii.). Its site is supposed to be indicated by some ruins 6 miles N. of Nazareth (see map of Palestine, ref. 6 D). The natives call this place *Cana-el-Jelîl*.

Ca'naan [lowland, netherlands, with immediate reference to the low coastlands where the Canaanites dwelt]: the name of the youngest son of Ham (Gen. ix. 18); of the tribe descending from him (Hos. xii. 7); and, most frequently, of the land inhabited by that tribe—the "land of Canaan" (Gen. ix. 31). In the last sense it denotes the whole region between the Jordan and the Mediterranean, from the Negebh in the S. to Phœnicia in the N. The rulers of the Canaanites in 1400 B. C. used Babylonian as the official language of diplomacy, which would seem to prove that the Babylonians had previously conquered the country. Like the Phœnicians, they were a commercial people and lived in peaceful relations with the people who occupied the land before their arrival. They had, moreover, cities with walls and gates (Josh. x. 20), fortresses on the heights, and formidable chariots of iron (Josh. xi. 4). One of their cities was called Kirjathsepher—that is, "the city of books" (Judg. i. 11)—which shows that they were not illiterate. They were divided into several tribes, each governed by a king and a council of elders. Recent discoveries have demonstrated that the country was in 1400 B. C. a dependency of Egypt. Many of the cities had Egyptian governors called in the Authorized Version "kings," and all paid tribute. On the N. the Canaanites were threatened by the Hittites, on the S. and E. by predatory tribes. The people worshiped Baal and Astarte, practiced witchcraft and magic, and were idolatrous, superstitious, and licentious. See *Records of the Past*, vol. v. (1892). See PALESTINE.

Canada, Dominion of: all the British possessions in North America, except Newfoundland and its dependency in Labrador, lying N. and N. E. of the U. S., embracing the provinces of Ontario, Quebec, Nova Scotia, New Brunswick, Manitoba, British Columbia, Prince Edward Island, and the Northwest Territories; bounded on the N. by the Arctic Ocean, E. by Baffin's Bay, Davis's Strait, Labrador, and the Atlantic Ocean, S. by the Great Lakes and the parallel of 45° N. lat. east of the lakes and that of 49° N. lat. west of them, N. W. by Alaska, and W. by the Pacific Ocean; area, 3,456,383 sq. miles, of which 140,736 were water; population (1891) 4,833,239. The principal cities, with population in 1891, are Montreal, 216,650; Toronto, 181,220; Quebec, 63,090; Hamilton, 48,980; Ottawa (the capital), 44,154; St. John, 39,179; Halifax, 38,556; London, 31,977; Winnipeg, 25,642; Kingston, 19,264; Victoria, 16,841; and Vancouver, 13,685.

Physical Features.—The coast-line is broken on the E. by the Gulf of St. Lawrence, the Bay of Fundy, and the Bay of Chaleurs; on the N. by Hudson Bay, Baffin's Bay, the Gulf of Boothia, and Melville and Lancaster Sounds; and on the W. by the Straits of Juan de Fuca, the Gulf of Georgia, and Queen Charlotte Sound. The principal mountains are the Rocky Mountains, extending from the Arctic Ocean to the U. S., on the W.; the Cascade Mountains, between the Rocky Mountains and the Pacific Ocean; the Laurentian range, extending from Labrador along the N. of the St. Lawrence river; the Notre Dame Mountains in Quebec; and the North and South Mountains and the Cobequid Mountains, both in Nova Scotia. Vancouver and Queen Charlotte, on the W.; Prince Edward, Cape Breton, and Anticosti, on the E.; and the chain along the entire north coast, known as the Arctic Archipelago, are the principal islands. All of the region from the Atlantic to the northwestern boundary of Ontario was once a vast forest, and still contains the principal timber growths. Where the forest has been cleared the soil is well adapted to agriculture. The great wheat-growing region is between the northern boundary of Ontario and the Rocky Mountains, and contains the Red river valley and the Lake Winnipeg plateau. The north part, from the Rocky Mountains to Hudson Bay, is heavily wooded, contains large auriferous deposits, and is still the great fur-preserve of the world.

Lakes and Rivers.—The most important system is that of the ST. LAWRENCE (*q. v.*), through which Lakes Superior, Huron, Erie, and Ontario, lying partly within the Dominion, find their outlet to the sea. Its principal tributaries in its



ARCTIC OCEAN
Longitude West
Pt. Barrow
Fort Morton
Colville R.
Arctic Archipelago
PR. PATRICK I.
C. McClintock
Lands End
PARRY ISLANDS
MELVILLE I.
NORTH CORNWALL
Belcher Ch.
GRINNELL LAND
BATHURST I.
CORNWALLIS I.
VICTORIA IS.
NORTH DEVON
Barrow Str.
NORTH SOMERSET
PR. OF WALES LAND
Pr. Regent Inlet
BOOTHIA FELIX
MAGNETIC POLE
Boothia Isthmus
Boothia
C. Maclure
Banks Strait
Pr. Alfred C.
Winter H.
BANKS LAND
Pr. of Wales Str.
MELVILLE SOUND
N. W. Passage
C. Kellett
C. Lambton
C. Bathurst
Collinson Inlet
PRINCE ALBERT LAND
Walker B.
C. Wollaston
C. Parry
Minto Inlet
Glenelg B.
McClintock Channel
Pr. Albert Sd.
Dolphin and Union Str.
Colville Mts.
VICTORIA LAND
KING WILLIAM LAND
Simpson Str.
Victoria Str.
Deuse Str.
Coronation Gulf
Coppermine R.
Bathurst Inlet
Committee B.
C. Barclay
Arctic Circle
Franklin L.
L. Garry
Beechey L.
L. Macdougal
Great Fish
L. Pelly
Hazard Hills
Baker L.
Chesterfield Inlet
Doubaunt L.
Mt. Jones
Ranken Inlet
Yath Kyed L.
C. Esquimaux
Thkendiaza R.
North Lined L. LANDS
BARREN
Seal R.
Fort Churchill
Churchill R.
C. Churchill
Reindeer L.
Indian L.
Hatchet or Wollaston L.
Nelson R.
York F.
Fox R.
ALASKA
Demarcation Pt.
Mackenzie Bay
Davidson Mts.
Red Mt.
Circle
Snow Mts.
Koyukuk
Tanana
Yukon
Fort Yukon
Porcupine
Rampart House
(U. S. Ter.)
Mt. McKinley
Circle City
Forty Mile
Mt. Sanford
Mt. Drum
Mt. Tillman
Mt. Blackburn
Mt. Wrangell
Copper R.
Mt. St. Elias
International Boundary
Belle Isle
Cudahy
KLONDIKE
Fort Reliance
Dawson
Stewart R.
Fort Selkirk
Pelly R.
Lewes R.
Mt. Logan
Icy B.
Yakutat B.
Mt. Fairweather
L. Lebarge
L. Bennett
CHILKOOT
WHITE PASS
Dyea
Skagway
L. Teslin
Juneau
Cross Sd.
CHICAGOF
ADMIRALTY I.
Sitka
BARANOF I.
PRINCE OF WALES I.
Dixon Entrance
GRAHAM I.
QUEEN CHARLOTTE ISLANDS
MORESBY I.
Hecate Str.
Queen Charlotte Sd.
C. Scott
VANCOUVER ISLAND
San Juan de Fuca Str.
C. Flattery
Victoria
Nanaimo
New Westminster
Vancouver
Fort Townsend
Olympia
Seattle
Whatcom
Mt. Baker
Columbia R.
Astoria
Portland
Salem
Yaquina
Albany
Gold Beach
OREGON
Walla Walla
Pendleton
Baker City
IDAHO
Boise City
Lewiston
Spokane
Anaconda
Butte
Helena
Great Falls
Missouri R.
Yellowstone R.
Milk R.
Fort Macpherson
Fort Good Hope
L. Colville
L. des Bois
Great Bear Lake
Fort Franklin
Fort Norman
Fort Wrigley
Fort Simpson
Fort Providence
The Horn Mts.
Fort Rae
Lake La Martre
L. Rey
Clinton Golden Lake
Great Slave Lake
Fort Reliance
Fort Resolution
Fort Smith
Fort Liard
Fort Nelson
Hay R.
Peace R.
Fort Vermillion
Fort Chipewyan
Fort Fond du Lac
Athabasca L.
Cree L.
Fort St. John
Dunvegan
Little Slave L.
Athabasca R.
Churchill R.
Beaver R.
Edmonton
Saskatchewan R.
Prince Albert
Battleford
Saskatoon
Calgary
Medicine Hat
Lethbridge
Moose Jaw
Regina
Yorkton
Estevan
Portal
Brandon
Winnipeg
Lake Winnipeg
Lake Winnipegosis
Lake Manitoba
Lake of the Woods
Rainy L.
Cat L.
L. Seul
Lac St. Joseph
Telegraph Cr.
Glenora
Fort Wrangel
Port Simpson
Fort Connelly
Fort Fraser
Ft. St. James
Ft. McLeod
Fort George
Cariboo Mts.
Fraser R.
Mt. Brown
Mt. Hooker
Donald
Banff
Revelstoke
Sicamous
Ashcroft
Lytton
Okanagan
Rossland
Robson
Nelson
Northport
CASCADE RANGE
SELKIRK MTS.
ROCKY MTS.
YUKON
ROCKY MTS.
MACKENZIE
NORTH
WEST
TERRITORIES
ATHABASCA
KEEWATIN
CASSIAR
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
ASSINIBOIA
MANITOBA
WASHINGTON
MONTANA
NORTH DAKOTA
MINNESOTA
UNITED STATES
Minot
Leeds
Grand Forks
Bismarck
Fargo
Duluth
Superior
Morris
PACIFIC OCEAN
HUDSON


DOMINION OF
CANADA
SCALE OF MILES
0 50 100 200 300 400 500 600
Railroad Routes
Projected Railroad and Steamer Routes
from 57 Greenwich 47
East
GREENLAND
(To Denmark)
BAFFIN BAY
BAFFIN LAND
DAVIS STRAIT
Hudson Strait
HUDSON BAY
JAMES BAY
LABRADOR
Labrador Peninsula
UNGAVA
QUEBEC
ONTARIO
NEW BRUNSWICK
NOVA SCOTIA
NEWFOUNDLAND
ATLANTIC OCEAN
GULF OF ST. LAWRENCE
HEIGHT OF LAND
SOUTHAMPTON ISLAND
CUMBERLAND
Cumberland Sd.
Frobisher Bay
META INCOGNITA
RESOLUTION I.
C. Chudleigh
Ungava Bay
Hamilton Inlet (Esquimaux B.)
Str. of Belle Isle
ANTICOSTI
CAPE BRETON I.
Halifax
Fredericton
Quebec
MONTREAL
OTTAWA
Toronto
Kingston
St. John's
C. Race
C. Farewell
C. Desolation
Julianehaab
Godthaab
Moose Factory
Fort Albany
Fort George
L. Mistassini
LAKE SUPERIOR
L. HURON
L. ONTARIO
L. ERIE
MAINE
VT.
N. H.
MASS.
NEW YORK
Boston
Portland
Augusta
Bangor
C. Cod
Albany
Providence
Buffalo
Detroit
Port Huron
Sault Ste. Marie
Sudbury
North Bay
Three Rivers
Sydney
Louisburg
C. Sable
Yarmouth
SABLE I.
NEWFOUNDLAND BANKS
WIS.
MICH.

lower course are the St. Maurice and the remarkable Saguenay. The St. John forms the N. boundary of Maine as far as Grand Falls, and then becomes the great river of New Brunswick. In the Northeast Territory the Koksoak or South river flows northward into Ungava Bay, while the Little and the Great Whale, the Big, the East Main, and the Rupert rivers enter Hudson Bay from the east. Albany river forms the greater part of the northern boundary of Ontario province, receives through a southern tributary the waters of Lake Nipigon, and empties into James Bay. The vast area between Hudson Bay and the Rocky Mountains is a region abounding in lakes and having intricate river systems. They may be divided into three parts, two of which are tributary to Hudson Bay and the other discharges directly into the Arctic Ocean. The most southern of these is the Nelson river. Its upper eastern course consists of Rainy Lake and river and Lake of the Woods, which discharge through the Winnipeg river, after it receives English river from the E., into Lake Winnipeg. The Red River of the North flows into the southern end of Lake Winnipeg. Its lower course lies in Manitoba, where it receives the Assiniboin, the great river of this province. The Saskatchewan supplies the principal drainage system of the territory of the same name and of Assiniboia, and finds its way through Cedar Lake into Lake Winnipeg, which also receives the waters of the very considerable Lakes of Manitoba and Winnipegosis on its W. This entire system discharges through the Nelson river into Hudson Bay. The second of the systems is that of the Churchill river, which forms the southern basin of the Northwest Territory, and is intermediate between the Saskatchewan and Athabascan waters. Its greatest lake is the Reindeer on the N., and it empties into Hudson Bay about 150 miles N. of the Nelson. The Mackenzie system is the most considerable, next to the Mississippi, of North America. It rises in Alberta Territory. On the W. the Peace river, which breaks through the Rocky Mountains, reaches it on the eastern boundary-line of Athabasca Territory, just below the inlet of Athabasca Lake. The united streams are now called Slave river until Great Slave Lake, in a complicated and extensive lacustrine basin, is reached. From the outlet of this lake the waters flow N. W. under the name of Mackenzie river, making a stretch of 900 miles. The largest lake entirely in the Dominion, Great Bear Lake, is tributary to the lower Mackenzie. On the Pacific coast the Kootenay and the north branches of the Columbia river, after forming great loops in the Rocky Mountains, unite near the southeastern boundary of British Columbia. Of this province the chief river is the Fraser, which rises in N. lat. about 57°, drains the basin between the Cascade and Rocky Mountains, flows southerly until near the southern boundary of British Columbia, when it turns to the W. and empties into the Straits of Georgia at Vancouver. Going N. the next considerable rivers of this province are the Skeena and Stickeen. The upper waters of the great Yukon river are in the Dominion. It is known as the Yukon below Fort Selkirk; above, the principal affluent is the Pelly river. Farther N. rises the Porcupine river, which forms another tributary to this Alaskan system.

Climate.—The climate of the Atlantic provinces resembles that of Norway; that of Ontario is considerably modified by the influence of the Great Lakes; and that of British Columbia, like the rest of the Pacific coast, is more equable than that of the Atlantic in corresponding latitudes. In general, the climate is much warmer in summer and colder in winter than in Great Britain. The mean summer temperature in ninety-nine places shows a range of from 48·7° to 69°, and the mean winter temperature a range of from −1° to 40·4°. The fall of rain and snow gives a total precipitation ranging from 10·41 to 71·44 inches.

Government.—The provinces were united under the British North America Act, which went into operation on July 1, 1867. It provided in substance that the constitution of the Dominion should be similar in principle to that of Great Britain, that the executive authority should be vested in the British crown and carried on in its name by a governor-general and privy council, that the legislative power should be vested in a parliament consisting of two houses to be called the Senate and the House of Commons. The Governor-General, who is appointed by the crown, has a salary of £10,000 per annum. The senators, of whom there are eighty, are nominated for life by the Governor-General; a senator must be thirty years of age, and have real or personal property of the value of $4,000. The members of the House of Commons (one for every 20,000 persons) are chosen by the people for a term of five years; there is a slight property qualification for the right of suffrage, varying in the different provinces and territories, except that in the Northwest Territory there is no property qualification. The provinces have also each a separate legislature and a lieutenant-governor.

Finances.—The total debt of the Dominion, incurred chiefly on account of public works, on June 30, 1899, was $345,130,754; the assets were $79,076,043; and the net debt was $266,054,711. The revenue was $46,741,249, June 30, 1900; expenditure, $41,903,500; and the surplus, $4,837,749.

Banking.—The Bank Act of 1890 provides that no bank shall be incorporated with less than $500,000 in capital stock; that all notes issued for circulation shall be redeemable at par in any part of the Dominion; that no bank shall issue circulation notes in excess of its unimpaired capital; and that the payment of circulation notes shall be the first charge on the assets of an insolvent bank, and any amount due the Dominion Government the second charge. The bank circulation Dec. 31, 1899, was $49,588,236, and the circulation of Dominion notes $27,076,309. The bank clearings in Toronto, Montreal, Winnipeg, Hamilton, Halifax, and St. John were $1,549,966,696. The discounts in chartered banks, Jan. 31, 1900, were $301,000,000. Under acts of 1867 and 1885 savings-banks were established in connection with the post-office department, and in 1899 contained $321,000,000 in deposits.

Industries.—Canada has large agricultural interests, but there are no reports for the whole of the Dominion. Lumbering is one of the most important industries. The fisheries, comprising cod, haddock, herring, mackerel, salmon, lobsters, etc., are extensive; the total product in 1899 was valued at $21,891,706. The principal mineral resources are coal, gold, iron, petroleum, asbestos, copper, silver, and nickel. Nova Scotia, British Columbia, Quebec, Ontario, and part of the Northwest Territories are the chief mining districts. The mineral production in 1899 had a value of $47,275,512. The census of 1891 showed 75,768 manufacturing establishments with a combined capital of $353,836,817, and products valued at $475,445,705.

Commerce.—The trade of the Dominion is chiefly with the U. S. and Great Britain. The principal imports from Great Britain are iron and cotton and woolen goods; the chief exports to Great Britain are breadstuffs, timber, cheese, cattle, and apples, and to the U. S. breadstuffs, lumber, cattle, fish, iron, and coal. The imports in 1900 were $183,209,273; exports, $175,656,947.

The South African War.—Canada contributed 3,000 troops and voted $2,000,000 for their transportation to South Africa, and for special remuneration in addition to their regular army pay. The Canadians were in service from Oct. 1, 1899, to Oct. 1, 1900, and lost 104 killed or died of disease, 180 wounded, and 52 missing.

Means of Communication.—The total mileage of canal, river, and lake navigation exceeds 2,700. The canals are designed principally to facilitate navigation between the Great Lakes and the St. Lawrence river. In 1899 they comprised the Welland, St. Lawrence system, Chambly, Ottawa, Rideau, St. Peter's, Trent Valley, and Murray, and had cost for construction and enlargement alone $92,036,524. All the systems belong to the Dominion Government. In 1899 there were 17,358 miles of railway in operation, with an invested capital of $964,699,784. The Dominion Government owned the Intercolonial, the Windsor Branch, and the Prince Edward Island railways.

Churches.—There is no state Church in the Dominion, each religious denomination being governed by its own laws. The census of 1891 gave the following statistics of the religious bodies: Roman Catholic, 1,992,017 adherents; Methodist, 847,765; Presbyterian, 755,326; Anglican, 646,059; Baptist, 302,565; Lutheran, 63,982; Congregational, 28,157; miscellaneous creeds, 108,013. The Roman Catholic Church was the strongest in Quebec, and the Anglican, Presbyterian, Methodist, and Baptist Churches were the strongest in Ontario.

Schools.—In 1890–92 there were 15,793 public and 1,011 high, normal, and model schools, with 883,266 pupils in the former and 114,207 in the latter. The annual expenditure exceeds $10,000,000. There were 14 universities, 10 colleges, 17 classical colleges, 6 colleges for women, 5 agricultural colleges, the Royal Military College at Kingston, and several schools for artillery and infantry instruction. The public-school system in Ontario is under the control of the Minister of Education; in other provinces it is under super-

intendents and boards of education, who report to the provincial secretaries. In Manitoba all public schools were made non-sectarian in 1890; in Quebec education is based on religious teaching; and in Nova Scotia, New Brunswick, British Columbia, and Prince Edward Island the schools are strictly undenominational.

History.—Jacques Cartier (*q. v.*) entered the St. Lawrence river in 1534 and again in 1535, and the first permanent settlement was made by a French colony under de Monts at Port Royal (Annapolis) in 1604. The French founded Quebec in 1608, after which numerous French colonists settled in Lower Canada, near the St. Lawrence river. The British general Wolfe captured Quebec in 1759, and the conquest of Canada was completed in 1760. Upper Canada was settled mostly by English and Scotch emigrants. In 1791 Canada was divided into two provinces, called Upper and Lower Canada (afterward called Canada West and Canada East, and later Ontario and Quebec). Both were disturbed by an insurrection in 1837, and reunited in 1840. By an act of the British Parliament, passed Mar. 29, 1867, and taking effect July 1 of that year, the Canadian provinces, Ontario and Quebec, and New Brunswick and Nova Scotia were federally united into one Dominion of Canada. The Legislature of Newfoundland declared in favor of joining the Dominion, but the people, in Nov., 1869, by a large majority, voted against it. From the Hudson Bay Company the Government of the Dominion purchased in the same year its vast territory. An insurrection of colonists and natives, who protested against having their land treated as a dependent territory, induced the Government to organize in 1870 that part of the newly purchased territory which is situated between lon. 96° and 99° W., and the U. S. boundary-line and lat. 50° 38′ N., as an independent province of the Dominion, under the name of Manitoba. The immense unorganized territory beyond the limits of Manitoba is called the Northwestern Territory. On Mar. 31, 1871, British Columbia was received into the Dominion. Invasions of Canada by armed Fenians from the U. S. were attempted in 1866 and 1870, but were repelled without difficulty. The long-pending controversies with the U. S. were mostly settled by the Washington treaty of 1871. In 1873 Prince Edward Island joined the Dominion. The Northwestern Territories were partly divided in 1882 into four provinces—Assiniboia, 95,000 sq. miles; Saskatchewan, 114,000 sq. miles; Alberta, 100,000 sq. miles; and Athabasca, 122,000 sq. miles. The half-breed and Indian rebellion in the Northwest Territories in the spring of 1885, led by Louis Riel, was put down in a few months. Riel was hanged the same year.

Authorities.—*Statistical Year-books of Canada*; *Annual Reports of the Geological Survey of Canada*; *Canadian Almanack* (annual); Selwyn and Dawson, *Descriptive Sketch of the Phys. Geog. and Geology of the Dom. of Canada* (1884); Silver's *Handbook to Canada* (1881); Morgan, *Canadian Parliamentary Companion and Dominion Annual Register and Review*; Bryce, *Manitoba* (1882); Chapleau, *Report on the Constitution of the Dom. of Canada* (1891); Greswell, *Geography of the Dominion of Canada and Newfoundland*; Smith, *Political History of Canada*; Adam, *Canadian Northwest and the Rebellions.*

Revised by Mark W. Harrington.

Canada Balsam (in Lat. *Balsamum canadense*): a turpentine or oleoresin obtained from the *Abies balsamea*, a species of fir which grows in Canada and the U. S., and is sometimes called balsam fir. It is a pale-yellow, transparent liquid, having a peculiar and agreeable odor and an acrid taste. When it exudes from the bark it has the consistence of honey, but by age and exposure to air it becomes solid. It was formerly used in medicine as a stimulant to check mucous discharges, and as a dressing for ulcers, but is now seldom used. It is valuable for a variety of purposes in the arts, in photography, in mounting objects for the microscope, and as an ingredient in varnishes.

Canada Goose, or **Wild Goose** (*Branta canadensis*): a goose of the family *Anatidæ*; 30 to 35 inches long; brownish above, lighter beneath, with the head, neck, bill, and feet black, a white patch on each cheek; inhabits North America, breeding at the N. and wintering in warmer regions. These birds usually fly in a >-shaped figure (though sometimes in a straight line), led by an experienced gander, who frequently gives utterance to his familiar *honk*. "Their spring migrations usually take place from Mar. 20 to the last of April, but are wholly dependent upon the state of the season. They breed at the N., and linger there till the hard frosts warn them that the lakes and streams will soon be frozen over."

Canada goose, or wild goose.

While performing their long journeys they usually fly at a great height, probably a quarter of a mile or more.

Canadian Literature: British Canada has literary men, perhaps in full proportion to her circumstances and opportunities; but she can not be said to have a national literature, as she has no distinct nationality. Her leading writers commonly publish in London, Edinburgh, or New York. Of her native authors some have gone to reside in other parts of the British empire or in the U. S. Some of her authors are not native. The late Sir Daniel Wilson was a conspicuous member of a group resident in Canada, but fully as much British as Canadian. French Canada, on the other hand, has a nationality distinct both from that of the British, with whom her people, though politically united, do not amalgamate, and from that of the French, from whom she has been not only severed by conquest, but estranged by the French Revolution, the effects of which she did not share. Her literature therefore may be said to be national, and forms a subject for separate notice.

Literature in Canada had its beginnings with the founding of the Catholic missions in the colony in the days of Champlain. From that period both the civil and the ecclesiastical history of the country date. The chief literary product of the era embraces Champlain's voluminous narratives of his voyages; Lescarbot's *History of New France*, to which is appended *Les Muses de la Nouvelle France*; Sagard's *Le Grand Voyage du Pays des Hurons*; and the famed *Relations des Jésuites*, a work replete with thrilling incidents, told with much simplicity of style, of missionary adventure. A collected and scholarly edition of Champlain's works, in six quarto volumes, appeared at Quebec in 1870, under the editorship of Abbé Laverdière. The crude records of the voyages of the early discoverers, Cartier, Roberval, and others, can hardly be said to belong to native literature, though Canadian reprints have been issued by the Quebec Literary and Historical Society.

The later writers of Old France identified with Canada prior to the conquest are also ecclesiastics, attached either to the Jesuit or to the Récollet order. Le Clerq is known by his work entitled *L'Établissement de la Foi*, which was published in France in 1691, and was translated with a memoir, by the late Dr. J. G. Gilmary Shea, of New York. The work gives an account of the author's missionary labors in the Gaspé region, and is chiefly notable for its satirical remarks on the Jesuits and their politic methods. A work held in some esteem by collectors is *Les Mœurs des Sauvages Ameriquaines*, by the Jesuit Father Lafitau, which consists of an intimate study of the Iroquois confederacy, among whom the author labored. Father Louis Hennepin's *Discoveries and Voyages* is valuable as the narrative of an enter-

prising traveler—the first European to visit the Falls of Niagara. In Charlevoix French Canada possesses the ablest and best informed of the writers of the era. His *History and General Description of New France* records the impressions of an accurate writer and trained observer who came to Canada in 1720 to inspect the Jesuit missions. Charlevoix personally traveled through the country from Acadia to the Gulf of Mexico. Baron La Hontan's *New Voyages in America*, though dealing with the important period of Frontenac and La Salle, is little to be trusted as a history of New France. The work was first published at La Haye in 1703.

The conquest was followed by a period of British military rule, little favorable to the intellectual activity of French Canada. When at last literature broke silence it was to engage in the political strifes and race jealousies which vexed the first fifty years of British occupation. Nor were matters mended by the promulgation of the Constitutional Act of 1791 and the division of the country into what was long known as Upper and Lower Canada. In these wrangling times history was rapidly made, though it did not find a chronicler until the union again brought the two races into an uneasy wedlock. Of this era the first author of note was Michael Bibaud, who in 1843 published a sober narrative of events dealing with the *Histoire du Canada et des Canadiens, sous la Domination Française*. In the following year the author brought out a new edition of his book, supplementing it with a history of Canada under English rule. Between 1845 and 1848 appeared a work of conspicuous merit, which the French-Canadians accept as their national history. This was F. X. Garneau's *Histoire du Canada*, of which an English translation, somewhat modified by its editor, Andrew Bell, appeared in 1866. The best edition of the original work, edited by Garneau, *fils*, with an introduction by Chauveau, was issued at Montreal in 1882. During the sixties two learned priests entered the field of French-Canadian authorship as historians, but their works, though alike valuable, are both incomplete, death in each case having arrested the writer's labors. The first in point of time to appear was *Cours d'Histoire du Canada*, par l'Abbé J. B. Ferland, continued to the conquest by l'Abbé Laverdière, who has the reputation of being one of the ablest scholars in the Canadian priesthood. The second of these two works is *Histoire de la Colonie Française en Canada*, by the Abbé Faillon, a Sulpitian priest from Old France, who spent a number of years in Canada. Abbé Ferland's narrative is in two volumes, and was published at Quebec in 1861–65. Of Abbé Faillon's work but three volumes appeared, which were issued in Paris in 1865–66.

Of the more recent writers of French Canada we have space to enumerate only those whose works are found in the chief public and private libraries. Among these are P. Bedard's *Histoire de Cinquante Ans*, Sulte's *Histoire des Canadiens-Français*, and Turcotte's *Le Canada sous l'Union*. The latter is an instructive work—from a French point of view, however—dealing with the political history of the two old provinces of Canada from the rebellion to confederation. Sulte's history is the work of an industrious and competent writer. David's *L'Histoire de la Rebellion de 1837–38* deals with the Papineau insurrection, from the point of view of a French-Canadian Liberal, opposed to the Tory oligarchy of the period. *Les Canadiens de l'Ouest*, by Joseph Tassé, consists, as its title imports, of a series of biographies of French pioneers in the West. To the list of these writers we have to add the names of two learned ecclesiastics, whose works are respectively held in deservedly high esteem in the French province. We refer to the accomplished philologist l'Abbé Tanguay, who has published an interesting work dealing with *La Généalogie des Familles Canadiennes*, and l'Abbé Casgrain, author of *Les Opuscules*, a series of papers which deals with incidents, historical and legendary, connected with early pioneering life in the Quebec province. Casgrain has also published *L'Histoire de l'Hôtel-Dieu de Quebec*, an account of one of the most interesting institutions of the Church in the ancient capital. Le Moine, who writes in both languages, is one of the familiar names in Canadian literature, and has done much to preserve from oblivion many of the more romantic legends and stirring events in French-Canadian history. His *Quebec, Past and Present*, and *Picturesque Quebec* are full of the military and ecclesiastical memories of the ancient city.

The writers of less grave cast are numerous, and their graces of style impart a charm to the literature of French Canada. One of the most popular of this class is Faucher de Saint-Maurice. Two of the best known of his works—*Les Provinces Maritimes* and *Promenades dans le Golfe St.-Laurent*—are light sketches of travel. *La Saguenay et la Vallée du Lac St. John*, by the pleasing *chroniqueur* Arthur Buies, treats of a region long dear to the Church, and now a resort of many tourists. Though the French province is rich in romantic history, little has been done in working up the material in the form of fiction. The novelette and light drama exist in plenty, but there is hardly anything of a sustained nature from the Gallic pen. *L'Intendant Bigot*, by Joseph Marmette; *Jean Rivard*, by C. M. Gerin-Lajoie; and *Charles Guérin*, by the Hon. P. J. O. Chauveau, are good examples of French-Canadian fiction, as are also Taché's *Forestiers et Voyageurs* and *Trois Légendes de Mon Pays*. Two others of Marmette's stories—*François de Bienville* and *Le Chevalier de Mornac*—have been dramatized, with acceptance by his fellow-countrymen. A more ambitious novel of an historical character is *Jacques et Marie*, by Napoleon Bourassa, M. R. C. A. It deals with the expulsion of the Acadians, and, of course, with French sympathy for the Neutrals.

French Canada, in spite of the rigors of nature, has ever been kind to the poets, of whom it is said she has close upon a hundred. Much of the work of these writers is ephemeral, but some of it is fairly entitled to more permanent rank as poetry. As a rule, its themes are Canadian, and from native subjects it takes its inspiration and local color. Generally it is fervently French, with frequent invocations to the muse of the Gallic motherland. The models of Old France are also closely followed. In the main, however, it is largely imbued with the spirit of its local home, and its subjects are drawn from the national history, with pictures of the religious and political life, and of the social and industrial pursuits. As a result of their light-heartedness and joyous temperament, not a little of the verse of the French-Canadian people is set to music. Three song collections have appeared, perhaps the best of which is *Chansons Populaires du Canada*, edited with the music, by Ernest Gagnon (Quebec, 1865). William McLennan's selected English version of these songs happily preserves much of the spirit and charm of the original (Montreal, 1886). The poets of the highest rank are Pamphile Le May, Octavie Cremazie, Louis Honoré Fréchette, and Benjamin Sulte. The first of the quartette is best known, perhaps, as the translator into French of Longfellow's *Evangeline*. Much of Cremazie's verse has the ring of true metal, though it is touched, in part, by the influences of a disappointed life. Sulte's verse has a national stamp, and in his volume entitled *Les Laurentiennes* he has given his compatriots reason for placing him high among the recognized poets of French Canada. Fréchette, as the crowned poet of the French Academy, holds the place of honor. His published works are *Mes Loisirs*, *Pêle-Mêle*, *Les Fleurs Boréales*, and *Les Oiseaux de Neige*. His themes are those which commend him as *par excellence* the national poet. His later work includes one or two dramas, many sonnets, and a profusion of lyrics, dealing with nature and life.

The early literature of English-speaking Canada is chiefly concerned with the varied aspects and resources of the country. The writers were, in the main, chance visitors from the motherland, or the more intellectual type of immigrant and settler. Sometimes we find among them a retired army or navy officer, a land surveyor, a schoolmaster, or a member of the office-holding class who had come to the country in the train of a colonial governor. At a still earlier era we find the writer either a Hudson's Bay factor engaged in the peltry trade, or some restless spirit whom loss of fortune or other accident had turned into the untrodden wilderness. The pursuit of the fur-trade, as we have hinted, led to exploration and discovery, particularly in the great hunting-grounds of the Canadian Northwest. Two of the more notable adventurers into the vast solitude of the Hudson's Bay Company appeared toward the end of the last century, the works of both being brought out in London. These were Samuel Hearne, a Hudson's Bay Company officer, who discovered the Coppermine river, and Alexander Mackenzie, a partner in the Northwest Fur Company, and the discoverer of the great Arctic river which bears his name. Mackenzie, who was knighted for his services, was the first white man to cross the Rocky Mountains to the Pacific. His work, entitled *Voyage from Montreal on the River St. Lawrence through the Continent to the Frozen and Pacific Oceans*, gives a valuable account of the fur-trade, and is rich in the results of geographical discovery. Hearne's work narrates his adventures on a *Jour-*

ney from Hudson's Bay to the Mouth of the Coppermine River, with some account of the Esquimaux and other tribal inhabitants of the region. The Red river country, in the heart of the continent, is full of the memories of Lord Selkirk's ill-fated colony at Fort Garry (now Winnipeg), an account of which is to be found in the nobleman's published *Narrative*, and in Prof. Bryce's recent work on Manitoba. The transfer in 1869 of the Hudson's Bay territories to the Dominion, and the subsequent carving out of Manitoba and the provincial districts of the Northwest, gave birth to a number of books on the country, of more or less interest. The chief of these, omitting English works, such as Milton and Cheadle's *Northwest Passage by Land* and Capt. Butler's *Great Lone Land*, are Prof. Hind's *Red River Exploring Expedition*, the same author's *Assiniboia and the Saskatchewan*, and the Rev. Principal Grant's *Ocean to Ocean. The Canadian Northwest: its History and its Troubles*, by G. Mercer Adam, may also be consulted for an account of the region, from the granting of the charter to the Hudson's Bay Company, through the troublous era of Lord Selkirk's conflict with the rival fur-trading corporation on the Red river, to the acquisition of the Territory by Canada, with the narrative of Riel's two rebellions and the military operations in suppressing them.

A new literature arose with the settlement of the British province of Upper Canada, which occurred shortly after the close of the war of independence and was largely recruited from the young republic by incoming bands of United Empire loyalists—that is, of the adherents of the British crown who preferred to live under the old flag even in the wilderness. At first this literature, as we have said, consisted chiefly of works of travel by old-country writers, then, as the provinces opened up, of works of a topographical and descriptive character; after which came the era of political agitation and of clamor for the reform of abuses connected with the autocratic form of colonial government which prevailed, together with a plentiful crop of political diatribes and other literary heralds of revolt. Prior to the political outbreak occurred the war of 1812, which called forth a number of works, in prose and verse, full of patriotic ardor. The more important of these are the works of David Thompson, Gilbert Auchinleck, and Col. Coffin. Students of the period should also be directed to Tupper's *Life and Correspondence of Sir Isaac Brock*. For an account of the youth of the province, including the raw materials of history, two works may be referred to: *The Loyalists of America and their Times*, by the Rev. Dr. Egerton Byerson, and *The Settlement of Upper Canada, with Special Reference to the Bay of Quinté*, by Dr. William Canniff, though the literary form of neither is good. Talbot's *Five Years' Residence in the Canadas*, Dunlop's *Statistical Sketches of Upper Canada*, and Bouchette's *British Dominions in North America*, belong also to the descriptive works of the period. *The Canadas*, by John Galt, the Scottish novelist, and *Sketches in Canada*, by Jameson, the English art-writer, and Col. Strickland's *Twenty-seven Years in Canada*, are to be added to the list of works which record the social annals of the time. *Roughing it in the Bush*, by Mrs. Moodie, sister of Agnes Strickland, the historian, is a narrative of a settler's trials.

The literary outcome of the political agitation on the reform side are Gourlay's *Statistical Account of Upper Canada* and the voluminous writings of William Lyon Mackenzie. On the Tory side are Sir Francis Bond Head's *Narrative of my Administration in Canada* and the *Report* of Attorney-General Robinson, the head of the Family Compact. An able state document, from an independent standpoint, and the chief fruit of this distracting political period, is Lord Durham's famous *Report* to the imperial Government on the affairs of the colony. This state paper, compiled, it is said, by Charles Buller, the Governor's able secretary, gives the result of Lord Durham's diagnosis of the political situation, and recommends enlarged measures of self-government to the colony.

The later works on the era of revolt and the political history of the times are numerous and for the most part controversial. *The Life and Times of William Lyon Mackenzie*, by his son-in-law, Charles Lindsey, and Dent's *History of the Rebellion* deal with the outbreak. The period is also historically treated of in MacMullen's *History of Canada*, the most notable repository of facts, carefully set forth from a Liberal standpoint, concerning native history. The distracting period between the revolt and the confederation is dealt with in Dent's *Last Forty Years* of Upper Canadian history; in Collins's *Life of Sir John A. Macdonald*, edited, with additions, by G. Mercer Adam; in Sir Francis Hinck's *Reminiscences*; and in Mackenzie's *Life of the Honorable George Brown*. The annals of the French province during the period of political agitation are to be found related in Christie's *History of Lower Canada*, the chief parliamentary and political text-book which deals with the half-century between the passing of the Constitutional Act and the union of 1841. Dr. William Kingsford's *History of Canada* is an industriously related repertory of facts, from the discovery of Canada to the conquest. The old province of Acadia has several annalists, the chief of whom are Murdock and Howe, in whose histories the political and social life of the maritime province may be traced. Annand's *Life and Times of the Hon. Joseph Howe* and the humorous works of Judge Haliburton ("Sam Slick, the Clockmaker") should be consulted by students of the local history of Nova Scotia. The constitutional history of Canada may be studied in the works of Todd, Bourinot, Watson, O'Sullivan, and Doutre. The prelections of the first two of these writers have found readers beyond the colony. *Canada and the Canadian Question*, by Goldwin Smith, embraces a brief history of the two older provinces of Canada, with chapters on the constitution and the economical questions of the time. Oliver Howland's *The New Empire* is an important work on the imperial and colonial system.

Confederation, which gave birth to the Canadian Dominion, brought to the front a number of writers, including not a few poets. Space forbids our doing more than enumerating the chief works of the period. Rattray's *The Scot in British North America* and Davin's *The Irishman in Canada* are more biographical than historical, though they set out to review important elements in the formation of national life and character. In the same category may be placed Dr. Bryce's *Short History of the Canadian People*. A popular text-book dealing with the annals of the Dominion is Dr. Withrow's *History*, as is also his illustrated handbook entitled *Our Country*. *Picturesque Canada*, edited by Principal Grant, is rich in the material descriptive of the social, industrial, and recreative life of the people. *Canada from Sea to Sea*, *Illustrated Toronto*, and *Illustrated Quebec*, by G. Mercer Adam, deal with picturesque features of the country. Dr. Scadding's valuable work *Toronto of Old* is of more antiquarian interest.

Fiction is not strongly represented in Canada, though the materials are plentiful. The three best known works of fiction are *The Golden Dog* (Le chien d'or), by William Kirby; *The Bastonnais*, by John Talon Lesperance; and *An Algonquin Maiden*, by G. Mercer Adam and A. E. Wetherald. The first deals with tragic incidents in the social life of Quebec during the French *régime*; the second treats of the Montgomery invasion of Canada in 1775; and the third is a romance of Upper Canada before the revolt, with types of character drawn from the French, English, and native races. In the department of *belles-lettres* Canada has produced several works dealing with criticism and the essay proper, a few of which may be mentioned. Among the more important of these are S. E. Dawson's *Study of Tennyson's Princess*, Dr. R. M. Bucke's *Study of Walt Whitman*, Prof. J. C. Murray's *The Ballads and Songs of Scotland, in View of their Influence on the Character of the People*, Prof. William Clark's *Savonarola*, Prof. Watson's *Treatise on Kant*, Sir Daniel Wilson's *Caliban*, Bourinot's *Intellectual Development of the Canadian People*, George Stewart's monograph on Frontenac, Morrison's *The Art Gattery of the English Language*, and Joseph Pope's *Jacques Cartier*. Biography is represented in Dent's *Canadian Portrait Gallery*, in Fennings Taylor's *Portrait of British-Americans*, in Hodgin's *Life and Times of the Rev. Dr. Ryerson*, the educationist, in Prof. Harrington's *Life of Sir William Logan*, in Collins's *Administration of the Marquis of Lorne*, and in Leggo's and in Dr. Stewart's histories of the administration of Lord Dufferin. Recent additions to the literature of biography include D. B. Read's *Life of Major-General Simcoe*, the same writer's *Lives of the Judges of Upper Canada*, and a memoir by William Buckingham and the Hon. G. W. Ross, of the late Hon. Alexander Mackenzie, Premier of Canada. G. Mercer Adam's *Life and Times of the Right Hon. John A. Macdonald* has been already referred to. Contributions to science are in the main scattered through the periodical press and the transactions of the several scientific institutions of Canada. Government blue-books and the series of valuable *Reports* of the Geological Survey of Canada en-

shrine other contributions. The many separately published works of Sir William Dawson on geology and the relation of science to theology, and those of the late Sir Daniel Wilson, president of Toronto University, dealing with questions connected with archæological and ethnological science, are worthy of special mention. Dr. McCaul's *Britanno-Roman Inscriptions* and Dr. Withrow's *The Catacombs of Rome and their Testimony to Christianity* are meritorious works in their departments. In military science, Col. G. T. Denison's Russian prize essay on the *History of Cavalry* has a high claim to notice.

We have already dealt with the chief poets of French Canada; those of the English-speaking province claim notice here, though necessarily brief must be their mention. At least four of the Canadian poets have found fame beyond the borders of Canada. These are Prof. Roberts, Archibald Lampman, Wilfred Campbell, and Bliss Carman. These names are not infrequently to be met with in the pages of Canadian and English magazines. *In Orion and other Poems* and *In Divers Tones*, Roberts deals largely with classical subjects, but a national ode is occasionally found. Lampman belongs, in the main, to the philosophical school. Wilfred Campbell's published work includes a volume entitled *Lake Lyrics and other Poems*. Charles Mair's drama entitled *Tecumseh* recounts an incident of the war of 1812 in connection with one of the Indian allies of Britain.

Other names deserving of mention among the poets of Canada include those of John Reade, author of *The Prophecy of Merlin*, etc; John Hunter Duvar, author of *Roberval and other Dramas*; Mrs. Kate Seymour McLean, author of *The Coming of the Princess and other Poems*; Heavysege's dramas of *Saul* and *Jephthah's Daughter* belong to the pre-Confederation period. To the same period belong Charles Sangster's volumes of collected verse, entitled *The St. Lawrence and the Saguenay* and *Hesperus and other Poems*. Miss Valancey Crawford has published *Old Spookses' Pass and other Poems* in dialect verse. *Marguerite*, by George Martin, takes its title from the heroine of a romantic legend of New France. *Pine, Rose, and Fleur de Lys*, by Mrs. Harrison, is a collection of verse characteristic of the combined national elements in the Canadian people.

The names of several other women writers, of Canadian birth and education, deserve mention. We refer to Miss Machar (*Fidelis*), Miss Sara Jeannette Duncan (now Mrs. Cotes), Miss Ethelwyn Wetherald, and Miss Pauline Johnson, the Indian poet.

GOLDWIN SMITH and G. MERCER ADAM.

Canadian River rises in the northeast part of New Mexico; flows through the north part of Texas into the Indian Territory. Its general direction is nearly eastward. After a course of about 900 miles it enters the Arkansas river about 50 miles W. of Fort Smith. The North Fork of the Canadian, sometimes called Rio Nutria, rises in northeastern New Mexico, flows E. S. E., and enters the Canadian about 50 miles from its mouth. Length about 600 miles.

Canajoharie: village; Montgomery co., N. Y. (for location of county, see map of New York, ref. 4–I); on the south bank of the Mohawk river and on the Erie Canal, and opposite Palatine bridge, on railroad, 55 miles W. N. W. of Albany; has a good school, a library of 800 volumes, a planing-mill, malt-houses, a large paper-bag-factory, refrigerator-factory, candy-factory, and three weekly newspapers. Pop. (1880) 2,013; (1890) 2,089; (1900) 2,101.

EDITOR OF "WIDEAWAKE COURIER."

Canal', Canale, or **Canalet'to**, ANTONIO: painter; b. in Venice, Oct. 18, 1697; studied in Rome; worked in his native city; painted many views of Venetian palaces, canals, etc., which are highly commended by some critics, but others charge him with mannerism. D. in Venice, Aug. 20, 1768.

Canal Dover: village (founded in 1807); Tuscarawas co., O. (for location of county, see map of Ohio, ref. 4–H); situated at junction of three railroads on a high level plateau on the banks of the Tuscarawas river and Ohio Canal, 100 miles from Pittsburg, Cleveland, and Columbus. Here are 6 churches, 2 large schools, electric lights, and electric street cars, baby-cab and track-sulky manufactories, galvanizing, tile, salt, and nut and bolt works, 3 grist-mills, rolling and sheet-iron mills, and an iron furnace. Iron-ore and coal deposits and fire-clay and building-stone are abundant in the neighborhood. Pop. (1880) 2,208; (1890) 3,470; (1900) 5,422. The rapid increase in population in the years 1890–93 is due to the establishment here of new industries.

EDITOR OF "IRON VALLEY REPORTER."

Canal Fulton: village; Stark co., O. (for location of county, see map of Ohio, ref. 3–H); on Ohio Canal, and on Clev., Lor. and Wh. and Pa. R. Rs.; 60 miles S. of Cleveland; has churches of six denominations, large public school, large tool-works, railroad-car and general repair-shops, and grist-mill. Stone, clay, and coal formations are abundant in the near neighborhood, and the surrounding region is agricultural. Pop. (1880) 1,196; (1890) 1,173; (1900) 1,172.

EDITOR OF "FULTON SIGNAL."

Canaletto, BERNARDO BELLOTTO: painter and engraver; b. in 1720; wrought in Rome, Brescia, Milan, and Dresden; celebrated for chiaro-oscuro, and for his views of buildings and environs of cities; was in England, and painted an interior for King's chapel, Cambridge. D. in Warsaw, Oct. 17, 1789. For his uncle Antonio, see CANAL.

Canal-locks: A canal-lock is a chamber with side walls and with gates at each end, and is intended to receive and enable a boat to pass from one level of a canal to another. Canal-locks were used in Holland and in Italy during the seventeenth century, and the invention is claimed in both countries.

The process of locking a boat from a lower to a higher level may be briefly described as follows: The water in the lock being at the same height as the water in the lower level, the boat enters the lock, and the gates at the lower end are closed. The boat being now in a comparatively water-tight chamber, valves are opened in the upper gates, and water from the upper level flows into the chamber until it is at the same height as that of the upper level. The upper gates are then opened and the boat passes out on the upper level. In locking from the upper to the lower level the process is reversed.

A lock may be divided into three parts—the chamber or part between the upper and lower gates; the head-bay or part above the upper gates; and the tail-bay or part below the lower gates. The side walls of the chamber are designed to withstand the pressure of saturated earth when the lock is entirely empty of water. Their width at the base is usually from four to five tenths the height. At the upper end of the chamber a wall, called the breast or lift wall, is built nearly to the height of the bottom of the upper level, and on it is placed the miter-sill, against which the lower part of the gates rests when closed.

The side walls of the head-bay are simply a continuation of the side walls of the chamber. Above the gates the walls of the head-bay set back from the face line of the chamber, forming the upper recess into which the upper gates fold back when open. This is of sufficient depth to allow the gates to fall entirely within the face of the chamber wall when they are open. That part of the recess in which the heel or quoin-post turns is called the hollow quoin. The recesses for the lower gates are within the lock chamber at the lower end, and are similar to those in the head-bay. Above the recesses the walls of the head-bay diverge somewhat, and are connected by twist walls to the slope walls of the canal.

The side walls of the tail-bay are also a continuation of the chamber walls for a distance about equal to the length of the gate recess, and then diverge as wing walls to join the slope walls of the lower level. The thickness of the masonry back of the lower hollow quoins is increased to withstand the pressure of the gates at that point. The bottom of the tail-bay, called the apron, is planked or paved for some distance to counteract the effect of the current caused by the discharge of water from the lock chamber.

The miter-sill is a triangular-shaped frame, usually of wood, from 10 to 12 inches high, which extends across the lock below each pair of gates, and against which the lower part of the gates rests when closed. The altitude of the triangle is usually from one-fourth to one-sixth the width of the lock.

A lock-gate is composed of two heavy upright timbers connected by several horizontal ones, and the whole covered on the upper side with heavy planks. The upright which fits in the hollow quoin and which acts as an axis for the gate is termed the quoin or heel-post. The opposite upright is called the miter or toe-post, and is beveled to fit tightly that of the opposite gate when the gates are closed. The horizontal pieces are called girts or cross-arms. The valves are usually placed between the two lower cross-arms, and are either operated by a rack and pinion or revolve about a horizontal or vertical axis. The levers or other arrangement for operating the valves are placed at the top of

the gate, and are reached by means of a wide board, termed the running-board, secured by brackets to the top of the gate. The balance-beam is a heavy timber extending from the toe-post over the heel-post, and several feet beyond. It is used as a lever to open and close the gate, and to partially balance the weight of the gate. The quoin-post rests upon a casting placed on the chamber floor called a step, which projects upward into a hollow casting called a thimble, fitted in the post. The top of the heel-post is held in position by an iron strap called the collar, which is fastened to anchor irons secured to the masonry.

Machinery is sometimes used to haul the boats into the lock, and is driven by a turbine utilizing the fall between the two levels.

In the larger locks of ship-canals the water is admitted to the lock chamber by culverts constructed in the lock masonry. These usually pass around back of the hollow quoin, and are provided with gates. Sometimes, however, the culvert passes underneath the lock chamber, and valves in the crown open into the lock bottom.

The locks on the Erie Canal, which are among the best of those used exclusively by canal-boats, are 110 feet long between miter-sills, 18 feet wide at the water surface of the lower level, and have a depth of 7 feet over the miter-sill. The lifts range between 5 and 15 feet. The locks, lengthened to admit two boats, have nearly the same dimensions, excepting the chamber length, which is 221 feet.

The locks of the Caledonian Canal in Scotland will admit the passage of frigates of the second class. They have a chamber length of 180 feet, a top width of 40 feet, and have a depth of 20 feet over the miter-sill. The lift is 8 feet.

The locks of the enlarged Welland and Lachine Canals have a chamber length of 270 feet, a width of 45 feet, and a depth over the miter-sill of 14 feet.

The locks on the St. Mary's Canal, on the Michigan side of St. Mary's strait, are, from the amount of traffic passing through them, perhaps the most important of any in the world. As originally built they consisted of two locks, with chambers 350 by 70 feet, and 12 feet deep. The lift of each lock was about 9 feet. They were completed in 1856. A single lock intended to take the place of those two was built alongside of them, and completed in 1883. This lock is 515 feet long in the chamber, 80 feet wide, but narrowing to 60 feet at the gates. The depth of water over the miter-sill is 17 feet, and the lift is 18 feet. At the time of its completion it was the largest lock in the world. The gates are operated by hydraulic power. A culvert connecting the upper and lower levels passes underneath the chamber, and water is admitted through apertures in the cut-stone lock bottom. The total cost of the structure was $1,071,000. A new lock is now being constructed on the site of the first two. It will have a total length of 1,200 feet, and a chamber 800 by 100 feet. The depth over the miter-sill will be 21 feet. The estimated cost of this structure complete, including the excavation, foundation, masonry, gates, and machinery, is $2,334,000.

Temporary locks for the Panama Canal were proposed by M. Eiffel. The chambers were to be 590½ by 59 feet, and the lifts were to be from 24¾ to 36 feet. The chamber walls were to be made of iron caissons, braced with cast iron, and filled with concrete. The gates were to be made of iron and slide directly across the lock, being suspended at the top to an iron drawbridge, which could be swung over one of the side walls when the gates were open.

On the Nicaragua Canal, now being constructed, there are six locks. The chambers will be 650 by 80 feet, and the lifts will vary from 21 to 42½ feet. The estimated cost is from $1,270,000 to $1,630,000 per lock.

The Eastham or tidal locks on the Manchester ship-canal have the walls made of concrete, with granite coping, fender courses, and hollow quoins. Three locks of different sizes are placed side by side to serve the different types of vessels. The chamber of the smallest is 150 by 30 feet; that of the next in size 350 by 50 feet. The largest, which is also the largest completed lock in the world, has a length of 600 feet between gates, and is 80 feet wide. The depth over miter-sill is 26 feet, and the walls are 49 feet high. The walls dividing the locks are 30 feet thick, and the filling and emptying culverts are built into each wall of the locks. The lock gates, unlike most gates for large locks, are built of wood instead of iron. The heel-posts are 26 inches in diameter. The gates are each 45 feet wide by 45 ft. 5 in. in height, and 5 feet thick at the center, and each contains 180 tons of timber. The total weight of a gate is 210 tons.

The literature of the subject is mostly found in reports made by engineers to canal companies and to governments. Stevenson's *Canal and River Engineering* (Edinburgh, 1872) and Hagen's *Wasserbaukunst* (Berlin, 1869) may, however, be quoted. For some of the attempts to avoid the use of locks, see Fulton's *Treatise on the Improvement of Canal Navigation* (London, 1796). See also the articles Canals, Ship-canals, and Inclined Planes.

John E. Ostrander.

Canals [Fr., from Lat. *cana'lis*, or Ital. *canale*]: artificial watercourses for drainage, irrigation, and especially for navigation. Whenever possible, advantage is taken of the natural river-courses for the purpose of canalization. A canal must be very nearly upon the same level. Whenever considerable elevations are to be overcome, it is usually accomplished by means of locks. Valleys are generally crossed by means of embankments, with openings called culverts for the passage of streams. Canal-boats are usually hauled by animals which walk upon a tow-path, upon one side of the canal.

Among the ancients, when civilization was confined almost entirely to the neighborhood of the ocean, inland navigation was very limited, and means of overcoming differences of elevation were unknown. The first canals were built for purposes of irrigation, and their enlargement to form navigable channels was an afterthought. The royal canal of Babylon, so enlarged about 600 B. C., is among the earliest recorded. Among the projects for connecting rivers and oceans by canals among the Egyptians, Greeks, and early Romans, we may mention the canal of Marius, B. C. 102 (see Fossa Mariana), connecting the lower Rhône with the Mediterranean; the canal of Alexandria, B. C. 332, by which the port of the new city founded by Alexander was put in navigable communication with the Nile, all the mouths of which were obstructed by impassable bars. About the Christian era the Emperor Claudius, on account of the obstruction of the port of Ostia, connected the Tiber with the Mediterranean by a short canal, and the new ports of "Claudius" and of "Trajan" were made at its termini. About the fourth century the Romans made improvements connecting rivers in Lombardy, and in the fifth century Odoacer built a canal from the sea to the Mentone, above Ravenna. Charlemagne in the eighth century began canals joining the Main and the Rhine with the Danube, and the ocean with the Black Sea. In China the Grand Canal, joining the Pei-Ho and the Yang-tse-kiang, 500 miles apart, was built in the thirteenth century. This great work, itself about 650 miles long, is a series of canalized rivers, and gives, with its connecting rivers, an inland navigation of nearly 1,000 miles. Its depth is 5 to 6 feet. Changes of level are surmounted by drawing the boats up inclined planes. The boats are either rowed or tracked along by men. Several canals were built in Holland and in Italy from the eleventh to the fifteenth century. About 1400 A. D., in Spain, the Moors built a canal from Granada to Cadiz, but after their expulsion internal improvements languished. In the early part of the sixteenth century the Ebro and Castile canals were partly built, but not completed. The spirit which dominated this nation is thoroughly exemplified in a decree of the council about 1680 regarding a project for improving certain rivers, which stated that "if it had pleased God that these rivers should have been navigable, he would not have wanted human assistance to have made them such; but that, as he has not done it, it is plain that he did not think it proper that it should be done. To attempt it, therefore, would be to violate the decrees of his providence, and to mend the imperfections which he designedly left in his works." In 1570 the Spaniards began a canal in South America, from Cartagena to the river Magdalena, 87 miles, including various lagoons on its route, and 14 miles of bay and harbor. It has been badly neglected, but efforts are being made to have it repaired.

In 1481 the invention of locks for passing from one elevation to another rendered canal navigation much more generally available. This invention, made by two engineers of Viterbo in Italy, at once gave an impetus to canal construction. Several important channels of communication were opened in Italy. The first French canal was that of Briare, built 1605–42. The Orleans Canal was built in 1675. The greatest work of that age was the Languedoc Canal, from Narbonne to Toulouse, 150 miles, its summit-level being 500 feet above the sea (built 1667–81). In 1700 Peter the Great began the immense system of canal navigation in Russia

which connects St. Petersburg with the Caspian Sea and inland districts, affording continuous navigation for 1,434 miles. Charlemagne conceived the idea of connecting the Danube and the Main by a canal, but the project was not carried out until 1836–46, by Louis I. of Bavaria. The canal is 108 miles long, and its summit-level is 650 feet above the Main and 270 feet above the Danube. The Danish Canal, 100 miles long, finished in 1785, unites the North Sea and the Baltic. In Prussia water-communication is had by canals and river improvements between Hamburg and Dantzic. The Gotha Canal in Sweden, one of the largest European works of this class, was planned in 1716, the first part opened in 1810, and completed in 1832. It crosses Sweden from Stockholm to Gothenburg, is 280 miles long, and at its greatest elevation is 308 feet above the sea. There are altogether 800 miles of canals in Sweden.

From a very early period extensive canals were used in India for purposes of irrigation. Some of these have in later times been enlarged for navigation. A canal for irrigation and for navigation by steamboats from Sunkelassa to Cuddapar, 190 miles, was built in 1861–71.

The oldest British canal, the Foss Dyke, in Lincolnshire, is a cut originally made by the Romans. Internal navigation was the subject of legislation in 1423, and there exist locks on the river Lee built in 1570. At Exeter, Hugh Courtenay, Earl of Devon, in 1316, in revenge for an affront, ruined the navigable approach to the town by dams in the river. Parliament passed an act for creating a navigable canal to the city in 1531, but the work was not begun until 1585, and was not completed until 1675. In 1758 the Duke of Bridgewater procured a grant for the construction of canals, and for forty years there was as great a rage for canals as in the second quarter of the nineteenth century for railroads. The canal excitement continued, somewhat subdued, however, for thirty years during that century. South of Durham no place in England is more than 15 miles from navigation. During the same period several short canals were constructed in Scotland. The Forth and Clyde Canal, first projected by Charles II., was constructed after plans of Smeaton in 1768–89. It is 35 miles long, and surmounts a summit of 160 feet by 39 locks. It is now in contemplation to make this a ship-canal with summit level 95 feet above tide, and 12 locks. The Caledonian Canal (*q. v.*) is properly classed under the head of *ship-canals*. In Ireland the Grand Canal, from Dublin to Ballinasloe, 164 miles in length with its connections, 40 feet wide and 6 feet deep, was built in 1765. Immense sums were thrown away in carrying this canal across the Bog of Allen. In 1792 the Royal Canal, from Dublin to Tormansburg, 92 miles, was built, of excessive size and nearly parallel to the Grand. The result is that neither of them has ever produced any revenue. In Great Britain 4,713 miles of navigable canals exist. Many of these canals have been bought by railway companies, and are operated in connection with the roads.

The first canal in America was built in 1793 around the falls of the Connecticut river at South Hadley, Mass., Benjamin Prescott, of Northampton, subsequently the superintendent of the U. S. armory in Springfield, being the engineer. The Middlesex Canal Company (for a canal from Boston to Lowell) was not incorporated until a year or more afterward. For this earliest work of internal improvement recourse was had—by no means an unusual case since then—to Holland; and this first placing of funds in canal-stocks in the U. S. returned as little interest as many subsequent larger operations. The boats were carried up and down an inclined plane in a car or caisson filled with water, and hauled by cables operated by water-wheels. The canal was subsequently lowered 4 feet, the cars and cables discarded, and the ordinary canal-lock introduced, under the direction of Ariel Cooley, a man of a great deal of energy and ingenuity. The canal around Turner's Falls, on the Connecticut river, was built by Capt. Elisha Mack in 1793–96. This canal is 3 miles in length. These works are now used only for water-power. The valley of the Mohawk, affording opportunity for connecting the lakes and the Hudson, early attracted attention. Gen. Washington examined it during the Revolutionary war. In 1792 the Western Inland Navigation Lock Company was formed, and by 1796 it had constructed locks around the rapids on the Mohawk river at Little Falls, and opened channels westward from Rome, making a passage navigable for 15-ton boats from Schenectady to Seneca Falls. The works and franchises of this company were purchased by the State of New York in 1812. In 1808 Simeon De Witt, the surveyor-general of New York, was directed to survey a route for a canal from the Hudson to Lake Erie. James Geddes, the first engineer appointed by him, made his report on Jan. 20, 1809, on canal routes from Oneida Lake to Oswego and to Lake Erie. On Mar. 13, 1810, the Legislature appointed a canal commission of seven members, at the head of which was Gouverneur Morris, to whom is attributed the first suggestion of the Erie Canal in 1803. These commissioners made several reports, but no decisive action was taken until Apr. 7, 1816, when a law was passed authorizing the construction of the Erie and Champlain Canals. The first ground was broken at Rome, N. Y., July 4, 1817, and the canal was opened on Nov. 4, 1825, from Buffalo to Albany, 352 miles. (See Clinton, De Witt.) As first constructed, it was 40 feet wide at top, 4 feet deep, and was navigable for 76-ton boats. Between 1835 and 1862 it was enlarged, and is now generally 70 feet wide, 7 feet deep, and navigable for boats of 240 tons burden. From 1884 to 1891 about half of the locks were lengthened so as to admit of the passage of two boats at once. The opening of the Erie Canal reduced the time between Buffalo and Albany from twenty days to ten days, and the cost of freight transportation from $100 per ton to $10, and later to $3 from Buffalo to New York.

During the second decade of the nineteenth century an immense impetus was given to the cause of internal improvements, and enormous projects were undertaken by several of the States. Pennsylvania and Maryland began to connect their tidewaters with the Ohio river; Virginia undertook the construction of two canals from Chesapeake Bay to the Ohio, Ohio and Indiana strove to connect the lakes with the Ohio river, and Illinois to join the lakes and the Mississippi.

Several canals in Pennsylvania had been undertaken by private companies between 1790 and 1816, but little was done by them. Between 1816 and 1824 the Union Canal, 82 miles long, from Reading to Middletown on the Susquehanna, was constructed. In 1826 the State began the construction of water-routes from Pittsburg to Philadelphia and to Lake Erie, and built 608 miles of canals and navigable feeders. The main route across the Alleghany Mountains was broken by a portage railroad 37 miles long, and the eastern terminus was on the Susquehanna, 82 miles from Philadelphia. The improvement of the navigation of the Lehigh river was caused by the necessity for cheap transportation of coal to tidewater. Two iron manufacturers at the Falls of Schuylkill, near Philadelphia, discovered in 1817 that anthracite coal could be made available for smelting, and to obtain a supply cheaply leased a large tract of coal-land near Mauch Chunk, and obtained a charter for improving the Lehigh river. This was done first by wing-dams, afterward by pools and sluices, the coal being carried in "arks," which were built in the woods and broken up at their destination. In 1827 the State began the Delaware Division Canal from Easton to Philadelphia, and the Lehigh Company constructed a slackwater navigation by dams and locks from White Haven to Easton. On June 4, 1862, a heavy freshet carried away eighteen out of twenty dams between Mauch Chunk and White Haven, and these have never been restored. Below Mauch Chunk the damage done was repaired. There were built altogether in Pennsylvania 974 miles of canal. The Pennsylvania R. R. purchased the Pennsylvania canal and used portions of it until 1890, and then abandoned its navigation. The Reading R. R. operates 153 miles of canals.

Ohio built two canals of limited capacity from the Ohio river to Lake Erie, and others of minor importance, 795 miles in all. Indiana, conjointly with Ohio, built the Wabash and Erie Canal from Toledo to Evansville, 461 miles. Mismanagement and neglect have brought much of this to ruin, and the lower portion of it has been for some years abandoned. In Virginia, a board of public works, established in 1816, furnished State aid to internal improvements. A favorite project since the days of Washington has been a water-route from the James river to the Ohio viâ the Kanawha. See James River and Kanawha Canal.

One of the very earliest projects was the connection of the Potomac and Ohio rivers by a navigable canal; and the improvement of the Potomac river (navigable by ships to Georgetown) to the foot of the Alleghanies was one of the first steps considered. In the year 1784 a charter was granted for this purpose by Maryland and Virginia conjointly; a company was organized, which up to the year 1822 had expended $730,000 in locks, dams, etc. The result,

however, was unsatisfactory, and after a prolonged investigation the substitution of an independent canal from Georgetown to Cumberland was recommended (1823) by the engineers, Messrs. Moore and Briggs, appointed by the two States. It was to be 182 miles long, 30 feet wide at surface, and 3 feet deep, with 63 locks, at an estimated cost of $1,575,094. About this time the general Government inaugurated its so-called system of internal improvements by act of Apr. 30, 1824, and a board of engineers was appointed, by whom the entire route to the Ohio at Pittsburg was surveyed, and the board rendered a report Oct. 23, 1826, estimating for 341 miles of canal from Georgetown to Pittsburg, to be 48 feet and 33 feet wide at surface and bottom, 5 feet deep, and to cost $22,375,081. The amount of money required was inordinate for that early day. In 1829 the eastern division was authorized to be built from Alexandria to Cumberland, Congress providing a subscription for 10,000 shares of stock; the city of Washington, 10,000; Georgetown and Alexandria, 5,000; and the States of Maryland and Virginia, 7,186 shares; the remainder being taken by individuals. The first blow struck for the actual construction was July 4, 1828, by the President of the U. S., John Quincy Adams. The dimensions were increased to 60 and 42 feet surface and bottom width, depth to 6 feet. The aqueduct by which it was carried across the Potomac at Georgetown, constructed (1832–40) under direction of Major Turnbull, U. S. Engineers, was one of the most important engineering constructions at that date undertaken in this country. The main portion consists of a wooden trunk resting on twelve masonry piers founded by coffer-dams on rock averaging 28 feet, and toward the western shore 40 feet, below the surface, covered by 15 to 20 feet of mud. Up to the year 1845 there had been expended on the canal $9,502,345, and subsequently about $1,500,000; besides, charges of interest, loss on sale of bonds, have carried the aggregate expenditure to $15,000,000 and upward. Its main business has been the transport of coal to tide-water at Georgetown. The "eastern division" (from Georgetown to Cumberland), as it now exists, follows the north side of the valley of the Potomac to the eastern foot of the Alleghany Mountains, at Cumberland, Md. It departs from the immediate valley of the river by a cut-off and a tunnel of 3,118 feet in length at Paw Paw Bend, 27 miles E. of Cumberland. The distance saved by this tunnel is about 6 miles. The Cumberland level is 613¾ feet, and is overcome by 74 locks, varying from 6 to 10 feet lift, with chambers 100 feet long and 15 feet wide. From Georgetown to Harper's Ferry, 60 miles, the canal surface is 60 feet wide, and from Harper's Ferry to Cumberland it has an average of 40 feet width, the depth throughout its length being 6 feet. The canal is supplied with water from the Potomac river by means of seven dams thrown across the river at suitable distances. The boats used on this canal are ordinary flat-bottomed boats from 90 to 95 feet long, and 14 feet wide, drawing 5½ feet when loaded. They carry from 110 to 115 tons of 2,240 lb. The terminus of the canal at Cumberland is 20 miles from the coal-field by the Cumberland and Pennsylvania R. R., its principal connection therewith.

In 1890 the company owed $1,699,500 in bonds and twenty-five years' interest on them, and after litigation the canal was handed over to the bondholders.

In the early years of Western settlement, when the great rivers formed the only vehicle of transportation, an obstruction to navigation so grave as that made by the rapids known as the Falls of the Ohio at Louisville could not fail to compel early attention. In 1825 the State of Kentucky authorized a private corporation to construct a lateral canal (known as the Louisville and Portland), which was completed in 1830 at a cost of about $1,000,000. Length, $1\frac{7}{10}$ miles; width, 64 feet; with three locks, each 200 feet long and 50 feet wide; lift, 8⅜ feet. In 1860 an enlargement, planned by T. R. Scowden, was undertaken, and $1,800,000 expended, the civil war interrupting the work. The Ohio being a great national highway, this work was deemed a proper object for governmental care, and in 1868 was placed in charge of the chief of engineers U. S. army, and carried on by appropriations of public money by Congress. A new enlarged canal was opened to navigation in Feb., 1872, and entirely completed Nov., 1873; the extra cost of enlargement (including the $1,800,000 already mentioned) was $3,250,000.

The present canal leaves the Ohio river in front of the city of Louisville, passes in a westerly direction around the falls, and enters the river just above Portland, Ky. Its length is $2\frac{1}{10}$ miles, and its general width 86½ feet. The upper entrance is 400 feet wide, and suitable turn-out basins are provided. A dam on the crest of the falls enables a minimum depth in the canal of 6 feet to be obtained. The depth depends upon the stage of water in the river; the least depth being 6 feet, and the greatest depth known about 42 ft. 8 in. The great expense of this work is due to the fact that its bed is cut through hard limestone rock, and its sides are protected by stone walls, above which rise earthen parapets to a height of 44 feet above canal bottom and 1⅛ feet above highest known flood. A set of guard-gates at the head provides for shutting off water when necessary. At the lower end are the old locks, still preserved as originally constructed, and the two new locks which form the outlet of a short branch have lifts of 12 and 14 feet; their length between miter-posts is 372 feet, available length 335 feet, width 80 feet.

The guard or flood gates at the head of the locks are 47⅔ feet long and 46 ft. 11 in. high. The upper lift-gates are 47⅔ feet long, 24¾ feet high, and built of a combination of oak and pine. The middle and lower lift-gates are 47⅔ feet long, 31 ft. 2¾ in. and 27 ft. 2 in. high, respectively. They are built entirely of oak, except planking, which is of pine. The upper lock was improved in 1890 by raising the lock walls and middle gates by building on them with timber 15 inches, increasing the practicable use of the canal 17 per cent.

Except during high water, when there are 10 feet or more at the head of the falls, the entire commerce of the Ohio river passes through the canal. During the year 1890–91 3,940 boats passed through the locks, and 3,878 down the river.

The Chesapeake and Delaware Bays were connected in 1824–29 by a canal through Delaware and Maryland nearly 14 miles long. The summit-level, 16 feet above mean tide and 10 miles long, is supplied by pumps. Surveys have been in progress for a few years for a new canal between these bays. This work was aided by the U. S. Government. In New Jersey the Delaware and Raritan Canal, built in 1831–34, 44 miles long, connects the Delaware and Raritan rivers, making an inland navigation from New York to Philadelphia. The first application of steam-power to operating locks was made in 1868 on this canal by Ashbel Welch, C. E., and increased the capacity of the canal 50 per cent. The Morris Canal, 101 miles long, built about 1830, connects the coal-regions of Pennsylvania with New York harbor. This canal was purchased by the Lehigh Valley R. R., but has been operated by it at a loss.

In the Southern States over 250 miles of canal have been built. Among the most important of these are the Chesapeake and Ohio, the Illinois and Michigan Canal and the James River and Kanawha Canal (*qq. v.*).

The speculation in canals which began in 1820–21 was checked by the introduction of railroads, and, of more than 5,000 miles projected and begun, less than 3,000 were built. A very small proportion of these have paid interest on the money invested. The New York State canals were built by the State Government. Of 906 miles built, 514 miles are operated by the State at an annual expense of about $700,000. No tolls have been collected since Jan., 1883. For the twenty-eight years 1862–90 the average tonnage was 5,714,170 tons. The actual expense of the canals to the State up to Jan., 1889, has been $39,851,986 in excess of all revenue derived therefrom. This sum represents the premium which the people of New York have paid in taxes to secure and encourage the use of these waterways for purposes of transportation. The annual cost for construction, maintenance, and operation from 1885–90 averaged $1,500,000.

The Ohio canals, built by the State Government, were a continual source of expense, and in 1861 were leased to private parties for an annual rental of about one-tenth of 1 per cent. on their cost.

The cause of the failure of through routes of canal transportation to be remunerative has apparently been the insufficient channel dimensions which for economy were given them, and the consequent small loads which could be carried. Experience has proved that with an enlarged section of canal prism, accommodating larger boats, the carrying capacity is three times as great, while the towing expenses are increased less than 50 per cent., making the cost per ton per mile on a large canal 41½ per cent. of what it is on a small one. The carrying capacity of a canal accommodating boats of a given size depends upon the number of lockages which can be made in a given time. Increase of

speed between the locks, while it lessens the time of transit on a canal worked to less than its maximum capacity, will not increase the volume of traffic. It is of the first importance, therefore, that the time of lockage should be decreased. Practically, the former consideration is first attended to, however, as no canals are as yet worked to their full capacity. The economical rate of speed for boats towed by horses is 2 miles per hour. The time lost by slowing up on approaching locks, the stoppage in locks, and the getting under way again, reduces the average rate of speed to 1·7 miles per hour. The first cause of detention at locks has been greatly overcome by the application of steam-power to the lock-gates, as designed by Mr. Ashbel Welch, previously mentioned. For lessening the second and third, the use of inclined planes instead of locks, up which the boats are drawn by machinery, and passing over a summit descend into the upper level with an initial velocity greater than the average, has been found effective on the Morris Canal in New Jersey. Inclined planes instead of locks were used in England on the Ketling Canal in 1789.

Hydraulic lifts in place of locks are used in some European canals. The first one was constructed in 1876 at Anderton on the river Weaver, England, with a lift of 50 feet. Two troughs, 75 by 15 by 5 feet, alternate in movement, are operated by two rams 3 feet in diameter under 520 lb. per sq. inch. In France there is the Fontinettes lift on Neufossé Canal, which connects North Sea ports with Paris. It supplements flights of five locks with a lift of 43 feet. It has troughs 130 by 18 by 7 feet in dimensions, accommodating 300-ton barges, and lifted by rams 6·6 feet in diameter; Louvière lift is in Belgium, on the Canal du Centre, connecting the waterways near Mons with those of Brussels, on which there is 293 feet fall in 17 miles, of which 213 feet is in 5 miles. There is one lift of 50·5 feet and there are five of 55·5 feet, with troughs 141 by 19 by 8 feet, taking 400-ton boats. The hydraulic rams are operated by turbines worked by water from the upper level. A boat of 400 tons can be passed up through the lift, and another boat passed down, every fifteen minutes.

High velocities between locks have not been attained, the chief obstacle thereto being the greatly increased traction force required.

In Middle France to this day boats of 60 to 110 tons burden are hauled by two men at a speed of 11 to 16 miles per day. A man and horse harnessed together travel about 18 miles per day. In Northern France the use of animal power is obligatory, and boats of 275 to 330 tons are hauled by two horses about 20 miles per day.

On some French canals boats are conveyed at a speed of 13 miles per day by being towed in floats of twenty to thirty boats, of 270 to 300 tons burden, by a tug on which is an engine driving a drum around which passes a chain cable laid on the bottom of the canal. This method is used especially in tunnels. A wire cable is similarly used on Belgian canals, and for ascending boats on rivers in Belgium and on the Danube between Linz and Vienna. In other cases an endless chain on the bottom of the canal is driven by stationary engines, and boats are attached to the chain.

It is alleged that this method can not be advantageously used on the U. S. canals, where the curves are much more frequent and sharp than in those of the countries where the system has been successfully applied. A trial on the Erie Canal in 1880 gave unsatisfactory results. On some Belgian canals boats are towed by a locomotive on the tow-path, running on a single rail. When two boats meet they exchange locomotives, the latter returning until another boat is met. On the Muscle Shoals Canal in Alabama, 15 miles long, boats are towed by a locomotive on a track along the bank. Screw propellers were used successfully on the Chesapeake and Ohio Canal 1872–80. In the U. S. steam propellers have been used for some years on the Delaware and Raritan Canal. In 1871 the New York Legislature offered rewards for the best motive-power other than animals for propulsion of boats on canals, excluding the Belgian system; 700 communications were received in reply, resulting in twelve steamers being placed on the canal for trial, of which three fulfilled the first test required. The result of experiments was so satisfactory that ninety-two self-propelling boats were placed on the State canals, having an average rate of speed of 2¾ miles per hour, including detentions. The total number of boats is 4,000.

The cost of transportation by steam on canals is now reduced to less than 3 mills per ton per mile. The cost of through transportation on railroads is 7 mills per ton per mile. These prices do not include the interest on capital, nor profits. Both may be reduced somewhat by good management, but the proportion between the two can not be much changed.

Canadian Canals.—In Canada there are many important canals, which may be classed under the following heads:

1. The St. Lawrence and lake navigation, including the Lachine Canal, the Beauharnois, Cornwall, Farran's Point, Rapide Plat, and Galops canals, commonly designated the St. Lawrence canals, on the river St. Lawrence, surmounting its rapids between Montreal and Kingston; and the Welland Canal, between Lake Ontario and Lake Erie, surmounting the falls and rapids of Niagara; to which may be added the Burlington Bay Canal, through a sandbar at the mouth of that bay, at the head of Lake Ontario.

2. The Ottawa and Rideau navigation, including St. Anne's Lock, the Carillon, Chute à Blondeau, and Grenville canals, surmounting the rapids of the Ottawa between Montreal and the city of Ottawa; and the Rideau Canal, connecting the river Ottawa with the St. Lawrence at Kingston, through the rivers Rideau and Cataraqui.

3. The Richelieu and Champlain navigation, being the St. Ours Lock and Chambly Canal, surmounting obstacles on the river Richelieu from the St. Lawrence to Lake Champlain.

4. The river Trent navigation, consisting of locks and dams on the river Trent, a large tributary of Lake Ontario, extending into the interior of the Newcastle district, originally proposed as a line of communication with Lake Huron.

5. The St. Peter's Canal, connecting the Bras d'Or, a bay of the sea in the interior of the island of Cape Breton, with St. Peter's Bay, on the south coast of the island.

Along with the foregoing may be noticed the following projected canals: The Caughnawaga Canal, to connect Lake Champlain with the river St. Lawrence above the Lachine Rapids; the Ottawa and Huron Canal, to form a direct and short route between Montreal and Lake Huron by the Ottawa and French river; a canal at Sault Ste. Marie; the Huron and Ontario, or Georgian Bay Canal; the Bay Vert Canal, from the Gulf of St. Lawrence to the Bay of Fundy; and the Shebandowan and Lake of the Woods navigation, forming 311 miles of the route from Lake Superior to Red river.

The total tonnage of all the Canadian canals, whether from or to Canadian or U. S. ports, amounted in 1879 to 2,690,737 tons, and the tolls levied on freight, vessels, and passengers, to $309,427. For the year 1889 the figures are 3,113,896 tons and $361,704. The tonnage of 1889 was classified as follows: 1,541,143 tons from Canadian to Canadian ports, 320,792 tons from Canadian to U. S. ports, 684,554 tons from U. S. to American ports, and 567,417 tons passing from U. S. ports to other U. S. ports.

For irrigating canals, see HYDRAULICS and IRRIGATION. For further general information regarding inland commerce by natural and artificial watercourses, see RIVERS; WATERWAYS; SHIP-CANALS, LACHINE, ST. LAWRENCE, ST. MARY'S RIVER, and WELLAND. J. JAMES R. CROES.

Canandai'gua: railroad center; capital of Ontario co., N. Y. (for location of county, see map of New York, ref. 5–E): 28 miles S. E. of Rochester; at the north extremity of Canandaigua Lake, which is navigated by daily lines of steamers. It is picturesquely situated on high ground, which commands an extensive view of the lake. The beautiful scenery of the lake and the fishing and boating accommodations make Canandaigua a popular pleasure resort. Canandaigua (or, as originally, *Canandarqua*, signifying in the Indian tongue the "chosen spot") is a beautiful village with wide, shaded streets, fine public buildings, and handsome residences. There are an academy for boys, boarding-schools for girls, union public schools, a library association and museum, various manufactures, two orphan asylums, an opera-house, 3 banks, 3 newspapers, 3 large hotels, a private lunatic asylum, a jail, and a fine court-house built jointly by the county and the U. S. Government. There are street-cars, electric lights, water-works, and a complete sewerage system. Pop. (1880) 5,726; (1890) 5,868; (1900) 6,151. EDITOR OF "TIMES."

Canandaigua Lake: in Western New York; mostly included within Ontario County. It is 15 miles long, and varies in width from ¾ of a mile to 1½ miles. It is surrounded by high banks which present beautiful and diversified scenery. The water is discharged at the northern extremity of the lake by an outlet which communicates with Clyde river, an affluent of the Seneca river. The surface of this lake is 437 feet higher than that of Lake Ontario, and 668 above the sea. The lake is navigable by steamers.

Cañár, kăăn-yaar′: a small highland province of Ecuador, lying in lat. 2° to 3° S., between the provinces of Chimborazo and Azuay. Pop. 64,014.

Cánara: See KANARA.

Canarese Language: See DRAVIDIAN LANGUAGES.

Cana′ries, or **Canary Islands** (anc. *Fortunatæ Insulæ*): a group of islands in the Atlantic Ocean: belonging to Spain; about 60 miles W. from the coast of Africa. They are between lat. 27° 49′ and 29° 26′ 30″ N., and between lon. 13° 25′ and 18° 16′ W. (see map of Africa, ref. 2–A). The names of the seven largest islands are Lanzarote, Fuerteventura, Gran Canaria, Teneriffe, Gomera, Palma, and Ferro (or Hierro); besides which there are several small islets. Their total area is 2,808 sq. miles. The Canaries are of volcanic formation, and have high rocky coasts. The surface is mountainous, and the highest point, the Pico de Teyde, in Teneriffe, rises 12,182 feet above the level of the sea. The climate is mild and equable, the heat being moderated by the sea-breezes. The vegetation is arranged in zones, according to the height above the sea. The first or lowest zone produces the date-palm, sugar-cane, etc.; in the second flourish the grapevine, olive, and maize. The highest summits are barren and naked rocks. Administratively the group is a province of Spain, to which the African possessions Rio de Oro and Adrar are subordinate. The largest island of the group is Teneriffe, which is nearly 60 miles long, and has an area of 877 sq. miles. Its chief town and port is Santa Cruz de Santiago, where the officers of the general government reside. Las Palmas, the former capital of the province, and the most populous of its towns, is on Gran Canaria. The Canaries have belonged to Spain since 1493, and the population is Spanish. The aboriginal race, called Guanches, was conquered in the latter year. The islands were known to the Romans, and have been described by the elder Pliny, who, however, states that at his time they were uninhabited. They are considered to be the Fortunate islands of the ancients. Incidentally rediscovered in 1334 by a French vessel, they were for a century and a half the prize of various French and Spanish adventurers. By the final conquest the native population, whose former history and ethnographical relations are entirely unknown, was nearly eliminated. The meridian of the island of Ferro (17° 39′ 51″ W. of Greenwich) is usually taken as the dividing line between the eastern and western hemispheres. It was considered by ancient geographers the most westerly point of the world, and they drew through it the first meridian. Longitude is still reckoned from it by some geographers. Pop. 287,728. See Olivia Stone, *Teneriffe and its Six Satellites* (1888).

Canarium: a genus of trees of the family *Burseraceæ*; natives of the East Indies; having compound leaves and diœcious flowers. The fruit is a drupe. The *Canarium commune* is cultivated in Java and the Moluccas for the sake of its fruit, which is edible and yields a lamp oil. This tree grows about 50 feet high, and is supposed to be one of the trees which produce elemi.

Canary Bird (*Serinus canarius*): a well-known singing-bird of the family *Fringillidæ*; native of the Canary islands. Its color in the wild state is gray above, with darker spots; the other parts yellow. In its domesticated form the whole bird is often yellow. In its wild state it builds on shrubs or trees, and produces five broods in a year. In confinement it seems to be contented, and breeds readily several times in a year. Its favorite articles of food are canary seed, hempseed, sugar, and bland green leaves, such as those of chickweed or lettuce. It has great imitative powers, and can be trained to sing various notes. Some of the wild canary birds are said to surpass the best-trained singers in loudness and clearness of note.

Canary-grass: the *Phalaris canariensis*; a short, erect annual grass with a large ovate spike, whose rather large seeds are used as food for CANARY BIRDS (*q. v.*). Although a native of Southern Europe, Western Asia, and Northern Africa, it has long been grown in other regions, and now grows spontaneously in many places in the U. S. When ground into flour the seeds form a valuable food for the inhabitants of some of the countries bordering on the Mediterranean Sea. A closely related species, *P. intermedia*, is a native of the Southern U. S., and may be called the native canary-grass. Another species of this genus is *P. arundinacea*, known in some places as the "wild ribbon-grass." It is a stout, perennial, broad-leaved grass, 2 to 4 feet high, with a branching panicle of large-flowered spikelets. It is found on wet grounds, and is widely distributed. Although a coarse grass, it yields a good deal of forage, which has some value in hay-making. C. E. B.

Canary-seed: the product of CANARY-GRASS (*q. v.*).

Canary Wine, or **Teneriffe Wine**: produced in the Canaries: so much resembles Madeira wine that it is often sold for that article. It is improved by a long voyage. The term Canary is properly applied to the Bidogue wine, which is the juice of grapes gathered before they are ripe, and is not good until it is rendered mellow by age.

Canastoga Indians: See IROQUOIAN INDIANS.

Canasto′ta: village; Madison co., N. Y. (for location of county, see map of New York, ref. 5–G); on N. Y. C. and H. R., West Shore, El., Cort. and North. and Canastota Nor. R. R., and on the Erie Canal; 22 miles E. of Syracuse. It has a high school, an academy, and five churches. The village has canning-factories and manufactories of glass, cutlery, furniture, knit goods, molders' tools, wagons, horse-rakes, agricultural implements, and novelties. There are sulphur and sulphur-and-iron springs within the village. Pop. (1880) 1,569; (1890) 2,774; (1900) 3,030.

EDITOR OF "JOURNAL."

Canaveral: See CAPE CANAVERAL.

Can′by, EDWARD RICHARD SPRIGG, LL. D.: soldier; b. in Kentucky in 1817; graduated at West Point 1839; major-general U. S. volunteers May 7, 1864, and July 28, 1866; brigadier-general U. S. A.; being in infantry till June 18, 1846, assistant adjutant-general to Mar. 3, 1855, and in infantry till July 28, 1866. He served in Florida 1839–42 on quartermaster duty; in emigrating Indians, garrison duty, etc., 1842–46; as adjutant Second Infantry 1846–47; in war with Mexico 1846–48, engaged at Vera Cruz, Cerro Gordo, Contreras, Churubusco (brevet major), and city of Mexico (brevet lieutenant-colonel); as assistant adjutant-general of Pacific division 1849–51; in adjutant-general's office, Washington, D. C., 1851–55; on Utah expedition 1857–60; and in command of Navajo expedition 1860–61. In the civil war he served in command of the department of New Mexico 1861–62, where, after the defection of his seniors, he displayed great energy and skill in defending the country at Fort Craig, Valverde (brevet brigadier-general), and Peralta against a formidable inroad from the South; on special duty in War Department at Washington and in suppressing New York draft riots 1863–64; in command of the division of West Mississippi 1864–65 (wounded on White river); in command of the expedition which captured Mobile and its defenses (brevet major-general), Montgomery, Ala., and received the surrender of the armies of Gen. R. Taylor and Gen. E. K. Smith; in command of various Gulf departments 1865–66, of department of Washington 1866–67. After the war he was placed on various important special duties, and when fatigued by a long and laborious career in 1869 he voluntarily consented to take command of the department of the Columbia, which he held till treacherously shot dead Apr. 11, 1873, by the chief "Jaek" while he was endeavoring to mediate for the removal of the Modoes from their rocky fastness on the northern border of California.

Cancella′ria: a genus of univalve mollusks of the class *Gasteropoda* and order *Prosobranchiata*. The shell is oval or turreted, the spire is prominent, the last whorl is ventricose, the surface reticulated, and the columella plicated. All the recent species are natives of tropical or sub-tropical seas. Numerous fossil species are found in the strata above the chalk.

Cancer: the typical genus of *Cancridæ*, or true crabs, in which the feet are constituted for walking. Species occur in Europe and America, the European, *Cancer pagurus*, being used as a food, which the American species rarely are.

Cancer [Lat. *cancer*, crab, malignant tumor. The same word viâ O. Fr. *cancre* (accus. *cancrum*) yields *canker*]: the popular name for *carcinoma*, a form of tumorous growth composed essentially of epithelial cells, which are usually arranged in nests or alveoli. The term cancer has been generally abused, being taken to signify any malignant or deadly growth, irrespective of its nature, and some writers are still inclined to use the term cancerous as synonymous with malignant. Much unfortunate confusion has arisen from this laxity, and of late careful writers prefer to use the term carcinoma as entirely definite. Cancer finds its most frequent seats in the uterus, the skin, the female breast, the

rectum, stomach, œsophagus, about the lips, the external genital organs, and less commonly in many other localities. There are two important forms—the ordinary or *glandular* cancer, such as occurs in the female breast, and which may be hard or scirrhous, soft or medullary; and the form called *epithelioma*, which is of epithelial nature, but not so distinctly after the type of glands—hence not glandular. Epithelioma was formerly and is still regarded as a tumor distinct from true cancer, though admittedly near this in nature. It is the form of cancer which affects the skin surfaces, especially about the lips and perineum, but also occurs on mucous surfaces, prominently the mouth of the uterus. The cause of cancer has been the subject of numerous investigations, but seems to be veiled in as much obscurity as ever. That heredity plays a part is admitted, but at the same time it is recognized that this is practically of little importance. The older pathologists believed that a certain dyscrasia or constitutional vice so alters the humors of the body that cancer and other tumors make their appearance. This is now rarely heard. Next it was maintained that injury could be found as the cause of cancer, and certain it is that mechanical agency does play a part in the production of "pipe-smoker's cancer" of the lip and many cancers of the female breast, but injury is by no means a constant occasion or cause. Most recently the parasitic theory has been applied to cancer, but there is as yet little proof of this. Certain animal parasites of the family *Sporozoa* (see PARASITES OF MAN) have been found in various forms of cancer with considerable regularity.

The dangers of cancer are (1) the local destructiveness; (2) the deterioration to the general health which results from interference with the functions of the organ, as the stomach, in which the cancer is situated, or from hæmorrhage or infection of the general system by poisons produced by ulceration of the cancer; and (3) metastasis to other parts of the body. The deterioration of the health is attended with a progressive form of anæmia, generally called Cancerous Cachexia, and this gave rise to the old view that an antecedent aberration of the general health causes the tumor, rather than, as we now know, the reverse.

Cancers are to be carefully distinguished from sarcoma, the other important form of malignant tumors. The latter is a more rapidly growing tumor; does not have as marked a tendency to infiltrate the neighboring structures, and hence is not attached so intimately to the overlying skin; is more vascular, and is not of epithelial character. Cancer occurs after forty years of age, sarcoma before forty, as a rule.

The treatment of cancer depends largely on its situation. Whenever possible it should be removed as soon as recognized, and before neighboring lymphatic glands (where secondary deposits first appear) have become involved. The outlook under these circumstances is to a degree favorable, but no great hopefulness is to be entertained. When secondary deposits have appeared, or when internal organs are affected, little but palliative treatment is to be thought of. If pain or hæmorrhages or wasting discharges add to the general deterioration of health, removal of the growth may be of temporary advantage. Cancers have been occasionally removed from internal structures, as the œsophagus and stomach, but without very favorable results.

WILLIAM PEPPER.

Cancer: the Latin word for *crab*. In astronomy it is the fourth sign of the Zodiac, and is denoted by the figure ♋. The sun enters this sign about June 21. The first point of Cancer is 90° distant from the first point of Aries, and is called the summer solstice. Cancer is also the name of a constellation of the Zodiac, which does not coincide with the sign just described.

Cancer-root, or **Beech-drops**: the *Epiphegus virginiana*; a parasitic plant of the family *Orobanchaceæ*. It is a native of the U. S., and grows on the roots of beech-trees. The plant is astringent, and the root has been reputed a remedy for cancer, but it has no such favorable effect.

Cancer, Tropic of: in geography, one of the lesser circles of the earth: a parallel about 23° 27′ N. of the equator. At the summer solstice (June 21) the sun is vertical over this line. There is a corresponding circle on the astronomical globe. This circle touches the ecliptic in the first point of the sign Cancer. Hence the name.

Cancionero: See SONG-BOOKS.

Cancrin′, GEORG, Count: a German financier; b. in Hanau, Dec. 8, 1774. He entered the service of Russia in 1796: became a councilor of state in 1811, and lieutenant-general in 1815. He was Russian Minister of Finance for twenty-one years (1823–44), and performed the duties of that office with ability and success. D. in St. Petersburg, Sept. 22, 1845.

Can′crinite: a silicate of alumina and soda with carbonate of lime; found in Norway and at Litchfield, Me. It is remarkable as an instance of a silicate containing carbonic acid.

Can′crum O′ris (also called *noma* and *gangrenous stomatitis*): an ulcerative process resulting in a mortification of the cheek, mostly observed in children. Impoverishment, poor hygienic surroundings, and debilitating diseases are the predisposing factors. Among the proximate causes are measles, scarlet fever, typhoid, whooping cough, dysentery, and severe inflammatory diseases generally; also an imprudent administration of mercurials. Usually but one cheek is affected. No special constitutional symptoms mark the onset. Locally a small vesicle shows itself, usually about half an inch or an inch from the angle of the mouth on the inner surface; this soon bursts, revealing a hard yellow area. This is soon followed by a well-marked induration in the cheek, extending rapidly; part of the skin becomes black, and a perforation generally results, accompanied by an extremely fetid odor and increased secretion of saliva. This destructive process may spread rapidly over the cheek, nose, eyelids, upper lip, neck, and jaw-bone, causing the teeth to fall out. The ordinary bacteria of suppuration are always present; a specific bacillus has been described by Lingard, but as yet its relation to the disease is considered doubtful. Hæmorrhages are rare. During the course of this destructive process the patient may be without fever, and even inclined to eat and play; malaise and intense thirst are common. In about one week fever will set in, depression takes the place of indifference, and aspiration pneumonia, severe diarrhœa, or gangrene of other parts and consequent collapse will hasten the usual fatal termination. Recoveries, although rare, have been observed. Among the best preventives are early attention in ulcerative inflammations of the mouth, restriction in the use of mercurials, and improvement in the condition of the poor. When developed, the diseased portions must be thoroughly cauterized by free application of pure nitric or hydrochloric acids, or actual cautery, always with anæsthesia. This should be followed by frequently renewed antiseptic dressings and repeated irrigation of the mouth with mild antiseptic fluids. Also a generous diet, stimulants per mouth or rectum, and tonic treatment generally are recommended. In case of recovery, plastic operations do much to relieve the discomfort of resulting cicatricial contractions.

A. JACOBI and F. E. SONDERN.

Candahar′, or **Kandahar**, called by the Afghans **Ahmed Shahee**: the capital of Central Afghanistan; in a fertile plain, 220 miles S. W. of Cabul (see map of Asia, ref. 5–D). It is well supplied with water by two canals. The houses are mostly mean and built of wood. Candahar has an extensive trade and some manufactures. About 2 miles N. of this town is a precipitous rock which is crowned by a strong fortress or citadel. Candahar is supposed to have been founded by Alexander the Great. It was captured by Tamerlane in 1384, and by Shah Abbâs of Persia in 1620. The British army occupied it in 1839–42. It was again occupied by the British in 1880, and several severe engagements took place in the vicinity. It is of great strategic importance, and a branch of the Indian railway system has been pushed beyond Quetta, the Kwaja Amran range has been tunneled, and the rails and all other necessary materials collected to carry the track into Candahar at any time. Pop. 30,000.

Candela′brum (Lat. plu. *candelabra*): a support for lamps. There were perhaps few articles in which the ancients so combined the beautiful with the useful as in their candlesticks and lamps. Candelabra usually were of wood, but marble and metals were used for their construction, and sometimes they were of great richness of material and workmanship. The base in many instances consists of three feet of a lion, goat, or other animal, real or imaginary. In addition to the various kinds of candelabra which seem to have stood on the floor, and which were often 4 or 5 feet high, the ancients had others intended to be placed on a table. These were small and low. The lamp was generally placed upon the flat top of the candelabrum, but other lamps were sometimes hung on the sides by rings or chains.

Candelaria, kăăm-de-la-ree'a: a town in the province of Pinar del Rio, Cuba, 65 miles from Havana, noted for its mineral springs and the excellence of the coffee grown in the neighborhood. Pop. 1,200.

Can'dia, or **Meg'alo-Cas'tro**: a fortified seaport and capital of the island of Crete; on the north coast; lat. 35° 21′ N., lon. 25° 8′ E. (see map of Europe, ref. 8–G). It contains several mosques, a cathedral, a pasha's palace, and an arsenal. Its massive fortifications and its cathedral were erected by the Venetians, who owned the island until it was captured by the Turks in 1669. Pop. 15,000.

Candia: See CRETE.

Candia, PEDRO de: soldier; so called from the Greek island of Candia, where he was born about 1470. He moved to America as a soldier in the Spanish army, and in 1527 was with Francisco Pizarro in the second expedition in search of Peru. In 1528 he was Pizarro's companion to Spain, and received the title of "Grand Pilot of the South Seas." After Pizarro's death he joined the rebellion of the younger Almagro. At the beginning of the battle of Chupas, Candia pointed his guns too high; and Almagro, suspecting treachery, ran him through with his sword (Sept. 16, 1542).

Candidate [from Lat. *candida'tus*, clothed in white]: the name given by the Romans to a person soliciting the office of quæstor, consul, etc., from his appearing in public dressed in a white (*candida*) toga. Among the early Christians converts newly baptized were called candidates on account of the white robes worn by them eight days after baptism. In Germany, at the present time, a theological student who has been approved before the highest authorities in the Church is called a candidate, and the term is generally given to any applicant for office, religious or secular.

Can'didus, WILLIAM: operatic tenor singer; b. June, 1840, in Philadelphia. During the civil war he served in the Union army. At its close he resided in New York, and became a member of the Arion and Liederkranz Societies. In 1866 he sang the part of Max in *Der Freischutz*. Then he went to Germany, and made a fine reputation as an opera singer. He was one of the members of the American Opera Company in 1886. D. E. HERVEY.

Candle [O. Eng. *candel*, an early loan-word from Lat. *cande'la*, deriv. of *cande're*, shine]: a cylinder of wax, fatty matter, or paraffin, through the axis of which runs a wick, used as a source of light. Though among the earliest forms of illuminants, the candle in its modern perfected form is an extremely ingenious device. It differs from the lamp in the fact that the combustible substance is solid at ordinary temperatures, while in the lamp it is liquid. As soon as the candle is brought into action, however, the solid combustible substance becomes liquid, and a receptacle for this liquid is formed automatically. A candle in action consists of some fusible, combustible substance through which an infusible, combustible substance — the wick — passes longitudinally. When the wick, which projects at one end, is lighted, the heat developed melts the material of which the candle is made, the melting taking place to a greater extent near the wick than near the outer edge of the candle. The result of this is that a small cup-shaped cavity is formed around the base of the wick, and this serves as a receptacle for the molten material. As the candle burns away, the conditions remaining the same, this receptacle remains, and thus the candle by its own action is converted into a miniature lamp. The liquid moves upward through the wick in consequence of what is called capillary action, and is soon converted into gases, which, burning, give the flame and the light. The earliest form of the candle was the *dip*. Dips were made on the small scale from refuse kitchen fat by melting this and dipping the wick into it. On the large scale, of course, the work was more carefully done, but the method was the same. Practically, all candles are now made by molding. Much depends upon the construction of the molds used. The wick is plainly a very important part of the candle, and much ingenuity has been displayed in bringing it to its present state of perfection. Until about 1820 the wicks were made of twisted cotton yarn. As the candle burned down the wick projected into the flame and seriously interfered with the combustion. It was necessary from time to time to remove the superfluous matter by means of snuffers. At present the wick is plaited, and this causes it to bend downward as it is released, and the outer end, thus coming in contact with the air, is burned off, so that snuffers are no longer needed. The burning off of the wick is further facilitated by "pickling" it—that is to say, by soaking it in a solution of some substance such as borax, niter, or sal ammoniac, that has the effect of causing the wick to burn in a clean way without smoke. The materials used for candles are at present palmitic and stearic acids and paraffin. Tallow, spermaceti, ozocerite, and beeswax are also used. Stearin candles contain some paraffin, and paraffin candles some stearin. IRA REMSEN.

Candle (in photometry): the practical unit of illuminating power. The standard candle of Great Britain, which is also legal in the U. S., burns 120 grains of spermaceti wax in an hour. The standard candle of Germany is otherwise defined. It has a diameter of 20 mm., is composed of paraffine wax, and must produce a flame 50 mm. in height. In France the practical standard of light is the Carcel, being the light produced by the lamp of that name. The relation between these standards of light is as follows:

1 Carcel = 9·5 standard candles (English).
1 Carcel = 7·5 " " (German).

See PHOTOMETRY; also Dibdin's *Practical Photometry*.

Candle, ELECTRIC: an early form of the electric arc-lamp, which was devoid of regulating mechanism. The best known is the Jablochkoff candle, which was extensively used in Paris in the early days of electric lighting. See ELECTRIC ARC and JABLOCHKOFF CANDLE.

Candle-fish: See OULACHAN.

Candlemas: a festival to commemorate the purification of the Virgin Mary; observed by the Roman Catholics on Feb. 2, when they form a procession with many lighted candles. On this day all the church candles for the year are blessed. The institution dates back to the reign of Justinian, 542. Candle-carrying on this day was customary in England till its abolition by order in council in the second year of King Edward VI.

Candle-nut (*Aleurites triloba*): a tree of the family *Euphorbiaceæ*: a native of Java, the Moluccas, and the Pacific islands. It bears a nut as large as a walnut, having a hard shell and a kernel which is edible when roasted. It yields an excellent bland oil, which is used for food and is burned in lamps. The natives of the Society islands arrange the perforated kernels on a string or rush and use them as torches.

Cand'lish, ROBERT SMITH, D. D.: preacher; b. in Edinburgh, Scotland, Mar. 23, 1806. He was educated in Glasgow, licensed as a minister in 1828, and began to preach in Edinburgh in 1834. He was one of the prominent leaders of the popular party, and co-operated with Dr. Chalmers in organizing the Free Church after the disruption which occurred in 1843. In 1847 he was chosen Chalmer's successor as Professor of Divinity in New College, Edinburgh, but declined to serve. In 1862 he became honorary principal of New College. He was particularly interested in education, and in movements looking toward the union of the various Presbyterian bodies outside of the Establishment. He acquired much distinction as a pulpit-orator and a debater in religious assemblies. D. in Edinburgh, Oct. 19, 1873. He published, among other works, *The Atonement, its Reality and Extent* (Edinburgh, 1845; new ed. London, 1861); *Examination of Mr. Maurice's Theological Essays* (1854); *The Fatherhood of God* (1865; 5th ed. 1870); *Expository Discourses upon Genesis* (3 vols., 1843–62; 2d ed. 1868); *John* (1866); and *Ephesians* (1875). See his biography by W. Wilson (London, 1880).

Candolle: See DE CANDOLLE.

Candy: a town of Ceylon. See KANDY.

Candytuft: a plant of the genus *Iberis* and family *Cruciferæ*; indigenous in the countries bordering on the Mediterranean. The flowers have unequal petals and grow in dense corymbs. Some of the species are cultivated in gardens for the beauty of their flowers.

Cane (Lat. *canna*): a name given to several species of plants, and to the stems of the smaller palms and the larger grasses. The canes or rattans of commerce, which are used in making cane-seats of chairs, etc., are the product of the palmaceous plants *Calamus rotang* and *Calamus viminalis*. The term cane is also applied to the *Arundinaria macrosperma*, an arborescent grass which grows in the Southern U. S. on the alluvial banks of rivers, and forms thickets called canebrakes, which are almost impenetrable. This

plant often grows to the height of 15 or 20 feet. See RATTAN and SUGAR.

Cane'a, called *Khani'a* by the modern Greeks: a seaport-town of Candia or Crete; on the north coast; about 70 miles W. of Candia (see map of Europe, ref. 8–G). It occupies the site of the ancient *Cydonia*. It is the most commercial town in the island, and has a safe but shallow harbor, which will admit vessels of 300 tons. It has a light-house, an arsenal, and a fort. Oil, soap, wax, etc., are the chief articles of export. Pop. 15,000.

Canel'la al'ba: a large tree which grows in Florida and the West Indies; also called wild cinnamon. It has fragrant flowers and an aromatic bark, which is sometimes used in medicine as a stimulant tonic. The genus *Canella* belongs to the family *Canellaceæ*.

Ca'nes Venat'ici (i. e., the Hunting Dogs): a constellation of the northern hemisphere. It is represented on the celestial globe by two dogs, Asterion and Chara, which are held in leash by Boötes, and appear as if pursuing Ursa Major.

Caney, kaa'nā: a Cuban town, 4 miles N. E. of Santiago de Cuba, scene of some of the hardest fighting (July 1, 1898) between the U. S. and Spanish forces in the battle of Santiago. Pop. 700.

Can'field, ARTHUR GRAVES, A. M.: b. in Sunderland, Vt., Mar. 27, 1859; educated at Burr and Burton Seminary, Manchester, Vt., Williams College, Universities of Leipzig, Göttingen, and Berlin, and at Collège de France; instructor in Modern Langnages University of Kansas 1883–87; Professor of French since then.

Canfield, JAMES HULME, A. M.: educator; b. in Delaware, O., Mar. 18, 1847; educated in the Polytechnic Institute, Brooklyn, N. Y., and Williams College, Mass.; admitted to the bar at Jackson, Mich., 1872; lawyer and superintendent of public instruction St. Joseph, Mich., 1872–77; Professor of History and Political Science University of Kansas 1877–91; has been president of the Kansas State Teachers' Association and of the National Educational Association; chancellor of University of Nebraska 1891–93; president of Ohio State University 1893–99; librarian Columbia University since 1899.

Cang, or **Cangue**: the Chinese *kia* or portable pillory.

Cangas de Tineo, kaan'gaăs-dā-ti-nā'ō: a town of Spain; province of Oviedo; 37 miles S. W. of Oviedo, on the Narcea (see map of Spain, ref. 12–D). Pop. 22,000.

Cangrande, or **Cane della Scala**: See SCALA.

Canicatti: a town of Sicily; in the province of Girgenti; on the river Naro; 15 miles E. N. E. of Girgenti (see map of Italy, ref. 10–E). It is well built, and has sulphur mines in the vicinity. Its principal business, however, is the cultivation of orange, fig, and almond trees and grape-vines. It dates back to the reign of the Saracens. Pop. 20,000.

Canic'ula (literally, little dog): Sirius, the dog-star; a star in the constellation Canis Major.

Canicular Year: the ancient year of the Egyptians; so called because its commencement was determined by the heliacal rising of Sirius (or Canicula). Their reason for computing time from the rising of that star was perhaps because it occurred about the same date as the annual inundation of the Nile. The common year of the Egyptians consisted of 365 days, and every fourth year of 366.

Canidæ [Lat. *canis*, a dog]: a family of carnivorous mammals containing the dogs, wolves, and foxes. The typical number of teeth is 42, I. $\frac{3}{3}$ C. $\frac{1}{1}$ Pm. $\frac{4}{4}$ M. $\frac{2}{3} \times 2$, but the molars may vary from $\frac{1}{2}$ to $\frac{4}{4}$. The feet are digitigrade, the claws non-retractile, and, save the Cape hunting-dog (*Lycaon pictus*), which has but four toes on the front foot, the toes are five in front and four behind, the first digit or thumb being small, and considerably above the level of the rest. The muzzle is long, ears somewhat variable, but generally erect and pointed, tail more or less bushy. The group is practically cosmopolitan, and its members, though carnivores, are usually fond of carrion and eat insects, berries, and vegetables. F. A. LUCAS.

Canienga Indians: See IROQUOIAN INDIANS.

Canina, kaă-nee'naă, LUIGI, Cavaliere: Italian architect and antiquary; b. at Casal, Oct. 23, 1795. He was Professor of Architecture at Turin; led the excavations of Tusculum in 1830 and of the Via Appia in 1833; and published, besides other works, *Ancient Architecture Described and Illustrated by Monuments* (9 vols., 1844). Much of his work was largely speculative, showing imaginary restorations of ancient buildings, of the plan of Rome, etc., and recent research has proved the worthlessness of this, so that his books have declined in estimation. D. in Florence, Oct. 17, 1856.

Ca'nines, or **Canine Teeth** [from Lat. *cani'ni*, belonging to a dog, deriv. of *canis*, dog]: four pointed teeth, placed between the incisors and bicuspidate teeth. Each jaw has two of these, which are sometimes called eye-teeth or stomach-teeth. In the *Carnivora* they are very large and adapted to tearing flesh and to holding prey; in the wild boar they constitute the long tusks.

Canis'ius, PETRUS, Blessed: a Dutch Jesuit; b. in Nimeguen, May 8, 1521. His proper name was PIETER DE HONDT. He was educated at Cologne, and entered the Jesuit order in 1543, the first German member of the society. He afterward founded Jesuit schools at Vienna, Prague, Innsprnck, Munich, Ingoldstadt, Freiburg, Dillingen, and Angsburg, and contributed much to stop the progress of the Reformation in Southern Germany. As court-preacher to Ferdinand I. he labored with still greater success for the suppression of the Reformation in Austria; indeed, Ferdinand allowed him to go to any length he wanted, and to use any means he chose. He became so hated that the friends of the Reformation in Germany called him "the Austrian dog," alluding to his name Canisius, de Hondt, "the Hound." He became in 1549 professor and rector of the University of Ingolstadt, and was also a prominent member of the Council of Trent in 1547 and in 1562. D. in Freiburg, Switzerland, Dec. 21, 1597. He was beatified by Pope Pius IX. Nov. 20, 1864.

He was the author of many polemical and homiletic works, and edited several of the Early Fathers. He is best remembered by his famous catechism, *Summa Doctrinæ Christianæ* (1554), which has been frequently translated and abridged, and is even yet considered by Roman Catholic theologians as a standard catechetical work. See his *Life* by V. Alet (Paris, 1865) and by F. Riess (Freiburg, 1865).

Revised by JOHN J. KEANE.

Ca'nis Ma'jor (i. e. the Greater Dog): a constellation which appears in the celestial globe under the feet of Orion. It comprises Sirius, the dog-star, which surpasses all the stars of the firmament in splendor and apparent magnitude.

Ca'nis Mi'nor (the Lesser Dog): a constellation adjacent to Canis Major and to Gemini. It comprises Procyon, a star of the first magnitude, which is nearly in a direct line between Sirius and Pollux.

Caniste'o: village; Steuben co., N. Y. (for location of county, see map of New York, ref. 6–E); on railroad and on the Canisteo river; 55 miles W. N. W. of Elmira; has public school, manufactures, electric street railway, and electric lights. Pop. (1880) 1,907; (1890) 2,071; (1900) 2,077.

Canister-shot: See CASE-SHOT.

Canker [from O. Fr. *cancre* < Lat. *cancrum*, accus. of *cancer*, crab, tumor. Eng. CANCER (*q. v.*) is a direct loan-word from Lat.]: in plants, a disease caused by a fungus (*Nectria distissima*). It occurs most commonly in fruit-trees which have undergone deterioration through being long generated by grafting and budding. Canker is also a disease of the horse's foot, causing a fetid discharge from the cleft of the frog. For canker of the human mouth, see MOUTH, DISEASES OF, and APHTHÆ.

Canker-worm: the larvæ of certain geometrid moths, of which many species occur in America and Europe. They are also called measuring-worms, from their peculiar locomotion. One common American species is *Anisopteryx vernata*. In this the female is wingless, but the male has four thin, silky wings, which have an extent of about an inch and a quarter when expanded. The moths come out of the ground principally in the spring, sometimes also in the autumn. The female lays from sixty to one hundred eggs, glued in clusters to branches of trees; they hatch in the early part of May. The larvæ then feed upon the leaves, especially of apple and elm trees, which they pierce with multitudes of holes. When fully grown the larva is nearly or quite an inch in length. After about four weeks of feeding, the larvæ descend, by crawling or hanging down by their threads, to the ground, burrowing generally to the depth of a few inches. Within twenty-four hours afterward they are changed to light-brown chrysalids. From these the moths emerge after a variable time. As the female canker-worms are wingless, trees may be protected from them by placing leaden troughs, containing tar or fish oil, around their trunks. It is also desirable to destroy as many

of the caterpillars as possible. Shaking the trees will often dislodge them.

Can'na [Lat., reed]: a genus of plants of the family *Scitamineæ*. The fruit is a capsule containing hard black seeds, which are called Indian shot. The flower has one fertile petal-like stamen, and a petaloid style. One or more species are extensively cultivated as ornamental plants. The starch of *Canna coccinea* is used sometimes instead of arrowroot, under the name *tous-les-mois*. The *Canna flaccida* is a native of the Southern U. S., near the coast.

Can'nabis [Gr. *κάνναβις*, hemp, a word probably of Scythian origin]: the typical genus of plants of the family *Cannabinaceæ*. The only known species of it is *Cannabis sativa*, or hemp, a tall dicœcious annual with elegant palmate leaves. It grows wild in India, and is cultivated for its fiber, etc. (See HEMP.) The intoxicating drug called *hashish* by the Arabs and *bhang* by the Hindus is procured from a variety called *Cannabis indica*. Under the name of *gunjah* the dried female flowering hemp-plants are sold in bundles for smoking. The resinous extract called *churrus* is swallowed for intoxicating effect. Several African tribes use it. There appears to be more of the active resinoid (*cannabin*) in the Indian than in the European variety, owing probably to the difference of climate. It has been proved by the experiments of Dr. H. C. Wood, of Philadelphia, that the extract of American hemp has the same kind of influence on the brain and nervous system as that from India. (Care should be taken to separate distinctly *Cannabis indica* of American growth, which is what Wood used, from *Apocynum cannabinum*, sometimes called American or Americo-Indian hemp, which is an intense irritant poison.) The effects of Indian hemp vary considerably with different persons. Usually they are agreeably exciting, the plant being known in India as the "increaser of pleasure," the "cementer of friendship," and the "laughter-mover." Some persons become violent under its use. The word *assassin* is derived from the Arabic *hashshāshīn*, one who drinks or smokes hashish. With many there is an exaggeration of ordinary impressions, so that slight sounds are taken for thunder, one's head seems as large as a house, etc. Others have their sensibility diminished or suspended by it. It does not, like opium, affect the secretions, and seldom produces nausea. There are no cases on record in which a cannabis-indica "habit" has developed in a European. What is quite as important is the fact that no death has ever been recorded from overdoses of the drug, and enormous amounts of an active preparation injected directly into the circulation fail to cause death.

The ancients possessed some knowledge of the narcotic powers of hemp. The Scythians made a vapor-bath of its fumes by throwing the seeds on red-hot stones. Dr. Royle suggests that it may have been the nepenthes (*φάρμακον νηπενθές*) which, according to Homer, Helen received from an Egyptian woman and gave to Telemachus in the house of Menelaus.

Extract of hemp (*Extractum cannabis indicæ*) is now used as a medicine for neuralgia and some other nervous affections. The variability of its effects, however, has hitherto interfered with its extensive employment. See Hare, *Practical Therapeutics* (3d ed. Philadelphia, 1892).

Revised by H. A. HARE.

Can'næ: an ancient Roman town in Apulia; on the river Aufidus (Ofanto); near its entrance into the Adriatic Sea. Here, on Aug. 2, 216 B.C., Hannibal gained a decisive victory over the Roman army commanded by C. Terentius Varro. According to Livy, the Romans on this day lost about 45,000 infantry and 3,000 cavalry. The site of Cannæ is occupied by a village called *Canne*, about 10 miles W. S. W. of Barletta.

Cannel Coal [generally explained as "candle-coal," with Lancashire pronunc. of *candle* as *can'l*]: a variety of bituminous coal which is very dense and compact, and breaks with an uneven or largely conchoidal fracture. It sometimes exhibits a brilliant waxy luster, and is generally of a brown or black color. It burns with a bright flame, and during the process of combustion splits and crackles without melting. This coal, which is found in England and the U. S., is used for fuel and is valuable for making gas. See COAL.

Can'nelton: the capital and principal town of Perry co., Ind. (for location of county, see map of Indiana, ref. 11–D); situated on a branch of L. E. and St. L. R. R., and on the Ohio river; about 68 miles above Evansville. Cannelton has 6 churches, 2 schools, water-works, a large cotton-factory built of sandstone (in which over 400 operatives are employed), 2 saw-mills, planing-mill, flour-mill, brick-yard, cooper-shop, and manufactories of draining-tiles, pottery, picks, and chairs. Bituminous coal abounds in the adjacent hills, and is supplied in large quantities to steamboats. An excellent quality of sandstone is quarried in large quantities. The walls of the Louisville Canal around the falls of the Ohio river are built of it. Pop. (1880) 1,834; (1890) 1,991; (1900) 2,188.

EDITOR OF "ENQUIRER."

Cannes, kăăn: a seaport-town of France; department of Alpes-Maritimes; on the Mediterranean Sea; 25 miles S. E. of Draguignan (see map of France, ref. 9–I). It has an old Gothic castle and a good quay. It is also the center of a large industry in raising fragrant and ornamental flowers. The mildness and salubrity of the climate render this a favorite winter resort for English families. Napoleon landed at Fréjus, near Cannes, after his escape from Elba on Mar. 1, 1815, and Lord Brougham died here in 1868. Pop. (1891) 19,983; (1896) 22,959.

Cannibalism [from the Span. *canibales*, deriv. of a variant of *Caribes*, a tribe in the West Indies]: the practice of eating human flesh. This has prevailed and still prevails among many savage peoples. It was in force among the aboriginal inhabitants of America. Modern sailors have found the custom in New Zealand, in Polynesia, in Malaysia, in the interior of Africa, and even in India. Having its origin in hunger, the habit has developed from the spirit of vengeance and the taste contracted for human flesh. Many tribes eat only the enemies who are taken prisoners. As prisoners of war were eaten, war was waged for the purpose of gratifying the appetite thus excited. In some cases superstition and even religion mingle with the custom. It is said that the inhabitants of New Zealand think that by eating an enemy's heart they assimilate his life and his courage, rob him of the protection of the gods, and gain double favor themselves. Among the Capanagugas of South America, cannibalism is said to take the place of burial. The Rhinderwas of India, in order to propitiate the favor of the goddess Kali, kill and eat those of their relatives who are attacked by an incurable malady, or whom old age has rendered infirm. The tribe of the Battas of Sumatra make cannibalism a part of the judicial system. Instead of condemning a man for certain crimes to be hanged, they sentence him to be eaten. In this case the condemned criminal is led out alive and those who have the right cut off in order the parts that they themselves prefer from the living victim. The custom is closely related to that of human sacrifices, and doubtless the latter in many instances gave rise to the former. Cannibalism as a custom among savage races must be distinguished from occasional acts of the kind committed under peculiar circumstances and even under the pressure of apparent necessity. With the advance of civilization this horrible custom is dying out in most of the places where it is still found.

C. H. THURBER.

Canniff, WILLIAM: See the Appendix.

Can'ning: See PRESERVATION OF FOOD.

Canning, CHARLES JOHN, Earl: statesman; son of George Canning, noticed below; b. Dec. 14, 1812: educated at Eton and at Christ Church College, Oxford. He became viscount on the death of his mother in 1837, and began his public life as a Conservative. In 1852 he became Postmaster-General in the ministry of Lord Aberdeen. He was appointed Governor-General of India in 1855. During his administration the great Sepoy mutiny (1857–58) occurred, which brought him obloquy for his clemency, but he is now seen to have shown courage and high judgment. In 1859 he was made an earl: D. in London, June 17, 1862.

Canning, GEORGE: statesman and orator; b. in London, Apr. 11, 1770. His father died in poverty when the boy was a year old, and his mother had hard work to live until an uncle took George's fortunes in care. He was educated at Christ Church College, Oxford, where he distinguished himself as a classical scholar. In 1793 he entered Parliament as a supporter of Pitt, who was then Prime Minister, and he became an Under Secretary of State in 1796. About 1797 Canning, Ellis, and others began to publish the witty and famous political satires called *The Anti-Jacobin*. He married a daughter of Gen. John Scott. After the resignation of Mr. Pitt, in 1801, Canning joined the opposition against the ministry of Addington, and in Pitt's last ministry, 1804–06, was treasurer of the navy. In Apr., 1807, he

became Minister of Foreign Affairs in the Tory cabinet formed by the Duke of Portland. He fought a duel in 1809 with Lord Castlereagh, Secretary of War in the same cabinet, because he opposed the Walcheren expedition. With the fall of the Portland government, 1809, he long ceased to be a cabinet minister. He advocated Roman Catholic emancipation in 1812, was returned to Parliament for Liverpool in that year, and became president of the Board of Control in 1816. In the latter part of his life Canning and Lord Brougham were considered the most eloquent and powerful orators in the House of Commons. On the death of Lord Castlereagh, in 1822, Canning succeeded him as Secretary of Foreign Affairs in the cabinet of Lord Liverpool. He infused a more liberal spirit into the cabinet, and rendered an important service to his country by pursuing a foreign policy that was not subservient to the interests and designs of the Holy Alliance. In Apr., 1827 he became First Lord of the Treasury as the successor of Lord Liverpool, who was disabled by paralysis. He formed a cabinet partly of Tories and partly of Whigs. D. in Chiswick, Aug. 8, 1827. See A. G. Stapleton, *George Canning and his Times* (1859); Rueder, *G. Canning, seine Leben, etc.* (1827); Lord Dalling, *Historical Characters* (1867).

Canning, Sir Samuel, C. E.: celebrated for his services in the laying of submarine cables; b. in Wiltshire, England, 1823; and has been engaged in laying the most important lines of cables, including the Atlantic cables of 1865, 1866, and 1869, and cables in the Mediterranean, North Sea, etc. He was knighted in 1866.

Canning, Stratford: See Stratford de Redcliffe.

Cannizzaro, kăn-nid-zaa'rō, S.: chemist; b. in Palermo in 1826. He was at first an artillery officer, and took part in the revolution in Sicily. In 1855 he became Professor of Chemistry in Genoa, in 1861 in Palermo, and in 1882 in the University of Rome. His influence had much to do in bringing the chemists of the world to recognize the value of Avogadro's law and of the law of specific heats as furnishing means for determining molecular weights.

Cannon: See Artillery.

Cannon-ball Tree (*Couroupita guianensis*): a large tree of the family *Myrtaceæ*; native of Guiana. It bears racemes of white and rose-colored flowers, and a fruit which has a hard woody shell and is nearly round. This fruit is about the size of a 36-lb. cannon-ball.

Cannon Falls: village; Goodhue co., Minn. (for location of county, see map of Minnesota, ref. 10–F); on Ch., Mil. and St. P. R. R., and on Cannon river; 25 miles W. of Redwing; has flouring and feed mills, foundry, machine-shop, etc. Pop. (1880) 942; (1890) 1,078; (1900) 1,239.

Cannstatt, kaan'stăt: a town of Würtemberg; in the beautiful valley of the Neckar; 2¼ miles by rail N. E. of Stuttgart (see map of German Empire, ref. 7–D). It is connected by railways with Carlsruhe, Heilbronn, and other cities. It has manufactures of cotton and woolen fabrics and an active trade, for which the navigable Neckar affords facilities. Here are many mineral springs, which are much frequented in the summer. In 1796 a battle was fought near the town between the Archduke Charles and Gen. Moreau. Pop. (1895) 22,590.

Cano, kaa'nō, Alonzo: a painter, sculptor, and architect; b. in Granada, Spain, Mar. 19, 1601. He studied painting under Pacheco and Juan de Castillo, and became the founder of the school of Granada; was put to the torture on a groundless accusation of destroying his wife. In 1638 he was appointed court-painter by Philip IV. Among his chief works is a *Conception of the Virgin*. His paintings may be seen in Granada, Seville, and Madrid. D. Oct. 3, 1667.

Cano, Juan Sebastian, del: Spanish navigator; b. at Guetaria, Guipuzcoa, about 1460. In 1521 he was commander of the Concepcion, one of the vessels with which Magellan passed the straits bearing his name and navigated the Pacific. After Magellan's death (Apr. 27, 1521), Carabello was put in command, but soon deposed. Del Cano was then elected to command the fleet, and he reached the Moluccas safely. Loading his two remaining vessels with spices, he crossed the Indian Ocean, where one more ship was lost; finally, with the Victoria he doubled the Cape of Good Hope, and reached Spain Sept. 6, 1522, being thus the first circumnavigator of the globe. He was generously rewarded, and granted a coat-of-arms on which was a globe with the inscription *Primus circumdedisti me*. Made second in command of Loaisa's expedition, sent to follow the same route, he died on the Pacific, Aug. 4, 1526.

Herbert H. Smith.

Canobus: See Canopus.

Canoe [the various forms *canoa, canow, cannow, canoo, canoe* are all ultimately derived from the native Amer. word, of which the Haytian form was *canoa*]: a rude boat made of the trunk of a single tree hollowed out. Canoes are generally open boats, propelled and steered by paddles. The length and other dimensions vary greatly. Eskimo canoes are made of whalebone frames covered with sealskins, which are drawn across as a deck, with only a hole large enough for one man to sit in. The Fiji canoe is sometimes 100 feet long and decked, as are others in the South Pacific islands. Stanley saw canoes carry 100 men on the Congo river. The name is also applied to boats made of birch bark, and to other rude craft, and of late to a pleasure-boat designed for long excursions by a single person. The modern cruising canoe of the clubs is fitted with metallic center-board, rudder, and sails. *The American Canoeist* is the periodical of the American Canoe Association.

Canon, or **Cannon** (in *billiards*): See Billiards.

Canon [from Gr. *κανών*, rule]: a term of various significations in theology, science, and art; means, in general, a law, rule, or standard. In ecclesiastical language it is applied to a law or rule of doctrine or discipline, or the decree of a general council; also to the genuine books of the Holy Scripture, called the *Sacred Canon*. The Roman Catholic Church recognizes as parts of the canon of Scripture the apocryphal books, which Protestants reject. In the canon of the New Testament the agreement of the Christian churches may be said to be unanimous. See Bible.

Canon [O. Eng. *canonic*, from Lat. *cano'nicus* = Gr. *κανονικός*, according to the canon (*κανών*)]: the name of a dignitary of the Roman Catholic and Anglican Churches. In each cathedral and collegiate church there are canons, who perform some parts of the services and receive a portion of the revenue of the church. In a collective capacity the canons are called a chapter, and once formed the council of the bishop. The chapter of an English cathedral still elects the diocesan bishop under letters from the crown nominating the man and threatening the penalties of *præmunire* if he is not chosen. It is a relic of the old authority and independence of the canons. Canons (in England) must reside at the cathedral for three months in each year. Canons were originally monks or priests who lived in a community or monastery. They are historically known as Canons Regular, and followed the rule of St. Augustine, St. Benedict, St. Anthony, etc. They were once the most numerous of the religious orders, and are still found in parts of Europe.

Canon [from Gr. *κανών*, rule]: in music, a species of composition whereby a melody announced by one part or voice is continuously answered in imitation by another or others throughout the piece. We have strict and free canons, according to the relative closeness and intervallic accuracy of the imitation referred to. There are many forms of canon of intricate nature. To comprehend these (and also the difference between canon and fugue), recourse must be had by the student to special treatises on the subject. See Albrechtsberger, *Counterpoint and Fugue*. For more modern and practical works, see E. F. Richter's *Fugue*; also J. F. Bridge, E. Prout, S. Jadassohn, etc. Dudley Buck.

Cañon, kăn'yŭn (Sp. pron. kăan'yōn'), or **Canyon** [Span. tube, pipe, cannon, liter., great tube: Ital. *canone*. The French form of this word is *canon*, from which Eng. *cannon*]: a narrow defile along a river-course. The typical cañon is a geologically young, water-cut valley, deep and steep-walled for a considerable distance along the course of the stream. A cañon is formed when an elevated plateau, uplifted in relatively recent geological times, is crossed by a large river: the river cuts down a narrow valley deep below the surface of the plateau. The steepness of the valley walls is favored if the rocks are hard and the climate dry, as the walls then waste with comparative slowness, while the stream rapidly deepens its trench-like valley, as in the cañons of the Colorado and of the Yellowstone (*q. v.*). Of the three factors, geological youth, resistant rocks, and climatic dryness, the first is the most important: for even with hard rocks in a dry climate a valley will in time lose its cañon form and become wide opened, while in a moist climate steep-walled cañons may be cut under favorable conditions; but in such cases their narrowness is geologically short-lived, and hence

they are comparatively rare. Cañon is also applied to a local narrowing of a valley, where a river cuts through a mountain-range or ridge, as the cañon of Weber river through the Wahsatch Mountains above Ogden, Utah; and in Western phrase the river is here said "to cañon." Gorge is often used for shorter defiles of this kind. See Colorado River, Yellowstone Park, River, and Gorge.

W. M. Davis.

Cañon City: capital of Fremont co., Col. (for location of county, see map of Colorado, ref. 4–D): a beautiful little city situated on the main line of two railroads and at the mouth of the Grand Cañon of the Arkansas, 5,280 feet above the sea-level. It is a celebrated resort for invalids, having hot and cold mineral springs, hot sulphur baths, a mild, healthful climate, and first-class hotel accommodations. Within one day's drive of Cañon City are many points the scenery of which is among the grandest in the Rocky Mountains. The river furnishes abundant water-power, and in the near vicinity are coal, iron, limestone, and oil-wells. The city is 162 miles from Denver, and is one of the oldest and most picturesque towns in the State. Pop. (1880) 1,501; (1890) 2,825; (1900) 3,775. Editor of "Record."

Canoness [*canon* + suffix *-ess*, but cf. Fr. *chanoinesse* and Mediæv. Lat. *canonissa*]: one of the members of certain religious orders of the Roman Catholic Church, who often took no monastic vows, though they lived in common and usually observed the rule of St. Augustine. Many noblemen sought well-endowed canonical livings for their daughters, who were at liberty to marry when they chose. The custom prevailed in Germany even after the Reformation, and there were many houses (*Stifter*) of Protestant canonesses, especially in Westphalia and Mecklenburg. See Nun and Sisterhoods.

Canonical Hours in the Roman Catholic Church are certain fixed times in the day for devotions. In the Church of England Bishop Cosin published a book of *Hours* for those who liked to use them. These hours are called noeturnes, matins, lauds, tierce, nones, vespers, and complines. The breviary has seven canonical hours, because the Psalter says, "Seven times in the day will I praise Thee." In England the hours between 8 A. M. and 12 M. are canonical, and until recently no marriage could take place in churches of the Establishment except in canonical time. Recent enactments extend the canonical hours to 3 P. M.

Canonical Virgins: young women who, in the early ages of the Church, remaining in their homes, took upon themselves vows of perpetual virginity. They were enrolled in a list or canon, whence their name.

Canon'icus: an American Indian; chief of the Narragansetts, who, though at first hostile to the Pilgrims who landed at Plymouth in 1620, subsequently became friendly to the whites, and especially to the inhabitants of the colony of Roger Williams. D. June 4, 1647.

Canonization: the act of declaring a person a saint; a ceremony in the Roman Catholic and Greek Churches by which deceased beatified persons are enrolled in the catalogue or canon of saints. In the Roman Catholic Church it takes place through a solemn and public declaration of the pope that the person in question is to be looked on as enjoying the vision of God, and to be venerated (not worshiped) and invoked throughout the whole Church. Regularly, canonization can not take place until fifty years after the decease of the servant of God, and is now always preceded by the act of beatification. (See Beatification.) The process of canonization is usually a long and minute one. It includes (1) a preliminary examination on the part of the local church authorities concerning the fact and antiquity of the local veneration, the reputation for sanctity and miracles, and the reality and frequency of the latter, both before and after the death of the person in question. (2) A protracted study of the same points by the Roman Congregation of Rites according to a procedure especially designed to prevent deception and error. Besides the preceding points, the orthodoxy of the writings of the *beatus* and the legality of any previous veneration are specially considered. It is at this stage that the promoter of the faith, usually called the devil's advocate, is obliged to urge all possible objections and the strictest compliance with the complicated procedure. (3) The solemn ceremony in St. Peter's, which includes a procession with banners decorated with the portrait of the new saint, and a special ritual. On this occasion the pope orders that the *beatus* be enrolled in the catalogue of the saints, and a day assigned in the calendar for the yearly celebration of his feast in the whole Church, in honor of the Holy Trinity, for the greater glory of the Catholic faith and the advancement of the Christian religion, by the power of Jesus Christ, by that of SS. Peter and Paul, and by his own. He also issues a bull, in which he informs the Church of the life, miracles, and canonization process of the saint. Frequently letters are issued to the nation of the saint, to the local episcopate, or to the public authorities. The first solemn papal canonization of which history speaks is that of St. Ulrich, Bishop of Augsburg, by John XV., in the Lateran Council of 993. In 1170 Alexander III. reserved to the holy see this right, formerly exercised by bishops or synods. In 1634 the reservation was renewed and strictly insisted on by Urban VIII., since which time it has remained the sole prerogative of the see of Rome. The great authority on canonization is Lambertini (Benedict XIV.), *De beatificatione et canonizatione sanctorum* (best ed. Venice, 1766, 7 vols.); partial trans. under caption *Heroic Virtue* (London, 1847, 3 vols.).

John J. Keane.

Canon Law: a system of rules for the discipline of the Church. It broadly divides into that of the Eastern and that of the Western Church. The former was finally compiled about 880 A. D. by Photius, Patriarch of Constantinople, and its principal documents are given in Beveridge's *Synodikon* or *Pandectæ* (2 vols., Oxford, 1672–82). The name in the West is especially applied to the rules of the early and mediæval Church, which are also in force to some extent in the churches of Roman obedience and of England, Scotland, and Germany. This system of laws is based largely upon decisions of ancient councils, and also shows marks of the influence of the Bible and of the Roman jurisprudence. It received frequent additions and other modifications from the decretals, bulls, and extravagants of the popes. The collected materials are known as the *Corpus Juris Canonici*, of which a standard edition was published by Gregory XIII. (see Freidberg and Richter editions, 2 vols., Leipzig, 1879). In England the kings and parliaments were always jealous of the introduction of foreign canons, but permitted to some extent their application in cases where they did not interfere with the statutes of the land. In this way the common law came to receive the influence of the papal decretals, which are sometimes cited as of authority in matters of marriage, divorce, inheritance, etc., since these affairs were under the control of the ecclesiastical courts. In Scottish jurisprudence the influence of canon law is very great, it having been originally received as of equal force with the statutes of the realm. In England the ancient canon law is in force in ecclesiastical causes so far as it does not conflict with the statutes of Parliament or later canons. Much of the code of 1603 has become obsolete, as incompatible with acts of Parliament, especially that one which transferred matrimonial and testamentary causes from ecclesiastical to secular courts.

In 1847, in New York, W. H. Odenheimer, afterward Bishop of New Jersey, published *An Essay on Canon Law . . . to which is appended An Index of the Canonical Code of the Primitive Eastern and Western Church*; and also *A Digest of the Canon Law of the Church in the United States*. In 1870 Dr. Francis Vinton published *A Manual Commentary on the General Canon Law and the Constitution of the Protestant Episcopal Church in the United States*. Later English works on this subject are *Principles of English Canon Law*, by John Brownbill (part i., *General Introduction*, London, 1883); *A History of Canon Law in Connection with other Branches of Jurisprudence*, etc., by the Rev. J. Dodd (1884); *Institutes of Canon Law*, by the Rev. Robert Owen (1884); and *The Elements of Canon Law*, by Oswald J. Reichel (1889). A great deal of information on the workings of canon law in England will be found in Hook's *Church Dictionary* and the two folio volumes of the *Ecclesiastical Courts Commission Report* (London, 1883), and incidentally in Bishop Stubbs's exhaustive volumes on *The Constitutional History of England* (1874–78). See Law.

W. S. Perry.

Can'onsburg: borough; Washington co., Pa. (for location of county, see map of Pennsylvania, ref. 5–A); on C. V. branch of P. C. C. and St. L. R. R.; 22 miles S. W. of Pittsburg; has important iron and steel works, coal-works, carriage-factory, and planing-mills. Here was founded in 1802 Jefferson College (now united with another to form Washington and Jefferson College), which was the first college

founded W. of the Alleghany Mountains. The borough is the seat of Jefferson Academy, and has a number of fine church buildings. Pop. (1880) 699; (1890) 2,113; (1900) 2,714. EDITORS OF "NOTES."

Cañon-wrens: wrens of the genus *Calherpes*, inhabiting the Southern U. S. from Texas to the southern and coast region of California. They live among cliffs, in the walls of cañons, and among rock formations; hence the name.

Canopic Vases: See EGYPT, ANCIENT.

Cano'pus: See EGYPT, ANCIENT.

Canopus, or **Cano'bus** (Gr. Κάνωπος): a very brilliant star of the first magnitude in Argo; a constellation of the southern hemisphere. It is never visible in the Northern or Middle U. S., being only 37½° from the South Pole.

Canopy [earlier *canape*, from Fr. *canape* and Ital. *canope* < Lat. *conope'um* < Gr. κωνωπεῖον, bed with mosquito curtains, deriv. of κώνωψ, mosquito]: an ornamental covering over a throne or bed; also a covering which is carried over the heads of kings on journeys, and over the holy sacraments in Roman Catholic processions. The latter is called BALDACHIN (*q. v.*). In architecture and sculpture, canopy is a magnificent decoration which covers an altar, throne, pulpit, or tribunal. In Gothic architecture, the term is applied to the rich coverings over niches and tombs.

Canosa, kăă-nō'săă (anc. *Canusium*): a town of Italy; in the province of Bari; on the declivity of a steep hill 14 miles S. W. of Barletta (see map of Italy, ref. 6–G). It has an ancient cathedral. Here are interesting ruins of the ancient *Canusium*, an important city of Apulia. In the subterranean tombs of this place were found painted vases and magnificent funereal furniture, with precious stones and jewels. Pop. 18,656.

Canos'sa: small town of Italy; 24 miles S. W. of Modena (see map of Italy, ref. 3–D); contains the ruins of the famous castle belonging to Matilda of Tuscany, before whose gates the German emperor, Henry IV., stood three days bareheaded and barefooted before Pope Gregory VII. would admit him to his presence.

Canova, kăă-nō'vaă, ANTONIO: sculptor; b. in Possagno, in Venetia, Nov. 1, 1757. He studied art in Venice and Rome, and aspired to restore the pure and classic style of the antique. Among his early works were a statue of Apollo and a group of *Dædalus and Icarus*. He settled in Rome in 1782, and acquired celebrity by his *Theseus and the Minotaur*. He did not adhere strictly to the severe simplicity of the antique, but modified it by a peculiar grace, which is apparent in his *Cupid and Psyche* and his *Venus and Adonis*. Having been invited by Napoleon, he went to Paris in 1802, and executed an admirable statue of that emperor. Among his other works are a *Venus Victorious*, a monument to Clement XIII., erected in St. Peter's church, a statue of Washington, and a *Perseus with the Head of Medusa*. In 1816 he received the title of Marquis of Ischia. He was the founder of a new school of sculpture, and was reputed the greatest sculptor of his age. D. at Venice, Oct. 13, 1822. See D'Este's *Biography* (Florence, 1864), and Henry Moses's outline engravings of his principal works (London, 1824).

Cánovas del Castillo, kăă'-no-văăs-dāl-kaăs-tĕĕl'yō, ANTONIO: Spanish statesman and writer; b. June 5, 1828; leader of the Conservative party in Spain. He entered the political field in 1852 as representative of Malaga to the Cortes. He belonged at this time to the Liberal party, and he nominally continued to belong to it until 1868, when internal divisions had completely broken it up. At this time he had made himself the leader of the group called Liberal Conservative. He was resolutely monarchist, and refused to accept the republic. He was one of the leaders of the movement which placed Alfonso XII. on the throne (Dec. 31, 1874). He was almost constantly (save for short intervals) Prime Minister during the life of this monarch: but upon his death (1885) was obliged to yield to Señor Sagasta, leader of the Liberal party. Cánovas del Castillo was in power, however, from 1890 to 1892, and (again replacing his great rival Sagasta) from 1895 till his own death. He was assassinated by an anarchist Aug. 8, 1897. He was a prolific writer on political and economical, and even on literary subjects. Worthy of mention are: *El Solitario y su tiempo* (2 vols., 1883); *Problemas contemporáneos* (2 vols., 1884); *Arles y Letras* (1887); *Estudios del reinado de Felipe IV.* (2 vols., 1888); *Obras poeticas* (1887), all published in the *Colección de Escritores Castellanos* (Madrid).
A. R. MARSH.

Canrobert, kăăṅ'rō'bār', FRANÇOIS CERTAIN: general; b. in St.-Céré, Lot, France, June 27, 1809. Having served many campaigns in Algeria, he became a general of brigade in 1850, and a general of division in 1853. He commanded a division in the Crimea in 1854, and was wounded at Alma. In Sept., 1854, he succeeded Marshal St.-Arnaud as commander-in-chief of the French army, and he began the siege of Sebastopol. He resigned the command to Gen. Pelissier in May, 1855, and was made a marshal of France in 1856. In June, 1859, he commanded a corps at Solferino. On the outbreak of hostilities in 1870, the Sixth Corps, under Canrobert at Châlons, was, immediately after the disasters of Forbach and Reichshofen, summoned to Metz to re-enforce Bazaine. As its commander, Canrobert took a prominent part in all the battles and events preceding and attending the investiture and capitulation of Metz (see BAZAINE), where he was made prisoner. At the trial of Bazaine the bearing and evidence of this veteran soldier excited popular admiration. He was a Bonapartist in politics, until the Prince Imperial was killed. In 1876 he became a senator of France. D. Jan. 28, 1895.

Can'so, Cape: See CAPE CANSO.

Canso, Gut of: a strait which separates Nova Scotia from the island of Cape Breton, and connects the Atlantic with the Gulf of St. Lawrence. It is 17 miles long, and has an average width of 2½ miles.

Canta'bri: a rude race of ancient mountaineers who lived in Cantabria, the northern part of Spain, near the Bay of Biscay. Their chief towns were Juliobrigas, Concana, and Vellica. They made a brave resistance to the Romans in the Cantabrian war (25–19 B. C.). They are said to have been of Iberian origin.

Cantabrian Mountains: a general name of several ranges in the northern part of Spain. They are connected with the Pyrenees, from which they extend westward to Cape Finisterre. The highest summits are estimated at 10,000 feet high. Several portions of these mountains receive the local names of Salvada, Ordunte, Peña, Anaña, Mellara, etc.

Cantacuze'nus, Anglicized as **Cantacuzene** (in Gr. Καντακουζηνός), JOHN: a Byzantine emperor and historian; was Prime Minister under Andronicus III. (who died in 1341), and he proclaimed himself emperor in 1342, fighting for his supremacy five years in a civil war with Anna, the wife of Andronicus III. He retired to a monastery in 1355 before Turkish inroads, and died in Gallipoli in 1383. He wrote a work on Byzantine history from 1320–57. His son, Matthias, was a colleague in the empire in 1353; abdicated with his father, and died in the same year with him.

Cantagal'lo: a town of the state of Rio de Janeiro, Brazil: 80 miles N. E. of the city of Rio Janeiro (see map of South America, ref. 7–G); on a small tributary of the Parahyba. Its gold mines were formerly of great importance, but seem to have become exhausted. Its inhabitants are now principally engaged in agriculture. Pop. 4,000.

Cantal, kăăṅ'tăăl': a central department of France; formed of the south part of the old province of Auvergne. It is bounded N. by Puy-de-Dôme, E. by Haute-Loire, S. E. by Lozère, S. by Aveyron, and W. by Lot and Corrèze. Area, 2,217 sq. miles. It is drained by the sources of the Dordogne. The surface is mountainous, and mostly occupied by the *débris* of extinct volcanoes. The soil is mostly sterile. Among the staple products are cattle, butter, cheese, and chestnuts. Capital, Aurillac. It is divided into four arrondissements. Pop. (1881) 236,190; (1896) 234,382.

Cantalonpe: See MUSKMELON.

Cantarini, SIMONE: painter. See CANTAVIUS.

Cantata, kăn-tăă'ta [Ital. deriv. of *cantare*, sing]: a vocal composition which consists of choruses, arias, and recitatives with instrumental accompaniment. While many cantatas are comparatively short works, some of them, more especially the modern ones, are of the caliber of the opera on the one hand, or the oratorio upon the other. The large secular *dramatic* cantata may as to style be defined as opera without scenery, costume, or stage-action, appealing solely to the imagination of the listener through a comprehension of the text, and a forceful and appreciative setting of the same by the composer. DUDLEY BUCK.

Cantavius, Simone, also called **Simone da Pesarese**: painter; b. at Oropezza, near Pesaro, in 1612; d. in Verona, 1648; was a pupil of Guido and a fellow-student with Domenichino. Pictures by him are found in Milan (a *Transfiguration*), Bologna (a portrait of Guido), Pesaro, and other places.

Canteen' [Fr. *cantine*, cellar, small shop, and in vulg. use a small vessel, from Ital. *cantina*]: a military term used in several senses: 1, a small tin or wooden vessel which each soldier carries and uses for holding water; 2, a small wooden or leathern chest or coffer containing the table equipage and utensils of an officer when he is in active service; 3, a public-house licensed in British garrisons and barracks for the sale of malt liquor, ardent spirits, and groceries, in order that the soldiers may obtain such articles without going beyond the precincts of the barracks.

Can'temir, Demetrius: historian; b. in 1673; a son of the Moldavian waywode; was early sent as a hostage to Constantinople, where he received an excellent education. He understood several Oriental and several European languages, and held positions of trust in the Turkish administration. In 1710 he was made waywode of Moldavia, but the conspiracy into which he had entered with Peter the Great miscarried, and in 1711 he fled to Russia, where he died in 1723. While there he wrote in Latin his *History of the Ottoman Empire* (English translation by Tindal, 1734).

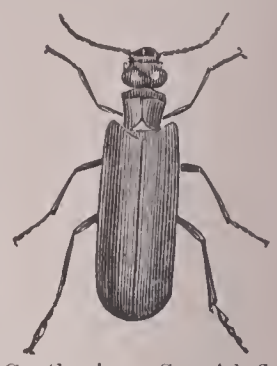
Can'terbury (anc. *Durovernum*): a city of Kent, England; on the river Stour; 56 miles E. S. E. of London, with which it is connected by railway (see map of England, ref. 12–L). It is the metropolitan see of England, being the seat of the Archbishop of Canterbury, who is Primate of all England and has precedence immediately after the royal dukes in court ceremonies. The archiepiscopal see or province of Canterbury comprises the dioceses of Canterbury, London, Winchester, Bangor, Bath and Wells, Bristol, Chichester, Ely, Exeter, Gloucester and Bristol, Hereford, Lichfield, Lincoln, Llandaff, Norwich, Oxford, Peterborough, Rochester, St. Albans, St. Asaph, St. David's, Salisbury, Southwell, Truro, and Worcester. Canterbury stands in a vale or level space between hills of moderate height. It contains fourteen old churches, mostly built of flint; also remains of St. Augustine's Benedictine abbey, and the ruins of a Norman castle. Among its institutions are several hospitals, a museum, and a theater. Canterbury returns one member to Parliament. It has manufactures of linen damask, and is noted for its brawn. St. Augustine became the first Archbishop of Canterbury in 597 A. D. About this time the town was the capital of the kingdom of Kent, and was called *Caer Cant* (i. e. city of Kent). Archbishop Cuthbert built here, about 740 A. D., a church which received numerous additions in succeeding ages. The choir having been destroyed by fire in 1174, it was soon rebuilt by William of Sens. This restored choir is probably one of the oldest parts of the cathedral, which presents a magnificent union of almost every style of Christian architecture. The central tower is 234 feet high, and the total exterior length of the cathedral is 545 feet. Immense numbers of pilgrims came here to worship at the shrine of Thomas à Becket, who was killed in the north transept in 1170. Pop. (1891) 23,026; (1901) 24,401. See Stanley's *Memorials of Canterbury Cathedral* (18th ed. 1883) and R. Jenkins's *Diocesan History of Canterbury* (London, 1880).

Canterbury: a provincial district of 14,040 sq. miles; on the east coast of the north island of the New Zealand group. Capital, Christchurch; Lyttelton is its chief port. The products are potatoes, oil, whalebone, gold-dust, and hides. Pop. (1891) 128,471.

Canterbury Bell: See Campanula.

Cantharides [plural of Cantharis (*q. v.*)]: the group of insects to which the genus *Cantharis* belongs. Also a medicinal preparation of Spanish-flies.

Can'tharis [*κανθαρίς*, the Greek name]: a genus of beetles (*Coleoptera*) belonging to the family of *Cantharidæ* or blister-beetles. The species, of which more than 200 are known, have elongate bodies, a rather large head bearing long slender antennæ, and long wing-covers, true wings being present. Most important of all the species is the so-called Spanish-fly, *Cantharis vesicatoria*. This is common throughout the warmer parts of Europe, where the adults feed upon the ash, elder, honeysuckle, maple, poplar, larch, and other trees. It is golden or bluish green, less than an inch in length, and appears in June, when it does considerable damage to the foliage. The female lays her eggs in the soil and the larvæ live as parasites on the bumble-bees. The adults are collected by beating the trees in the cooler hours of the day and catching the insects as they fall on cloths. They are usually killed by the fumes of sulphur or vinegar, and, when dried by heat, are ready for the market. They owe their use in therapeutics to a peculiar substance, cantharidin ($C_{10}H_{12}O_4$), which when placed on the skin produces blisters and when taken internally causes severe and even dangerous inflammation of the throat, stomach, kidneys, etc. On account of the presence of this poisonous principle the gathering of these insects is often accompanied with disagreeable results. They are used in various ways, the most common being in a plaster composed of the powdered beetles mixed with lard, etc., as alcoholic tincture, etc.


Cantharis, or Spanish-fly

Other members of the family *Cantharidæ* possess the same vesicatory properties, though possibly in a less degree. In the U. S. there are many allied species. The most common species belong to the genus *Epicauta*, and the adults feed upon the leaves of the potato and the pollen of the golden-rod. An aberrant member of the family is the "oil-beetle," *Meloe angusticollis*, so named from the oily fluid which exudes from the abdomen when the insect is handled. J. S. K.

Can'ticle [from Lat. *canti'culum*, little song; dimin. of *can'ticum*]: called in the common English version of the Bible **Solomon's Song**; in the Hebrew שיר השירים (i. e. Song of the Songs, of which the Vulgate *Canticum Canticorum* is a translation); a lyric poem with a dramatic arrangement in the form of a dialogue (as is evident from the change of number and, in the Hebrew, of gender). The subject is chaste love. The rabbis first began to interpret it allegorically of God and his people, and this interpretation was so established before the time of the Massoretes that they did not hesitate to recognize the book as canonical. The same method of interpretation passed into the Christian Church, only that the allegory was there accepted as referring to Christ and the Church. The more rude forms of this method of interpretation have been abandoned, but the effort is still made by types or symbols or other devices to give to the book another significance than that which it bears on its face. Not a syllable appears in the book to suggest any such hidden significance, and this interpretation rests on the assumption that, since the book is in the canon, it *must* be something more than it appears to be. The *Canticle* is still an unsolved riddle, but it is one of the finest products of Hebrew poetry, and unsurpassed in any poetry for genuine sympathy with nature and as a description of pure love, the strongest and holiest of human passions, a flame of Jehovah which can not be extinguished. This love in its purity and faithfulness is canonized by this book. Niebuhr replied to a young man, who regretted its place in the canon, that he would not consider the Bible complete as "the book of humanity" if it contained no representation of pure and faithful love. The book probably belongs to the time of Solomon, though there are no satisfactory data for deciding as to its date and author. The best modern commentaries on the *Canticles* are by Herder, who first fully appreciated its poetic and dramatic character; Umbreit (1828); Magnus (1842); Hengstenberg (1842); Hitzig (1855); Ginsburg (1857); Ewald (1867); Delitzsch (1875); Zöckler (1880); Oettli (1889); Griffis (1890). Comp. Driver's *Introduction to the Literature of the Old Testament* (1891), pp. 409, *sqq.*, and Cornill's *Einleitung in das A. Test.* (1892), pp. 238, *sqq.*

Revised by Philip Schaff.

Can'tilever: the part of a beam which projects out from a wall or beyond a support. A balcony in front of a window of a house is often supported by cantilever beams or brackets, and another example is that of the projecting beams which support a sidewalk placed outside of the trusses of a bridge. A beam supported at its middle point consists of two equal cantilever arms. When a beam is supported at one end and the other projects beyond the second support, the projecting part is a cantilever, and sometimes the whole beam is said to be a cantilever beam. A cantilever bridge is formed by two such cantilever beams or trusses extending out from opposite shores and united over the middle of the river by a short truss. See Bridges for a full account of

this important class of structures, which, although developed since 1882, is now applied to the longest spans.

MANSFIELD MERRIMAN.

Cantire, kăn-tīr', or **Kintyre**: a long narrow peninsula of Scotland; forms the south end of the county of Argyle. It is bounded on the E. by the Frith of Clyde or Kilbrannan Sound, and on the W. by the Atlantic Ocean. Its length is 40 miles, and its average width 6½ miles. It contains a large portion of arable land. A lighthouse stands at the southwest extremity, which is called the Mull of Cantire.

Can'to Fer'mo [Ital.], also **Cantus Firmus** [Lat.]: in music, the subject-song or theme. Every part that is the subject of counterpoint, whether plain or figured, is called canto fermo by the Italians. In church music this term means plain song or choral song in unison, and in notes all of equal length.

Can'ton [Fr. *canton*, from Ital. *cantone*, corner, district, deriv. of *canto* < Celt.* *cambitos*, corner, crook]: a small piece of territory; the name of each of the states or independent provinces which united form the federal republic of Switzerland, each retaining its autonomy in matters of internal administration.

Canton: in heraldry, a division of an escutcheon consisting of a square in the dexter chief. It is sometimes a bearing and sometimes is used to receive a special bearing.

Canton' [a corruption of *Kwangtung*, the Chinese name of the province; written by the Portuguese *Kamtom*; the native name of the city is Kwang-chow Foo]: a populous city; one of the greatest commercial emporia of China; capital of the province of Kwangtung; on the left (north) bank of the Canton or Pearl river; about 70 miles from its entrance into the China Sea; lat. 23° 7′ N., lon. 113° 14′ E. (see map of China, ref. 9–I). The mean annual temperature is 69° F. The city is inclosed by a brick wall about 7 miles in extent, and is entered by twelve gates. It is also defended by four strong forts, erected on the hills which rise on its northern side. Several islands in the river below Canton are also fortified. The city is divided into the old and new town, the former of which is occupied by Tartars and the latter by the Chinese.

The streets are crooked and narrow. The houses are built of brick, stone, or wood, and are seldom more than two stories high. Many thousands of people called Tankia, having no homes on the land, live on boats and rafts, and gain a subsistence by fishing and rearing poultry. Canton contains several many-storied pagodas, a Mohammedan mosque, and about 120 Bûddhist temples or monasteries, called joss-houses by foreigners. The most remarkable of these is on the island of Honam, opposite the city. This temple covers about 7 acres. Canton has extensive manufactures of silk, cotton, brass, iron, and wood.

Since the war between France and Great Britain on the one side, and China on the other (1857–61), the foreign merchants settled in Canton occupy the so-called *Sha-mien* or "sand-flats," an artificial island 2,850 feet long and 950 feet broad, surrounded with a substantial embankment of granite, and separated from the Chinese city by a canal 100 feet wide. The location is very advantageous, cool, healthy, and convenient for trade. The opposite suburb of the Chinese city is the seat of the wholesale trade.

The city has an advantageous position for foreign and internal trade, and access to the rich provinces of Kwangtung and Kwang-si by its large navigable river. The chief articles of export are tea and silk goods. Sugar, porcelain, and precious metals are also exported. All the legitimate foreign trade of China was confined to Canton before 1843, when the more northern ports of Amoy, Foochow, Ningpo, and Shanghai were opened to foreigners, since which time the importance of Canton has declined. The position, however, which it holds in the commerce of the world is still considerable. In 1891 the total imports amounted to $33,376,872, and the exports to $21,783,638. In the same year 1,900 vessels, with a tonnage of 1,711,488 tons, entered port, and 1,888, with a tonnage of 1,709,874 tons, cleared.

Portuguese vessels visited Canton in 1517; English in 1596. But the port was not formally opened to foreign trade until the close of the seventeenth century, and more than once the European powers have been compelled to use force in order to overcome the prejudices of the natives. In May, 1841, the British forces captured the defenses of Canton, but before they entered the city they were induced to retire by the payment of £6,000,000. The city was again occupied by the British and French armies 1857–61. Pop. (1891) 1,600,000.

Revised by R. LILLEY.

Canton: city of Fulton co., Ill. (for location of county, see map of Illinois, ref. 5–C); 28 miles W. S. W. of Peoria, 12 miles W. of Illinois river. The industrial establishments include one of the most extensive manufactories of agricultural implements in the West, 16 cigar-factories (employing about 600 persons), machine-shop and foundry, stove-foundry, 2 flouring-mills, tile-factory, several brick-yards, gun-factory, marble-works, broom-factory, cigar-box factory, gas-works, and electric-light works. Canton is the commercial center of one of the largest and richest counties of the great "corn belt" of Illinois, and has abundant, convenient, and cheap supplies of timber and brick and tile clay. There are coal mines within the city. Canton has a public library and a high school. Pop. (1880) 3,762; (1890) 5,604; (1900) 6,564.

EDITOR OF "REGISTER."

Canton: town (founded in 1797); on railroad; Norfolk co., Mass. (for location of county, see map of Massachusetts, ref. 5–I); 14 miles S. of Boston. Canton has manufactures of cotton and woolen goods, sewing-silk, machinery, copper and iron works, electric lights and town water-works; has seven schools, including a high school, and a public library of 7,000 volumes in the town-hall. Pop. of township (1880) 4,516; (1890) 4,538; (1900) 4,584.

EDITOR OF "JOURNAL."

Canton: capital of Madison co., Miss. (for location of county, see map of Mississippi, ref. 6–F); on the Illinois Central R. R.; 22 miles N. of Jackson; has 5 schools (2 for colored children), 8 churches (3 colored), 2 planing-mills, box-factory, agricultural-implement works, electric-light plant, and water-works. Pop. (1880) 2,083; (1890) 2,131; (1900) 3,404.

EDITOR OF "TIMES."

Canton: town; Lewis co., Mo. (for location of county, see map of Missouri, ref. 1–H); on St. L., K. and N. W. R. R., and on Mississippi river; 142 miles N. N. W. of St. Louis. It is one of the chief shipping-points of the county, and has lumber and planing mills, flour-mills, and agricultural industries. Canton has two public graded schools, and is the seat of Christian University, under control of the Christian Church of Missouri. Pop. (1880) 2,632; (1890) 2,241; (1900) 2,365.

EDITOR OF "NEWS."

Canton: capital of St. Lawrence co., N. Y. (for location of county, see map of New York, ref. 1–H); on railroad; 60 miles N. E. of Watertown; on Grass river, which affords valuable water-power, used in manufacturing lumber, flour, machinery, leather, castings, etc. Canton contains a court-house, jail, almshouse, good graded schools, and is the seat of St. Lawrence University (Universalist), having law and theological schools connected with it. Pop. (1880) 2,049; (1890) 2,580; (1900) 2,757.

Canton: city and railroad center; capital of Stark co., O. (for location of county, see map of Ohio, ref. 3–H); at the confluence of the east and west branches of Nimishillen creek. It contains woolen and flouring mills, and manufactures of mowers and reapers, printing-presses, safes, saws and springs, plows, watch-cases and movements, cutlery, wrought-iron bridges, steel saddlery, hardware hay-rakes, pottery, tiles, carriages, street-paving brick, building-brick and tile, revolving bookcases, paint, street-cars, etc. The city has water-works, and derives its prosperity chiefly from its manufactures, though the surrounding country is a very rich agricultural one. In 1890 there were $5,621,960 invested in manufactures, producing merchandise valued at $7,986,627. Of these $1,774,896 were the product of agricultural implement shops; $530,000 in roofing material; $493,550 in foundry and machine-shops; $388,206 in flour and grist mills; and $225,225 in saddlery and harness. Pop. (1880) 12,258; (1890) 26,189; (1900) 30,667.

EDITOR OF "DEMOCRAT."

Canton: borough; on Northern Central R. R.; Bradford co., Pa. (for location of county, see map of Pennsylvania, ref. 2–G); is 38 miles S. of Elmira, N. Y., and has foundry, lumber-mills, etc. Pop. (1880) 1,194; (1890) 1,393; (1900) 1,525.

Canton: city; capital of Lincoln co., South Dak. (for location of county, see map of South Dakota, ref. 5–J); on Ch., M. and St. P. R. R., and on Sioux river; 20 miles from Sioux Falls. Here are eight churches, Augustana College, excellent public schools, extensive manufactures, water-works, and an electric-light system. The river furnishes good water-power. Pop. (1880) 675; (1890) 1,101; (1900) 1,943.

EDITOR OF "SIOUX VALLEY NEWS."

Can'tonment (Fr. *cantonnement*): a military term applied to temporary resting-places of European armies. When troops are detached and quartered in several adjacent towns or villages they are said to be in cantonments. In India the term is applied to permanent military stations of the British army, or to regular military towns at a considerable distance from any city, and which sometimes contain magazines, public offices, etc.

Cantù, kän-too', Cesare: Italian historian; b. near Milan, Sept. 5, 1807; lectured in various Italian universities on history and literature. His *Universal History* (35 vols., 1834–42) has been translated into English, French, Danish, etc. He also wrote *The History of the Italians* (Turin, 1854); *The Last One Hundred Years* (Florence, 1864); *The Italian Heretics* (Turin, 1866–68), etc. D. Mar. 11, 1895.

Cann'sium (in Gr. Κανύσιον): an important and very ancient city of Apulia, in Italy; on the river Aufidus (Ofanto); about 15 miles from its mouth. It was probably founded by the Greeks. The inhabitants were called *bilingues* by Horace, because they spoke Greek and Latin. It was captured by the Romans in 318 B. C. Its site is occupied by the modern Canosa (*q. v.*). Here were found, about 1803, remarkable remains of ancient art, among which were painted vases, marble statues, and jewels of exquisite workmanship.

Canute', **Knut**, or **Knud**: King of Denmark; conqueror of England: son of Sweyn, King of Denmark, who died in 1014; succeeded to the English conquests of his father; fled before Ethelred to Denmark in 1014; returned next year, and overran the realm, except London; after the battle of Assandum, Edmund Ironsides divided the kingdom with him, retaining Wessex; on death of Edmund he became sole monarch, sending Edmund's infant sons out of the kingdom. He confirmed his power by mildness and prudent policy; placed Saxons in power; married Emma, widow of Ethelred; divided the kingdom into the earldoms of Mercia, Northumberland, Wessex, and East Anglia; inherited the crown of Denmark on the death of his brother Harold, 1018, and Norway on that of Olaf, 1030, and became the most powerful European monarch of his time. He founded monasteries, patronized minstrels, and wrote verses or ballads himself. D. at Shaftesbury, Nov. 12, 1035, leaving three sons, Sweyn, Harold, and Hardicanute. The story of his courtiers and the rising tide which would not recede at his command rests upon the authority of Henry of Huntington.

Canvas [M. Eng. *canevas* < Norm. Fr. *canevas*: Ital. *canavaccio* < Lat. **cannaba'ceus*, of hemp; deriv. of *can'nabis*, hemp]: a coarse hempen or linen cloth which is extensively used in the form of tents and the sails of ships. It is also the principal material on which artists paint oil-pictures. The word is sometimes employed as synonymous with sail. In Old English it meant also a straining-cloth or sieve.

Canvas-back (*Aythya vallisneria*): a species of North American duck, the flesh of which is highly prized for the table. It frequents the bays of the sea and the estuaries of rivers. The plumage is diversified with black, white, chestnut brown, and slate-color. The length is about 20 inches. These birds, after breeding in the northern parts of the continent, migrate southward about November.

Canzone: See Lyric Poetry.

Caonabó: a Carib who had been adopted by the Indians of Hayti. In 1492 he was cacique of Maguana, a region in the central and southern part of the island. He was married to the celebrated Anacaona. In 1493 he massacred the small colony which Columbus had left at Fort Navidad, and made war on Guacanagari, the ally of the Spaniards. In 1494 he headed a general league of the Indians against the whites. Attacking the fort of St. Thomas, he was repulsed by Ojeda, and finally with an immense army of Indians was routed by Columbus at the battle of the Vega Real (Apr. 25, 1495). Shortly after Ojeda penetrated to Caonabó's country with a small force, and pretended to treat with him. Gaining his confidence, Ojeda induced the chief to mount a horse, and suddenly seized and galloped off with him. He was sent as a prisoner to Spain, but died on the voyage (1496). Herbert H. Smith.

Caoutchouc, koo'chŏŏk, **Gum Elastic**, or **India-rubber** [caoutchouc is viâ Fr., from Caribbean *cahuchu*]: a valuable substance used in the arts for a great variety of purposes; the inspissated juice or sap of several species of plants of the families *Euphorbiaceæ*, *Moraceæ*, *Artocarpaceæ*, and *Apocynaceæ*. It is produced chiefly in tropical and subtropical countries, especially in the East Indies and South America. The milky juice of the tree is obtained by incisions in the bark, and is dried on clay molds over smoky fires, which gives it its usual black color. Pure caoutchouc is a hydrocarbon, C_8H_{14}. It is extremely valuable in the arts on account of its elastic and waterproof properties. When combined with less than 25 per cent. of sulphur, and exposed to a temperature of about 270° F., it is converted into soft vulcanized rubber, a substance much more valuable than the original caoutchouc. By adding 50 per cent. or more of sulphur, and heating to 300° F., it forms hard vulcanized rubber or ebonite. See India-rubber.

Capacity [from Lat. *capac'itas*, deriv. of *capax*, competent]: in law, ability or power to do a particular thing, such as to take or to hold land, to sue and to be sued, and the like. Capacity may sometimes exist to do one of these acts, and not to do another. Thus one may be able to take and hold land, and not have capacity to dispose of it, as in the case of an infant; or one may be able to take, and not have the power to hold against another, as in the case of an alien, who may at common law take land as between himself and his grantor, but can not hold it as against the state. Capacity may be conveniently considered under two general heads —capacity to have rights, and capacity to act. Some rules as to incapacity depend upon natural disabilities; others rest upon arbitrary grounds. This subject is closely connected with the doctrine of *status*, as treated by writers on public law. This has been shown by Maine in his work on *Ancient Law* to have had its principal origin in the early idea of the family. The arbitrary rules of archaic law have been, to a considerable extent, gradually supplanted by the modern idea of fixing one's relations to another by contract, so that the movement of modern progressive society has been from *status* to contract. This doctrine is well illustrated in the case of master and servant. In ancient law the position of the servant was fixed by an arbitrary rule, so that he was a slave. In modern times the relation depends on contract. Still, there always will be a class of cases where legal capacity is denied, as where persons, including infants, insane persons, and habitual drunkards, have not the mental power to enter into a contract, or where a supposed rule of public policy may intervene, as in the case of aliens. Aliens are still in some of the American States denied the power to hold land by purchase, or even to take it at all by descent. In fact, capacity to have rights largely depends on the general convictions of the people of a State, while the capacity to act is commonly determined by a desire to protect one who has rights from an improvident surrender of them.

T. W. Dwight.

Capacity, in electricity: the quantity by means of which is measured the charge of a condenser. The relation between capacity, potential difference, and electrical quantity is expressed by the equation

$$C = \frac{Q}{V_1 - V_2},$$

where C is the capacity and Q the quantity of electricity necessary to produce a difference of potential ($V_1 - V_2$) between the plates of the condenser. See Condenser and Electricity.

Cápac Ynpánqui: fifth sovereign of the Inca line of Peru; reigned from about 1320 to 1340. The Inca kingdom was then small, and he extended it only by subduing the Quichuas W. of Cuzco and the tribes southward to the border of the Titicaca basin. H. H. S.

Cape Ann: the eastern point of Essex co., Mass.; 31 miles N. E. of Boston. Here is a rocky headland, on which, at Rockport, valuable quarries of syenite are worked. Lat. 42° 38′ 3″ N., lon. 70° 34′ 2″ W. Two stone lighthouses stand on Thatcher's island, ¾ of a mile distant, each 112½ feet high, showing fixed white dioptric lights of the first class, 165½ feet above the sea.

Cape Ar'ago, or **Greg'ory**: a point at the south side of the entrance to Coos Bay, in Coos co., Ore. Its lighthouse stands on a small island, lat. 43° 20′ 38″ N., lon. 124° 22′ 11″ W., and shows a flashing light 75 feet above the sea.

Cape Bab-el-Mandeb: on the Arabian side of the strait of that name; lat. 12° 40′ N., lon. 43° 31′ E.; is a rock of basalt 865 feet high.

Cape Béarn, bā-aarn': a promontory of France; in the Mediterranean; lat. 42° 31′ N., lon. 3° 7′ 30″ E. Here is a lighthouse of the first class, 751 feet above the sea.

Cape Blanc: lat. 37° 20′ N., lon. 9° 48′ E. This is the most northern point of Africa.

Cape Blanco (i. e. White Cape): on the Atlantic; next to Cape Verde the westernmost point of Africa; lat. 20° 47′ N., lon. 17° 4′ W.

Cape Blanco, or **Orford**: on the Pacific; the most western point of Oregon; lat. 42° 50′ N., lon. 124° 32′ 29″ W. Its lighthouse shows a fixed white dioptric light of the first order, 256 feet above the sea.

Cape Boeo, bō-ā′ō (anc. *Lilybæum Promontorium*): the most western point of Sicily. It was in ancient times an important naval station, near which the Romans gained a great naval victory in the first Punic war. Lat. 37° 48′ N., lon. 12° 25′ E.

Cape Bojador′: a bold headland of Western Africa; the termination of a range of Mt. Atlas; in lat. 26° 7′ N., lon. 14° 29′ W.

Cape Bon, or **Ras Adder**: on the north coast of Africa; 58 miles N. E. of Tunis; lat. 37° 6′ N., lon. 11° 3′ E.

Cape Breton, brit'n: an island of North America; belonging to Great Britain, and forming a part of the province of Nova Scotia; in the Atlantic Ocean, and separated from the northeastern extremity of Nova Scotia by a narrow strait called the Gut of Canso. It is a rocky island of a very irregular shape, nearly divided by the lakes of Bras d'Or, which to the N. E. communicate with the sea, and with a surface much broken by various ranges of hills and covered with dense forests. It has an area of 5,365 sq. miles, but only about 200,000 acres are under cultivation. The chief articles of export are fish, coal, and lumber. It is noted for its fisheries of cod and mackerel. It is divided into four counties. Cape Breton, Inverness, Richmond, and Victoria. The climate is severe. Pop. about 90,000.

Cape Canav′eral: on the east coast of Florida; in Brevard County; lat. 28° 27′ N., lon. 80° 33′ W.; is nearly surrounded by dangerous shoals; has on its northeast pitch a revolving light of the first order, 139 feet above the sea.

Cape Canso: the most easterly point of Nova Scotia; has a lighthouse on Cranberry island; lat. 45° 19·5′ N., lon. 60° 55′ 3″ W. It is also a port of entry in Wilmot township, Guysborough County, having active trade and fishing interests. It has a U. S. consul. Gold has been found here. Pop. 1,500.

Cape Catoche, kăă-tō′chā: the northeastern extremity of Yucatan; on the Gulf of Mexico. This was the part of the American continent on which the Spaniards first landed; lat. 21° 34′ N., lon. 86° 57′ 51″ W.

Cape Charles, Va.: the southern point of the "Eastern Shore," a peninsula which separates Chesapeake Bay from the Atlantic Ocean. A lighthouse stands on Smith's island near this cape, with a flashing light of the first order; lat. 37° 07′ 08″ N., lon. 75° 53′ 12″ W.

Cape Clear: the most southern point of Ireland; in the county of Cork. Here is a lighthouse on a cliff 455 feet above the sea; lat. 51° 26′ N., lon. 9° 29′ W.

Cape Coast Castle: a British settlement and town on the Gold Coast, west coast of Africa; lat. 5° 6′ N., lon. 1° 15′ W. It is defended by several forts. The climate is unhealthy. The chief articles of export are palm oil, gold-dust, and tortoise-shell. Pop. 25,000.

Cape Cod, Mass.: a long and narrow sandy peninsula, which nearly coincides with Barnstable County. It is about 65 miles long, and from 1 to 20 miles wide. The form of it is similar to a man's arm bent at the elbow. On the northern extremity, Race Point, is a revolving light 47 feet above the sea; lat. 42° 03·7′ N., lon. 70° 14·3′ W.

Cape Colon′na (anc. *Sunium Promontorium*): the most southern point of Attica; on the Mediterranean; lat. 37° 39′ N., lon. 24° 2′ E. Its summit is crowned by the ruins of a marble temple 269 feet above the sea.

Cape Colony: a British colony, occupying the southern extremity of Africa; bounded N. by the Orange river, E. and S. by the Indian Ocean, and W. by the Atlantic. Area, 221,311 sq. miles. The interior of this region is described as a succession of plateaus and mountain-ranges, which increase in elevation as they recede from the coast. The highest mountains are estimated at nearly 10,000 feet above the level of the sea. The seacoast presents several comparatively safe and commodious harbors, among which the most frequented are Table Bay and Algoa Bay. Cape Colony has no rivers that are of much value for navigation. The climate is healthy, but the extremes of temperature have a wide range. But little rain falls in the interior. The vegetation of this region is peculiar, and rich in beautiful flowers, among which are the ixia, gladiolus, tritonia, strelitzia, pelargonium or Cape geranium, and xeranthemum. The characteristic vegetation of the vicinity of Cape Town consists of *Ericaceæ* (heaths), *Stapeliæ* or carrion flowers, and *Proteaceæ*. Here are about 400 species of *Ericaceæ*. Among the indigenous animals of Cape Colony are the elephant, giraffe, rhinoceros, lion, buffalo, panther, wild boar, hyæna, antelope, quagga, springbok, and ostrich. Many cattle and sheep are raised here. The soil in some parts is fertile, but a large portion of it is arid and barren without irrigation. Wheat and other cereals are cultivated extensively. The chief articles of export are wool, wine, copper, hides, horses, flour, aloes, fish, fruits, and maize. The value of the exports in 1890 amounted to £10,152,979, and that of the imports to £10,106,466. Wool is one of the principal articles of export.

The colony comprises Cape Colony proper, Griqualand West, Transkei, Griqualand East, Tembuland, and St. John's River Territory. Total pop. (1891) 1,527,224, of whom 376,987 are whites. Cape Town is the capital of the colony.

History.—The Dutch were the first Europeans who colonized this region. They founded Cape Town in 1652. The colony was captured in 1806 by the British, to whom it was formally ceded in 1815. The European colonists have been often disturbed by the hostility of the Kaffirs, a warlike race of Negroes. In 1836 the Boers (*q. v.*) left the country in great numbers, and founded the independent Transvaal Republic and Orange Free State. In 1866 British Kaffraria, in 1868 a part of the Basuto country, and in 1880 the province of Griqualand West, were annexed to the colony.

References.—*Official Handbook* (1887); *Argus Annual and South African Directory* (annual); Silver's *Handbook to South Africa* (1880); Froude's *Oceana* (1886); Greswell's *Geography of Africa South of the Zambesi* (1892).

Revised by Mark W. Harrington.

Cape Com′orin: in the Indian Ocean; the southern extremity of Hindustan; lat. 8° 5′ N., lon. 77° 30′ E.

Cape Diamond: in Canada; at the confluence of the St. Charles river with the St. Lawrence. It is 333 feet above the river, to which it presents a precipitous bluff. On this point stands the citadel of Quebec.

Cape Disappointment, or **Cape Hancock**: the southwest point of the State of Washington and of Pacific County; at the mouth of the Columbia; lat. 46° 16′ 33″ N., lon. 124° 02′ 13″ W.; has a lighthouse 40 feet high, showing a fixed white light of the first order 232 feet above the sea.

Cape Duca′to, or the **Leuca′dian Prom′ontory**: sometimes called **The Lover's Leap**; the south point of the Greek island of Leucadia or Santa Maura; lat. 38° 34′ N., lon. 20° 32′ 45″ E. It is a perpendicular white cliff over 2,000 feet high, whence Sappho is said to have cast herself for love of Phaon. From this precipice the ancients once a year cast a criminal, first tying a great number of birds to him. If the man was carried to the sea alive by the birds, he was taken up in a boat and set at liberty. Mariners have always regarded this cape with dread.

Cape Elizabeth: a township of Cumberland co., Me. (for location of county, see map of Maine, ref. 10–B): 1 mile from Portland; contains a rolling-mill, oil-refinery, a dry-dock, manufactures: is a summer resort and the seat of a State reform school. The township takes its name from the cape, in lat. 43° 33′ 56″ N., lon. 70° 11′ 41″ W. It has two stone lighthouses, one with a fixed and one with a flashing light. Pop. of township (1880) 5,302; (1890) 5,459; (1900) 887 (part taken to form South Portland since 1890). Publisher "Sentinel."

Cape Farewell: the southern extremity of Greenland; in lat. 59° 49′ N., lon. 43° 54′ W.

Cape Fear: on the Atlantic; the southern extremity of Smith's island, N. C.; the most southern point of the State; lat. 33° 52·3′ N., lon. 77° 59·8′ W.

Cape Fear River: formed by the Haw and Deep rivers, which unite at Haywood in Chatham co., N. C. It flows southeastward; passes Fayetteville and Wilmington; enters the Atlantic near Cape Fear. The length, excluding the branches above named, is estimated at 200 miles. Steamboats can ascend it to Fayetteville, 120 miles.

Capefigue, kăăp′fēēg′, Baptiste Honoré Raymond: historian; b. in Marseilles, France, in 1802. He studied law in

Paris; joined the reconciliatory party, which came into power with M. de Martignac in 1827; took an active part in the political discussion of the day as editor of various papers and historical writer. Among his numerous works on French history are *Europe during the Consulate and the Empire* (1839–41); a *History of the Restoration* (1842); and (his best work) a *History of Philippe Auguste* (1831–34, 4 vols.). D. Dec. 23, 1872.

Cape Flattery: the northwest point of the State of Washington and of Clallam County. On Tatoosh island, half a mile distant, is a small lighthouse, in lat. 48° 23′ 20″ N., lon. 124° 43′ 48″ W. This is the most western point of the U. S., exclusive of Alaska.

Cape Florida: the south point of Key Biscayne; off the southeast point of Florida; has a lighthouse, lat. 25° 39′ 56″ N., lon. 80° 09′ 24″ W., with a fixed white light.

Cape Foulweather, or **Yaqui'na Head**: the westernmost point of Benton co., Or.; has a brick lighthouse 81 feet high, showing a fixed white light of the first order 150 feet above the sea; lat. 44° 16′ 33″ N., lon. 124° 05′ W.

Cape Français: See CAPE HAYTIEN.

Cape Gas'pé: the point of land at the north side of the entrance to Gaspé Bay, and the south shore of the mouth of the St. Lawrence river, Quebec, Canada. It is in lat. 48° 45′ N., lon. 64° 12′ W.

Cape Girardeau: a city (founded in 1793); Cape Girardeau co., Mo. (for location of county, see map of Missouri, ref. 6–K); on Grand Tower and Carbondale R. R., and St. Louis, Cape Girardeau and Fort Smith Ry., and on west bank of the Mississippi; 150 miles S. of St. Louis; is the seat of St. Vincent's College, a normal school, and an academy for young ladies. Its exports are cotton, plows, mineral paints, and flour. Pop. (1880) 3,889; (1890) 4,297; (1900) 4,815.

EDITOR OF "DEMOCRAT."

Cape Guardafui, gwaar'da-fwē, or **Gardafui**: the easternmost point of Africa; in lat. 11° 50′ N., lon. 51° 21′ E.

Cape Hancock: See CAPE DISAPPOINTMENT.

Cape Hat'teras: the eastern extremity of North Carolina; a point of a low sandy island separated from the mainland by Pamlico Sound. The navigation is dangerous in this vicinity, on account of shoals which extend far out into the sea; lat. 35° 15·2′ N., lon. 75° 30·9′ W. Two miles N. of the extremity stands the lighthouse, 190 feet in height, showing a flashing dioptric light of the first order.

Cape Haytien, hā'ti-*en*, or **Cap Français**, frăn'sā': often in everyday conversation called **Le Cap**, while its original Indian name was **Guarico**: a seaport-town of the republic of Hayti; on the northern coast of the island of San Domingo; in lat. 19° 46′ N., and lon. 72° 14′ W. (see map of West Indies, ref. 5–G). Its population now (1893) is estimated at 10,000, but in the middle of the eighteenth century, while under French rule, it was a flourishing city with over 30,000 inhabitants, a university, an academy of music, etc. In 1791 it was burnt by Toussaint l'Ouverture; in 1842 it was destroyed by an earthquake. Its trade is principally with the U. S.

Cape Henlo'pen, Del.: at the entrance of Delaware Bay; 13 miles S. S. W. of Cape May; lat. 38° 46·6′ N., lon. 75° 04·7′ W. It has a stone lighthouse, showing a fixed white dioptric light of the first order, 128 feet above the sea.

Cape Henry, Va.: at the entrance of Chesapeake Bay: 12 miles S. of Cape Charles. Here is a fixed light 129 feet above the level of the sea; lat. 36° 55·5′ N., lon. 76° 0·2′ W.

Cape Horn: the southernmost point of America; an island of the archipelago of Terra del Fuego: lat. 55° 59′ S., lon. 67° 16′ W. It received its name from the Dutch navigator Horn, or Hoorn, who discovered it nearly a century after Magellan had discovered the strait which bears his name. It is an exceedingly dismal place, the last, rugged, barren outpost of the Andes, with a perpetual antarctic climate. Nevertheless, vessels which pass from the Atlantic to the Pacific, or the reverse, usually double this cape, rather than pass through the Strait of Magellan.

Cape la Hague (Fr. pron. laă-aag'): a headland of France, in Normandy; on the English Channel; the northwest extremity of the peninsula of Cotentin; about 16 miles N. N. W. of Cherbourg. On the east side of Cotentin is Cape la Hogue, near which the English and Dutch fleets defeated the French in 1692. Lat. 49° 44′ N., lon. 1° 56′ W.

Cape'lin: a little marine fish (*Mallotus villosus*) allied to the smelt family; visits the coasts of Alaska, Labrador, and Newfoundland in vast shoals, furnishing bait for the cod-fishermen. Capelins are also taken and dried for the European market, and are very good eating.

Cap'ell, EDWARD: Shakspearean critic; b. at Bury St. Edmunds, England, in 1713. He published the works of Shakspeare in 10 vols. 8vo, 1767; *Notes and Various Readings of Shakspeare* (1775); and the *School of Shakspeare* (3 vols. 4to, 1783). D. Feb. 24, 1781.

Capel'la (i. e. the Kid); a bright star of the first magnitude in the constellation of Auriga; also called *α Aurigæ*. It is a double star.

Capella, MARTIA'NUS: a Latin writer, probably of the fifth century A. D.; from North Africa; b., according to Cassiodorius, in Madaura. His work written in prose, with an occasional admixture of verse, is a handbook of the seven liberal arts which then comprised the cycle of human knowledge. The whole is clothed in the form of an allegory. The first two books represent the marriage of Mercury to a nymph, Philologia. The liberal arts are personified as their courtiers. Book iii. takes up grammar, iv. dialectics, v. rhetoric, vi. geometry, vii. arithmetic, viii. astronomy, ix. music. In the Middle Ages the work was very popular. Best editions by Kopp (Frankfurt, 1836) and Eyssenhardt (Leipzig, 1866). M. W.

Cape Lookout: the southeast extremity of the islands off Carteret co., N. C.; has a lighthouse 150 feet high near its extremity; in lat. 34° 37′ 16″ N., lon. 76° 31′ 07″ W., with a fixed white light of the first order.

Cape May: (1) the southern extremity of New Jersey; at the entrance of Delaware Bay. Here is a revolving light elevated 152 feet above the sea, in lat. 38° 55·8′ N., lon. 74° 57·3′ W. (2) A city and watering-place; 2 miles E. of the lighthouse; on the seacoast; the terminus of the West Jersey R. R.; 82 miles S. of Philadelphia, with which it has daily communication by water; has two huge and many small hostelries and boarding-houses, capable of accommodating 25,000 guests; public graded schools, many churches; frequented for bathing, fishing, and gunning. Pop. (1880) 1,669; (1890) 2,136; (1900) 2,257. Between the lighthouse and the steamboat-pier on Delaware Bay (1,000 feet long) lies *Cape May Point*, a borough with a pop. (1900) 153, but a seaside resort accommodating 3,500 persons.

Cape Mendoci'no: a lofty headland of Humboldt co., Cal.; the westernmost point of that State. It has a wrought-iron lighthouse, with a flashing white light of the first order, 428 feet above the sea; lat. 40° 26′ 24″ N., lon. 124° 23′ 27″ W.

Ca'pen, ELMER HEWITT: Universalist scholar; b. at Stoughton, Norfolk co., Mass., Apr. 5, 1838; graduated at Tufts College in 1860; studied law one year in the Harvard Law School; admitted to the bar in 1863; elected to the Legislature in 1859, while still in college. After practicing law for a short time in his native town, he began the study of theology, and was ordained in Gloucester in 1865, where he preached for four years; then preached for one year at St. Paul, Minn., and in 1870 accepted a call to the First Universalist church in Providence, R. I. In 1875 he became president of Tufts College.

Cape North: promontory in the Arctic Ocean; northernmost point of Europe. It is the north extremity of the island of Magerö; separated by a narrow channel from the mainland of Norway; lat. 71° 10′ 12″ N., lon. 25° 46′ E.

Cape of Good Hope: a promontory near the southern extremity of Africa; the termination of Table Mountain; rising about 1,000 feet above the level of the sea; lat. 34° 22′ S., lon. 18° 30′ E. It is about 30 miles S. of Cape Town, but, though it is nearly half a degree to the N. of Cape Aguillas, the southernmost point of the African continent, it is in reality this point at which the course is changed from S. to E. on the voyage from Europe to India. This cape was discovered by Bartholomew Diaz in 1486, and was first doubled by Vasco da Gama in 1497.

Cape Pal'mas: the southern extremity of Liberia; lat. 4° 22′ N., lon. 7° 44′ W.; a high point with a lighthouse. It is also the popular name of that part of the country. It is included in the Liberian state of Maryland.

Cape-pigeon: a species of petrel (*Daption capensis*) common in high southern latitudes, and especially around Cape Horn and the Cape of Good Hope. The bird is about 14 inches long; is black, marked with white above and below. It will follow a ship for a long distance, and may be captured with a hook and line baited with salt pork.

It has an intensely strong, musty odor, and, when taken, ejects from its crop an oily, ill-smelling fluid.

F. A. Lucas.

Cape Pine: Newfoundland; lat. 46° 37′ 4″ N., lon. 53° 31′ 45″ W.; has an iron lighthouse with a fixed catoptric white light of the first order, 314 feet above the sea.

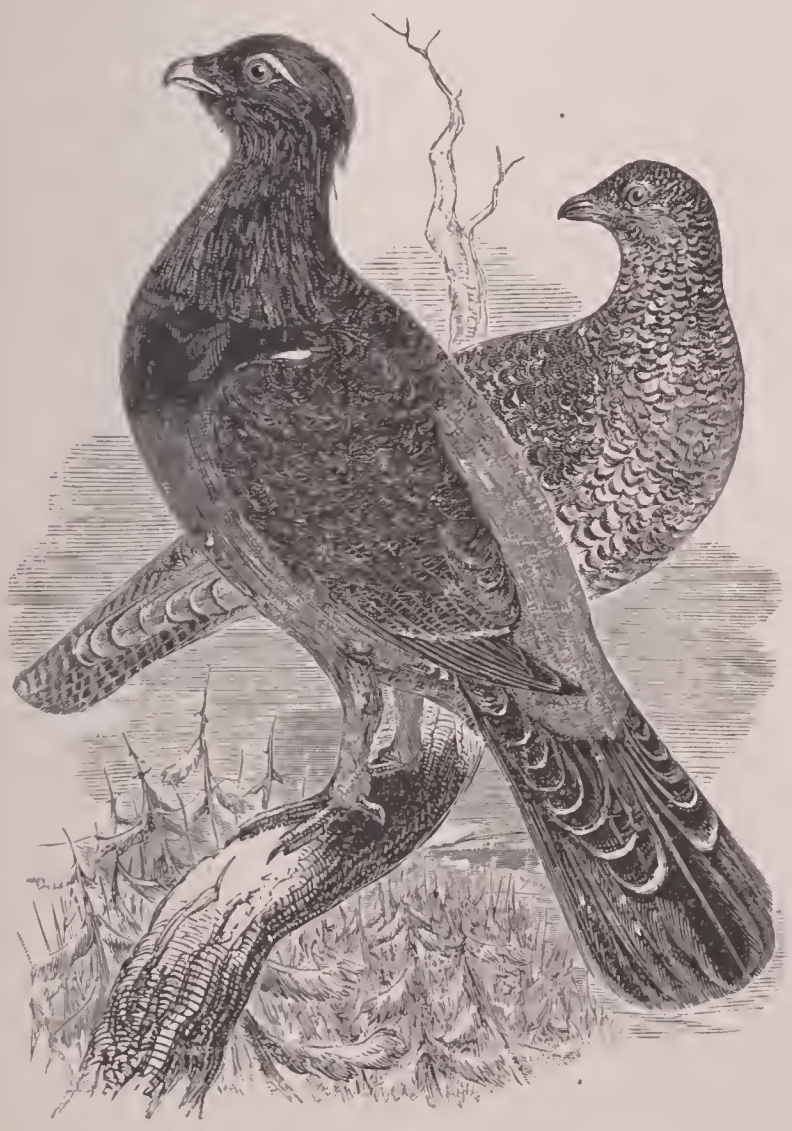
Cape Poge: the northeast point of Chappequiddick island; in Edgartown, Dukes co., Mass.; lat 41° 25′ 14″ N., lon. 70° 26′ 44″ W.; has a wooden lighthouse 36 feet high, with a fixed white light of the fourth order.

Cape Prince of Wales: the westernmost point of the American continent; on the east side of Bering Strait; lat. 65° 45′ N. lon. 168° 17′ W. It is a lofty headland, with dangerous shoals in the vicinity.

Caper: the common name of the pickled flower-buds of the *Capparis spinosa* of Southern Europe and Barbary. Several other species yield buds which are similarly used. It is a trailing shrub of the family *Capparidaceæ*, growing on rocks and walls, and extensively cultivated in Sicily and the south of France. The flowers are large and beautiful. Capers have an agreeable pungency of taste, and are used as a condiment and ingredient of sauces. They have medicinal properties, being anti-scorbutic, stimulant, and laxative. The buds are gathered every morning, and immediately put into vinegar. They are sorted and the best are sent to market in jars. Florida has two native species of the caper-tree, which are erect and not trailing. The plant called "caper" in England is the caper spurge, a *Euphorbia*.

Cape Race: near the southeast extremity of Newfoundland; lat. 46° 39′ 30″ N., lon. 53° 4′ 30″ W.; a point very dangerous to ships sailing in foggy weather between the U. S. and Europe. It has a revolving light 180 feet above the sea, established by the British Government, and (with Cape Pine light) is sustained by a tax upon all ships sailing from or to Great Britain to or from Canada and the Northeastern U.S.

Capercailzie, kăă-per-kāl′*ye*, or **Capercail′lie, Wood Grouse**, or **Cock of the Woods**: a large gallinaceous bird



The capercailzie.

(*Tetrao urogallus*); native of Europe; a species of grouse. The male sometimes weighs 15 lb. or more. The plumage of the male is variegated with black, brown, and white, and the chest is dark green. Above the eye is a scarlet patch of naked skin. The legs and feet are feathered to the toes. This bird is found in the pine-covered mountains of several countries of Europe and Northern Asia, and feeds on berries, seeds, insects, and young shoots of the fir and pine. It builds on the ground. The flesh is highly esteemed for food.

Caper′naum: an ancient city of Palestine; situated on the northwest coast of the Sea of Galilee (see map of Palestine, ref. 5–E). Some authorities identify it with the modern Tel-Hûm.

Cape Romain′: on Raccoon Key, Charleston co., S. C.; has a brick lighthouse 150 feet high, with a flashing light of the first order; lat. 33° 01′ 08″ N., lon. 79° 22′ 12″ W.

Capers, William, D. D: preacher and bishop of the Methodist Episcopal Church South; b. in St. Thomas parish, S. C., Jan. 26, 1790; educated at South Carolina College; studied law; entered the Methodist ministry in 1809; was sent as delegate to the Wesleyan Conference in England in 1828; Professor of Evidences of Christianity in Columbia College (South Carolina) 1835; editor of the *Southern Christian Advocate* 1836–40; missionary secretary of the M. E. Church 1840–44; and superintendent of Negro missions in the Southern States 1844. He took an active part in the proceedings of the Methodist General Conference of 1844, which resulted in the division of the Church, and was elected bishop by the Southern division in 1846. D. in Anderson, S. C., Jan. 29, 1855. He was author of an *Autobiography* (in Wightman's *Life of Capers*, Nashville, Tenn., 1859); *Catechisms for the Negro Missions*; and *Short Sermons and True Tales for Children*.

Cape Rubies: the name applied to the fine pyrope garnets found with the diamond in South Africa.

Cape Sable: the southwest point of Nova Scotia; in lat. 43° 26′ N., lon. 65° 38′ W. It has a lighthouse and is on Cape Sable island, in Barrington township, Shelburne County. The island had, in 1891, 2,117 inhabitants, mostly fishermen, descended from loyalists who left the U. S. during the Revolution. A ferry connects it with the mainland. The name Cape Sable island is also given to Sable island.

Cape Sable: the most southern point of the peninsula of Florida; lat. 25° 06′ N., lon. 81° 09′ W. It is sandy and low, and is the site of Fort Poinsett.

Cape San Blas: the southern extremity of Calhoun co., Fla.; has a brick lighthouse 96 feet high, with a flashing white light of the third order 102 feet above the sea; in lat. 29° 39′ 46″ N., lon. 85° 21′ 38″ W.

Cape San Lucas: the southernmost point of the peninsula of Old California; lat. 22° 44′ N., lon. 109° 54′ W.

Cape Spear: Newfoundland; lat. 47° 31′ 11″ N., lon. 52° 36′ 59″ W.; has a colonial lighthouse, showing a revolving catoptric light of the first order, 264 feet above the sea.

Cape St. George: the southernmost point of St. George's island, Franklin co., Fla.; lat. 29° 35′ 15″ N., lon. 85° 02′ 40″ W.; has a brick lighthouse 68 feet high, with a fixed white light of the third order 73 feet above the sea.

Cape St. Mary's: Newfoundland; lat. 46° 49′ 30″ N., lon. 54° 11′ 34″ W.; has a brick (colonial) lighthouse, with a flashing red and white catodioptric light of the first order, 300 feet above the sea.

Cape St. Roque: a promontory on the coast of Brazil; lat. 5° 28′ S., lon. 35° 16′ W.

Cape St. Vin′cent (anc. *Promontorium Sacrum*): the southwest extremity of Portugal; lat. 37° 3′ N., lon. 9° W. Near this cape the British admiral Jervis defeated the Spanish fleet on Feb. 14, 1797.

Ca′pet, Hugh: King of France; founder of the Capetian dynasty. He was a son of Hugh the Great, Count of Paris, and was born about 940 A. D. The throne having become vacant by the death of Louis V., the last Carlovingian king, in 987, Hugh assumed the royal power with the consent of many of the barons. He ruled with moderation, and selected Paris as the capital of France. He died in 996, and was succeeded by his son Robert.

Cape′tian Dy′nasty: third dynasty of French kings; founded by Hugh Capet, who ascended the throne in 987 A. D., and is said to have been the ancestor of thirty-two Kings of France. According to some authorities, the last of the direct line of Capetian kings was Charles IV., who died

in 1328, without male issue. He was succeeded by his cousin Philippe, who founded the house of Valois. The Bourbon line, from Henry IV. onward, were descendants of the youngest son of St. Louis, or Louis IX., and so of Capet.

Cape Titmouse (*Anthoscopus capensis*): a small bird belonging to the order *Insessores*, family *Paridæ*; found at Cape of Good Hope. It is remarkable for the ingenuity it displays in constructing its nest, which is made chiefly of

Cape titmouse.

cotton, and is shaped like a bottle, as shown in the accompanying illustration. While the female is hatching inside, the male, a most watchful sentinel, remains outside, resting in a pouch made for the purpose fixed to one side of the neck of the nest. But when his mate moves off, and he wishes to follow her, he beats the opening of the nest violently with his wing, and succeeds in closing it, in order to protect their young from enemies.

Cape Town: a seaport of South Africa; capital of Cape Colony; on the southwest shore of Table Bay; and between that bay and Table Mountain; lat. of observatory 33° 56′ 3·2″ S., lon. 18° 28′ 45″ E. (see map of Africa, ref. 10–E). It is intersected by several canals, is built on a regular plan, and lighted with gas. Close behind rise the huge granite walls of Table Mountain. The town contains an exchange, a college, an observatory, a public library, and a botanic garden. It is the see of a bishop of the Church of England. This port is visited by a large number of vessels, and is a convenient place for mariners to stop for rest and provisions in the voyage between Europe and India. The Constantia wine is produced in this vicinity. Cape Town was founded by the Dutch in 1652, and ceded to Great Britain in 1815. Pop. (1891) with suburbs, 83,718.

Cape Trafalgar: a headland of Spain; on the Atlantic Ocean, between Cadiz and Gibraltar; lat. 36° 10′ N., lon. 6° W. Near this cape, on Oct. 21, 1805, the English fleet gained a great victory over the French, and Lord Nelson, who commanded the former, was killed.

Cape Verde (Green Cape): the most westerly point of Africa; projecting into the Atlantic Ocean between the rivers Senegal and Gambia; lat 14° 44′ N., lon. 17° 33′ W.

Cape Verde (called also **Cape de Verde**) **Islands**: a group of islands belonging to Portugal; in the Atlantic, 320 miles W. of Cape Verde (see map of World, ref. 5–I). They are between lat. 14° 47′ and 17° 12′ N., and between lon. 22° 45′ and 25° 25′ W. Area, 1,650 sq. miles. The climate is hot. The group consists of fourteen islands, nine of which are inhabited—namely, Sal, Boavista, Mayo, Fogo, Brava, São Nicolão, São Thiago, São Antão, and São Vicente. They are all mountainous and of volcanic formation, and the highest point is the peak of Fogo, which rises 9,157 feet, and is an active volcano. They have mostly a fertile soil, and are covered with luxuriant vegetation. Sugar, cotton, coffee, maize, indigo, salt, and tobacco are the staples. The majority of the inhabitants are Negroes. The principal occupations are cattle-breeding and the making of salt from sea-water. The most important articles of exportation are coral, salt, physic-nuts, hides, and coffee; and of importation, cotton cloths, timber, glass, crockery, hardware, and wine. Pop. (1885) 110,930.

Cape Vincent: a port of entry of Jefferson co., N. Y. (for location of county, see map of New York, ref. 2–G); on Rome, Wat. and Og. R. R., and on the St. Lawrence river; 25 miles W. N. W. of Watertown. Extensive seed warehouses are located here. In the vicinity is good fishing, and the place is a favorite resort for summer tourists. Pop. (1880) 1,361; (1890) 1,324; (1900) 1,310. Editor of "Eagle."

Cape Wrath: the northwestern extremity of Scotland; projects from Sutherland into the Atlantic Ocean. It is a pyramid of gneiss about 600 feet high, and is remarkable for the wildness and grandeur of its scenery. Here is a lighthouse 400 feet above the sea, in lat. 58° 37′ N., lon. 4° 58′ W.

Ca'pias (Lat., you may take): in law, a common-law writ requiring the officer to take a person into custody. It assumes a number of forms, still designated by the leading words in the old writs, which were framed in Latin, such as (1) *Capias ad audiendum*, issued to bring up for judgment a defendant who has been found guilty of a misdemeanor or minor crime. (2) *Capias ad respondendum*, or, as it is frequently termed, simply *capias*, issued to the sheriff, commanding him to take and safely keep the defendant, and produce him in court on a certain day to *answer* the complaint of the plaintiff. This writ, which was formerly resorted to as a mode of commencing an action, is now, as originally, issued only as a part of the Mesne Process (*q. v.*). It has been much modified in England, and altogether abolished in most of the U. S. (3) *Capias ad satisfaciendum* (abbrev. *ca. sa.*), a writ of execution against the person, commanding the sheriff to take the person named, and have his body before the court on a specified day to *satisfy* the claim of the party resorting to it. The result is that the party is retained in custody until discharged by due course of law. The debtor could be released only by showing an irregularity in the writ, or by satisfying or reversing the judgment against him. Statutes abolishing imprisonment of debtors have much restricted its use. (4) *Capias in withernam*, issued in an action of replevin, and commanding the sheriff to take goods of a distrainor equal in value to other goods taken under a distress by the distrainor, and by him removed or concealed so that they can not be replevied by him. (5) *Capias utlagatum*, used to arrest an outlaw.

Revised by F. Sturges Allen.

Capibara: See Capybara.

Cap'illaries [from Lat. *capilla'ris*, of hair; deriv. of *capil'lus*, hair]: the minute blood-vessels intermediate between arteries and veins. They have but a single coat, consisting of a single layer of flat cells arranged edge to edge. In size they vary considerably, most of them being too small to admit the passage of more than one or two blood-corpuscles at a time. Their arrangement differs very much in the different tissues and organs. They can be examined only by the aid of the microscope, hence their existence was not known to the ancients. During life the capillary movement of the blood may be seen in the web of the frog, the tail of the tadpole, or the wing of a bat. The use of the capillaries is to subdivide and distribute the blood among all the organs and tissues of the body. Their importance in nutrition and in the performance of all the organic functions is very great. See Circulation of the Blood.

Cap'illary Action: primarily, the elevation or depression of liquids in fine hair-like tubes, as compared with the level of liquids in equilibrium in vessels or in wide tubes. If a clean wide open tube be plunged into water, nice observation will show an elevation of the fluid next the walls, both within and without the tube. If the tube be very fine the water within rises very considerably above its level outside, and the finer the bore the higher the rise. Careful examination will show that the upper surface of the water in the capillary tube is concave. The concavity of the "meniscus" is greatest in the finest tubes. If two glass plates are united at one edge, the opposite edges being slightly sepa-

rated, and the plates are placed in water with the united edges vertical, the water will rise between the plates, forming a curve which assumes the form of a right-angled hyperbola, of which the asymptotes are the common vertical edge and a line at right angles to this edge so drawn as to be equidistant from the two panes of glass. If mercury be substituted for water, the capillary action is reversed; the mercury not rising in the tube or between the plates, but being depressed. The meniscus, too, is convex in this case, and the hyperbola is likewise reversed. In the barometer and eudiometer it is necessary to make corrections for this capillarity.

The cause of capillarity is well understood, and its results can be mathematically explained. It depends on the adhesion which exists between the fluid and the material of the tube; while the degree of cohesion between the particles of the fluid itself must affect the result. As the size of tubes increases, the column within increases with the square of the diameter, while the attracting surface increases only with the diameter. Attraction is therefore relatively much greater in fine tubes.

The following table exhibits the relative capillary elevation of certain fluids in glass tubes 2 mm. in diameter at 0° C., according to Frankenheim:

Liquid.	Height of cap. column in millimeters.
Water	15·336
Acetic acid	8·510
Sulphuric acid	8·40
Oil of lemons	7·23
Oil of turpentine	6·76
Alcohol	6·05
Ether	5·40
Carbon disulphide	5·10

The temperature of the tubes and the liquid exercises an important influence upon capillarity. Heat diminishes the cohesion of the particles of the liquid among themselves, and hence greatly decreases capillary action.

Capillarity is, however, not confined to tubes, but is seen wherever a liquid surface comes in contact with a solid body. The principle is obviously the same as in the case of fine tubes. It has been proved that the principle of capillarity exercises a most important influence upon the circulation of nutritive fluids in both plants and animals.

Revised by E. L. Nichols.

Cap'ita [Lat., plural of *caput*, head]: in law, mostly used in the phrase *per capita*. See Succession.

Cap'ital [from Lat. *capita'lis*, pertaining to the head (*caput*)]: pertaining to the head or life; important, principal, chief; affecting life, as capital punishment; large, as capital letters. Capital crimes are those which are punishable with death.

Capital, in geography, the city or town which is the official seat of government in a country, state, or province, or of the courts of record of a county.

Capital [earlier, *capitell.* from Lat. *capitellum*; dimin. of *caput*. The Fr. cognate is *chapiteau*; Ital. *capitello*]: in architecture, is a term applied to the head or uppermost part of a column or pilaster. Each of the orders of ancient classic architecture—viz., Doric, Ionic, Corinthian, Tuscan, and Composite—had a peculiar form of capital. The capitals were the prominent characteristic features of the Corinthian and Ionic orders. They became more ornate in proportion to the development of art, the Doric, the most ancient, being very plain and simple compared with the Corinthian capital. See Corinthian, Doric, Ionic, etc., respectively.

Capital: in political economy, is "that part of a man's stock which he expects to afford him revenue" (Adam Smith). "What capital does for production is to afford the shelter, protection, tools, and materials which the work requires, and to feed and otherwise maintain the laborers during the process" (J. S. Mill). See Political Economy.

Capital Account: a term used especially in connection with railroad or other stock companies, as distinguished from the revenue account. It includes the money obtained for shares of stock and that borrowed upon mortgages (debentures) or the property of the company, and begins with the first preparatory operations of the company; whereas the revenue account commences with the returns from actual traffic or other productive business.

Capitalization (of words): the use of capital letters in beginning words. The practice of different nations varies, as in some small degree does that of individual scholars. The usages in English are, however, virtually uniform. Capitals are employed alike in MSS. and in print to begin a sentence and each line of poetry. The Germans begin all nouns and words used substantively with capitals, but not their derivatives (unless used substantively), even though derived from proper names. The general rule in English is to begin all proper names, and each separate word composing a proper name, with a capital. The rule is expanded to apply to the specific names of institutions, denominations, countries, towns, and in general to words and collections of words used to perform the function of proper nouns as a means of individualizing any single person or thing. Thus to write the "Reformation," or the "French Revolution," or the "Ascension," is to indicate a well-known specific event. Titles of books, churches, universities, works of art, and other styles embracing several words, have the principal, but not the connective or minor, words in initial capitals. Adjectives derived from proper names are begun with capitals in English almost universally, but a few scholars follow the French and German use, which refuses initial capitals to adjectives. The names of deities, of days and months, and all titles of honor begin with capitals. The personal pronouns relating to God, but not the relative pronoun nor the derivative personal pronoun, should be capitalized; e. g. *He*, *His*, and *Him*, but not *whom* or *himself*. The first word of a quotation preceded by a colon should also begin with a capital, but not when the quotation is virtually a part of the sentence. When a place-name is preceded by an adjective of location, the adjective is capitalized; e. g. Central New York. In the natural sciences the names of branches, orders, families, and genera are indicated by initial capitals, but when the specific is added to the generic name in this work the specific name, even when derived from a proper noun, begins with a small letter; e. g. *Aloe americana*, *Physalospora bidwellii*. All abbreviations of substantive words call for capital letters, except the names of weights and measures and the names of law writs; but not so the abbreviations of mere connective words, as A. D. for Anno Domini (though small capitals are frequently used in this case, as in this encyclopædia), LL. D. for Doctor of Laws, but *i. e.* for *id est*, *ib.* for *ibidem*, *circ.* for *circa*, *e. g.* for *exempli gratiâ*, etc.

Capital Punishment: the punishment of death (so called from the Latin *caput*, head, also life). As the penalty for murder it has prevailed from the earliest times in all parts of the world. In most nations treason or rebellion against lawful government has also been thus punished; and in England and elsewhere, down to a very recent period, the same has been true of counterfeiting, forgery, mail-robbery, and several other crimes. The manner of execution varies greatly. Military criminals, in modern times, are usually shot. In civil administration the modes most prevalent have been decapitation upon the "block," used for political criminals of rank in Great Britain; the Guillotine (*q. v.*) in France; in Spanish countries the Garrote (*q. v.*); and hanging. On June 4, 1888, hanging was abolished in the State of New York for all murders committed after Jan. 1, 1889, and death by electric shock substituted therefor. In China there are three degrees of capital punishment: *ling-chi*, or slow death by being cut to pieces, decapitation, and strangling. The last mentioned is preferred for many reasons. In Japan, for some offenses, the criminal was formerly condemned to take his own life by disembowelment in the presence of officials. See Hara-kiri.

In Christendom the tendency in modern times has been to limit capital punishment to the greatest crimes only, and many intelligent persons believe that it should be abolished altogether. The grounds upon which the question is argued are chiefly—1, common right; 2, Scripture; 3, expediency. The Marquis of Beccaría (*Essay on Crimes and Punishments*, 1775) denies the right of governments to take human life, under any circumstances, in punishment of crime. It appears to be evident, however, on any theory of society, that such a right exists in all cases in which the safety of the community requires it. As to Scripture, the Old Testament, in accordance with the words, "Whoso sheddeth man's blood, by man shall his blood be shed" (Gen. ix. 6), affords very numerous examples of its enforcement under Divine authority; and the New Testament contains no prohibition of it. It is urged, nevertheless, that the benevolence of Christianity and its high regard for human life oppose the continuance of the death-penalty. In William Penn's code

of laws for Pennsylvania it was prescribed for two crimes only—murder and treason. The chief reason for its retention in Christendom is perhaps its biblical injunction, especially as this injunction (as above) was given to Noah when he represented the whole human race, and is not therefore merely a Mosaic or Jewish statute, which might be supposed to be superseded, like the Mosaic system generally, by Christianity. It has been plausibly replied, however, that the Noachic law may reasonably be supposed to be subject to modification by the progress of the race, like the Mosaic; and that Christendom has practically recognized this fact by abolishing the capital punishment of *brutes*, which was enjoined in the same Noachic law that enjoins it for man, and without any discriminative qualification whatever. In the early training of the race such means of teaching the value of human life, it is argued, might be necessary; but as one part of the law is now deemed unnecessary, and its execution would be esteemed preposterous, it is inferable that the other is equally subject to change. Beccaría and many others deny the expediency of capital punishment, asserting that it does not lessen the amount of crime; but whether this be true or not, it is a fact that such public executions as formerly took place in England are brutalizing and injurious to public morality. Although some of the U. S., as Rhode Island, Maine, and Wisconsin, and some other governments, as Brazil, Holland, and Portugal, have abolished capital punishment, the effect upon the commission of crime has not been decided enough to prove such a step either advisable or unadvisable. See Basil Montagu's *On the Punishment of Death* (1809–13); *Memoirs of Sir S. Romilly* (1840); Jeremy Bentham's *Rationale of Punishment* (1830); E. G. Wakefield's *Facts Relating to the Punishment of Death in the Metropolis* (1831); F. Hill's *Crime: its Amount, Causes and Remedies* (1853); Bovee's *Reasons against Capital Punishment*; T. Pyne's *A Plea for the Abolition of Capital Punishment* (1845); *Report of Select Committee on Capital Punishment*, New York State Assembly (Albany, 1851).

Revised by R. Lilley.

Capitar'ida: city of Venezuela; in the state of Falcon; on the Gulf of Maracaibo. It has an important trade in tobacco. The climate is warm and unhealthy. Pop. (1893) 2,000. H. H. S.

Cap'itol [from Lat. *Capito'lium*]: the magnificent temple of Jupiter Capitolinus, which, together with the citadel or fortress and other buildings, occupied the Capitoline Hill (*Mons Capitolinus*), in ancient Rome. These edifices were founded by the Tarquins abont 600 B. C., and dedicated in 507 B. C. The temple was burned in the time of Sulla, in 83 B. C., was soon rebuilt, and was burned again in 69 A. D. Here was also the *Tabularium*, containing the public archives, and here the senate often met in both ancient and modern times. The steepness of the sides of the Capitoline Hill rendered it a natural fortress. On one side of it was the Tarpeian Rock, from which traitors and state criminals were thrown. The name *Capitolium* was often applied to the whole hill. The site of the Capitol is now occupied by the Church of S. Maria in Araceli, and the Palazzo del Campidoglio, built by Michael Angelo. More than twenty provincial cities of the empire are known to have had capitols modeled on that of Rome, and that of Toulouse has been the seat of authority for that city for centuries. The term Capitol is also applied to the imposing edifice in which the Congress of the U. S. holds its sessions at Washington, and to the State-houses which are erected at the capitals of the several States.

Capitoli'nus, Julius: a Latin biographer; one of the authors of the *Historia Augusta*; lived about 300 A. D. The biographies of the Emperors Antoninus Pius, Marcus Aurelius, Pertinax, Opilius Macrinus, the two Maximins, and others, are ascribed to him.

Capit'ularies [from Med. Lat. *capitula're* (subst.), *capitula'ris* (adjec.), pertaining to a chapter, deriv. of *capi'tulum*, small head, heading, passage or section of a book, synod]: the laws enacted by the Frankish Kings from the time of Childebert. These laws were general for all the states of the kingdom, while those called *leges* were issued for the several states. The most celebrated capitularies were those of Charlemagne and St. Louis. After Charles the Simple, in 922, they were no longer issued. The best collections of them are those of Baluze (Paris, 1677 and 1780); of Pertz, in the *Monumenta Germaniæ*, and of Boretius (Hanover, 1883).

Capitula'tion [Med. Lat. *capitula'tio*, deriv. of *capitula're*, draw up under heads, draw up articles of agreement, as for surrender]: the act of capitulating or surrendering to an enemy upon stipulated terms; a treaty of surrender to an enemy, which is concluded when the garrison or besieged force does not surrender at discretion or unconditionally. The treaty often consists of several specified conditions or articles, and those who surrender are sometimes permitted to retain their arms and to march out with the honors of war. The name is also applied to those agreements whereby citizens of one state residing in another are released from the jurisdiction of the country of their residence and placed under that of consular courts of their own nation, as is the case in Egypt and Japan.

Capo d'Istria, kaa'pō-dis'trēē-aă (anc. *Ægida*): a fortified seaport-town of Austria; in Trieste; situated on a rocky island in the Gulf of Trieste; 8 miles S. W. of Trieste (see map of Austria-Hungary, ref. 8–C). It was formerly the capital of Istria. It is connected with the mainland by a bridge about half a mile long. It is the seat of a bishop, has a cathedral and other churches; also manufactures of soap and leather. Pop. (1890) 8,646.

Capodis'trias, John Anthony, Count: b. in Corfu, Ionian islands, Feb. 11, 1776; d. in Nauplia, Oct. 9, 1831. His father practiced as a physician, and he began himself to study medicine, but entered afterward upon a political career and held a high position in the Government of the republic of the Seven United Islands, when, in 1807, by the Peace of Tilsit, that republic was incorporated with France. He obtained an appointment in the Russian diplomatic service, and was finally made Secretary of Foreign Affairs. The aid he thus was able to give his countrymen in their exertions for the establishment of an independent Greece induced them to elect him president of the Greek republic in 1827. But he was utterly unable to keep his course straight through the tempest of the moment, and while prosecuting Mauromichali for some criminal offense he was assassinated by two of Mauromichali's cousins, an incident deeply deplored by all friends of the great cause he served. See his *Life* (Berlin, 1864) by Mendelssohn-Bartholdy.

Caponière, or **Caponier** [Fr. *caponnière*; Ital. *capponiera*, a covered lodgment]: in fortification, a defensive outwork situated in the ditch of the main work. 1. A passage or communication covered from horizontal fire by a parapet on both sides (double caponière) or on one side only (single or half caponière). The parapets are usually 6½ or 8 feet high and are provided with a banquette. The superior slope usually forms a glacis and extends to the bottom of the ditch. 2. A casemated structure, situated at the middle of the face of a polygonal work to flank its ditch. These were formerly made with two or more tiers of fire, but in modern works they have but one. They have bomb-proof roofs and are protected from cannon fire by their location in the ditch.

Capon Springs or **Watson**: Hampshire co., W. Va.; 17 miles E. of Romney and 22 N. W. of Winchester (see map of West Virginia, ref. 6–L); has celebrated warm springs. The scenery is fine and the trout-fishing excellent. The hotels and bathing-houses are extensive. Pop. district (1900) 1,556.

Cappa, Carlo Alberto: See the Appendix.

Cappado'cia (in Gr. Καππαδοκία): an ancient province of Asia Minor; bounded N. by Pontus and Galatia, E. by Armenia, S. by Mt. Taurus (which separated it from Syria and Cilicia), and W. by Lycaonia. It was traversed by the river Halys. Among its chief towns were Comana, Ariarathia, and Tyana. It was conquered by Cyrus the Great of Persia, and was ruled by independent kings from the time of Alexander the Great until 17 A. D., when Tiberius reduced it to a Roman province. The greater part of it is included in the modern Karamania.

Cappel', or **Cappel'lus**, Louis, or Ludovicus: biblical critic; b. in St.-Elien, near Sedan, Oct. 15, 1585; educated at Sedan, Oxford, and Saumur; became Professor of Hebrew in the Protestant Seminary of Saumur 1613; of Theology there 1633. In his book *Arcanum punctationis revelatum* (Leyden, 1624) he proved that the vowel-points and accents are not a part of the original Hebrew text of the Old Testament. This work called forth a passionate controversy, in which the Buxtorfs took a leading part in behalf of the traditional opinion. Cappel followed up his attack in his *Critica Sacra* (Paris, 1650), in which he discussed various readings of the Hebrew text. He was in an important sense the founder of the science of biblical criticism. D. in

Saumur, June 18, 1658. See G. H. Schnedermann's *Die Controverse des L. Cappellus mit den Buxtorfen über das Alter der hebräischen Punctation* (Leipzig, 1879). C. H. Toy.

Capre'ra (literally, Goat Island): one of the Buccinarian islands; in the Mediterranean; 4 or 5 miles from the northeast coast of Sardinia; belongs to Italy (see map of Italy, ref. 6–C). It is nearly 6 miles long, and abounds in goats and rabbits. The patriot Garibaldi, after reaching middle life, often resided here. He built a house here about 1854.

Capri (anc. *Capreæ*): a charming island of Italy; in the Mediterranean; at the entrance of the Bay of Naples; 20 miles S. of the city of Naples (see map of Italy, ref. 7–F). It is about 4½ miles long and 3 miles wide. The shores of the island are steep and inaccessible. The town of Capri is the seat of a bishop. Upon this island is a remarkable cavern called the "Grotto of the Nymphs" or the "Blue Grotto." The Emperor Tiberius passed the last ten years of his life here, and built twelve villas or palaces, of which the ruins are still visible. Area, 19 sq. miles. Pop. 2,907.

Capriccio, ka-prit'chiō [Ital., freak, sudden start; borrowed into Fr. as *caprice*; deriv. of Lat. *caper*, goat]: a musical term applied to a species of free composition which is not subject to rule as to form or measure.

Cap'ricorn [Lat. *capricornus*, name of the constellation the Goat; liter., goat-horned; *caper*, goat + *cornu*, horn; Gr. *αἰγόκερως*, same]: the tenth sign of the Zodiac, which the sun enters at the winter solstice, about Dec. 21. It is denoted by this figure, ♑. Capricorn is also the name of a constellation which may be seen in the south during autumn.

Capricorn, Tropic of: in geography, one of the lesser circles of the earth; a parallel nearly 23° 27′ S. of the equator. At the winter solstice (Dec. 21) the sun is vertical over this line. There is a corresponding circle on the astronomical sphere. This circle touches the ecliptic in the first point of the sign Capricorn, which therefore gives name to this tropic.

Caprifo'lium: See Honeysuckle.

Caprimul'gidæ [Lat. *caper*, goat + *mulge're*, milk, suck]: a family of insectivorous birds of the order *Macrochires*. They have long wings, short legs, and toes united at the base by a membrane. The base of the bill is furnished with long stiff bristles. This family includes the goatsucker (*Caprimulgus*) and the American whippoorwill (*Antrostomus vociferus*), as well as the night-hawk (*Chordeiles virginianus*), the chuck-will's-widow, and the poor-will of the Western States (*Antrostomus carolinensis*).

Caprivi de Caprera de Monte-Cucculi, Gen. Georg Leo, von: German soldier and statesman; b. at Charlottenburg, Feb. 24, 1831; son of Julius Edward von Caprivi, who held a high legal office in Prussia. Entering the army in his eighteenth year, he won rapid promotion, and served with distinction in the campaigns of 1864 and 1866. In the Franco-Prussian war he served as chief of staff of the Tenth Corps. In 1883 he was appointed to the command of the Thirtieth Division at Metz. In the following year he was transferred to the head of the Admiralty, where he displayed rare adaptability to new modes of thought and lines of work. After the reorganization of the navy under the present emperor, Gen. von Caprivi again returned to the army, and received the command of the Tenth, or Hanoverian, Army-corps, one of the finest in the whole army. He succeeded Bismarck as Chancellor of the German empire and president of the Prussian Council Mar. 19, 1890. In 1892 he resigned the presidency, but retained the chancellorship: retired Oct. 26, 1894. D. Feb. 6, 1899. C. K. Adams.

Caps and **Hats**: the name applied to the political parties in Sweden which were formed under the reign of Frederick of Hesse, 1718–51. After the death of Charles XII. his sister Ulrikke and her husband, Frederick of Hesse-Cassel, were elected King and Queen of Sweden. The Swedish crown, however, had no real power. The power was in the hands of the nobility, of which one party, the Hats, leaned toward France, and the other, the Caps, toward Russia. It was this party division which afterward enabled Gustavus III. to break the power of the nobility.

Capsicin: an exceedingly acrid, soft, resinous alkaloid of a reddish color; obtained from the seed-pods of the *Capsicum annuum*, or Cayenne pepper, of which it is the active principle.

Capsicum [etym. doubtful; perhaps formed from Lat. *capsa*, case, i. e. pod]: a genus of plants of the family *Solanaceæ*; natives of the warm parts of America, Africa, and Asia. They are mostly annual or biennial plants, with more or less woody stems, and have a wheel-shaped corolla, with five convergent protruding anthers. The fruits of *Capsicum annuum*, *frutescens*, *fastigiatum*, *baccatum*, *grossum*, and *cerasiforme*, with perhaps those of other species, form, when pulverized, the Cayenne pepper which is extensively used as a condiment. It is extremely pungent, and is often employed with excellent results in medicines as a derivative and stimulant. The *Capsicum annuum* is a hardy plant, cultivated in the U. S., where pickles are made of its unripe fruit. It is stated that the fruit of *Capsicum toxicarium* of tropical America is a narcotic poison. The *Capsicum frutescens* grows wild in Florida, as well as in most warm countries. It is the true Cayenne pepper.

Capstan [Fr. *cabestan*, from a deriv. of Lat. *capis'trum*, halter]: a strong, massive column of timber, shaped somewhat like a truncated cone, and having its upper part pierced to receive bars or levers for the purpose of winding a rope round it, to raise heavy weights or otherwise exert great power. It is chiefly used in vessels for drawing in cables in order to raise anchors, etc. There are several improved forms in use on ships.

Capsule [Lat. *cap'sula*, small box, deriv. of *cap'sa*, box]: in botany, a dry, syncarpous, dehiscent fruit or seed-vessel. The term is applied to all dry fruits which are dehiscent, whether simple or compound, one-celled or many-celled, and whether they open by valves or by pores. The capsule or pod is a general name of dry-seed vessels which split or burst open at maturity. The capsule is the pod of a compound pistil. The poppy, lobelia, iris, and snapdragon afford examples of it.

Captain [Fr. *capitaine* (loan-word, cf. O. Fr. *chevetaine*), with Ital. *capitano*, Span. *capitan* from Lat. **capita'nus*, head-man, deriv. of *caput*, head]: a military term which in a general sense signifies a commander, a man skilled in war or the military art. In some countries the commander-in-chief is called captain-general. In a more limited and technical sense, captain is the title of an officer who commands a troop of cavalry, a company of infantry, or a battery of artillery. He is the next in rank below a major. In the U. S. army a captain is responsible for the camp and garrison equipage, the arms, ammunition, and clothing of his company. A captain of the U. S. marines is of a rank corresponding to that of a captain in the army and that of a lieutenant in the navy.

Captain (of the navy) is an officer of higher rank and holds a more responsible position than a captain of the land forces. He has the command of a ship, and is responsible for everything on board—all that relates to the *personnel* or the *matériel* of the vessel. The commanders of all British vessels, from first-rates down to ship-rigged sloops, are captains. A captain in the royal navy is the next in rank above a commander. A captain in the U. S. navy takes rank with a a colonel in the army, and next below a commodore. He rises by regular succession to the rank of rear-admiral. Before the civil war (1861–65) there was no legal rank in the U. S. navy higher than that of captain. (See Commodore.) The term captain is also applied to the master of a merchant-vessel. Revised by S. B. Luce.

Caption [from Lat. *captio*, a taking; in its application to a part of a legal instrument the English word means note of caption or taking]: in law, is that part of a legal document, such as an indictment or commission, which shows the time and place where, and the authority by which, it was made or executed. It is of considerable consequence in the case of indictments. While a caption is not strictly a part of an indictment, its absence or imperfection may be of serious import. Its office is to summarize the history of the case up to the time of the indictment, stating the style of the court, the time and place of its meeting, the time and place where the indictment was found, and the number of the jurors who found it, though their names need not be mentioned. When the indictment is removed into a higher court (see Certiorari) it is said that there must be enough in the caption to show that the inferior court had jurisdiction in the case. See Francis Wharton's *Criminal Law*; James Bassett's *Criminal Pleading and Practice*; and John F. Archbold's *Criminal Pleading and Evidence*, where useful forms of captions are given.

Revised by F. Sturges Allen.

Capture: See International Law.

Cap'ua (in Gr. **Καπύη**): an important city of ancient Italy; capital of Campania; situated on a plain about 2 miles from the river Vulturnus; about 18 miles N. of Naples (see map of Italy, ref. 6–F). It is supposed to have been founded by the Etruscans, who called it *Vulturnum*. It was probably nearly as ancient as Rome itself. Capua was the greatest and most opulent city of Italy about 350 B. C. It was conquered by the Romans in 340 B. C., but it continued to prosper under the Roman power, and in the time of the second Punic war was scarcely inferior to the great cities of Rome and Carthage. Capua was noted for its luxury and refinement. After Hannibal had defeated the Roman army at Cannæ in 216 B. C., the popular party of Capua, in hopes of rendering their city independent of Rome, opened their gates to the Carthaginians, who spent the winter in Capua and became enervated by its luxury. The Romans, having besieged the city and captured it in 211, punished its revolt with severity, nullified its political importance, and reduced it to the condition of a provincial town of the most degraded class. It continued, however, to be a popular city for several centuries, but it was taken and ruined in 456 A. D. by Genseric the Vandal. The site is now partly occupied by a town called Santa Maria di Capua, with 20,058 inhabitants. Here are visible the remains of a grand amphitheater.

Capua (anc. *Casilinum*): a city of Italy; province of Caserta; beautifully situated on the river Volturno, 27 miles by rail N. of Naples (see map of Italy, ref. 6–F). It is on the railway which connects Naples with Rome, and is a military station of the first class. It was considered one of the keys of the former kingdom of Naples. Capua contains a remarkable old cathedral, a college, and several convents. It was founded on the site of *Casilinum*, 2 or 3 miles E. of the ancient Capua, in 856 A. D. Pop. 13,860.

Capuchin' Friars [capuchin is viâ Fr. from Ital. *capucchino*, deriv. of *capuccio*, hood, deriv. of *cappa*; Span. *capa* (from which Eng. *cape*) < Lat. *cappa*, a head-covering]: a branch of the order of Franciscan monks which originated with Matteo di Basso, an Observantine Franciscan in the convent of Montefaleo, in Urbino, Italy, in 1525. They are the third of the chief branches of the Franciscans, the other two being the Observantines and the Conventuals. They are very strict in discipline; are committed to the most absolute poverty; and have rendered distinguished service upon the mission field. They spread with extraordinary rapidity, and reached their greatest extent in 1775, when they numbered over 31,000. Owing to political measures of suppression in many countries and the general decline in zeal for monasticism, they now number only some 8,000. They have a few convents in the U. S. At first they did not cultivate learning, but since the opening of the seventeenth century they have done so; yet there are few eminent names among them. Two persons of note in Church history were Capuchins, Bernardino Ochino (*q. v.*), twice elected vicar-general of the order; famous orator; became a Protestant at the age of fifty-six (1542); and Father Theobald Mathew (*q. v.*), the distinguished advocate of total abstinence. There is also an order of Capuchin nuns who are Franciscans of the strictest observance. It was founded in 1538 at Naples by Maria Laurentia Longa. They are properly Clares. Samuel Macauley Jackson.

Capuchin-monkey: a South American monkey (*Cebus capucinus*), which receives its name from the cowl-like appearance of the hairy covering of its head. Other species of the genus bear the same name.

Capudan' Pasha [capudan is a corruption of Ital. *capita'no*, captain]: the high admiral or commander-in-chief of the Turkish navy. He has the control of all naval affairs, appoints all the officers of the navy, and is governor of the Turkish islands in the Archipelago.

Ca'put Mor'tuum [Lat., dead head]: the inert residue of distillation and sublimation. When sulphate of iron is distilled at a red heat, it leaves a residue of red oxide of iron, which the alchemists called *caput mortuum vitrioli*. Its symbol was a death's head and cross-bones; hence *caput mortuum* signified also a "bugbear," a source of groundless terror.

Capyba'ra, or **Capiba'ra**, known also as the **Water Cavy**: the largest known quadruped (*Hydrochœrus capybara*) of the order *Rodentia*, and family *Caviidæ*. It is an aquatic animal, a native of South America, and feeds on vegetable food exclusively. Its dentition resembles that of the cavy, except that the grinding teeth are formed of many transverse plates, the number of plates increasing as the animal advances in age. It is inoffensive and easily tamed. The flesh is esteemed good food. It is somewhat smaller than the common hog.

Capybara.

Caquetá River: See Japurá.

Car: a vehicle for transporting freight or passengers, and usually running on wheels. Reference may be made to Railway Equipment for information concerning railway cars. As special kinds may be mentioned *push-cars*, *hand-cars*, *dump-cars*, *wrecking-cars*, *logging-cars*, etc. A velocipede-car for the use of foremen of railway sections has also been devised. Mine-cars for transporting ore and coal are sometimes made entirely of iron or steel. For the *motor-cars* of Electric Railways, see that article. Mansfield Merriman.

Velocipede-car.

Carabaño, kăă-răă-baan yō, Francisco: Venezuelan general; b. in Cumaná, 1783. He took an early and active part in the revolution of 1810, until 1814, when he was captured and sent to Spain. Returning in 1822, he was employed in various military and civil capacities; was elected to Congress in 1829, and in 1830 became Minister of War. In 1835 he was a leader of the attempted revolution called *de las reformas*, and on its failure in 1836 was banished. In 1844 he returned and was made commandant at Cumaná, where he was assassinated, Aug. 19, 1848. Herbert H. Smith.

Carabaya, or **Caravaya**: an eastern province of Peru; in the department of Puno; area, 12,000 sq. miles; pop. about 15,000, besides wild Indians. The Andes form the western frontier, with an eastern branch which divides the province into two parts; the mountains fall steeply to the Amazonian plains, which are covered with heavy forest extending far up the slopes; the climate is very moist and rainy, and warm in the plains. Carabaya was settled about 1543 by fugitives from the army of the younger Almagro; gold was discovered by them, and for two centuries this was one of the richest mining regions in South America, with several flourishing towns (Sandia, San Gaban, San Juan del Oro, and others). In 1767 these cities were destroyed by the Chuncho Indians, and even their sites are now unknown; not a single white man was left east of the mountains. The mines have remained abandoned, owing to the difficulty of communication, but the region is known to be very rich in gold, copper, and other metals, as well as forest products. The principal product at present is cinchona.

Herbert H. Smith.

Carab'idæ: a family of coleopterous or beetle-like insects, equivalent to the Linnæan genus *Carabus*. Its species are very numerous and of various habits. Most of them are voracious devourers of other insects and of worms; the larvæ have similar propensities. Some of them are more

than an inch in length, and with rather long legs, used in pursuing their prey. A few species have only rudimentary wings. Several have considerable beauty of color and luster.

Carabo'bo: a plain a few miles S. of the city of Valencia, Venezuela, on the western side of the river Paito; two roads cross on it. It is memorable for two great victories won by Bolivar. The first was on May 28, 1814, when with 5,000 men he completely routed 6,000 Spaniards under Captain-General Cajigal. The second was on June 25, 1821. The Spaniards had been reduced and discouraged by defeat, and their remaining army of 5,000 men, under La Torre, was stationed in the plain, the passes into it being difficult and strongly defended. Bolivar, advancing from Tinaquillo with 6,000 veteran troops, forced the passes and defeated La Torre, destroying or capturing most of his army. The brunt of the battle was born by the battalion of English volunteers under Col. Ferrier. This victory ended the Spanish domination in Venezuela, and insured the independence of Colombia and Ecuador. HERBERT H. SMITH.

Carabobo: the smallest state of Venezuela; on the northern coast; bounded N. by the Caribbean Sea, E. by Miranda, S. by Zamora, and W. by Lara. Area, 2,984 sq. miles. Pop. (1891) 198,021. Capital and principal city, Valencia. The coast-range mountains which cross it are interspersed with beautiful and fertile valleys, and agriculture is almost the only industry. The principal products are coffee, cacao, and sugar. Puerto Cabello is an important port, and Montalban, Nirgua, and Ocumare are thriving towns.

HERBERT H. SMITH.

Car'acal (*Lynx caracal*): a species of lynx found in the warm parts of Asia and in Africa, supposed to be the same animal as that which the ancients called lynx. It is larger than a fox, and is powerful enough to kill a hound

Caracal.

with ease. The fur of the upper part is of a deep brown or wine red, its ears being tufted with long black hair. It is naturally fierce, but is capable of being tamed, and has been employed in hunting.

Caracal'la, MARCUS AURELIUS ANTONINUS BASSIANUS: a Roman emperor; son of Septimius Severus; b. at Lyons in 188 A. D. On the death of his father, in 211 A. D., he ascended the throne, and caused his brother Geta to be murdered. He also massacred several thousand friends of Geta, including Papinian, the great jurist. His reign was disgraced by many acts of cruelty and infamy. He was assassinated near Edessa in 217 A. D., at the instigation of Macrinus, who became his successor. The baths of Caracalla are among the most striking ruins of Rome.

Caraca'ra, or **Caracara Eagle**: a rapacious bird of the genus *Polyborus*; peculiar to America; resembling in habit both the American vulture and the buzzard. The *Polyborus brasiliensis*, which is found in Brazil and other parts of America, has fine plumage, and measures about 4 feet from tip to tip of the wings. *Polyborus tharus* is common throughout South America, and is found as far north as Texas and Florida. Its principal food is carrion, yet it will attack new-born lambs, a fact which makes it much dreaded on the sheep-ranges of South America. Other species are known. Revised by D. S. JORDAN.

Caracas, kăă-raa'kas: capital of the republic of Venezuela; situated 12 miles S. of La Guayra, and nearly 3,000 feet above the level of the sea; lat. 10° 30′ 50″ N., lon. 67° 5′ W. (see map of South America, ref. 1–D). It is separated from La Guayra, its seaport, by a high mountain-range. It is liberally supplied with water by several streams which run through or near the city. The streets are narrow, straight, and well paved. Among the principal edifices are the cathedral and the Church of Alta Gracia. Caracas is the seat of a Roman Catholic archbishop, and contains a college and several hospitals. The climate is healthy, but the place is subject to earthquakes, one of which in 1812 destroyed about 12,000 people. The chief articles of export are cacao, cotton, indigo, coffee, hides, etc. Pop. (1881) 55,-638; (1888) 70,466. Caracas is in a "federal district," having an area of 45 sq. miles and a total population of 71,399. This district is surrounded by the state of Guzman Blanco.

Caracci, kăă-raat'chĕe, or **Carracci**, AGOSTINO: brother of Annibal Caracci; b. in Bologna in 1558; d. in Parma, 1602; assisted Annibal in his Farnese work; was an engraver of high merit; painted the *Communion of St. Jerome*, now in Bologna; had literary tastes.

Caracci, ANNIBAL, or ANNIBALE: painter; b. in Bologna in 1560. He was a pupil of his cousin, Ludovico Caracci, with whom he was associated as a founder of the Bolognese school of painting. The pictures which he painted in the Farnese Gallery in Rome, on which he expended eight years, are considered his best works. His *Three Maries* is in Castle Howard, England. He is generally regarded as the greatest painter of the Caracci family. D. at Rome in 1609. See Kugler's *Schools of Painting in Italy*.

Caracci, or **Carracci**, LUDOVICO: founder of the Bolognese school of painting; son of a butcher of Bologna; b. in 1555. Among his works are a *Transfiguration*, *The Preaching of John the Baptist*, and some *Madonnas*, all to be seen in Bologna. He was the founder of a school of painting known as Eclectic, which became famous for its adherence to nature and freedom from traditional methods; most famous as a teacher. He had several eminent pupils, including Domenichino and Guido Reni. D. in 1619.

Caraccioli, kăă-răăt-chiō'lĕe, CARMINE NICOLAS: a Neapolitan nobleman; fifth Prince of Santo Bono; lived in the latter part of the seventeenth century and the first of the eighteenth, and held high offices in Spain, to which Naples was then attached. From Oct. 5, 1716, to Jan. 26, 1720, he was Viceroy of Peru. H. H. S.

Caraccioli, FRANCESCO, Prince: admiral; b. in Naples in 1752. He entered the service of the Parthenopian republic formed at Naples in 1798, and obtained the command of a small fleet. He repulsed the Anglo-Sicilian fleet in 1799. After Naples had surrendered to the royalists, he was arrested and hung by the order of Lord Nelson June 29, 1799. See J. C. Jeaffreson's *Lady Hamilton and Lord Nelson* (1888).

Car'acole [Fr., deriv. of *caracol*, snail]: in horsemanship or the *manège*, a semi-round or half-turn. When cavalry advance to charge in battle they sometimes perform caracoles in order to perplex the enemy, and excite a doubt whether they will attack the flank or the front.

Carac'tacus, or **Cara'doc**: King of the Silures, a tribe of ancient Britons who lived in Wales. He resisted the Roman invading armies for nine years, but was at length defeated by Ostorius on the border of South Wales; fled to Cartismandua, Queen of the Brigantes, who betrayed him; was carried a captive to Rome in 51 A. D., where, according to tradition, he died in 54. His deportment in the presence of the Emperor Claudius was admired by the Romans, who treated him with clemency.

Carafa de Colobrano, kăă-raa'fa-dā-kō-lō-braa'nō, MICHELE: musician and composer; b. in Naples, Nov. 28, 1785. He became a resident of Paris about 1821. Among his works are operas entitled *Il Sonnambulo* and *Massaniello*. D. July 26, 1872.

Caraffa, GIOVANNI PIETRO: pope. See PAUL IV.

Caraites: See KARAITES.

Car'alis, or **Calaris**: the capital or chief town of ancient Sardinia; is said to have been founded by the Carthaginians

before the second Punic war. It had a good port, and was for many centuries an important place. The site of it is now occupied by Cagliari.

Carambo'la: an East India fruit produced by the *Averrhoa carambola*; a small evergreen tree of the family *Geraniaceæ*. The fruit is about as large as a hen's egg, and has five longitudinal ribs, with a thin, smooth, yellow rind. The pulp has an agreeable flavor (sweet or acid), and is used in making sherbets, tarts, etc. It is one of the most generally cultivated fruits in India, and is sometimes called Coromandel gooseberry. The tree has irritable or sensitive leaves, and exhibits in a remarkable degree the phenomenon called sleep of plants. The acid fruit called *bilimbi* grows on another species of *Averrhoa*.

Car'amel [viâ Fr. from Span. *caramelo*; etym. uncertain]: the dark-brown substance produced by burning sugar or exposing it to a great heat. It is also formed in the process of roasting coffee and malt. It is used to color wine and to adulterate coffee. Caramel is also a sort of confectionery.

Caramurú, or **Alvares Coelho**, Diogo: best known by the first of these, which was his Indian name; a Portuguese; in 1510 was shipwrecked on the coast of Brazil, near Bahia. His companions were killed, and, it is said, eaten by the Tupinambá Indians. There is a legend that Alvares awed them by killing a bird with a gun which he had saved; it is certain that he gained their respect and friendship, married the daughter of a chief, and lived among these savages as one of them for many years. When Bahia was settled by the Portuguese, Caramurú was the means of establishing friendly relations between them and the Indians, and he was greatly respected by both. D. near Bahia, Oct. 5, 1557. H. H. Smith.

Cara'pa: a genus of plants of the family *Meliaceæ*; natives of warm climates. *Carapa guianensis* is a large tree called anderaba, which grows in Guiana, and has large pinnate leaves. Its bark is reputed a valuable febrifuge, and is used in tanning. Masts of ships are made of the trunks. Lamp oil is obtained from the seeds of this tree, and from those of the *Carapa guineensis*, which is a native of Guinea. Its oil is used to protect the bodies of the natives from the bites of insects.

Car'apace [viâ Fr. from Span. *carapacho*; etym. uncertain]: the upper shell or dorsal shield of chelonian reptiles (turtles and tortoises) and of the *Crustacea Malacostraca* (crabs and lobsters). In the *Chelonia* it is chiefly an expansion of the ribs covered by a thick layer of horny substance. The latter is most peculiar in the hawk's-bill turtle, furnishing the tortoise-shell of commerce.

Caraquette, Lower: a port of entry in Gloucester co., New Brunswick; has a good harbor and extensive fisheries (see map of Quebec, ref. 3–I).—The settlement of Upper Caraquette is in the same parish. Pop. 1,000.

Carasco'sa, Michele: b. in Sicily; an officer successively in the armies of King Ferdinand, the Neapolitan republic, King Joseph, and Joachim Murat; signed the convention of Casalanza; was made Minister of War; placed himself at the head of the revolution; was defeated; fled to London, and fell there in a duel. His *Mémoires sur la Révolution de Naples en 1821* appeared in London in 1823.

Carat [Fr. *carat* from Ital. *carato* < Lat. *ceration* = Gr. κεράτιον, little horn (κέρας), a measure of weight. The Span. and Portug. forms *quilate*, *quirate*, come from the Gr. viâ the Arab. *qīrā't*]: a unit of weight used by jewelers in weighing gold and precious stones. For diamonds a carat is $3\frac{1}{6}$ troy grains, a "carat grain" being one-fourth of this. In assaying gold the term is equivalent to "$\frac{1}{24}$ part," and is used to designate the proportion of pure gold in an alloy with another metal or metals. That which contains $\frac{22}{24}$ of gold is said to be "22 carats fine." Eighteen-carat gold contains 18 parts of pure gold and 6 parts of alloy, while 14-carat gold contains $\frac{14}{24}$ of pure gold and $\frac{10}{24}$ of alloy. There is here no absolute designation of weight.

Carau'sius: Emperor of Britain 286–294 A. D.; a native of what is now the Netherlands; invited by the Britons to become their ruler, where he successfully resisted the Romans. He maintained himself for seven years as sovereign of Britain and of a maritime confederacy at the mouth of the Rhine, waging wars against the Romans on one side and the Scots and Picts on the other, and executed many important public works, traces of which still exist. He was assassinated at York by his minister Allectus in 294 A. D.

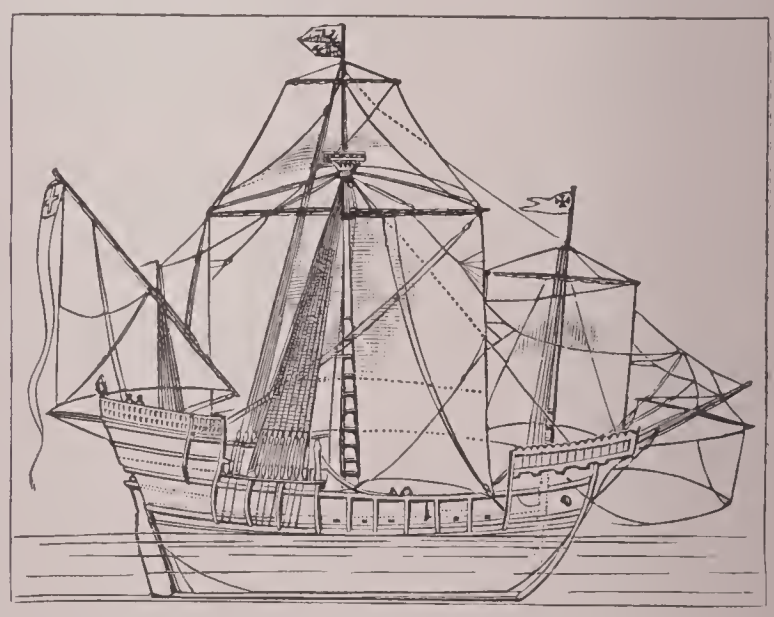
Caravaca, kă-ră-vaa'kă: a town of Spain; province of Murcia; on the slope of a hill 40 miles N. W. of Murcia (see map of Spain, ref. 18–H). It has an old castle, a college, and a fine church. Excellent wine is produced in the neighborhood. Pop. 15,017.

Caravaggio, kă-ră-vaad'jiō, Michael Angelo, da: an Italian painter; b. at Caravaggio in 1569. His proper name was Michael Angelo Amerighi (or Morigi). He imitated no model except nature, and formed an original style; lived a turbulent life; painted scenes from the lanes and alleys of a wild and gloomy nature; was effective and excelled in chiaro-oscuro and coloring. Among his masterpieces are a *Supper at Emmaus*, in the National Gallery, London, *The Fraudulent Gamblers*, in the Sciarra Gallery, Rome, and a *Burial of Christ*. D. near Rome of wounds and fever in 1609.

Caravan [from Pers. *kārwān*]: a company of merchants or pilgrims who associate together in order to traverse with greater security the deserts of Africa and Asia. The commercial intercourse of those regions has been from the remotest ages carried on chiefly by caravans of camels. In Mohammedan countries large caravans of pilgrims are annually assembled to perform the journey to Mecca. The most important regular caravans are those which annually travel to Mecca from the three following points—Damascus, Cairo, and Babylon.

Caravan'serai', or **Caravan'sary** [from Pers. *kārwān*, caravan + *sarāī*, inn]: also called **Khan**: an Oriental public-house or unfurnished inn for the shelter and lodging of travelers in Asia and Africa. The travelers in those regions usually carry their own food with them. Each of these inns is commonly a square building of four wings built round a courtyard, in which the beasts of burden are confined. There is always a well or spring of water in it. The wings are divided into small lodging-rooms, in which the traveler finds no bed or furniture but that which he carries with him. In many caravanserais the hospitality is gratuitous, their erection being a work of pious charity. It was in the stable of one of them (called *inns* in the Bible) that our Saviour was born.

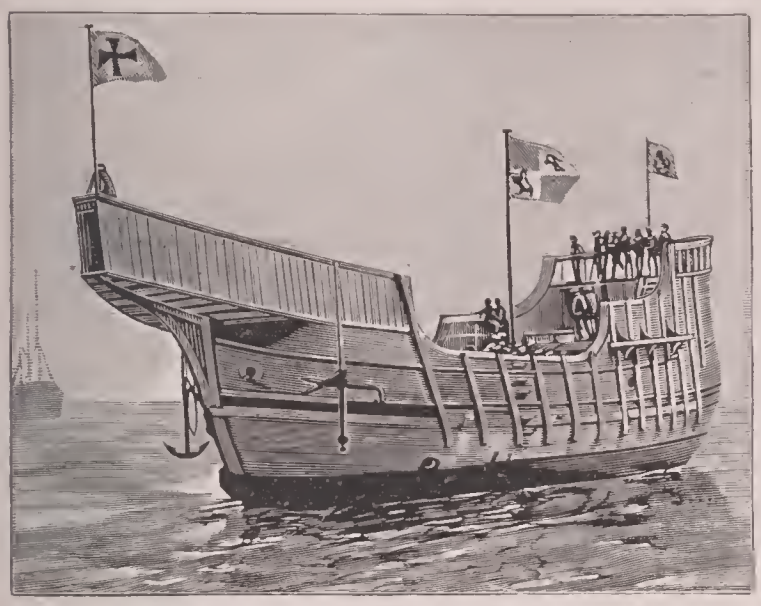
Caravel, or **Carvel** [Fr. *caravelle*; Span. *caravela*, or *carabela*, a caravel; Portug. *caravela*, deriv. of *caraba*: Mediæv. Lat. *carabus*, a kind of boat]: a vessel of from 100 to 150 tons, used by the Portuguese; a vessel of from 25 to 30 tons, used in Normandy and Picardy in the herring-fisheries. The mariners of Tunis and Algiers apply the same name to a frigate, and a large Turkish ship of war is also called a caravel (*garavela*). In the fifteenth and sixteenth centuries



The caravel Santa Maria.

a caravel was a galley-rigged bark, employed by the Spaniards and Portuguese for purposes of commerce and exploration, its lightness enabling it to run close to shore and to enter shallow harbors. The Portuguese made use of it in war, as well, on account of its swiftness and the ease with which it could be managed. The chief features of the caravel of that day, which was not unlike a Japanese trading-junk of the present time, were a single deck, a narrow and

very high stern, a broad bow, a cabin at stern and bow, three masts, lateen rigged, and a bowsprit. The vessels employed by Columbus in his different voyages were caravels, although one of the three, with which he made his first trip across the Atlantic, the Santa Maria, was, according to the nomenclature of that time, a carrack, being much larger than the average caravel. Late in the sixteenth century, however, it was customary to apply the term caravel to ships of large size. Reproductions of the vessels used by Columbus in 1492 were made in Spain in 1892, and played a very conspicuous part in the ceremonies attending the celebration of the discovery of America, both in the Old World and the New, and were an attractive feature of the World's Co-



The caravel Santa Maria (unrigged).

lumbian Exposition in 1893. The Santa Maria was 75 feet from stem to stern, was about 14 feet amidships, and drew 4 ft. 10 in. of water. She was 26 ft. 10 in. high at the stern, and 16 feet high at the bow; her breadth of beam was 25 feet, and her tonnage was 125·57. Her mizzenmast had a decided rake aft, her foremast a corresponding rake forward. Upon all three masts sails were bent to crossyards. Her mizzen rig resembled a lateen sail, and she carried a small triangular sail under her bowsprit. She had a double forecastle deck and a double deck aft. The Pinta, which closely resembled the flagship, was 52 feet long on her keel, 65 feet on her main deck, and had 23 feet breadth of beam; displacement, about 100 tons. The Niña was 46 feet long on her keel, 50 feet long on her main deck; her breadth of beam was 18 feet; all her sails were lateen.

Caraway [from Arab. *al-karawiyā*]: a plant (*Carum carui*) of the order *Umbelliferæ*; grows wild in Southern Europe and in some parts of Asia. It is cultivated in Europe and America for its aromatic seeds (carpels), which are used in medicine as a carminative and tonic. They are also used as a condiment by confectioners, pastry-cooks, and perfumers. Their aromatic principles depend on a volatile oil called oil of caraway, which is obtained by distilling the crushed seeds with water.

Carbajál, or **Carvajál**, Francisco, de: a Spanish soldier; b. of obscure parents at Aravalo, 1464. He served for forty years as a common soldier and subaltern in the Italian wars. At the sack of Rome (1527) he obtained some papers of value, and with the proceeds of their sale went to Mexico. Sent with others to aid Pizarro in Peru (1537), he speedily became known as one of the most skillful leaders there, and also the most cruel. For his services against Amalgro he received rich grants near Cuzco. As field-marshal under Vaca de Castro, he directed the battle of Chupas, in which the younger Almagro was overthrown (Sept. 16, 1542). Joining the revolt of Gonzalo Pizarro, he reduced Lima to submission (1544), and aided in the pursuit of the viceroy Vela to Quito. Pizarro then sent him against Centeno, who had declared for the viceroy in the south. He chased that leader for 200 leagues through the Collao, utterly scattered his army, and drove him to concealment (1546). Carbajál, though over eighty years old, showed such terrible energy and such remorseless cruelty in this pursuit that he nearly caused a revolt of his own soldiers. In the campaign of the succeeding year Carbajál's musketeers decided the second defeat of Centeno at Huarina (Oct. 26, 1547), and, as usual, he hung all the fugitives he could find, enlivening the proceedings with ghastly jokes. Faithful to Pizarro until the last, he was captured while trying to escape from the disastrous field of Caxiguana (Apr. 8, 1548), and was executed with his leader next day. He died with a joke on his lips.

Herbert H. Smith.

Carbine, or **Carabine**: See Small-arms.

Car'bo, Cneius Papirius: a Roman general who was elected consul in 86 B. C.; was a partisan of Marius in the civil war that ensued; commanded in a battle against Sulla at Clusium; soon after that event was defeated by Metellus at Faventia. Having fled to Africa, he was taken prisoner and put to death in 82 B. C.

Carbohy'drates: a large class of compounds consisting of carbon combined with hydrogen and oxygen, which elements are present in the same proportions as in water. They are classified under three heads:

1. *The Glucose Group*, which includes glucose, or grape-sugar, levulose, or fruit-sugar, and galactose. These substances have the composition $C_6H_{12}O_6$.

2. *The Cane-sugar Group*, including cane-sugar, sugar of milk, or lactose, and maltose. These sugars have the composition $C_{12}H_{22}O_{11}$.

3. *The Cellulose Group*, the principal members of which are cellulose and starch. The composition of these compounds is represented by the formula $C_6H_{10}O_5$.

The carbohydrates are among the most widely distributed and important compounds in the vegetable kingdom. Tollens has proposed to apply the name carbohydrate to all substances that show the following reactions: 1. Reduction of alkaline metallic solutions; 2. Rotation of polarized light; 3. Subject to alcoholic fermentation by yeast; 4. Formation of levulinic acid; 5. Formation of characteristic compounds with phenylhydrazine; 6. Certain color reactions; 7. Solubility, either before or after hydrolysis; 8. Decomposition by heat.

Recently some substances have been prepared that are plainly of the same kind as the natural carbohydrates, and these do not belong to any one of the three groups above given, and do not show all the reactions named; and it has been proposed to extend the term carbohydrate to include these new substances. Whether they be called carbohydrates or not, it is now known that they are related to the members of the glucose group in a very simple way. They have the general formula $C_nH_{2n}O_n$ with the common properties: 1. Sweet to the taste; 2. Optically active; 3. Reducing alkaline metallic solutions; 4. Yielding with phenylhydrazine characteristic crystalline compounds. Those containing three, or multiples of three, carbon atoms undergo alcoholic fermentation with yeast. The principal members are:

Triose, $C_3H_6O_3$ (glycerose); tetrose, $C_4H_8O_4$ (erythrose); pentose, $C_5H_{10}O_5$ (arabinose, xylose); hexose, $C_6H_{12}O_6$ (dextrose, levulose, galactose, mannose); heptose, $C_7H_{14}O_7$; octose, $C_8H_{16}O_8$; nonose, $C_9H_{18}O_9$.

Ira Remsen.

Carbolic Acid, called also **Phenic Acid**, **Carbol**, and **Phenol**: This derivative of coal-tar (C_6H_5OH.), obtained by distillation, is extensively employed as a disinfectant and germicide, for which purposes it is one of the most efficient agents used. It does not, however, act at all through the atmosphere, and it is essential that it be brought in direct contact with the body to be disinfected. It is also necessary that the solution of it be not less than 1 per cent., and for this strength of solution to act the contact must be maintained for many hours; ordinarily the solution of 5 per cent. should be employed, though the strength of the solution may be weaker than this when a prolonged immersion of the object is obtainable.

Carbolic acid acts upon the human system as an exceedingly powerful and quick poison. When in sufficient concentration it kills all tissue, so that it may paralyze the respiratory centers and the heart at once. Death has been produced by it in less than three minutes. The symptoms are violent burning pain in the œsophagus and stomach, with vomiting, stupor, distress of breathing, widespread paralysis, and finally complete unconsciousness and collapse. Sometimes there are convulsions. In the rapid cases unconsciousness and collapse occur immediately. In slow cases of poisoning, especially after the external use of carbolic acid, the urine becomes dark and may have the odor of the acid. Diluted sulphuric acid and soluble innocuous sulphates, such as the sulphate of sodium, are very efficient antidotes to carbolic acid. They have the power not only of neutralizing the acid in the gastro-intestinal tract before absorption, but of follow-

ing the poison into the blood and general tissues of the body, and there converting it into a harmless sulpho-carbolic acid. They therefore should be administered freely at any stage of the poisoning at which the patient is first seen. Half an ounce of carbolic acid taken by the mouth has caused death, while the free external use of the agent in surgery has sacrificed many victims. In internal medicine carbolic acid is of very little use, save only for its benumbing influence upon the gastro-intestinal nerves, and to check fermentation in the gastro-intestinal tract.

H. C. Wood.

Carbon [from Lat. *car'bo, -o'nis*, coal]: one of the elementary forms of matter. Its symbol is C, and its atomic weight 12. It is the principal constituent of all plants and animals, in which it occurs in a great variety of forms of combination. Among the most abundant natural substances of which it forms a part are cellulose, starch, sugar, the fats, albumin, fibrin, etc. It is also found in immense quantities in the solid portions of the earth in the forms of carbonates, of which limestone, chalk, and marble are the most common varieties. In the atmosphere of the earth it is present principally as carbon dioxide, which is commonly called carbonic acid; and this gas is also found dissolved in all natural waters. The different varieties of coal consist largely of carbon, the proportion of this element being largest in the hard coals. Further, carbon is the principal constituent of petroleum.

Carbon occurs in nature crystallized in two forms, diamond and graphite or plumbago. There are therefore three forms of the element, (1) diamond, (2) graphite, and (3) amorphous carbon, or charcoal. Of these, diamond is the purest. All three forms, though they differ so markedly from one another in some respects, have certain properties in common. They are all insoluble in all the ordinary solvents; they are all infusible; and all are converted into carbon dioxide, CO_2, when heated to a high temperature in air or oxygen. Lampblack, coke, and charcoal are impure forms of carbon. Lampblack is deposited from flames of burning oil; coke is formed when coal is heated so that it is protected from the air, as in the manufacture of gas; and charcoal is made by heating wood in kilns by which the action of the air is prevented, except so far as may be necessary to keep up slow burning.

Chemically carbon most resembles silicon, which is one of the most important constituents of the inorganic or inanimate portion of the earth. Ira Remsen.

Carbon: town; Carbon co., Wy. (for location of county, see map of Wyoming, ref. 11–J); on Un. Pac. R. R.; 140 miles N. W. of Cheyenne. The chief industry is agriculture. Pop. (1880) 365; (1890) 1,140; (1900) 634.

Carbona'ri [Ital., charcoal-burners]: a secret political society; founded during the French rule in Naples in the beginning of the nineteenth century. After the restoration of the Bourbons in Naples the society rapidly increased. In 1820 they organized branches in France, and after the defeat of the revolutionary party in Naples and Piedmont, Paris became their headquarters. After the revolution of 1830 the society disappeared, although as late as 1841 a society of Carbonari was found to exist in Southern France. In the revolution of 1848 they took no part.

Carbonated (or **Acidulous**) **Waters**: those waters which contain a large portion of carbonic acid gas. The term is applied to mineral springs, as those of Seltzer, Vichy, Pyrmont, Salzbrunn, Reinerz, Saratoga, etc. Such waters sparkle much when poured from one vessel to another. They are refreshing and exhilarating, and are useful in some disordered states of the stomach. See Mineral Water.

Carbonates: salts of Carbonic Acid (*q. v.*).

Carbon Bisulphide, or **Disulphide**: a heavy, clear liquid compound of carbon and sulphur; very volatile and very inflammable; obtained by passing the vapor of sulphur over red-hot charcoal. Its composition is expressed by the formula CS_2. While swallowed or inhaled it produces serious symptoms of poisoning, which may end fatally. It has great solvent power, and is largely used in chemistry and the arts as a solvent of caoutchouc and other organic matters, particularly for extracting oils from seeds and other substances. It has recently been used in boilers as a substitute for water in working engines. In contact with alcohol and potassic hydrate it produces potassic xanthate, which has been extensively used to destroy phylloxera. This compound is a sulphur acid, and when combined with sulphur bases it produces compounds of the class known as sulphocarbonates.

Car'bondale: city (founded in 1852); Jackson co., Ill. (for location of county, see map of Illinois, ref. 10–E); on Ill. Cent., Cairo Short Line and Grand Tower and Carb. R. Rs.; 57 miles N. of Cairo, 91 miles from St. Louis. Here are the Southern Illinois Normal University, 5 public schools, and 8 churches (4 colored). The principal industries are farming, fruit-growing, stock-raising, lumbering, and coal-mining. Pop. (1880) 2,213; (1890) 2,382; (1900) 3,318.

Editor of "Republican Free Press."

Carbondale: a city and railroad junction, Osage co., Kan. (for location of county, see map of Kansas, ref. 6–I); 67 miles S. W. from Atchison. It has extensive mines of coal. Pop. (1880) 710; (1890) 847; (1900) 625.

Carbondale: a city and railroad center of Lackawanna co., Pa. (for location of county, see map of Pennsylvania, ref. 3–I); settled in 1824, on the Lackawanna river. Principal industry, mining and preparing anthracite coal. The city has machine and car shops, foundries, grist-mills, wood-working factories, an electric street-railway system connecting it with the suburban villages, excellent waterworks, gas-works, electric lights, etc. It has fine mountain scenery and is a summer resort. Pop. (1880) 7,714; (1890) 10,833; (1900) 13,536. Editor of "Leader."

Carbone'ar: a town of Newfoundland; a port of entry on Conception Bay; 4 miles N. of Harbor Grace. Pop. 3,756.

Carbon'ic Acid: a name commonly given to the oxide of carbon of the formula CO_2, which is called *carbon dioxide* by chemists. Its occurrence in nature is referred to in the article on Carbon (*q. v.*). It is constantly formed by a number of natural processes, as combustion, respiration, and fermentation. All substances used for fuel contain carbon as one of the chief constituents, and when they are burned the carbon combines with the oxygen of the air to form carbon dioxide. In the process of respiration waste-products are exposed in the lungs to the action of the oxygen of the air, and they are burnt up very much as if they were put into a stove, the carbon contained in these waste-products being converted into carbon dioxide and given off from the lungs. There are many kinds of fermentation, this name being used to designate changes brought about by the action of minute organisms. One of the best-known kinds of fermentation is that by which sugar is changed to alcohol and carbon dioxide. This fermentation takes place naturally, and gives rise to the formation of large quantities of carbon dioxide. In 10,000 parts of the earth's atmosphere there are about 3 parts of carbon dioxide. Notwithstanding the fact that such large quantities of the gas are constantly being introduced into the air, the relative quantity remains practically constant. This is due to the fact that all plants make use of carbon dioxide as food, decomposing it, and building up from it the complicated compounds which form their tissues.

Carbon dioxide is a colorless gas, about half again as heavy as ordinary air. It has a slight taste and slight odor. In it the process of burning can not take place, nor can the process of breathing.

Carbon dioxide is easily made by bringing together limestone, marble, or any other carbonate, and hydrochloric or sulphuric acid. In general terms any carbonate gives off carbon dioxide when brought together with an acid.

At a low temperature and under high pressure the gas is liquefied, and when the vessel containing the liquid is opened at the ordinary temperature a part of that which escapes becomes solid, owing to the great absorption of heat caused by the conversion of a part of the liquid into gas.

Carbon dioxide dissolves in water at the ordinary temperature and under the ordinary atmospheric pressure to the extent of one volume of gas to one volume of water. Under higher pressure the amount which can be dissolved is much greater, and when the pressure is removed a large part of the gas escapes. The effervescent waters which occur in nature, and which are manufactured, owe their effervescence to the presence of carbon dioxide. This is true also of beers, champagne, and other similar beverages.

Liquid carbon dioxide is now obtainable in the market, and is used as a fire-extinguisher and for the purpose of giving life to beer.

It is frequently stated that the bad effects caused by breathing the air of badly ventilated rooms are due to the

presence of carbon dioxide. It has, however, been shown that air containing pure carbon dioxide to the extent of 5 per cent. can be breathed with impunity. The gases given off from the lungs contain volatile organic substances which are undergoing decomposition, and these are poisonous. If taken back into the lungs, bad effects follow.

All life on the earth is dependent upon the presence of carbon dioxide in the air; for all animals, either directly or indirectly, depend upon plants for food, and all plants in turn depend upon carbon dioxide. See CHOKE DAMP.

IRA REMSEN.

Carbonic Oxide, more commonly called **Carbon Monoxide**: a compound (CO) formed when carbon dioxide comes in contact with highly heated coal. It is therefore formed in the interior of every coal fire. It burns with a blue flame, and it is this flame that is always seen at the surface of a hard coal fire, as the carbon monoxide formed in the interior burns to carbon dioxide when it reaches the surface of the coal and finds air with which it can combine. It is a colorless gas of specific gravity ·967. It is extremely poisonous. It is contained in large quantity in the so-called water-gas, now so extensively used for illumination. It is therefore very important that the gas should not be allowed to escape into rooms occupied by human beings. As is well known, deaths have been caused not infrequently by the inhalation of illuminating gas. It should be said in this connection that ordinary coal gas is also poisonous. As has been said, carbon monoxide is produced in anthracite stoves and furnaces, and it is sometimes the cause of death in sleeping-rooms when the fire is checked by closing the damper between the fire and the chimney. This gas does not perform any active part in natural phenomena, but in the reduction of ores, as in the blast furnace, it is of the greatest importance. IRA REMSEN.

Carbonif'erous Period: a division of geologic time, preceded by the Devonian period, followed by the Jura-Trias. The name (literally "coal-bearing," from the Latin *carbo*, coal, and *fero*, bear) originated in Great Britain, where the coal-bearing strata belong to this period, but may also be applied in its etymologic sense in the eastern part of North America. In western North America and in all other parts of the earth rocks of carboniferous age contain little or no coal, and such rocks as do afford coal belong to later periods. During the earlier half of the period the greater part of the U. S. seems to have been covered by the ocean, but the extent of submersion afterward diminished, and at the close of the period all E. of the Great Plains was probably dry land.

The coal-bearing series of strata known as the coal-measures constitute the upper portion of the rock system in Nova Scotia, in Southern Michigan, and in three belts extending from Pennsylvania southwestward to Alabama, from Western Kentucky northwestward to Central Illinois, and from Eastern Nebraska southwestward to Texas. They consist of alternating shales and sandstones, for the most part formed in fresh water, with beds of coal, occasional strata of limestone, and bands of clay iron ore. Associated with the coal are fossil leaves, branches, trunks, roots, and even fruits, in great abundance, affording the most complete picture we have of a palæozoic forest. (See PLANTS, FOSSIL.) In Pennsylvania, and generally at the northeast, the series of rocks beneath the coal-measures are constituted of shales, sandstones, and conglomerates. Traced westward, they are found to undergo a gradual change in composition, and in the Mississippi basin consist chiefly of limestone. The underlying series have a larger area than the coal-measures, and serve to connect in a single great field the three belts mentioned above. In the far West limestone is the most abundant rock of the system, but there are also sandstones and shales, especially in the upper part. In the lower carboniferous limestones of Missouri and Kansas are important mines of zinc and lead, and many of the silver-lead ores of Montana, Idaho, Colorado, Utah, and Nevada are associated with limestones of this age. See COAL, COAL MEASURES, GEOLOGY, and PALEONTOLOGY. G. K. GILBERT.

Carbons: See ELECTRIC LIGHT.

Carborundum: See SILICIDE OF CARBON.

Carboy: a large globular bottle of green glass protected by basket-work or inclosed in a wooden box. Carboys are used to contain acids and other corrosive liquids. A carboy of sulphuric acid usually contains about 160 lb. of that acid.

Carbuncle [viâ O. Fr., from Lat. *carbun'culus*, a small coal, carbuncle stone, a tumor, dimin. of *car'bo*, coal]: a name applied by jewelers and lapidaries to certain kinds of fine red garnet, usually the *pyrope* and *almandine* varieties, when cut *en cabochon*, i. e. with a rounded convex surface. (See GARNET.) The carbuncle of the ancients seems to have been any transparent deep-red gem, whether garnet, ruby, or red spinel. Nearly all come from Siam, Pegu, India. They are also found in North Carolina, but generally are too defective for gems. Revised by G. F. KUNZ.

Carbuncle (for etymol., see above): the *anthrax* of surgical writers; a violent and painful inflammation, larger than a boil, on any part of the skin, most frequently on the back. The part swells and hardens, and, as the disease advances, assumes a livid redness. The cuticle often rises in blisters, and a number of small openings may occur, through which matter escapes. The origin of carbuncle seems to be constitutional, and it is usually attended by great suffering and considerable prostration. It is sometimes fatal, especially to old people. In its treatment, besides supporting the patient's strength and softening the skin by warm poultices, it is usual to divide the skin early and freely with a knife, or to destroy its surface with caustic.

Carcajente, kär-kä-*kh*en-tā': a town of Spain; province of Valencia; 22 miles by rail S. S. W. of Valencia (see map of Spain, ref. 17–I). It is on a fertile plain near the river Juncar, and is well built. Here are manufactures of linen and woolen fabrics. Pop. 12,102.

Carcassonne, kär-kas-sŭn' (anc. *Carcaso*): a city in the S. of France; capital of the department of Aude; on the river Aude and the Canal du Midi; 56 miles by rail E. S. E. of Toulouse (see map of France, ref. 9–F). The river is here crossed by a bridge of ten arches, and separates the old from the new town. The old town, which stands on high ground, is inclosed by walls of great solidity, has an ancient castle, and retains in a remarkable degree the aspect of a fortress of the Middle Ages. Carcassonne is the seat of a bishop, and has a cathedral, a town-hall, a theater, a public library with about 22,000 volumes, and a college. Here are extensive manufactures of fine woolen cloth, which have long been celebrated. This city suffered much in the crusades against the Albigenses. Pop. (1881) 27,512; (1886) 29,330; (1896) 29,298.

Carcel, or **Carcel-lamp**: a lamp burning vegetable oil (colza oil), the flame from which furnishes the standard of illumination employed in France. Uniformity of combustion is secured by means of a small pump driven by clockwork, which feeds the wick with oil. The standard carcel-lamp for photometric purposes consumes 42 grammes of oil in an hour, and should furnish a flame 40 mm. in height. See CANDLE; also PHOTOMETRY.

Carchi: a northern province of Ecuador; bounded N. and E. by Colombia, S. by Imbabura, and W. by Esmeraldas; area, 1,495 sq. miles; pop. (1890) 36,000; capital, Tulcan. It is mountainous, and is one of the poorest provinces in the republic; agriculture and grazing are the only industries. H. H. S.

Carcinoma: See CANCER.

Car'damom [from Gr. *καρδάμωμον*, name of the spice; *κάρδαμον*, a kind of cress + *ἄμωμον*, name of an Indian spice-plant]: the capsule and seed of several species of plants of the genera *Amomum* and *Elettaria* of the family *Scitamineæ*. The capsules are three-celled, and contain numerous seeds, which are aromatic and pungent, with a peculiar and agreeable taste. They are used as a condiment in Asia and Germany. Having mild cordial and stimulant properties, they are used in medicine and in combination with cathartics. The officinal cardamom of the U. S. and British Pharmacopœias is the seed of the *Elettaria cardamomum*, a native of India. The cardamoms of commerce are produced in India, Ceylon, Madagascar, and the Malayan Archipelago.

Car'dan (Ital. *Cardano*), JEROME: philosopher, author, and physician; b. in Pavia, Italy, Sept. 24, 1501; graduated as M. D at Padua in 1525, and became Professor of Mathematics at Milan. He also practiced medicine and acquired a wide reputation as a physician. In 1552 he visited Scotland and cured the primate of that country of asthma. He afterward resided successively at Pavia, Bologna, and Rome. He was an astrologer, and professed to be an adept in magical arts. In 1545 he published in his *Ars Magna* a formula for the solution of cubic equations, which is called "Cardan's Formula." He wrote numerous works on physics, astrology, medicine, astronomy, etc. Among them are *De*

Rerum Subtilitate (On the Subtilty of Things) and *De Rerum Varietate* (On the Variety of Things). D. in Rome, Sept. 2, 1576. See his autobiography, entitled *De Vita Propria* (1643); H. Morley's *Life of Jerome Cardan* (1854).

Cardboard is made by pasting and pressing together a number of layers of paper, making either three, four, six, or eight sheet boards. Bristol board, used by artists, is entirely of white paper; common cardboard is white on the outside only. Mill-board, employed in bookbinding, is composed of coarse brown paper, glued and pressed between iron rollers. The enameling of cardboard is effected by brushing over it a mixture of white lead (China or Kremnitz white) with size. After drying, the surface is lightly rubbed with flannel which has been dipped in powdered talc; it is then polished with a hard, fine brush.

Car'denas: a seaport-town on the north coast of Cuba. See the Appendix.

Cardenas, Fr. Bernardino: Peruvian ecclesiastic; b. in Chuquisaca, Charcas, about 1595. He entered the Franciscan order, and was a missionary to the Indians, imperiling his life among the wild Chunchos, and doing much to preserve peace with the whites. Made Bishop of Paraguay in 1640, he quarreled with the Jesuits, and was twice expelled. On the death of the governor Osorio, he was elected to fill his place (Feb., 1649), and at once drove the Jesuits from Asuncion. Deposed by the audience of Charcas, he refused to submit, and defeated a force sent against him, but was imprisoned and excommunicated in Oct., 1649. He was restored in 1662, and in 1666 made Bishop of Santa Cruz de la Sierra, where he died soon after. He wrote *Manuel y relacion de las Cosas del Reyno del Peru* (Madrid, 1634), a defense of his course. Herbert H. Smith.

Car'diac [from Gr. *καρδιακός*, pertaining to the heart, deriv. of *καρδία*, heart: Lat. *cor*, *cordis*: Eng. *heart* (approx.)]: belonging to the heart, or connected with or acting upon the heart. The "cardiac orifice" is the superior opening of the stomach.

Cardial'gia, or **Car'dialgy** [Gr. *καρδιαλγία* (Galen), heartburn; *καρδία*, heart + *ἄλγος*, pain]: literally, pain in the heart. The term is commonly applied, however, to the uneasiness (heartburn) connected with indigestion, the seat of which is really in the stomach, and which is called gastralgia. This painful affection may be of nervous origin—a form of neuralgia—or a clew to various organic diseases of the stomach. The pain comes on at various times, but usually when the stomach is empty, and may attain great severity.

Car'diff: a seaport-town of South Wales; capital of Glamorganshire; on the river Taff; 171 miles by rail W. of London (see map of England, ref. 12–F). It contains a town-hall, a fine old castle owned by the Marquis of Bute, a theater, and about thirty churches and chapels. Railways extend from this town to the mining districts of South Wales, the products of which are exported from Cardiff. It has a good harbor, improved by the construction of magnificent basins and docks. Coal and iron are the chief articles of export, and its coal exports exceed those of any port in the world. The Marquis of Bute owns enormous docks here. The opening of the canal from Merthyr Tydvil to the sea in 1796 has contributed much to the prosperity of the town. The cathedral city of Llandaff is a suburb, which is the see of an Anglican bishopric. The population has increased rapidly since 1870. Cardiff Castle, built in the eleventh century, is partly in ruins. Robert, Duke of Normandy, was confined in it about twenty-seven years by Henry I. Cromwell obtained possession of it in 1648 by stratagem, after he had bombarded it for three days. Pop. (1881) 85,378; (1891) 128,915; (1901) 163,844.

Car'digan: a seaport of South Wales; capital of Cardiganshire; on the river Teify; 240 miles by rail W. by N. from London (see map of England, ref. 11–C). It has an old and stately church, and the ruins of a castle which is supposed to have been founded in 1160. Romantic scenery is in the vicinity. Pop. 3,600.

Cardigan, James Thomas Brudenell, Earl of: an English general; b. Oct. 16, 1797; was obliged to leave the service when a lieutenant-colonel on account of bullying conduct toward a brother officer, but was restored to his rank; became known as a daring dragoon officer, and rose in India to be a major-general. At the battle of Balaklava Lord Cardigan led the famous charge of the "six hundred." D. Mar. 28, 1868.

Car'diganshire: a maritime county of South Wales; bounded N. by Merioneth, N. E. by Montgomery, E. by Radnor and Brecknock, S. by Carmarthen and Pembroke, and W. by Cardigan Bay. Area, 693 sq. miles. The surface is diversified with rugged hills, fertile valleys, and small lakes. The rocks which underlie this county are lower Silurian slates and shales, in which rich veins of copper, lead, and zinc occur. The chief articles of export are cattle, sheep, oats, barley, butter, slates, and pigs. Capital, Cardigan. Pop. (1881) 70,226; (1891) 63,467; (1901) 61,068.

Cardi'idæ: a family of lamellibranchiate bivalve mollusks; includes those species in which the mantle is open anteriorly for the foot, and has two orifices, one for respiration and the other for excretion, as the cockle (*Cardium edule*).

Cardim, P. Fernão: Portuguese Jesuit; b. at Vienna do Altivo, Alemtejo, 1540. He was sent to Brazil in 1599, and traveled over the known portion of the country. In 1601 he went to Rome as procurador of his order, and was there named provincial of Brazil; but on his return he was captured by English corsairs, and only released in 1604 on payment of a ransom. He then went to Brazil, where he was provincial until 1608, and subsequently rector of the Jesuit College at Bahia. He wrote *Narrativa epistolar de uma viagem e missão jesuitica pela Bahia*, etc., first published in 1847, and of great historical interest.

Herbert H. Smith.

Cardinal [subst. use of an adj. from Lat. *cardina'lis*, pertaining to a hinge, principal, deriv. of *car'do*, *car'dinis*, hinge]: the title of an ecclesiastic in the Roman Catholic Church. The cardinals are the highest dignitaries of the Church, except the pope, of whom they are the electors and the counselors. Their distinctive dress is the scarlet birretta, cape, and cassock. The scarlet hat is only symbolical, imposed once by the pope in person, and after death hung up in the titular church or the cathedral of the cardinal. Pope Urban VIII., in 1630, gave them the title of Eminence, which is still used. They are appointed by the pope. Those resident in Rome are said to be *in curia*, and are usually employed in the administration of the great congregations. The remainder are, as a rule, bishops of the more important sees of Christendom or men of mark in letters, Church administration, and the like. At present cardinals are rarely sent on foreign missions. The see of Rome conducts such business through its nuncios and ablegates, or the chief ecclesiastics of the different nations. The body of cardinals is called the Sacred College. The total number of these prelates has been for several centuries limited to seventy, of whom six are bishops of small suburban sees in the vicinity of Rome; fifty, styled cardinal-priests, hold their titles from parishes in Rome (many of them being at the same time bishops of foreign dioceses); and fourteen are cardinal-deacons, holding their titles from ancient diaconal churches of the city. The actual number of cardinals is often less than seventy. When the pope dies a successor is chosen by the cardinals, who are assembled in conclave at Rome, and who usually elect one of their own number to the vacant pontificate. During the election, which in the past was occasionally protracted several weeks or months by their inability to agree, they are confined in a certain building, formerly the Quirinal Palace, and debarred from intercourse with the public; even the door through which they enter the conclave is walled up, and only a small aperture is left, through which food is brought to them. Revised by John J. Keane.

Cardinal-grosbeak (*Cardinalis cardinalis*), called also **Redbird**: one of the finest of American song-birds; a native of the U. S.; remarkable for the beauty of its form and plumage. The bill is thick and broad, but not long. It belongs to the family *Fringillidæ*. The back of the male is a dusky red, and the rest of the plumage is a bright, vivid scarlet. It has on the crown long feathers erected into a conical or pointed crest, which it is said to raise and lower at pleasure. The total length is about 8 inches. It visits the Northern States as a summer bird of passage, and spends the winter in the Southern States, where some of them remain all the year.

Cardinal-flower [so called from its bright-red flowers, in color like a cardinal's hat]: the *Lobelia cardinalis*; a perennial herbaceous plant of the family *Campanulaceæ*; common in most parts of the U. S. in wet places, in the Atlantic region. There is a similar species or a new variety of it in Mexico. The color is a most intense red.

Car'dington: village; Morrow co., O. (for location of county, see map of Ohio, ref. 4–F); on east branch of Olentangy river, and on C. C. C. and St. L. R. R.; 38 miles N. E. of Columbus; in a rich agricultural section; has manufactories of furniture, wheat-cleaning machines, and poultry supplies; four churches, and an excellent union school. Pop. (1880) 1,365; (1890) 1,428; (1900) 1,354.

Cardin'ia: a genus of fossil *Conchiferæ*, of which over eighty-five species, ranging from the Silurian formation to the lower oölite, have been described. The shell is oval or oblong, attenuated posteriorly, has an external ligament, and is marked with lines of growth.

Cardiograph: See Recording Apparatus, Psychological, in the Appendix.

Cardi'tis: See Heart Disease.

Cardoon': a thistle-like plant (*Cynera cardunculus*) native to the south of Europe and the north of Africa. The artichoke is a cultivated derivative of the same species. The cardoon is cultivated (sparingly in the U. S.) for the stalks and midribs of the leaves, which are blanched before being eaten. It is spontaneous on the pampas of South America.

Cardo'zo, Isaac N.: journalist; b. at Savannah, Ga., June 17, 1786; became in 1816 editor, and some years later proprietor, of the *Southern Patriot*, a free-trade journal of his native town. In 1820 he published *Notes on Political Economy*. He established the *Evening News* in 1845. He was active in commercial affairs, and, though opposed to the tariff of 1828, was not of the extreme nullification party. He was drowned in Virginia Aug. 26, 1850.

Cards: See Playing-cards.

Cards [from Fr. *carde* = Ital. *carda*, teasel, deriv. of *cardo*, thistle < Lat. *carduus*]: a device for preparing the fibers of wool, cotton, or other textile material for the spinning process. The operation was formerly performed by hand-cards, but at present machines of surprising ingenuity are employed. The manufacture of cards is itself accomplished by wonderfully perfect mechanism. The subject is more fully discussed under Spinning (*q. v.*). Other forms of cards are employed for the purpose of currying or cleaning the hair of domestic animals. The operation of the common cards has often been compared to the combing and brushing of one's hair; and, indeed, the card combines the properties of the comb and the brush.

Carducci, kaär-doot'cheĕ, Giosué: an Italian poet; b. July 27, 1836; is also a critic and Romance philologist of unusual powers. In 1858, with some young fellow-poets, he founded *Il Poliziano*, a review for the advocacy of a poetry classic in form, though modern in significance. His first poetical success was his *Inno a Satana* (1863), published under the name *Enotrio Romano*. His *Poesie* have been many times republished, with constant additions. His *Odi Barbare*, written in new poetic forms of his own invention, have caused a real literary controversy in Italy. (See Chiarini's *I Critici italiani e la metrica delle Odi Barbare*, Bologna, 1878.) As critic he has published *Studii letterarii* (1874); *Bozzetti critici e discorsi letterarii* (1875). He has edited with commentary the *Poesie Latine di L. Ariosto* (1875) and the *Rime* of Petrarch (1879); also a collection of mediæval popular songs—*Cantilene e Ballate, Strambotti e Madrigali nei secoli XIII. e XIV.* (1871), besides other works too numerous to mention. A. R. Marsh.

Carduus benedictus: See Blessed Thistle.

Card'well, Edward, Lord: statesman; b. in Liverpool, England, July 24, 1813; entered Parliament 1842; joined the party called Peelites, and was president of the Board of Trade from 1852 to 1855. In the latter year he was returned to Parliament for Oxford. He became secretary for Ireland in 1859, and Secretary of State for the colonies in April, 1864. Having resigned with his colleagues in June, 1866, he entered the cabinet of Gladstone as Secretary of State for War in Dec., 1868. He was raised to the peerage in 1874 as Lord Cardwell. As Secretary for War he did much for the reorganization of the British army, abolishing the purchase of commissions by officers, and introducing the short-service system, with the view of forming a reserve. To him is also due the introduction of the localization principle of the military forces and the linking of battalions. D. Feb. 15, 1886.

Care or **Carle Sunday**: See Carling Sunday.

Carew', Thomas: English poet and courtier; b. in 1589. He was patronized by Charles I., in whose court he served as gentleman of the chamber. He wrote sonnets and short lyrical poems which are remarkable for elegance and ease. D. in 1639. See W. C. Hazlitt's edition of his poems (1870). The name Carew is by some English families of the name pronounced like Carey.

Ca'rex [Lat., sedge]: a genus of coarse grass-like plants of the family *Cyperaceæ*. They abound in temperate and cold climates, and are perennial herbs, often growing in dense tufts in swamps and wet places. The genus is characterized by male and female flowers, separated (mostly monœcious), with an ovary inclosed in an inflated sac called a *perigynium*. Stamens three, rarely two. More than 800 species of *Carex* have been described, and 289 species are enumerated by Bailey as natives of North America. The *Carex arenaria* is planted in Holland on the dikes for the purpose of binding the sandy shores with its spreading roots (rhizomes) and resisting the encroachments of the sea. Few of the species are good for pasture, but they tend to convert swamps gradually into fertile soil. In the U. S. they are harvested in large quantities from wet lands, but produce a poor quality of hay. See Sedge Family. C. E. B.

Ca'rey: village; in Crawford township, Wyandot co., O. (for location of county, see map of Ohio, ref. 3–E); on Pitts., Akron and W. and C. C. C. and St. L. and two other railroads; 16 miles from Findlay and 50 miles from Toledo; has six churches, public and church schools. Pop. (1880) 1,148; (1890) 1,605; (1900) 1,816. Editor of "Times."

Carey, Henry: poet and musician; illegitimate son of George Savile, the famous Marquis of Halifax. He composed many songs, operas, farces, and burlesques, but his most noteworthy productions were the popular ballad *Sally in our Alley* (1715) and the mock-tragedy *Chrononhotonthologos*, first performed at the Haymarket Feb. 22, 1734. D. by suicide in 1743. Henry A. Beers.

Carey, Henry Charles: son of Mathew Carey; political economist; b. in Philadelphia, Pa., Dec. 15, 1793. He became in 1821 the head of the firm of Carey & Lea, publishers. He advocated a protective tariff, and wrote besides other works, *The Principles of Political Economy* (3 vols., 1837–40); *The Past, the Present, and the Future* (1848); *The Principles of Social Science* (3 vols., 1858–59); and *The Unity of Law* (1872). He was the founder of a school of political economy, whose principles are anti-socialistic and more deductive than those of Smith, Ricardo, and Mill. His philosophy lies behind the speculations of Bastiat. Carey reversed the Ricardian theory of rent, and advanced new theories of wealth and value. He has been translated into German, and he opened the way to the methods of the new historical school. He was distinguished especially for the zeal with which he urged the principle of protection as opposed to that of free trade after his conversion from his earlier views. D. at Philadelphia, Pa., Oct. 13, 1879.

Carey, Joseph M.: U. S. Senator; b. in Milton, Del., Jan. 19, 1845; attended Fort Edward Collegiate Institute and Union College, New York; studied law at Philadelphia: admitted to the bar in 1867, graduating the same year at the law department of the University of Pennsylvania; is engaged in stock-growing; was appointed U. S. attorney for the Territory of Wyoming on the organization of the Territory in 1869; was an associate justice of the Supreme Court of Wyoming from 1871 until 1876; a member of the U. S. Centennial Commission 1872–76; was three times elected mayor of Cheyenne, serving 1881–85; was elected to the Forty-ninth and two succeeding Congresses as a Republican, and served in the U. S. Senate from 1890 till 1895.

Carey, Mathew: publisher; b. in Dublin, Ireland, Jan. 28, 1760; was the father of Henry Charles. He emigrated to Philadelphia in 1784, and became a bookseller. He published *The American Museum* (1787–93), wrote several political pamphlets and *Essays on Political Economy*, and had much influence in public affairs. D. in Philadelphia, Sept. 16, 1839.

Carey, William, D. D.: b. in Paulerspury, Northamptonshire, England, Aug. 17, 1761; was a shoemaker in early life, then preacher; but becoming impressed with the duty of giving the gospel to the heathen, he went to India in 1794 and founded the Baptist mission at Serampore, 13 miles N. of Calcutta; became (1801) Professor of Sanskrit, Bengalee, and Mahratta at the College of Fort William; published a Sanskrit grammar, a Bengali-English dictionary, and other works, besides assuming the principal labor in the transla-

tion of the Scriptures into several Oriental languages. D. in Serampore, June 9, 1834. He takes rank among the most distinguished of modern missionaries for his fidelity, success, and learning. See his *Life* by E. Carey (London, 1836) and by G. Smith (1885; 2d ed. 1887).

Carhart, Henry Smith: See the Appendix.

Ca'ria (in Gr. Καρία): an ancient province in the extreme southwest part of Asia Minor; bounded N. by Lydia, E. by Phrygia, S. by the Mediterranean, and W. by the Ægean Sea. The surface is mountainous. It was drained by the river Meander. The chief towns were Miletus, Halicarnassus, and Cnidus, which were founded by the Greeks. The natives of Caria were called *Cares*.

Cariam'idæ: a family of South American birds whose chief characters are long tarsus and elevated hallux, short

Cariama cristata.

wings, long and graduated tail, nostrils vertically oval, and forehead with erect crest. It embraces only the one genus, *Cariama*, and its two species, *C. cristata* and *burmeisteri*. They are about the size of the large blue heron, can be easily domesticated, and feed on insects and seeds.

Caribbe'an Sea: a grand inlet of the Atlantic Ocean; between North and South America, and separated from the Pacific by the Isthmus of Darien (or Panama) and by Central America. It separates the West India islands from South America, and communicates with the Gulf of Mexico by a passage about 120 miles wide, which divides Cuba from Yucatan, and is called the Channel of Yucatan. The water accumulated in the Caribbean Sea by an oceanic current flows continually into the Gulf of Mexico, from which it can only escape by the narrow passage between Florida and the Bahamas, thus forming the great Gulf Stream. The depth of this sea is generally more than 500 fathoms.

Car'ibbee Bark, or **Piton Bark**: bark obtained from the *Exostemma caribæum*; a small tree of Mexico, Florida, and the West Indies. It belongs to the cinchona tribe, and, though possessing none of the active principles of cinchona, it resembles it so much as to be sometimes substituted for it. The flower differs from that of the cinchona in having its stamens exserted, instead of their being included in the corolla.

Caribbee Islands: See West Indies.

Caribe: See Caripe.

Car'ibou (*Rangifer tarandus*, var. *Carabou*): the American reindeer; inhabits Maine, New Brunswick, and other cold regions of North America. The caribou is remarkable for the great development of the brow-antlers or branches, which extend in both sexes forward over the forehead. The color of its hair in summer is a rich reddish brown. The average weight of this animal is about 250 or 300 lb. Its flesh is much esteemed as food, and its skin is of value. The "barren ground caribou" (var. *Grœnlandicus*), also regarded as a variety of the European reindeer, is found farther N.

Caribou: village in Caribou township; Aroostook co., Me. (for location of county, see map of Maine, ref. 3–F); on the Vanceboro, Woodstock, and Edmundston Division of Can. Pac. R. R., and on Aroostook river, 150 miles N. by E. of Bangor (250 miles by rail). The village has churches of five denominations, high school, starch, carriage, and sash and door factories, foundry, grist-mills, lumber and shingle mills, woolen-mills, water-works, and electric lights. The principal industry of this section is agriculture. The first settlement here was made in 1844. Pop. of township (1880) 2,756; (1890) 4,087.

E. W. Wall, town clerk.

Ca'ribs: a race of Indians who, in the fifteenth century, occupied portions of the northern coast of South America from the Amazon to the Orinoco, and beyond and far up the latter river; they had driven the Arawaks from the Caribbean islands, and occupied most of them. The Caribs may be described as Indian freebooters; they were constantly at war with surrounding tribes, by whom they were much feared, and their incursions in canoes often extended for hundreds of miles. In battle they were very fierce and cruel, but treated their prisoners well, and often married the women; hence there was a constant change going on in the race. Cannibalism was practiced in their war-feasts, but its extent has been greatly exaggerated. The tribal ties were very loose, and the chiefs had only a nominal authority. At the time of the conquest they practiced agriculture. The Spanish courts condemned the Caribs to slavery as cannibals, but for a long time they were hardly molested, probably because they were dangerous foes and useless as workmen. The French and English occupation of their islands led to bloody wars with these Indians. Their last stronghold was St. Vincent, where they mixed with fugitive slaves, forming the race called black Caribs. They were conquered by the English, and the survivors, to the number of 5,000, were transported to the island of Ruatan in the Gulf of Honduras (1796); thence they passed over to the mainland, where their descendants now live and are esteemed as excellent workmen. A few hundred were allowed to return to St. Vincent, where they have a reservation, and there are a few others in the other islands. On the mainland some thousand live in a semi-wild state on the Orinoco and in Guiana. The early Spaniards applied the name Carib indiscriminately to any Indians whom they regarded as cannibals or very savage.

Herbert H. Smith.

Caricature [from Ital. *caricatura*, charge, loading, deriv. of *caricare*, to load]: a grotesque representation in art. Caricature is of two kinds: the first confines itself to giving merely an exaggerated prominence to deformities and physical infirmities; the second, which alone is worthy of serious consideration, while giving prominence to the grotesque aspects, is concerned more especially with man's vices, weaknesses, or passions. The first is a mere grotesque amusement; the second may become cruel personal injury, revengeful satire, or the most redoubtable means of public censure. Caricature, in the latter aspect, has unquestionably played no small part in political and social movements. Caricature is more than picturesque satire: it partakes of the character of the burlesque and of comedy. It is violent and unrestrained only in periods of social effervescence; but it is hardly just to say that it has no significance except in crises, for its *rôle* is less to reflect revolutions than to prepare the way for them.

Caricature was employed in remote antiquity to score and to ridicule vices. The Assyrians, the Egyptians, and the Greeks cultivated this branch of art successfully. The Greeks especially carried this species of satire so far that they did not even spare their gods. The most notable Greek artist in this line was Pozon. Egypt was as bold in caricature as Greece. The Egyptian Museum at Turin possesses the fragments of a papyrus which represents people by animals, which careful study has shown to be a caricature of an Egyptian sculpture of four women playing on musical instruments. The British Museum possesses a

papyrus of similar character. The Romans greatly enjoyed caricature. Cicero speaks in his *De Oratore* of pictures which so exaggerated certain physical deformities as to excite laughter. Caricatures were even painted on public monuments. Pliny speaks of a painter named Antiphilus, who conceived the idea of a picture represented in grotesque garb, to which he gave the name of Gryllus. This afterward became the common designation of pictures of that sort. A caricature of Æneas, Anchises, and Ascanus was found in the ruins of Pompeii, in which the three fugitive Trojans were represented with dog's heads. Numerous other caricatures are found in the same ruined city. The Jesuit Garruci found in the catacombs of Rome a caricature of the crucifixion of Christ which represents a man standing with his arms extended in an attitude of adoration before the cross, on which hangs a human body with an ass's head. Beneath is this ironical legend, "Alaxamenus is adoring God." The miniatures in manuscripts of the Middle Ages, even the most religious, are often caricatures of great skill and fineness of execution. During this period all art was colored with the spirit of caricature. Most of the sculptures that ornament the cathedrals with their burlesque and grotesque attitudes were true caricatures in stone. Very curious caricatures may still be seen on the portals of the cathedrals at Rouen, Amiens, Chartres, and elsewhere. After the Renaissance caricature reappeared in more vigorous form than ever in Italy. Leonardo Da Vinci was distinguished for his satirical compositions, as was also Carrache the Florentine and Baccio del Binco. The Venetian Pietro Belloti, and later in the eighteenth century the Roman Pierleone Ghezzi, were distinguished caricaturists. Caricature early spread among the countries of the north. In Germany Holbein became most distinguished. Among his principal works of this character are the *Dance of Death*, and illustrations for the *Praise of Folly* of his friend Erasmus. In France in the seventeenth century Callot was the leader in this art. The Fronde called forth innumerable caricatures, but they were less cruel than those that attacked Louis XIV. toward the close of his reign. Louis XV. was not spared. Hardly a day passed without an order to the police to discover and punish the authors of the caricatures with which Paris was flooded, the subjects of which were Louis XV. and his relations with Mesdames de Pompadour, Du Barry, *et al.* The revolution of 1789 stirred up caricature anew. The king and queen were especially attacked, and later all the different parties were assailed in their turn. The first emperor controlled caricature as everything else, but Louis Philippe was its special victim. His pear-shaped head was an admirable point of attack for the caricaturists. Charles Philipon founded Nov. 4, 1830, *La Caricature*, which was devoted to attacking and exciting the Government. To this succeeded *Charivari* and the *Journal pour Rire*. The most notable caricaturist of England was Hogarth. He is one of the most humorous and vigorous of all artists of this class. Gillray, Bunbury, and Cruikshank are also distinguished in this line in England. In no country of Europe has political caricature had such free play as in England. The most eminent Spanish caricaturist is Goya. In recent years Du Maurier in England has won great fame in the field of social caricature. In the U. S. caricature has had wide development and free scope. Perhaps its power as a political agent was never so fully illustrated as during the exposure of the Tweed Ring in New York, when public sentiment was very largely formed by the sketches of Nast in *Harper's Weekly*. Among the leading journals largely devoted to caricature are *Puck* and *Judge* in the U. S.; for the English, *Punch*; for the French, *Charivari*; for the Germans, *Fliegende Blätter*. C. H. Thurber.

Ca'ries [Lat., rottenness]: a Latin term signifying "rottenness," applied to a disease of the bones analogous to ulceration of the soft parts, as *necrosis* of bone is analogous to gangrene of soft parts. In caries as in ulceration the parts destroyed are cast off in small portions, "molecularly"; in necrosis large portions are removed at a time. Systematic writers define different varieties, according to extent, such as circumscribed and diffused; according to cause, as tubercular, syphilitic, etc.; but in all cases the process is much the same. A carious bone is lighter than a normal one, is fragile, of dark-gray or brown color, and presents hollows and cavities filled with the products of disintegration. The bone is usually insensitive, but there may be considerable pain in some cases. In all cases abscess forms around the bone, and usually discharges externally. Caries very frequently affects the vertebræ, and the weight of the trunk then produces curvature of the spine, either interior or lateral. (See Spinal Caries.) The small bones of the hands and feet and the ends of long bones are also frequently affected.

The causes of caries are (1) a predisposition, such as scrofula, syphilis, and various other diseases, which depress the general vitality, and (2) exciting causes, such as traumatism, which serve to localize the disease. The treatment is directed to the general predisposing condition and locally to the removal of the diseased portions. This may be accomplished by caustic substances or mechanically by scraping, gouging, and the like. Excision of joints and amputation may be necessary in some cases.

Caries of the teeth is a very common disease. It may be due to general conditions, such as indigestion or various other diseases, or to improper care of the teeth. It is now known that a micro-organism has a part in the causation of this condition. See Dentistry. William Pepper.

Carillon: See Bell-ringing.

Cari'na [Lat., the keel of a ship or boat]: in botany, the sharp thin ridge or keel of any organ; also the lower pair of petals of a papilionaceous flower, which are more or less united, and form a body somewhat like the keel or prow of a boat.

Carina'ria [from the Lat. *carina*, a keel]: a family of heteropodous gasteropods; characterized by having the heart, liver, generative organs, etc., protruded from the body, and incased in an extremely fragile and beautiful shell, which is sub-transparent, symmetrical, and compressed. The convexity of the shell is terminated by a single keel.

Carina'tæ [from Lat. *carina'tus*, keel shaped]: a group of birds, established by Merrem in 1817, comprising those with a keeled breast-bone. It includes all existing birds except the ostriches and related forms. The group is termed an order by Huxley, a sub-class by most ornithologists. F. A. Lucas.

Carini, kăă-ree'nĕĕ: a town of Sicily; in the province of Palermo; beautifully situated 10 miles W. N. W. of Palermo (see map of Italy, ref. 9–E). It has a Gothic castle. Near it are the ruins of the ancient *Hyccara*. Pop. 12,539.

Carin'thia (in Germ. *Kärnthen*): a division of the Austrian empire; bounded N. by Salzburg and Styria, E. by Styria, S. by Carniola and Italy, and W. by the Tyrol. Area, 4,005 sq. miles. It is intersected by the river Drave, the valley of which separates the Noric from the Carinthian Alps. It is mountainous, with the exception of the eastern portion, where the valley of the Drave opens out into a plain containing the two large lakes, the Wörthersee and the Ossiochersee. Of the surface, one-half is covered with dense forest; of the other half, the larger portion is occupied by pastures, the minor by meadows, grain-fields, and gardens. The mineral production comprises iron, lead, zinc, graphite, and coal. The population numbered 361,008 according to the census of 1890, of whom 30 per cent. were Slavs and the remainder mostly Germans. The German language is used in 255 schools, the Slavonic in 24, and both in 70. There are about 19,000 Lutherans; the rest are Roman Catholics. The principal town is Klagenfurth. There are in all 10 towns, 28 market-villages, and 2,911 hamlets. The name Carinthia is derived from the Cari, a Celtic people which inhabited the country when it was conquered by the Romans and incorporated with the province of Noricum. By Charlemagne it was made a margraviate, and by Louis the Bavarian the margraviate was bestowed on the Dukes of Austria.

Cari'nus, Marcus Aurelius: Roman emperor; a son of the Emperor Carus. On the death of Carus, in 284 A. D., Carinus and Diocletian became competitors for the throne. The former gained an advantage in Mœsia over Diocletian in 285, but was killed by his own soldiers, whom he had offended by his cruelty.

Caripe, kăă-ree'pāy, or **Caribe**: a town of Venezuela; 40 miles E. of the city of Cumaná (see map of South America, ref. 1–D); remarkable on account of the extensive caves in the neighborhood, stretching into the limestone rock for a distance of 2,800 feet, and with a height of 70 or 80 feet. The caves, which have been described by Humboldt, are inhabited by a peculiar species of night-hawk, whose young ones are killed in great numbers for the sake of the oil they contain. Pop. 4,000.

Caris'sa: a genus of plants of the family *Apocynaceæ*. The *Carissa carandas*, a thorny shrub found in India, bears edible berries, and is much used there for hedges.

Carlén', Emilie: Swedish novelist; b. (*Emilie Smith*) at Strömstad, Aug. 8, 1807. She published in 1838 her first novel, *Waldemar Klein*. She was married a second time in 1841 to a lawyer named Carlén, her first husband having been a musician named Flygarre, from whom she was divorced. Translated into English, among her works, are *Home in the Valley*, *The Lover's Stratagem*, *The Professor*, and *Woman's Life*. They were much read when they first appeared, but have now fallen into neglect on account of their sentimentality. D. at Stockholm, Feb. 5, 1892. See her *Reminiscences of Swedish Literary Life* (1878).

Carleton: a thriving suburb of St. John, New Brunswick, and within the city limits, but separated from the main city by the St. John river (see map of Quebec, ref. 6–H). Carleton has extensive fisheries. See St. John, N. B.

Carleton, Sir Guy, Lord Dorchester: a British general; b. at Strabane, in Ireland, Sept. 3, 1724. He became governor of Quebec in 1772, which he defended against the American Revolutionary army in Dec., 1775. He invaded New York in 1776, and fought a battle against Arnold on Lake Champlain. In 1777 he was relieved of the command, but he succeeded Sir Henry Clinton as commander-in-chief in North America in 1781. D. in Maidenhead, Nov. 10, 1808.

Carleton, William: Irish novelist; b. in County Tyrone in 1794. His first work was *Traits and Stories of the Irish Peasantry* (1830), which was received with favor. In 1839 he published *Fardorougha the Miser*, which was very successful. He described Irish life and manners with much vigor and accuracy in other works, among which are *Rody the Rover* (1846) and *Willie Reilly* (3 vols., 1855). D. Jan. 30, 1869.

Carleton, William: poet; b. at Hudson, Mich., Oct. 21, 1845; was educated at Hillsdale College, and engaged in journalism and lecturing, living first at Chicago and afterward in Brooklyn, N. Y. His poems of humble life have been widely read, especially his *Farm Ballads* (1873).

Henry A. Beers.

Carleton College: a Congregational institution; located in Northfield, Minn.; open to both sexes; founded in 1866; chartered in 1870; has about 20 instructors and 300 pupils; 15,000 volumes in library.

Carleton Place: town; Lanark co., Ontario, Canada; on main line of Can. Pac. Railway; 46 miles from Brockville, on the St. Lawrence, and 28 miles from Ottawa; on a navigable stream called the Mississippi river (see map of Ontario, ref. 2–H). It has superior schools, and manufactures of woolens and iron and extensive lumber-mills. In the vicinity are camping-grounds for summer pleasure-seekers. Pop. (1881) 1,975; (1891) 4,435.

Editor of "Central Canadian."

Car'li, or **Car'li Rub'bi**, Giovanni Rinaldo, Count: political economist; b. at Capo d'Istria, Italy, Apr. 11, 1720. He acquired a high reputation by an important work entitled *Delle Monete e delle Instituzione delle Zecche d'Italia* (On Italian Coins and the Institution of Mints in Italy, 4 vols., 1754–60). He was appointed president of the council of commerce and public economy at Milan. Among his other works is a treatise *On Italian Antiquities* (1788). D. Feb. 22, 1795.

Carlile, Richard: free-thinker; b. at Ashburton, Devonshire, England, Dec. 8, 1790; educated at the village school; converted to radical propagandism by Paine's *Rights of Man*; sold a large edition of Southey's *Wat Tyler*; was imprisoned eighteen weeks for reprinting Hone's *Parodies* and writing some imitations of them. For reprinting the works of Paine and similar writers he was tried and sentenced in 1819 to a fine of £1,500 and imprisonment for three years in the Dorchester jail. His influence for the freedom of speech and of the press was very great. D. Feb. 10, 1843.

Carling, John: Canadian statesman; b. in township of London, Middlesex, Ontario, Jan. 23, 1828; was educated at the common school there. He was receiver-general of Canada in 1862; a member of the Canadian Assembly 1857–67; at the latter date was elected to the Dominion Parliament, and held the seat up to 1874; was re-elected in 1878, and was returned to each succeeding Parliament up to that of 1891. He was Postmaster-General from 1882 till 1885, when he was appointed Minister of Agriculture, a portfolio which he held till 1891, when he was reappointed to the same office. He failed to secure re-election at the general election of 1891, but was immediately afterward appointed to the Senate. He also held the portfolio of Minister of Agriculture and Public Works in the government of Ontario 1867–71. Mr. Carling was a member of the firm of Carling & Co., brewers; a director of the Great Western Railway, and of the London, Huron and Bruce and London and Port Stanley Railways.

Neil Macdonald.

Carling Sunday: an English term for the fifth Sunday in Lent, or Passion Sunday; so called because a certain sort of pease, termed "Carles," were made into cakes and eaten on that day. A rhyming couplet, designating the Sundays in Lent, is still quoted in certain parts of England. The abbreviated words in it refer to portions of the old services of the Church:

> Tid, Mid, and Misera,
> *Carling*, Palm, and Pasch-egg day.

Carlinville: city; on railroad; capital of Macoupin co., Ill. (for location of county, see map of Illinois, ref. 8–D); on Ch. and Alt. and Jackson So. East. R. Rs.; 57 miles N. N. E. of St. Louis and 38 miles S. W. of Springfield. It is the seat of Blackburn University, connected with which is a theological seminary. Here are brick-works, file-works, large flouring-mills, and three coal mines. Its court-house is a fine building. Pop. (1880) 3,117; (1890) 3,293; (1900) 3,502.

Editor of "Enquirer."

Carlisle, kar-līl' (anc. *Luguvallio*, or *Luguvallum*): an ancient episcopal city of England; the capital of Cumberland; situated on an eminence at the confluence of the Eden and Caldew rivers, by which it is nearly surrounded. It is 301 miles by rail N. N. W. of London, 98¼ miles by rail S. of Edinburgh, and 12 miles E. of Solway Frith (see map of England, ref. 4–F). Several railways converge to this point, which also has communication by steamboats with Liverpool and Belfast. It has a cathedral founded by William Rufus, dedicated in 1101, greatly damaged by fire in 1292, and restored about 1854. The choir, which is 138 feet long and 72 feet high, is one of the finest in England. Here is a castle founded in 1092. Carlisle sends two members to Parliament. It has manufactures of ginghams and cotton checks, print-works, iron-foundries, etc. It was the residence of the ancient Kings of Cumbria, and was destroyed by the Danes in 900. During the wars between the English and Scotch it was an important fortified border-town, and was often besieged. Pop. about 40,000.

Carlisle: town (founded in 1816); capital of Nicholas co., Ky. (for location of county, see map of Kentucky, ref. 2–I); on Kentucky Central R. R.; 100 miles from Louisville and Cincinnati, and 36 from Lexington. Here are six churches, a good graded school, a large flouring-mill, two carriage-factories, and a creamery. Pop. (1880) 909; (1890) 1,081; (1900) 1,377.

Editor of "Mercury."

Carlisle: borough; capital of Cumberland co., Pa. (for location of county, see map of Pennsylvania, ref. 6–F); on Cumberland Valley and Reading R. Rs.; in the valley between the Kittatinny and South Mountains; 18 miles W. by S. from Harrisburg, and 125 miles W. of Philadelphia. It is well built, and has wide streets and a public square, fine schools and churches, water-works, electric lights, and many beautiful private residences. Its chief industrial establishments are a car-factory and machine-shops, engine, axle, and frog and switch works, silk-mill, steam-carriage works, 3 large shoe-factories, overall-factory, 2 carpet-factories, and novelty-works. Carlisle is the seat of Dickinson College, founded in 1783; of Metzger Institute for girls; and of a Government Indian training and industrial school, with about 1,000 Indian boys and girls in attendance. This place was shelled by the Confederates July 1, 1863. Four miles N. from the court-house is Carlisle Springs, where there is a mineral spring, much visited in summer. Pop. (1880) 6,209; (1890) 7,620; (1900) 9,626.

Editor of "Sentinel."

Carlisle, Earls of: Viscounts Howard of Morpeth and Barons Dacre of Gillesland (England, 1661).—George William Frederick Howard, seventh earl; b. in London, Apr. 18, 1802; educated at Eton and Oxford; chief secretary for Ireland 1835–41; succeeded to the peerage on the death of his father 1848; twice appointed by Lord Palmerston Lord-Lieutenant of Ireland, in 1855 and in 1859; author of a *Diary in Turkish and Greek Waters* and a volume of poems. D. Dec. 5, 1864, and was succeeded by his brother, William George Howard, rector of Londesborough, as eighth earl;

b. Feb. 23, 1808. He died Mar. 29, 1889, and was succeeded by GEORGE JAMES HOWARD as ninth earl, who was born in 1843; was M. P. for Cumberland 1879–85.

Carlisle, JOHN GRIFFIN: b. in Kenton co., near Covington, Ky., Sept. 5, 1835, where his father had a farm; began to teach school and read law; was admitted to the bar in 1858; practiced with great success in the Covington district; was member of the State House of Representatives 1859–61; elected State Senator in 1866 and again in 1869; delegate at large from Kentucky to the National Democratic Convention at New York in July, 1868; Lieutenant-Governor of Kentucky 1871–75; and member of the 46th, 47th, 48th, 49th, 50th, and 51st Congresses. He was elected Speaker of the 48th, 49th, and 50th Congresses. He was sworn in as U. S. Senator from Kentucky May 26, 1890, in place of James B. Beck, deceased; was Secretary of the Treasury 1893–97; removed to New York city to practice law 1898.

Car'lists: a political party of Spain, consisting of the followers of Carlos of Bourbon and his descendants. See CARLOS OF BOURBON and CHRISTINOS.

Car'loman, or **Karloman**: a French prince; son of Charles Martel, at whose death, in 741 A. D., he became King of Austrasia, Suabia, and Thuringia. He abdicated in favor of his brother, Pepin le Bref, in 747, and became a monk. D. in 755 A. D.

Carloman: a son of Pepin le Bref and a brother of Charlemagne; b. in 751 A. D. On the death of his father in 768 he began to rule over Neustria and Burgundy. D. in 771, and Charlemagne then obtained possession of Carloman's dominions.

Carlos, kaar'lōs, Don: infante of Spain; son and heir-apparent of Philip II.; b. July 8, 1545. He was a youth of violent temper and sickly constitution, and appears to have been deficient in intellect. He attacked or menaced the Duke of Alva with a poniard in 1567. The king regarded him with suspicion, and ordered him to be tried by the Inquisition, which pronounced him guilty. He died in 1568, but the cause and manner of his death are involved in mystery. He is the subject of Schiller's tragedy of *Don Carlos*. See Prescott's *History of Philip II.*

Carlos of Bourbon, Don: Count de Molina; b. Mar. 29, 1788; the second son of King Charles IV. of Spain. He was the heir-presumptive to the throne until the birth of Isabella in 1830. On the death of his brother, Ferdinand VII., in 1833, Don Carlos claimed the throne, under the Salic law introduced into Spain in 1713, and abrogated by Ferdinand on his marriage to Christina, and was supported by a party called Carlists, between whom and the partisans of Isabella a civil war ensued. The priests and absolutists mostly preferred Don Carlos, but his claim was rejected by the Cortes in 1836. The Carlist army, which drew its numerical and strategic strength from the Basque provinces, was defeated in 1839, and Don Carlos fled to France. He abdicated in favor of his son, Don Carlos, Count de Montemolin, in 1845. D. in Trieste, Mar. 10, 1855.

Carlos, DON: Count de Montemolin; son of the preceding; b. Jan. 31, 1818. After the death of his father he was a pretender to the throne of Spain, and was recognized as Charles VI. by the Carlists, who revolted in 1860, without success. D. in 1861.

Carlos, DON: Duke of Madrid: nephew of the preceding; son of Don Juan of Bourbon and grandson of Don Carlos, Count of Molina; b. Mar. 30, 1848. His father, Don Juan, abdicated in his favor on Oct. 3, 1868, and from that time he was recognized by the Carlists as Charles VII. He made, in 1870 and again in 1872, unsuccessful efforts to overthrow the Government of King Amadeus, and in 1873 waged war against the republican Government. He fled to France; put forth claims to the French throne in 1881; was obliged to seek refuge in London. His eldest son, Jayme, Prince of Asturias, was b. June 27, 1870.

Carlot'ta: former Empress of Mexico; b. in Brussels, June 7, 1840; the daughter of Leopold I. of Belgium; married MAXIMILIAN (*q. v.*), Archduke of Austria, 1857; accompanied him to Mexico 1864; returned to Europe in 1866 to seek in vain aid from Napoleon and the pope, and lost her reason on account of her failure and her husband's disaster. Lives in Brussels.

Carlovin'gian [for *Carlingian*, by analogy of *Merovingian*]: the name of the second dynasty of French or Frankish kings. The origin of the family is traced to Arnulph, Bishop of Metz, who died in 631. The dynasty derived its name from Charles Martel or his grandson, Charlemagne. Charles Martel became in 714 A. D. mayor of the palace and king in reality, but he permitted Childeric to retain the name and form of royalty. The Merovingian dynasty ended in Childeric, a *roi fainéant*, who, after a merely nominal reign, was deposed in 752 by Pepin le Bref, a son of Charles Martel. Pepin usurped the throne, and was the first Carlovingian who took the title of king. He was succeeded by his son, Charlemagne, who began to reign in 771, extended his dominions by conquest, was the most powerful European monarch of his time, and the founder of the Germanic empire. He was crowned as Emperor of the West by Pope Leo III. in 800 A. D., and died in 814. Under his descendants the empire continually declined in power. His son and successor, Louis le Débonnaire, divided his dominion among his three sons, Lothaire, Pepin, and Louis. Louis le Débonnaire, who died in 840, had another son, Charles the Bald, who became King of France. He died in 877, and was followed by a succession of feeble princes. The last of the Carlovingian dynasty was Louis V., who died in 987. Hugh Capet then assumed the royal power. This house included a number of German and Italian monarchs.

Car'low: a county of Ireland; in Leinster; bounded N. by Kildare and Wicklow, E. by Wicklow, S. E. by Wexford, W. by Queens County and Kilkenny. Area, 353 sq. miles. The surface is mostly level or undulating; the soil is fertile. The rocks found near the surface are granite and limestone. It contains many dairies, and exports grain, flour, and butter. Coal is mined near the western border of this county. Chief town, Carlow. Pop. (1881) 46,568; (1891) 40,899.

Carlow: a town of Ireland; capital of county of same name; on the navigable river Barrow; at the mouth of the Burren; 57 miles by rail S. S. W. of Dublin (see map of Ireland, ref. 11–H). It is well built, has two bridges, a Roman Catholic cathedral, a college for students of divinity, a lunatic asylum, and a handsome court-house; also extensive flour-mills. Here are the picturesque ruins of a large Anglo-Norman castle founded in 1180. This castle was taken and dismantled by the army of Gen. Ireton in 1650. Pop. 7,200.

Car'lowitz: a town of Austria; on the right bank of the Danube; 8 miles S. E. of Peterwardein (see map of Austria-Hungary, ref. 9–H). It contains a Greek cathedral, and is the seat of the Greek Archbishop of the Serbian nationality. It is noted for its excellent wine, the product of which sometimes amounts to 1,750,000 gal. in a year. An important treaty was concluded here in 1699 between Turkey on one side and Austria, Russia, and Venice on the other. Pop. 4,419.

Carls'bad, or (Germ.) **Karlsbad**, kaarls'baat (i. e. Charles's bath): a town in Bohemia famous for its hot springs; on both banks of the river Tepl; about 76 miles W. N. W. of Prague (see map of Austria-Hungary, ref. 3–C). It is in a narrow valley between steep granite mountains, and is surrounded by very beautiful scenery. It contains a theater, several reading-rooms, and over a thousand different hotels and pensions for the entertainment of guests. The city is, indeed, one vast hotel. There are seventeen different springs, the most famous being the Sprudel (discovered, according to tradition, by Emperor Charles IV. while hunting), the Schlossbrun, and the Mühlbrunn. The temperature of the waters varies from 85° to 166° F. The solid constituents of the waters are mainly sulphate of soda, carbonate of soda, chloride of sodium, carbonate of lime, and sulphate of potash, with traces of other salts. The waters also contain a large amount of free carbonic acid gas. The average number of annual visitors here is over 28,000. Carlsbad was a favorite resort of Goethe. A congress of German powers was held here in 1819. Pop. (1890) 12,033.

Revised by C. H. THURBER.

Carls'burg, or (Germ.) **Karlsburg**, kaarls'boorkh (anc. *Apulum*): a fortified town of Austria; in Transylvania; on the right bank of the Maros; 46 miles S. S. E. of Klausenburg (see map of Austria-Hungary, ref. 7–K). Saltpeter is manufactured here. It is the seat of a Roman Catholic bishop, and has a gymnasium, a theological seminary, a normal school, and several convents. Pop. 8,000, many of them Jews.

Carlscro'na, or (Sw.) **Karlskro'na** (i. e. Charles's crown, sometimes called in English **Carlscroon'**): a seaport in the south of Sweden; situated on several small islands, which are connected by bridges with each other and with the main-

land; 258 miles S. S. W. of Stockholm; lat. 56° 10′ N., lon. 15° 36′ E. (see map of Norway and Sweden, ref. 13–F). It has an excellent and safe harbor, with sufficient depth of water to float the largest ships, and is the principal station of the Swedish navy. The entrance to the harbor is defended by two strong forts. Here are dry docks blasted out of the granite rock, and a naval arsenal. It has manufactures of linen cloths, naval equipments, etc. Pop. (1891) 20,613.

Carl'seu, Emil: still-life and landscape painter; b. in Denmark in 1848. Removed to the U. S. in 1872 and studied painting in Boston. His works have often been seen in New York exhibitions, and he settled there about 1887. Since then he has lived for some time in San Francisco, and finally returned to New York in 1891. His landscapes are truthful and interesting in style, but he is more distinguished as a painter of still life. In this branch of art his work is marked by fine qualities of color and pictorial charm.

William A. Coffin.

Carlson, Frederick Ferdinand: a Swedish statesman and historian; b. June 13, 1811. Served as Professor of History in Upsala, and was twice a cabinet officer. Among his numerous historical works the most excellent and important is his *Sveriges Historia under Konurgarne af Pfalziska Huset*, which may be regarded as a continuation of Geijer's history. D. Mar. 18, 1887.

Carls'ruhe, or (Germ.) **Karlsruhe**, kaarls'roo-*e* (i. e. Charles's rest): a city of Germany; capital of the grand duchy of Baden; 46 miles by rail S. of Mannheim (see map of German Empire, ref. 6–D). It is connected by railways with all parts of Germany. The streets are arranged like the radii of a semicircle, converging toward a central point, which is occupied by the palace of the grand duke. Connected with this palace is a museum and the ducal library of 150,000 volumes. The town also contains a botanic garden, a mint, a theater, an arsenal, and several hospitals. Here are manufactures of carpets, jewelry, chemical products, carriages, etc. Carlsruhe was founded in 1715 by Charles William, Margrave of Baden. Pop. (1885) 61,074; (1895) 84,030.

Carl'stad: a town of Sweden; on the island of Thingvalla; in Lake Wener; about 141 miles W. of Stockholm (see map of Norway and Sweden, ref. 11–E). It is connected with the mainland by a large and handsome bridge. It has a cathedral, a college with an observatory, and a cabinet of natural history. Copper, iron, timber, and grain are exported from this town through Lake Wener and the Gotha Canal; suffered by fire in 1865, since which time the town has greatly improved in appearance. Pop. (1891) 8,716.

Carlstadt, Andreas Rodolphus Bodenstein: b. at Carlstadt, in Franconia, probably two years before Luther (1481); d. at Basel, Dec. 25, 1541; played a singular part in the history of the Reformation. He studied theology at various Italian universities, and was in 1513 appointed professor at Wittenberg, where he expounded the Christian doctrines in the usual manner of the Schoolmen. After an absence of some time on a visit to Rome, he found the whole theology of the university changed by Luther. He first offered some opposition, but then suddenly adopted the views of the Reformer and carried them to extremes. During Luther's stay at the Wartburg he caused great disturbance in Wittenberg by his violence and recklessness, and it cost Luther great exertions to restore order. Humiliated at his failure, Carlstadt began to attack Luther, and made himself the center of a circle of ill-advised enthusiasts. In 1528 he was banished from Saxony, and in 1530 he settled at Strassburg. Siding with Zwingli in the controversy concerning the Lord's Supper, he was appointed pastor at Basel, where he continued his attacks on Luther. (See his *Life* by Jäger, Stuttgardt, 1856.) A complete list of his works—mostly polemical, and often rather unsavory—has been given by Rotermund in his *Erneuertes Andenken* (Bremen, 1818).

Carlton, Thomas, D. D.: clergyman of the Methodist Episcopal Church; b. in Londonderry, N. H., July 26, 1808; began his ministry in the Genesee Conference in 1829; occupied important pulpits in Rochester, Buffalo, and other places for several years. His superior administrative and financial abilities led to his appointment as agent, for three years, of the Genesee Wesleyan Seminary, as presiding elder of important districts for seven years, and principal agent or publisher of the Methodist Book Concern in New York, and treasurer of the Methodist Missionary Society for twenty years (1852–72). D. in Elizabeth, N. J., Apr. 16, 1874.

Carludovi'ca Palma'ta: a tree or shrub of the order *Pandanaceæ*; grows in the tropical parts of South America. It produces the leaves of which panama hats are made. Those of the best quality are plaited from a single leaf without any joints. As this process requires several months, the price of such a hat is very high.

Carlyle, kar-līl′: capital of Clinton co., Ill. (for location of county, see map of Illinois, ref. 9–D); on railroad and on the Kaskaskia river; 48 miles E. of St. Louis; has fine churches, school-houses, and stores and a spoke-factory. The public library contains 5,000 volumes. There is a seminary for young ladies. Pop. (1880) 2,017; (1890) 1,784; (1900) 1,874. Editor of "Constitution and Union."

Carlyle, Alexander, D. D.: Scottish Presbyterian divine; b. at Prestonpans, Jan. 26, 1722; educated at the universities of Edinburgh, Glasgow, and Leyden; ordained as minister of Inveresk, near Edinburgh, 1748; moderator of the General Assembly 1770; dean of the Chapel Royal 1789. His *Autobiography*, edited by Burton in 1860 (London), excellently describes the society and events of his time. D. in Inveresk, Aug. 25, 1805.

Carlyle, Thomas: a distinguished British critic and historian; b. Dec. 4, 1795, at Ecclefechan, Scotland. He was of a family of peasants, "pithy, bitter-spoken bodies," and his father was a stone-mason. He was educated at Annan school—the "Hinterschlag (i. e. whip behind) Gymnasium" of *Sartor Resartus*—and at Edinburgh University. At school he made acquaintance—which ripened into a warm friendship—with Edward Irving, afterward the famous preacher and founder of the Irvingite communion. In 1814 Carlyle became mathematical master in Annan Academy, and continued to teach there and subsequently at Kirkcaldy till 1818. His first published book was a translation of *Legendre's Geometry* (1824). He began to contribute to the magazines about 1820, and set himself especially to the task of acquainting English readers with German literature through his translations and critical essays. His *Life of Schiller* was published in the *London Magazine* in 1823–24. His translation of *Wilhelm Meister* appeared in 1824, and *Specimens of German Romance—Tieck, Richter, Musæus, Hoffmann*, etc.—in 1827. He wrote for the *Edinburgh, Foreign*, and *Westminster Reviews* and *Fraser's Magazine* articles on Goethe, Werner, Novalis, Heyne, Richter, German playwrights, early German literature, the *Nibelungen Lied*, etc. His own style became gradually more and more tinctured with Germanisms. Richter had a particularly strong influence on him, and his imitation of that writer's whimsical, uncouth, and rhapsodical manner produced in time a vicious and affected diction in his imitator. In 1824 he went to London, married Jane Welsh in 1826, and after a short residence in Edinburgh removed to a solitary farm received by her as an inheritance, at Craigenputtoch, among the wild granite hills of Dumfriesshire. Here he was visited by Emerson, by Francis Jeffrey, the editor of the *Edinburgh Review*, with whom he had formed a close intimacy, and by others who were attracted by the power and originality of his writings. In 1833–34 he published in *Fraser's Magazine* his first great book *Sartor Resartus* (The Tailor Retailored). This was a satire on shams, conventions, the disguises and wrappings of the human soul. It purported to be the life and "clothes-philosophy" of Herr Diogenes Teufelsdröckh, Professor of Things-in-General in the University of Weissnichtwo (know-not-where), and was possibly suggested by a paragraph in Swift's *Tale of a Tub*: "A sect was established who held the universe to be a large suit of clothes," etc. In 1834 Carlyle removed to Chelsea, a London suburb, where he resided for the rest of his life. In 1837 he published his *French Revolution*, which is not so much a history as a series of vivid pictures. He conceived of history dramatically, and defined it as "the essence of innumerable biographies." His *French Revolution* is really a great tragedy acted out by a few leading characters, Mirabeau, Danton, and others. The MS. of the first volume had been lent to John Stuart Mill, and while in his possession was accidentally burned. Carlyle rewrote it with infinite pains, but he said of the new version, "I dinna think it's the same." *Chartism* (1839) dealt with a modern social and political problem. In *Heroes and Hero Worship* (1841) he repeated and developed most fully the political philosophy of *Chartism* and the ideas sketched in his three early essays, *Signs of the Times* (1829), *History* (1830), and *Characteristics* (1831). He took

issue with modern liberalism; with the utilitarians and their "greatest happiness" principle; with the conclusions of political economy, which he called the "dismal science"; and with the *laissez-faire* theory of government, which he said makes it the business of government not to govern, but to refrain from governing. Carlyle had no faith in democracy and universal suffrage; he sneered at the self-congratulations of the age, and the talk about unexampled prosperity, progress of the species, the march of intellect, etc. He called the American civil war "the burning of a dirty chimney," and wrote contemptuously about *The Nigger Question* (1849) and *Shooting Niagara* (1867). His doctrine of salvation through the hero was further illustrated in his *Cromwell's Letters and Speeches* (1845), which may be said to have revolutionized the general estimate of its subject, and his *History of Frederick the Great* (1858–65). The last-mentioned work gave evidence of an increasing admiration for mere despotic force, as *Past and Present* (1845) and *Latter-day Pamphlets* (1850) had shown a constantly growing eccentricity of style and pessimism of thought in their violent arraignment of modern society. The *Life of John Sterling* (1851) was of milder mood, and is one of Carlyle's pleasantest books. In 1866 Carlyle was honored with the rectorship of Edinburgh University, and made an address to the students. In 1875 appeared his *Early Kings of Norway*. After his death, Feb. 4, 1881, his *Reminiscences* were edited by J. A. Froude, and re-edited by Charles E. Norton in 1887. Mr. Norton also edited the *Correspondence of Thomas Carlyle and Emerson* in 1886, and the *Correspondence of Thomas Carlyle and Goethe* in 1887. (See also *Letters and Memorials of Jane Welsh Carlyle*, 1883.) The first collected edition of Carlyle's works was published in 1857–58; a second collected edition in 34 vols. was issued in 1870–82.

HENRY A. BEERS.

Carmagnole, kär-mäñ-yōl′: a political song of the Jacobins in the French Revolution; also applied to a popular dance of that period, and to a jacket which was worn by the revolutionists as a symbol of patriotism.

Car′man, ALBERT, M. A., D. D.: minister of M. E. Church; b. in Matilda, Ont., Canada, June 27, 1833; educated at Victoria University; president of Albert Seminary, College, and University 1857–74; bishop of the Methodist Church in Canada 1874–83, when he became general superintendent of the Methodist Church of Canada; author of *Guiding Eye* and various magazine articles.

Carman, BLISS: See the Appendix.

Carmar′then, or **Caermarthen** (anc. *Maridunum*, Welsh, *Caer Fyrddyn*): a seaport-town of South Wales; capital of Carmarthenshire; on the river Towy, 8 miles from its entrance into the Bristol Channel (see map of England, ref. 11–D). It has a picturesque situation, but the streets are steep and narrow. The Towy, which is here crossed by a bridge, is navigable for vessels of 200 tons from its mouth to this point. Tin plates, cast iron, timber, slates, lead ore, marble, and grain are exported from it. The famous prophet Merlin is said to have been born here. Pop. 11,000.

Carmar′thenshire, or **Caermarthenshire**: a county of South Wales; bounded N. by Cardigan, E. by Brecon, S. E. by Glamorgan, S. by the Bristol Channel (here called Carmarthen Bay), and W. by Pembroke. Area, 974 sq. miles. The surface in the northern and eastern parts is mountainous; the soil of the valley is fertile. It is bounded N. by the river Teify, and intersected by the Towy, which flows through the celebrated Vale of Towy, 30 miles long. Its mineral resources are copper, coal, iron, lead, slate, marble, etc. Capital, Carmarthen. Pop. (1891) 130,574; (1901) 135,320.

Carmathians: See KARMATHIANS.

Car′mel: town; capital of Putnam co., N. Y. (for location of county, see map of New York, ref. 7–K); on N. Y. and North. R. R.; 50 miles N. by E. from New York city, in the Croton water-shed. It is the site of Drew Ladies' College. The well-known summer resort of Lake Mahopac is situated in Carmel township. Pop. of township (1890) 2,912; (1900) 2,598.

EDITOR OF "PUTNAM COUNTY COURIER."

Car′melites, or the **Order of Our Lady of Mt. Carmel**: a monastic order of the Roman Catholic Church; founded on Mt. Carmel in 1156 by the crusader Berthold from Calabria; but the Carmelites claim to have been instituted by the prophet Elijah. They were compelled by the Saracens to wear a striped dress; but later their present brown habit, with white cloak and scapular, was adopted, and they were called "The White Friars." They were at first under the rule given them by Albert, Patriarch of Jerusalem in 1209. They were hermits at first, but when they passed into Europe in 1238, being driven out by the Mohammedans, they began to live in communities, and their rule was mitigated by Pope Innocent IV., and confirmed under the title "Order of Friars of Our Lady of Mt. Carmel" (1247). Carmelite nuns were instituted in 1452. St. Theresa in the sixteenth century reformed them, and the friars as well, and the strict Carmelites are called Discalced or Barefooted Carmelites. They are entirely independent of the former. Their manner of life is very austere. The Carmelite monks and nuns are found, both Mitigated and Discalceate, in almost every country, though in numbers they are much reduced. The pulpit orator Father Hyacinthe (Loyson) was superior of the Barefooted Carmelites in Paris.

Carmel, Mt.: a mountain-ridge of Palestine; extends from the plain of Esdraelon to the Mediterranean, and terminates in a steep promontory in that sea, about 9 miles S. W. of Acre; lat. 32° 51′ 10″ N., lon. 34° 57′ 42″ E. It is formed of limestone, with an admixture of hornstone. Its highest point is 1,740 feet above the sea, and it terminates in a bluff 480 feet above the sea. Oaks, pines, olives, and laurels grow on its summit and sides. Carmel is mentioned in Scripture as the place where the prophet Elijah slew the priests of Baal. He lived there hidden during the reign of Ahab, and the cave in which he found shelter is still shown. From the first passage of Scripture (1 Kings xviii. 19) in which the mountain is mentioned, it appears that it was considered a holy place, where altars were erected to Baal; hence the reason why Elijah selected it for his sacrifice. The exact place where the wondrous contest between Jehovah and Baal took place and the fires proved who was the true God (1 Kings xviii. 17–42) has not been identified. The meaning of the word Carmel in Hebrew is a *park* or *garden*. Near the top of the bluff is a monastery, the inmates of which, eighteen in number, are called CARMELITES (*q. v.*). The ORDER OF MT. CARMEL was a body of 100 knights, all of noble descent, instituted by Henry IV. of France.

Car′men Syl′va: pseudonym of Queen Pauline Elisabeth Ottilie Louise of Roumania; b. Dec. 29, 1843; married Nov. 15, 1869, to Prince Karl von Hohenzollern, proclaimed King of Roumania Mar. 14, 1881. It was not until after her marriage that Carmen Sylva showed her powers as a writer. Her childhood and youth were passed in close companionship with her father, Prince Hermann Karl von Wied, a man of serious and even philosophic mind. She knew also the aged Arndt, and interested herself in many languages and literatures. From 1880 on, however, she has given continual evidences of her own ability as a writer. In that year appeared her *Sappho*; in 1881, *Rumänische Dichtungen* and *Stürme*; in 1882, *Jehovah*, *Die Hexe*, and *Leidens Erdengang*; in 1883, *Pelesch Märchen*. Her lyric poems have been published under the title *Meine Ruh'* (4 vols. 2d ed. Berlin, 1886). Carmen Sylva is universally beloved in Roumania, owing to her efforts to improve popular education and her interest in the development of Roumanian industries. See Kremnitz, *Carmen Sylva* (Berlin, 1882); and Von Stackelberg, *Aus Carmen Sylva's Leben* (4th ed. 1886); Blanche Roosevelt, *Elisabeth of Roumania* (London, 1891).

A. R. MARSH.

Car′mi: city (founded in 1812); capital of White co., Ill. (for location of county, see map of Illinois, ref. 10–F); on L. and N. and C. C. C. and St. L. R. Rs., and on the Little Wabash river; 124 miles E. of St. Louis, Mo., and 38 miles W. of Evansville, Ind. It has 8 churches, good public schools, with school library and lecture course, 2 saw and stave mills, and 3 grist and flour mills. It is situated in the center of a very rich agricultural county, wheat and corn being the principal grains produced; there are large apple and peach orchards. Pop. (1880) 2,512; (1890) 2,785; (1900) 2,939.

EDITOR OF "COURIER."

Carmin′atives: medicines such as cardamoms, ginger, and the essential oils of peppermint and juniper, used for the purpose of remedying flatulence and colic.

Car′mine [from Fr. *carmin*: Span. *carmesí*: Ital. *carmesino* < Arab. *qermazī*, crimson, deriv. of *qermiz*, the cochineal insect; cf. CRIMSON, KERMES; ultim. from Sansk. *kṛimijā*, dye produced by an insect or worm (*kṛmi-*)]: a beautiful red pigment composed chiefly of cochineal, mixed with alumina and a little oxide of tin. It is employed by artists and silk-dyers, and is an ingredient in the best red inks. It is considered the most beautiful of all red pigments, and has been

in use since the middle of the seventeenth century. Under the name of *rouge* it is used by women to paint their cheeks. One of the processes by which it is prepared is as follows: Digest 1 lb. of cochineal in 3 gal. of water for fifteen minutes; add 1 oz. of cream of tartar: heat gently for ten minutes; add ½ oz. of alum, and boil it for several minutes. After the impurities have settled, the clear liquid is placed in clean glass pans or shallow glazed dishes, in which it is allowed to stand while the carmine is slowly deposited. Imitations of carmine are made of red sandal-wood, Brazil-wood, and other substances, and are often sold as *rouge*. See COCHINEAL.

Carmo'na (anc. *Carmo*): a town of Spain; province of Seville; picturesquely situated on a hill or high ridge 21 miles N. E. of Seville (see map of Spain, ref. 19–C). It is near the railway which connects Seville with Cordova. It contains a fine old Gothic church, a ruined castle, and a university. Here are manufactures of woolen fabrics, hats, soap, leather, and exeellent wine and olive-oil. It has a large annual cattle fair. Pop. (1887) 17,459.

Carnac: a village of France; department of Morbihan; 19 miles S. E. of Lorient (see map of France, ref. 4–B). On a wide plain adjacent to Carnac, and near the sea, is a remarkable monument, consisting of about 1,100 to 1,200 (formerly over 4,000) rude obelisks of granite, standing with their smaller ends on the ground, arranged in eleven parallel rows, and from 6 to 21 feet high. Most writers have called these remains Druidical or Celtic, but late authorities ascribe them to a prehistoric race. Pop. 2,900.

Car'nahan, JAMES, D. D., LL. D.: a Presbyterian divine; b. near Carlisle, Pa., Nov. 15, 1775; graduated at Princeton in 1800; was a tutor there 1801–04; licensed 1804. After holding several pastorates, he became in 1823 president of Princeton College, performing his duties with fidelity and wisdom till his resignation in 1854. D. in Newark, N. J., Mar. 2, 1859.

Carnahu'ba Palm, or **Caranai'ba Palm** (*Copernicia cerifera*): a beautiful palm which abounds in the north part of Brazil. It seldom attains a height of more than 40 feet. The

Carnahuba palm.

fruit is edible, and the timber is valuable for several purposes. The young leaves are coated with wax, which is collected, and, like the wax of certain other species of palm, is an article of commerce. Its timber is exported to Great Britain, where it is used for veneering.

Car'nallite: a hydrated chloride of potassium and magnesium, which occurs in coarse granular masses, mixed with rock-salt, near Magdeburg, in Prussia. It is used as a fertilizer of the soil.

Carnar'von, or **Caernarvon** (anc. *Segontium*): a seaport-town of North Wales; capital of Carnarvonshire; on the east side and near the southwest end of the Menai Strait, which separates it from the island of Anglesey (see map of England, ref. 8–D). It is 7 miles S. W. of the Menai bridge, and about 60 miles W. S. W. of Liverpool. The harbor will admit vessels of 400 tons, and steamboats ply between this port and Liverpool. Carnarvon is a much-frequented watering-place, and has beautiful scenery in the vicinity. Here is a castle founded by Edward I. in 1282, which now forms one of the most imposing ruins in the kingdom. It has thirteen embattled towers surmounted by turrets. Carnarvon is about half a mile from the site of *Segontium*, an ancient Roman town or station. Pop. 10,000.

Carnarvon, HENRY HOWARD MOLYNEUX HERBERT, Earl of: an English Conservative statesman: b. in London, June 24, 1831; succeeded his father as fourth earl in 1849. He was appointed Secretary of State for the Colonies in June, 1866, and he framed a plan for the confederation of the British North American colonies, which was approved by Parliament. He resigned in Mar., 1867, because he was opposed to the Reform bill which Disraeli introduced; resumed office under Disraeli in 1874; resigned in 1878. During the Conservative administration of 1885–86 he was Lord-Lieutenant of Ireland; author of *The Druses of Mount Lebanon* (1860), etc. D. June 28, 1890.

Carnar'vonshire, or **Carnarvon**: a county of North Wales; bordering on the Irish Sea; has an area of 577 sq. miles. It is bounded N. W. by Menai Strait and Carnarvon Bay, N. by the Irish Sea, E. by Denbigh, and S. by Merioneth and Cardigan Bay. The surface is very mountainous, and the scenery is remarkably grand. Here is Snowdon, which is the highest mountain in Wales, and rises 3,571 feet above the level of the sea. Among the minerals of this county are copper, lead, zinc, coal, and roofing-slate. The chief branch of rural industry is the rearing of black cattle for the dairy. Carnarvonshire is traversed by the Chester and Holyhead Railway, which crosses the Menai Strait. Capital, Carnarvon. Pop. (1891) 117,586; (1901) 125,654.

Carna'tion [from Lat. *carnatio*, fleshiness, deriv. of *caro*, *carnis*, flesh; but cf. Ital. *carnagione*, flesh-color]: This term is used in painting, and is applied to the flesh-tints or natural color of flesh; also to the parts of a picture which represent the nude human figure. The term is not in very common use at present; the phrase flesh-tints seems to have replaced it.

Carnation: the most popular ornamental plant of the pink family, known to botanists as *Dianthus caryophyllus*. The aboriginal form of the carnation is not certainly known, but it is pretty generally agreed that its wild prototype now grows in France and some other parts of Europe. The carnation has been cultivated for several centuries, and flowers were known in old times which were nearly 4 inches across. The species is immensely variable, in the color and shape of the flower, and in the character of the plant. The common

Carnation.

carnations are essentially greenhouse plants; but there is a tribe of outdoor or border varieties which deserves to be better known. Carnations are commonly classified into four groups distinguished by the markings of the flower: *Selfs*, or those having but one color; *picotees*, those having white

petals margined across the end by a band of color: *flakes*, with two colors in broad stripes running lengthwise the petals; and *bizarres*, with three colors disposed in stripes or spots. The common carnation is ordinarily treated as an annual. It is started from short cuttings in late winter, and the plants are commonly set in ground in the open during summer. They are taken up late in the fall and transferred to the glasshouse, where they bloom more or less continuously throughout the winter. One of the chief faults of the large carnations is their habit of bursting the calyx with expansion of the flower. Carnation-growers now desire varieties with short and broad calyxes which possess pouch-like expansions to take up and equalize the pressure.

L. H. Bailey.

Carne'ades (in Gr. Καρνεάδης): a Greek philosopher and orator; b. at Cyrene, in Africa, in 213 B. C. He opposed the doctrines of the Stoics; was the founder of a school called the New Academy, and maintained that man has no criterion of truth. He was distinguished for his subtle dialectic and powerful and specious eloquence. In 155 B. C. he was sent as ambassador from Athens to Rome, where he gained much applause by his orations. One day he eulogized justice, and the next day refuted himself by a sophistical argument tending to confound the distinction between justice and injustice. This offended Cato, who caused him to be expelled from Rome. D. at Athens about 129 B. C.

Carnegie, kar-nĕg'i, Andrew: manufacturer; b. at Dunfermline, Scotland, Nov. 25, 1835; removed with his family to the U. S. in 1845; settled at Pittsburg, and began his career two years later by attending a small stationary engine; became successively telegraph-messenger, operator, clerk of the superintendent of telegraph-lines of the Pennsylvania R. R. Co. at Pittsburg, and superintendent of the Pittsburg Division of the Pennsylvania R. R. While a clerk in the superintendent's office he aided in the introduction of the Woodruff sleeping-car, which gave him the nucleus of his present fortune. Subsequently he formed one of a syndicate which purchased the Storey farm on Oil Creek for $40,000, which in one year yielded over $1,000,000 in cash dividends. He associated with others in establishing a rolling-mill, which has grown to be the largest and most complete system of iron and steel industries in the world. Besides managing these great business enterprises, he has been the owner of a number of British newspapers, which are edited in the interests of Radicalism. He has spent large sums of money for educational and charitable purposes. In 1879 he established commodious swimming-baths for the use of the people in his native town; the following year gave $40,000 for a free library there; gave $50,000 in 1884 to the Bellevue Hospital Medical College for a histological laboratory; gave $500,000 in 1885 for a public library at Pittsburg; and in 1886 gave $250,000 for a music-hall and library at Allegheny City, Pa. In 1890 a large music-hall was erected in New York through his instrumentality. He has given $250,000 for a library in Edinburgh, $50,000 for a library at Ayr. In 1900 his gifts, mostly to public libraries and industrial institutions, aggregated about $5,000,000. He has contributed many articles to periodicals on social and economic topics, and is the author of *An American Four-in-hand in Britain* (1883); *Round the World* (1884); and *Triumphant Democracy* (1886). C. K. Adams.

Carneiro Leão', Honorio Hermeto: Brazilian statesman; b. at Jacahy, province of Minas Geraes, Jan. 11, 1801; studied law, and before he was thirty years old had attained high judicial honors. Elected deputy in 1830, he was successively re-elected, voting with the moderate liberals but retaining his political independence. By exposing a revolutionary scheme in 1832 he saved the country from great danger, but made many enemies. From Sept., 1832, to Mar., 1833, he was Minister of Justice. In 1836 he joined the new conservative party, and quickly became its chief. In 1841 he was chosen senator; shortly after was president of Rio de Janeiro; was Prime Minister Jan., 1843, to Feb., 1844; president of Pernambuco 1849, and envoy to the Platine states 1851; received the title of Viscount of Paraná July, 1852, and of Marquis of Paraná Dec., 1854, when he again became Prime Minister. He remained in power until his death at Rio de Janeiro, Sept. 3, 1856. Herbert H. Smith.

Carneiro de Campos, José Joaquim: Brazilian statesman; b. at Bahia, Mar. 4, 1768. He graduated in law at Coimbra, Portugal, and returned to Brazil in the fleet which carried the royal family to Rio de Janeiro. He was at once employed in important government offices, and in 1823 was a member of the Brazilian constituent assembly. In politics he was a moderate liberal, without strong party prejudices, and his probity and sincerity won him universal respect. He was three times minister, councilor of state, and from 1826 senator from Bahia. In 1826 he was created Marquis of Caravellas. On the abdication of the Emperor Pedro I., he was elected one of the three regents to govern Brazil during the minority of Pedro II. D. at Rio de Janeiro, Sept. 8, 1836. Herbert H. Smith.

Carne'lian, or **Corne'lian** [Fr. *cornaline*, deriv. of Lat. *cornu*, horn; the other form with *car-* is due to influence of Lat. *carnem*, flesh]: a name given to a fine variety of chalcedony; red or flesh-color, and rarely milky white. It has a conchoidal fracture. Beautiful specimens are found in Hindustan, where they are highly prized, and are manufactured into various ornamental articles; it is found also in Scotland and in many parts of Europe and America. The bright, clear red carnelian is most valued.

Car'nifex Ferry: over the Gauley river, Nicholas co., Va.; about 8 miles below Summerville; gives its name to the severe action on the north bank of the river near this ferry Sept. 10, 1861. The Confederates under Gen. Floyd, numbering about 5,000, had strongly intrenched themselves in this position, where they were attacked by the forces under Gen. Rosecrans on the afternoon of Sept. 10. Darkness terminated the battle of the day, and during the night Gen. Floyd, being largely outnumbered, escaped with his command across the Gauley river, destroying his bridge behind him, which prevented pursuit. All the camp equipage and munitions of war fell into the hands of the Federal forces.

Carnio'la (in Germ. *Krain*): a division or crown land of the Austrian empire; bounded N. by Carinthia, N. E. by Styria, S. E. and S. by Croatia, and S. W. by the Adriatic Sea and the Littoral province. It was formerly a part of the kingdom of Illyria. Area, 3,856 sq. miles. The surface is mountainous, and partly occupied by the Carinthian Alps. Among its remarkable physical features are Lake Zirknitz and the rock-bridge of St. Kanzian, which is 130 feet high. The chief river is the Save. Carniola contains the quicksilver mines of Idria, which are among the richest in the world. Iron, coal, and marble also occur. Among the products are flax, silk, honey, and wine. Pop. (1890) 498,958.

Carnival [from Ital. *carneva'le*, explained either by help of the Med. Lat. *carneleva'rium*, *carnileva'men*, as removal of flesh, or from a Lat. *currus nava'lis*, boat on wheels, from a supposed usage of the processions. The explan. from Ital. *carne*, flesh + Lat. *vale*, farewell, is mere folk-etym.]: a festival in the Roman Catholic countries of Europe just preceding Lent. It was formerly most brilliantly celebrated at Venice; later, especially in Rome. Like many other usages in modern Europe the customs connected with the carnival probably originated in the heathen spring-time festivals, as the Lupercalia and Bacchanalia of the Romans and the Yule-feasts of the Germans. During the Middle Ages costly banquets with the rich, and drinking-bouts among others, marked the time. The carnival at Rome sometimes lasts eight days, during which the whole city is given up to revelry, the center of which is the street called the *Corso*. In this all the houses are hung with crimson drapery, and each afternoon continuous lines of carriages and promenaders pass through it. Most of those who appear in the street are masked, and an incessant interchange of bouquets, *confetti*, and other harmless missiles makes a scene of extreme liveliness. At six o'clock, after the firing of cannon and the clearing of the Corso by troopers, a number of horses are let loose at one end of the street, and are urged by the shouts of the people to full speed. The last event of the Carnival week is the celebration of the *Moccoletti*. For this, after dark, all the revelers, on foot, in carriages, and at the windows of the Corso, provide themselves with a number of small lighted tapers, which each endeavors to preserve, while he puts out as many as possible of those of his neighbors. The political disturbances of Italy somewhat depressed these festivities from 1859 to 1870.

Carniv'ora [neut. pl. (sc. *animalia*) of Lat. *carni'vorus*, flesh-eating; *carn-em*, flesh + *vora're*, devour]: animals which prefer flesh and eat little or no vegetable food. They belong to the class *Mammalia*, the name *Feræ* being an earlier name for the same group. It is characteristic of them to have sharp cutting teeth, simple stomachs, very muscular bodies, and active habits. This order includes, among other

animals, all those quadrupeds which are properly called beasts of prey, excepting a few of the marsupials of Australasia, which are carnivorous in their habits, and resemble in their external characters certain animals of this order, which they may be said to represent in the native fauna of that region. Interesting fossil remains of carnivora are referred to the eras just preceding and just following the glacial period. The order is divided into several families, as Felidæ, Mustelidæ, Ursidæ, Canidæ, Phocidæ, etc. (*q. v.*).

Carnivorous Plants: See Insectivorous Plants.

Car'nochan, John Murray, M. D.: b. at Savannah, Ga., July 4, 1817; studied medicine at Edinburgh and various places on the continent of Europe; began practice in New York in 1847; soon gained distinction for his bold and successful surgical operations. Thus he excised the whole trunk of the second branch of the fifth pair of nerves for the cure of neuralgia, depending upon disease in the nerve. This nerve was cut out from the infraorbital foramen to the foramen rotundum, and consequently involved an operation through the malar bone to the base of the skull. In 1852 he tied the femoral artery, and thus ingeniously cured a disease of exaggerated nutrition, *elephantiasis arabum*, which operation has been accepted in Europe and extensively practiced. He also tied the primitive carotid artery on both sides for the cure of elephantiasis of the head-base and neck. He exsected the entire radius in 1853, the entire ulna in 1854, and also exsected the entire lower jaw and the calcaneum. In 1851 he became Professor of Surgery at the New York Medical College and surgeon-in-chief to the State Immigrant Hospital. He published many valuable professional monographs and lectures; a treatise on *Congenital Dislocations* (1850); a translation of Rokitansky's *Pathological Anatomy*, etc. D. in New York, Oct. 28, 1887.

Carnot, kär'nō', Lazare Hippolyte: a French radical republican; son of L. N. M. Carnot; b. at St.-Omer, Apr. 6, 1801. He was a member of the Chamber of Deputies from 1840 to 1848, and was Minister of Public Instruction from February to July of that year. In 1864–68 he was again a member of the Legislative Assembly. In 1871 he was again elected to the Assembly, where he voted with the extreme left. He wrote an able work on Saint-Simonism, and published the memoirs of his father (2 vols., 1860–64). D. Mar. 16, 1888.

Carnot, Lazare Nicholas Marguerite: soldier and statesman; b. in Nolay, Burgundy, May 13, 1753, of one of the oldest and most distinguished families of France. He was educated as a soldier and a military engineer, and at eighteen distinguished himself so greatly as to earn a second lieutenancy in the corps of engineers. He was honored with the laurel crown in 1783 for his eulogy on Vauban, and was sent to the legislature by the Pas-de-Calais, and later, as a member of the Convention, voted for the execution of Louis XVI. He took a prominent place among the revolutionists, and was regarded by his countrymen as the genius of victory, exhibiting the talents later illustrated by the German Von Moltke. He was Minister of War before the consulate was established, and voted against its extension, as well as against the empire; but, defeated, retired to private life in the early days of the latter. He died, proscribed, at Magdeburg, in 1823. R. H. Thurston.

Carnot, Marie François Sadi: President of the French Republic; b. at Limoges, Aug. 11, 1837; the son of Adolphe Carnot and grandson of L. N. M. Carnot, "the organizer of victory" of the time of the first Napoleon. He was a grandnephew of the famous "founder of the science of thermodynamics," the first Sadi Carnot, and was by profession an engineer. He was educated at the École Polytechnique and the École des Ponts et Chaussées, Paris, graduating at both with high distinction. He was immediately assigned to duty in the engineer corps and given tasks of considerable importance, which were admirably performed. His first active service was performed during the siege of Paris, 1871, when he was made Prefêt de la Seine-Inférieure, and discharged the duties of commissary-general under peculiarly trying circumstances with marked success. He took part in all important works of defense, and distinguished himself as much by his knowledge of the art of war as by his gallantry in the face of the enemy. He was a republican, and earnest in his republicanism. He was elected to the National Assembly in 1871 by the Côte-d'Or, and immediately became prominent in its discussions. In 1876 he became the secretary of the Chamber of Deputies, taking his seat as member for Beaune; became Secretary of Public Works in 1878, and there had ample scope for his engineering and constructive talent. He was promoted to the ministry of Public Works in the cabinet of 1881–82; made Minister of Finance in 1882 and again in 1886, with Brisson as Premier; and on the resignation of M. Grévy was elected by the Legislature, Dec. 3, 1887, to fill the president's chair.

In his message of Dec. 12 he outlined a policy of practical reforms, economical administration, peace with foreign nations, and the promotion of the efficiency of the army and navy—a policy which he followed with fidelity and success throughout his administration. He had many difficulties to contend with in the hostility of the different factions. The supporters of Boulanger, the socialists, and the anarchists were the most disturbing elements in the state, but he won the confidence of all conservative republicans. The attempt of his enemies to involve his name in the Panama scandal proved an utter failure. On the night of June 24, 1894, while attending an exposition at Lyons, he was stabbed by an Italian anarchist and died the following day. His successor in office was M. Casimir-Périer. R. H. Thurston.

Carnot, Nicholas Leonard Sadi: "founder of the modern science of thermodynamics"; b. June 1, 1796, in the smaller Luxembourg, where his father, the genius of the army in the days of the consulate, was living as member of the Directory. A year later they were obliged to flee in consequence of proscription. The boy, delicate in constitution and affected still more seriously by the vicissitudes of the life which his mother was compelled to lead, continued weak in body, but grew rapidly in power and strength of mind. His father returned to France during the consulate of Napoleon, and was made Minister of War, the child thus being brought into Paris, where he was educated, in part, in the presence of Napoleon. He was admitted to the Polytechnic School at sixteen in the year 1812. Two years later he left the school with the rank No. 6, and was sent into the field to engage in work on fortifications. In 1819 he was made a member of the staff, where he found large opportunities for scientific study, and devoted himself to it with enthusiasm and success. The outcome of this work was a small but now famous book, *Réflexions sur la puissance motrice du feu*, the first of modern works on thermodynamics, the science of heat and work transformations. In this little treatise, as subsequently brought to light by Sir William Thomson, Carnot anticipates all the great discoveries and principles of science of the later thermodynamists Rankine and Clausius, including the common efficiency of all working substances, the constant values of the specific heats, the thermodynamic cycle, and the idea of its reversibility. He even computed a rough measure of the "mechanical equivalent" of heat, and asserted the unchangeability of the aggregate energy of the universe and its transformability. He recognized the modern theory of the nature of heat-motion, but based his work on the older material theory in deference to the views of the scientific men of his time. Carnot's studies were interrupted by the revolution of 1830, into which he entered with enthusiasm. D. of cholera in Paris, Aug. 24, 1832. See *Réflexions sur la puissance motrice du feu* (Paris, 1824); also a translation by the writer (New York, 1890). R. H. Thurston.

Caro, kär'ō: capital of Tuscola co., Mich. (for location of county, see map of Michigan, ref. 6–J); on Mich. Cent. R. R. (Bay City Div.); on Cass river; 100 miles by rail N. N. W. of Detroit. Caro has five churches, new central school, new city-hall, flouring-mills, lumber and stave factories, water-works supplied by springs, and electric lights. The chief industries of the surrounding region are agriculture and stock-raising. Pop. (1880) 1,282; (1890) 1,701; (1900) 2,006.

Editor of "Tuscola County Advertiser."

Caro, kaa'rō, Annibale: b. in 1507 at Citta Nuova, near Ancona, Italy, in the Papal States; was for several years a tutor in the family of Lodovico Gaddi; entered after the latter's death (in 1543) the service of Lodovico Farnese, a natural son of Pope Paul III., and since 1545 Duke of Parma and Piacenza; accompanied in 1548 Cardinal Alessandro Farnese to Rome, where he died in 1566. His works occupy a foremost place in the Italian literature of the sixteenth century. They comprise a translation of the *Æneid*; *Rime* (1569); *Lettere familiari* (2 vols., 1572–75), etc. A collected edition appeared in 1757 in six volumes.

Caro, kär'ō', Elme Marie: French philosopher; b. in Poitiers, Mar. 4, 1826; lecturer in the École Normale of

Paris 1857; professor at the Sorbonne 1867; member of the French Academy 1876. His lectures in defense of Christianity were very popular, especially with women. Author of *L'Idée de Dieu et ses nouveaux Critiques* (7th ed. 1883); *La Philosophie de Goethe* (2d ed. 1880); *Le Matérialisme et la Science* (4th ed. 1883); *Études Morales sur le Temps présent* (4th ed. 1879); *Mélanges et Portraits* (1888). D. July 13, 1887.

Car'ob, or **Algaro'ba** [Arabic, *kharoob*]: a tree (*Ceratonia siliqua*) of the family *Leguminosæ*; a native of the countries around the Mediterranean. It has pinnate, evergreen leaves, with two or three pairs of large oval leaflets.

Carob.

The fruit is a brown pod, 4 to 8 inches long, having a fleshy or mealy pulp of an agreeable taste, which is extensively used as food by the Arabs, Moors, and Italians. This fruit or pod is supposed to be the same as the article translated "husks" in the parable of the Prodigal Son; and it is thought by some that the locusts eaten by John the Baptist were these pods. They are exported to Great Britain and the U. S. under the name of locust-beans; also called "St. John's bread." The wood of the carob is hard and valuable.

Caroli'na Mari'a: Queen of Naples; b. Aug. 13, 1752; a daughter of Francis I. and Maria Theresa of Austria. She was married in 1768 to Ferdinand, King of the Two Sicilies, over whom she obtained great influence. She persuaded him to join the coalition against Bonaparte, who expelled King Ferdinand from his kingdom in 1806. D. in Vienna, Sept. 8, 1814.

Carolina, North: See North Carolina.

Carolina, South: See South Carolina.

Car'oline Ame'lia Elizabeth: Queen of England; b. May 17, 1768; a daughter of the Duke of Brunswick and a niece of George III. of England. She was married in 1795 to the Prince of Wales, afterward George IV., who regarded her with aversion, and separated from her soon after the birth of their daughter, the Princess Charlotte. On the accession of George IV. in 1820 she was prosecuted on a charge of adultery, was defended by Mr. Brougham, and was not convicted. D. Aug. 7, 1821.

Caroline Books, The (*Libri Carolini*): exercised a decisive influence—at least so far as the Latin Church was concerned—on the settlement of the question of image-worship. The second synod of Nicæa (787) declared in favor of images, and Pope Adrian I., who had participated in the synod, accepted its decrees and communicated them officially to Charlemagne and the Frankish Church. Charlemagne, however, who at that moment was not on good terms with the Byzantine court and suspected the pope of playing false, determined to have not only the authority of the synod, but also the orthodoxy of its decrees thoroughly scrutinized by his own theologians; and the result of that scrutiny was the *Libri Carolini*. The work is divided into four books, or 120 chapters, and contains a very sharp criticism of the synod and its decrees. The principle which it tries to establish is this: Christian art must have full freedom in its representation of Christian ideas, but any superstitious misuse of such artistic creations must be rigidly excluded. It was sent to the pope, who received the rebuke with complete submission, and the further decisions of the synods of Frankfort (794) and of Paris (825) were based on it. The best edition of the work is that by Heumann (Hanover, 1731).

Caroline Islands: an archipelago of Micronesia; situated between the Philippines, the Ladrones, the Marshall islands, and New Guinea, and extending from lat. 3° 5′ to 12° N. (see map of World, ref. 5–C). Area, 560 sq. miles. They number about 500 islands. The greater portion of the inhabitants are of the Malay race. The islands were discovered in 1543, and named after Charles V. The Spaniards always claimed them as forming part of the Philippines. In 1885 the Caroline islands were claimed by Germany. The sovereignty of Spain over these islands was decided by the pope the same year, and admitted by Germany and Great Britain. Pop. 36,000.

Carolus-Duran, kăr'ō-lŭs-dü'raăn, Auguste Émile: painter of portraits and of figure subjects; b. at Lille, July 4, 1837; pupil of Souchon. He is universally known as Carolus-Duran, but his family name was Durand, and he was christened Charles A. E. His portraits of women are brilliant and are much in fashion. He is a painter of great technical skill and a colorist of genuine merit. One of the best of his portraits, the *Lady with the Glove* (1869), is in the Luxembourg Gallery, and a ceiling representing *The Triumph of Marie de Medici* is in the Salle Beauvais in the Louvre. He greatly admires Velasquez, and his own work possesses some of the qualities that distinguish the work of that great master, though not comparable to them in artistic value. He received the medal of honor at the Salon of 1879, and was created commander of the Legion of Honor in 1889. A number of contemporary American artists have been his pupils in his painting-school in Paris. He is a sculptor of considerable ability and a talented musician. Studio in Paris. William A. Coffin.

Carom: See Billiards.

Caron, Sir Joseph Philippe Réné Adolphe: Canadian statesman; b. in the city of Quebec in 1843. He graduated at McGill University in 1865; was admitted to the bar the same year, and became a member of the law firm of Andrews, Caron & Andrews, Quebec. He was elected to the Dominion Parliament in 1873, and to each succeeding Parliament up to and including that of 1891. He was appointed Minister of Militia Nov. 9, 1880, a cabinet appointment which he held up to Jan. 25, 1892, when he was appointed Postmaster-General. He was knighted in 1885, in recognition of his services in suppressing the Northwest rebellion. Neil Macdonald.

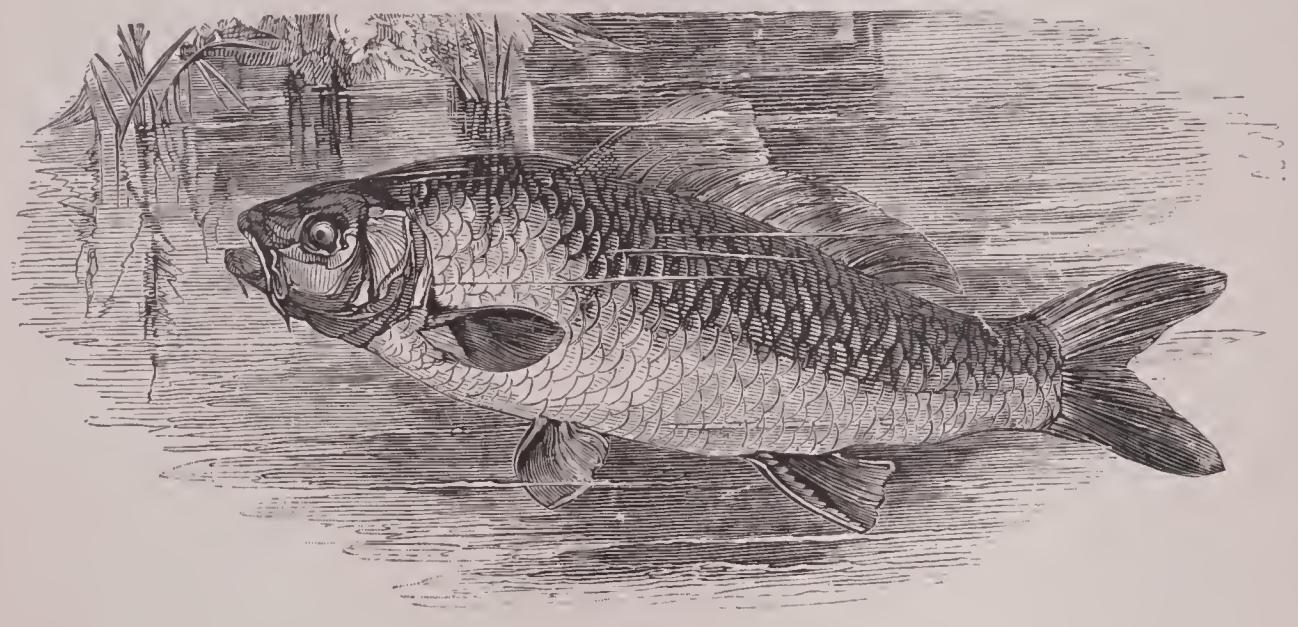
Carot'id Ar'tery [Gr. καρωτίδες, the carotid arteries, from καροῦν, to stupefy, because pressing upon them produces sleep (κάρος)]: the large artery which lies at the side of the neck and supplies blood to the head and brain. On the right side the primitive or common carotid artery is one of the branches of the innominate artery which springs from the arch of the aorta. On the left the common carotid springs directly from the arch of the aorta. Opposite the upper part of the larynx the common or primary carotid artery divides into an external and an internal branch, the former supplying the tissues of the neck, face, tongue, and other external parts with blood, the latter entering the cranium through the carotid canal and supplying the membranes and substance of the brain. The common carotid and the branches at their origin are comparatively superficial and may be readily felt. They may be wounded in stabs and in attempted suicide, though in the latter case the wound rarely penetrates deep enough to injure this vessel.

Frequently the carotids pulsate vigorously and visibly, especially in certain forms of heart disease and in anæmic persons. Aneurism of the carotid artery is occasionally observed, and has called for the operation of Ligation (*q. v.*). The circulation in the brain is not materially interfered with by it, on account of the free anastomosis of the smaller branches with those from the carotid artery on the other side. W. P.

Carouge, kaä′roozh′: a town of Switzerland; canton of Geneva; on the river Arve; 1½ miles S. of Geneva; beautifully situated, and surrounded by elegant villas and orchards (see map of Switzerland, ref. 7–A). It has manufactures of watches, leather, pottery, and thread. Pop. (1888) 5,703.

Carp (*Cyprinus carpios*): a fresh-water fish of the family *Cyprinidæ*; distinguished by its toothless jaws, its fleshy lips and small mouth with four barbels on its upper jaw, its stout teeth on the pharyngeal bones, its olive-brown color above shading off into yellow below, its excellence for food, the ease with which it is propagated, and the variety of conditions under which it will thrive. It will live for days with no other water than that afforded by wet moss, and it is said to attain at times to the age of 200 years. A carp weighing 10 lb. was found by Schneider to contain no less than 700,000 eggs. It thrives best in the quiet waters and soft, muddy bottoms of the southern temperate zone, though is is found in all the countries of Northern Enrope and in America, and is a favorite fish in China. The weight at five years old is from 3 to 6 lb. It is now becoming abundant in the lower Sacramento, where it has fallen under the displeasure of hunters and sportsmen, because it feeds upon and destroys the water-celery which makes a large part of the food of the canvasback-duck, and upon which the delicate flavor of that bird is supposed to depend.

Carp-culture.—The culture of carp for food has long been a very important industry in many parts of the world. This fish is common not only in most of the large rivers of South-



The carp.

ern and Central Europe, but has been grown in artificial ponds with extraordinary success. In point of ease of culture, rapidity of growth, and excellence of quality for the purposes of food, the carp has no superior. In the great cities of Central Europe, such as Vienna, Berlin, and Paris, where there is an abundant supply of the differents kinds of salt-water and fresh-water fish, the carp is a favorite, and, if we except trout and salmon, commands ordinarily a higher price in the market than any of the others. In addition to its excellence in point of quality it must be considered as one of the most important food-producers from an economic point of view. It destroys no valuable food matter, for its food consists for the most part of produets of nature whieh could not otherwise be of use. It is so easily satisfied with the soil and water in which it grows that it can easily be raised almost anywhere, and it grows so rapidly that under good management it brings a prompt and profitable return for the investment.

History and Varieties.—The carp, it is supposed, was originally introduced into Europe from Central Asia. But whatever its origin, it is now common in most of the rivers of Europe, and in many parts, especially in Austria and in Southern, Central, and Northern Germany, it has been domestieated by means of artificial culture. In Austria, where there are the most extensive carp-fisheries in the world, the culture can be traced back historically as far as the year 1227. A celebrated establishment for the culture of this fish was located early in the fourteenth century in the town of Wittengau in Bohemia. This estate, after suffering much from the Thirty Years' war, passed into the possession of the Princes of Schwarzenberg in the year 1670. At the present time it is said that artificial ponds for the culture of carp in these domains comprise an area of no less than 20,000 acres, with an annual product of about 500,000 lb. Carp are said to have been imported into England in the year 1504, and are now found in very many of the streams and ponds of Great Britain. Of the species most profitably cultivated there are three varieties, popularly known as the *scale-carp*, the *mirror-carp*, and the *leather-carp*. The first of these is characterized by regular, concentrically arranged scales covering nearly the whole of the body. The mirror-carp is so named on account of the extraordinarily large, brilliant scales which run along the sides of the body in three or four rows, leaving the rest comparatively bare. The leather-carp has on its back only a few scales or none at all, and is covered with a thick, soft, velvety skin. All three of these varieties are suitable for culture. Though the scale-carp is perhaps the most popular in market, the others are equally good for food, and the leather-carp has the advantage of being less liable to injury in transportation. The breaking of the scales from any aeeidental eause is liable to injure the fish so seriously as to produce its death. These species of carp are frequently crossed with related species, the result generally being the production of an inferior fish; and in stocking new ponds care should be taken to ascertain the genuineness of the species offered. There is a very common cross between the genuine carp and what is known as the Crucian carp, resulting in a very poor and bony fish which in Germany is often called the "poor man's carp." It should be well understood that sueeess in earp-culture depends very largely upon the care with which varieties are selected.

Adaptability to Artificial Culture.—For carp-culture it is of the greatest advantage that this fish is able to live and thrive in waters where other fish could not possibly exist—for example, in the pools of bogs and sloughs. The earp lives upon vegetable food as well as upon worms and larvæ of aquatic insects which it finds in the mud. It is easily satisfied with refuse from kitchens, slaughter-houses, and breweries, and even with the excrement of cattle and pigs. Added to these advantages is the fact that it takes no food from about the first of October until about the end of March. During this period each year it hibernates, and, though it eats nothing whatever during its winter sleep, it does not diminish in weight. In summer it grows rapidly. In the month of May a carp two years old increases in weight under good conditions about 15 per cent., while in June its increase is about 33 per cent., and in July about 36 per cent. If the weather is not unusually cold, a carp may be eounted upon to increase during the second year of its growth by about 110 per cent., reaching a weight at the third year of its age of about 3 or 4 lb. Under favorable conditions the fish grows steadily year by year until it reaches 15 or 20 lb., although the growth after the fifth or sixth year is less rapid than before. Carp weighing from 40 to 60 lb. each have been taken in some of the waters of Europe. These, however, are so unusual as to attract very general attention. The longevity of the fish is remarkable, individual specimens having been known to live more than 140 years. Not less remarkable is its extraordinary rate of inerease. A fish weighing from 4 to 5 lb. contains, it is said, on an average from 400,000 to 500,000 eggs. The eggs, after being deposited, develop themselves rapidly if assisted by warm water. About the twelfth or, at the latest, the fifteenth day the embryo fish breaks through its envelope. In colder waters as many as twenty days are sometimes required. The carp prefers stagnant or slowly running waters

with a muddy bottom, so that it can avail itself of aquatic plants as well as of seeds, worms, and the larvæ of water insects. It does not attack other fishes, and therefore on account of its harmlessness is an excellent fish for the culturist as well as for stocking large lakes and rivers in general.

Localities Adapted to Culture.—A rocky, gravelly ground is not advantageous for carp; neither is a sandy ground, unless it has with it a considerable admixture of clay and loam. A ground that contains some marl or some of the elements of humus is of the greatest advantage. The most successful carp ponds of Europe ordinarily have a yellow, muddy color, from the fact that the constituents of humus have been dissolved, and thus support a profuse number of microscopic beings which are consumed by larger creatures, thus becoming adapted to the wants of carp. While the humus of a mucky soil in sufficient quantity is desirable, too much is found to be injurious. Water running through boggy meadows or oak woods contains too much humic acid and tannin, and therefore is not advantageous. Mineral waters must also be avoided. The most favorable situations are those offered by rivers and brooks that have run through fertile fields and meadows, carrying with them the drainage of farms and villages. Spring water direct from the ground is not favorable. A stream running for a considerable distance through a low, undulating country, with only slight elevations or hills, where small valleys by means of dams are converted into ponds, gives the most favorable opportunities for the successful culture of carp. Where the business of carp-culture has been undertaken on a large scale it has been found that four different ponds are desirable: (1) a spawning-pond; (2) a raising-pond; (3) a stock-pond; and (4) a winter-pond. All the necessary details in regard to the construction of artificial ponds may be found in the publication of the U. S. fish commissioner entitled *Pond Culture*, by Carl Nicklas (Washington, 1886). See also *The Carp: its Culture in Rivers and Lakes, and its Introduction into America*, by Rudolph Hessel (Washington, 1881). C. K. Adams.

Carpa'thian (or **Karpathian**) **Mountains** (in Germ. *Karpathen*; anc. *Carpates*): a long curvilinear range of mountains, chiefly in the Austrian empire. It separates Hungary from Galicia, and Transylvania from Moldavia and Wallachia, and is nearly in the form of a semicircle, one end of which meets the Danube at Presburg and the other touches the same river at New Orsova. This chain, which is about 800 miles long, is divisible into two portions, called the Eastern and Western Carpathians, the latter of which extends along the north border of Hungary. The highest points of the Eastern Carpathians, which are of primitive formation, are Negui, 8,573 feet, and the Kuhhorn, 7,303 feet. Among the Western Carpathians the Eisthalerspitze rises 8,875 feet above the sea. Many of the Hungarian mountains are formed of limestone. The sides of the Carpathians are mostly covered with forests of pine, beech, and other trees. The vegetation presents four zones—that of the beech, to 4,000 feet above the sea; that of the Scottish fir, to 5,000 feet; that of the dwarf-pine; and that of the moss. Minerals, including gold, silver, copper, iron, and quicksilver, are abundant.

Carpeaux, kaär'pō, Jean Baptiste: sculptor; b. in Valenciennes, France, in 1827. He established his reputation in 1863 by the group *Ugolino and his Children*. His most celebrated works are a group representing *The French Empire spreading Light over the World, and protecting Agriculture and Sciences*, made for one of the pediments of the Flora Pavilion of the Tuileries in 1865, and another representing *La Danse*, made in 1869 for the New Opera. He was one of the most prominent representatives of the naturalistic school. D. Oct., 1875.

Carpel [from Gr. *καρπός*, fruit]: an ovule-bearing leaf in the cover-seeded flowering plants (*Angiosperms*), constituting the pistil, wholly or in part. When the pistil is composed of one carpel it is simple, but more commonly two or more carpels are united, the result being a compound pistil. Pistils are thus monocarpellary (as in beans), bicarpellary (as in mustard), tricarpellary (as in lilies), tetracarpellary, etc.

Carpenta'ria, Gulf of: a broad and deep indentation of the north coast of Australia; a portion of the South Pacific Ocean. It extends from Cape Arnhem to Cape York, and is about 500 miles long from N. to S. and 350 miles wide. It is mostly included between lat. 10° 40′ and 17° 30′ S., and between lon. 138° and 142° E. Its shores are generally low. It incloses numerous islands. It is visited by vessels for the *bêche de mer* which is found in its waters. It was named in honor of Peter Carpenter, who from 1623 to 1627 was governor-general of the Dutch possessions in the East Indies. It has been explored by Cook (1770); Flinders (1802); Stoke (1841); Leichardt (1845); Gregory (1856); Landsborough (1861–62); and McKinlay (1862).

Carpenter, Charles C.: naval officer; b. in Greenfield, Mass., Feb. 27, 1834; entered the navy as a midshipman Oct. 1, 1850. He was executive officer of the Catskill in the attacks on the forts of Charleston harbor of Apr. 7 and July 10, 1863. In command of navy-yard, Portsmouth, N. H., Apr., 1892. Retired as rear-admiral in 1896. D. Apr. 2, 1899.

Carpenter, Francis Bicknell: portrait-painter; b. at Homer, N. Y., Aug. 6, 1830. Began the study of painting under Sanford Thayer in Syracuse, N. Y., in 1844; associate National Academy, New York, 1852. His portrait of President Fillmore is in the City Hall, New York; that of President Lincoln in the Capitol at Albany; and his *Emancipation Proclamation*, painted in 1864, is in the Capitol at Washington. He was the author of a book called *Six Months in the White House with Abraham Lincoln*. D. in New York city, May 23, 1900. William A. Coffin.

Carpenter, Joseph Estlin, M. A.: English Unitarian scholar; b. in Ripley, Surrey, England, Oct. 5, 1844; educated at University College, London, and at Manchester New College (now at Oxford); vice-principal Manchester New College, Oxford; author of *Life and Work of Mary Carpenter* (1879); *The First Three Gospels* (1890); editor of *Ewald's History of Israel, vols. iii., iv., v.* (1871–74); translator of Tiele's *Outlines of the History of Religion* (1877); joint editor with Prof. T. W. Rhys Davids of the *Sumaṅgala Vilāsini*, vol. i. (1886); and the *Dīgha Nikāya*, vol. i. (1889). Prof. Carpenter's rank is with the highest as a Sanskrit scholar and New Testament critic.

Carpenter, Lant, LL. D.: theologian; b. in Kidderminster, England, Sept. 2, 1780. He studied in Glasgow College and entered the ministry in 1801. He published an *Introduction to the Geography of the New Testament* (London, 1806; 5th ed. 1824) and *Unitarianism, the Doctrine of the Gospel* (1809; 3d ed. Bristol, 1823). In 1817 he became minister of a Unitarian church at Bristol. He was a man of the most saintly character and philanthropic spirit, and he bequeathed the latter in full measure to his daughter, Mary Carpenter. The distinguished scientist Dr. William B. Carpenter was his son, and his son Philip was a Unitarian minister of unique ability and the loftiest spirit. See his *Life* by R. L. Carpenter (Bristol, 1842). He was drowned Apr. 5, 1840, in the passage from Naples to Leghorn.

Revised by J. W. Chadwick.

Carpenter, Louis G., C. E.: irrigation engineer; b. Mar. 28, 1861, at Orion, Mich.; graduated from the Michigan Agricultural College 1879, where he became Instructor and Assistant Professor of Mathematics and Engineering; pursued graduate studies at the University of Michigan and at Johns Hopkins University; Professor of Engineering at the Colorado Agricultural College, and meteorologist and irrigation engineer on the Agricultural Experiment Station 1888; organized the first course in irrigation engineering given in any American college; was special agent for Colorado and New Mexico in the congressional investigation relating to artesian wells 1890; founded the American Society of Irrigation Engineers 1891; member of the British Association for the Advancement of Science, fellow of the American Association for the Advancement of Science, etc.

Carpenter, Mary: eldest child of Lant Carpenter; b. in Exeter, Apr. 3, 1807; devoted her life to the elevation of the degraded and criminals both in England and India with singular energy and success. Her attention was first called to India by Rammohun Roy, the predecessor of Keshub Chunder Sen; and to the needs of the ragged urchins at home by Joseph Tuckerman (*q. v.*), the Boston philanthropist. In 1835 she began to work in earnest, and for twenty years was secretary of a "working and visiting society" in Bristol. She opened a reformatory school at Kingswood 1852, and a separate school for girls in Bristol 1854 (the famous Red Lodge). In 1866 she made her first visit to India, going again in 1868, 1869, and 1875. As results there have been many improvements in the jails and reformatory schools; also in the condition of women. She visited America in 1873. She published valuable books upon her chosen fields: *Reformatory Schools for the Children of the Perishing and*

Dangerous Classes (London, 1851); *Juvenile Delinquents, their Condition and Treatment* (1853); *Our Convicts* (1864; 2 vols. on the *Index Expurgatorius* of the Roman Catholic Church); *Six Months in India* (1868, 2 vols). See her *Life* by J. Estlin Carpenter, 1879. D. June 15, 1877.

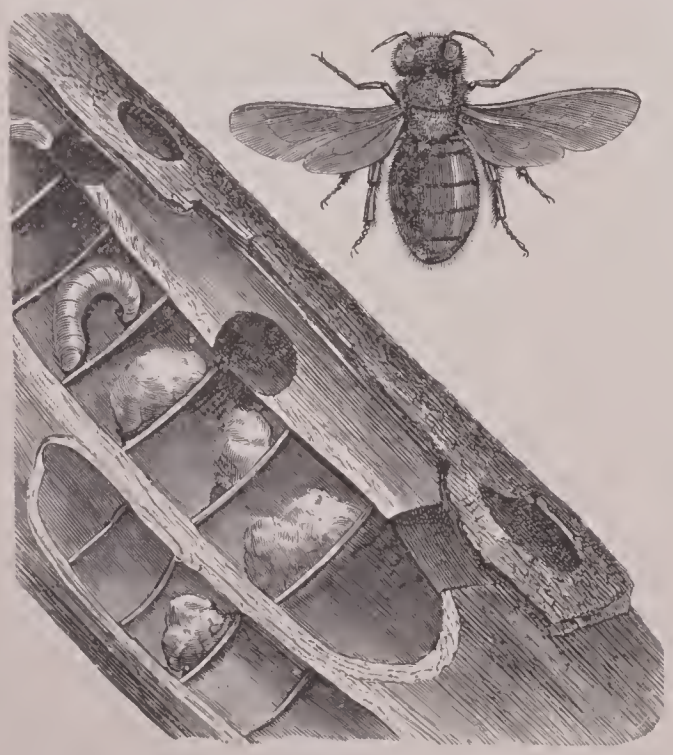
SAMUEL MACAULEY JACKSON.

Carpenter, WILLIAM BENJAMIN, M. D., LL. D., F. R. S.: physiologist; son of Dr. Lant Carpenter; b. in Exeter, Oct. 29, 1813; studied medicine and graduated as M. D. in Edinburgh in 1839. In the same year he published an important work entitled *Principles of General and Comparative Physiology*. His reputation was widely extended by an excellent work called *Principles of Human Physiology* (1846). This has gone through nine editions, and is considered by many to be the best work extant on that subject. He became Professor of Medical Jurisprudence in University College, London, and for many years edited the *British and Foreign Medico-chirurgical Review*. Among his works are *Zoölogy and Instincts of Animals* (2 vols., 1857); *The Microscope* (6th ed. 1881); and *Nature and Man* (1888). He had few living equals in acquaintance with natural science, capacity for original inquiry, and skill as a scientific writer. Some of his latest investigations have been in regard to oceanic currents. He was president of the British Association for the Advancement of Science in 1872. D. from accidental causes Nov. 19, 1885.—His son, PHILIP HERBERT, b. in London, Feb. 6, 1852, d. in London, Oct. 22, 1891, was educated at Eton and Cambridge; gave especial attention to deep-sea life; fellow of the Royal Society; worked on the U. S. survey in the Caribbean seas.

Carpenter, WILLIAM BOYD, D. D., D. C. L.: Bishop of Ripon, Church of England; b. in Liverpool, Mar. 26, 1841; graduated B. A. at Cambridge 1864; became bishop 1884. His publications consist mostly of discourses, but they include the Hulsean lectures, *The Witness of the Heart to Christ* (London, 1879), and the Bampton lectures, *Permanent Elements of Religion* (1889).

Carpenter, WILLIAM HENRY, Ph. D.: philologist; b. at Utica, Oneida co., N. Y., July 15, 1853; educated at Utica Academy, Cornell University, Leipzig, and Freiburg; Ph. D., Freiburg in Baden; fellow, by courtesy, Johns Hopkins University 1881–83; instructor in Rhetoric and lecturer on North European Literature at Cornell 1883; instructor in German and the Scandinavian Languages, Columbia College, New York, 1883–89; assistant professor 1889–90; and adjunct Professor of Germanic Languages and Literatures 1890. He has published *Grundriss der Neuisländischen Grammatik* (Leipzig, 1881); *Nikolas-drapa Halls Prests*, an Icelandic poem from A. D. 1400 (Doctor's dissertation; Halle, 1881).

Carpenter-bee: the popular name of hymenopterous insects of the bee family, which show great skill in working



Carpenter-bee.

wood. These insects, including some of the true bees, mostly inhabit warm countries. Perhaps the most celebrated of the tribe is the *Xylocopa violacea* of Southern Europe, a beautiful insect of a rich blue color, about the size of a large humble-bee. It attacks dry wood, especially when partly decayed, cutting a longitudinal canal about a foot deep and more than a third of an inch wide. After finishing one of these canals, it lays an egg at one extremity of the hole, and places near it a mass of pollen and honey as food for the future larva. The egg and its accompanying store of food are then hermetically sealed up by a thin wall composed of powdered wood, formed into a very hard compound by being mixed with a substance secreted by the insect. In this manner the mother bee divides her house into many little chambers with one egg in each. In due time the eggs hatch, each of the larvæ devours the food prepared for it, and then passes into the chrysalis state. At last, when the perfect insects are developed, they destroy the partitions made by the parent bee, and escape into the air; the one produced from the egg first laid escaping first, through an opening made for it by the mother, and the others following in order. The genus is also American. See BEE.

Carpentras (anc. *Carpentoracte*): a town of France; department of Vaucluse; on the river Auzon; 15 miles by rail N. E. of Avignon, and near the base of Mont Ventoux (see map of France, ref. 8–H). It is surrounded by walls which were built about 1365, and are flanked by towers, and is mostly well built. It has a Gothic cathedral, part of which was erected in the tenth century, and a public library of 25,000 volumes, containing also a large collection of medals and antiquities; also manufactures of cotton and woolen fabrics, brandy, etc. Here are remains of a Roman triumphal arch. Pope Clement V. removed the papal court to this town in 1313. Pop. (1896) 10,797.

Carpentry [deriv. of *carpenter*, viâ Norm. Fr. from Lat. *carpenta'rius*, carriage-maker; deriv. of *carpentum*, carriage, a word of Celtic origin]: the art of building structures in wood; and more especially the construction of wooden buildings, wooden bridges, and the framings of heavy machines. The labors of the carpenter are necessarily directed by some knowledge of the forces which may be brought to act upon the structure when completed; that is, by some knowledge of the principles of engineering.

The lesser and lighter works of wood, such as furnish the interiors of dwellings, are the products of another branch of labor, termed *joinery*.

The skill of the carpenter is directed toward giving two distinct qualities to the structures he builds—viz., *strength* and *rigidity* or stiffness. The first is secured mainly by *dimensions* assigned to the different parts, and the skill with which these parts are united; and the latter depends upon the *arrangement* of the several members.

Strength.—Timbers designed for structures are subjected to one or more of the following varieties of stress: transverse, tensile, compressive. A transverse stress is a force applied to a beam in a direction more or less perpendicular to its length; the timbers of a floor afford examples. A tensile stress is one that tends to elongate, and a compressive stress one that, acting in the direction of the length of the member, tends to shorten or crush it.

When the entire structure is of such dimensions that each member of it may be formed of a single stick of timber, the work of the artisan is comparatively simple, and is guided by plain and brief rules. But when by reason of the size of the entire work single parts are required of greater dimensions than can be supplied by single pieces of timber, then skillful joining of smaller parts must be relied upon to meet the emergency. Now, to so combine separate pieces of timber as to form a single member, and thereby employ the available strength of the component parts, at the same time to form such a connection with adjacent portions of the structure as to transmit properly the force assigned to the position, is to apply in the fullest sense the science of carpentry.

It may be remarked here that even in our most important bridges no special effort is made to secure solid timbers for the larger members, because the quality of thorough soundness can be more easily secured by a judicious selection of smaller parts, and then a proper combination can be made to insure the requisite strength.

When a beam is subjected to transverse stress the fibers upon the side that tends to become convex under the action of the strain are subjected to a tensile or pulling force, while upon the opposite side they are at the same time compressed. It becomes evident upon slight reflection—first, that the extreme upper and lower fibers are most severely strained;

and second, that the central portion of the stick is acted upon by forces comparatively slight. The obvious conclusion is that the portions of the timber most actively engaged in sustaining the force are those at the greatest distance from the middle of its depth, and consequently that beams acted upon by transverse forces should present considerable width in the direction of the bearing force. It is easily demonstrated that the strength of a beam of given length and breadth, to bear a weight between two supports, varies as the square of the depth of the beam. Floor-beams are accordingly made narrow and deep.

To secure depth of beam without employing material which is comparatively of little use the method has been employed of joining two sticks by blocks and bolts, as shown in Fig. 1.

It will readily be seen that the condition of providing material where the strains are greatest has been secured,

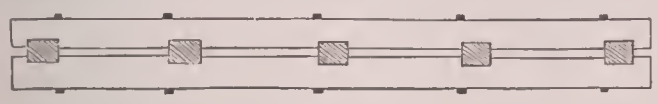


Fig. 1.

provided the combination when under strain acts as a single stick. The plan fails when through want of secure bolting there is any motion among the component parts. The chances of failure increase very rapidly as the halves of the compound beam are separated by larger space, as the point is soon reached where each half acts like a simple beam. Compound beams are most frequently made in the simple manner shown in Fig. 2.

The most common way of re-enforcing the strength of a simple beam is by the addition of iron rods, as shown by

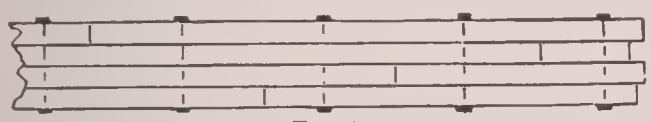


Fig. 2.

Fig. 3. The consideration of such a combination belongs to the subject of *trusses*.

When a stick of timber is employed so as to resist a tensile force the manner of connecting it with the portions of

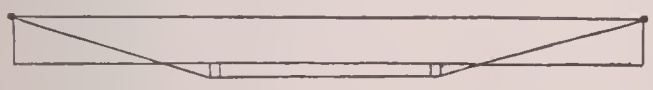


Fig. 3.

the structure through which or to which the force is to be transmitted becomes a matter of great importance. In the case of an iron rod, which can be furnished with a head, an eye, or a nut, the problem of attaching it so as to resist a tensile force is easily solved; but when the conditions require a wooden *tie-beam*, the problem of uniting the various parts so that the strength of the stick shall not be too largely sacrificed requires consideration, because to join timbers implies more or less cutting of their substance, and this in turn sacrifices material.

In the common king-post truss, as the combination represented in Fig. 4 is termed, the methods of uniting parts that fulfill different functions are employed. This truss is frequently employed in roofs, and also bridges of moderate span. In the latter case the flooring is sustained by the horizontal member or tie-beam; a large portion of the weight sustained is transmitted through the upright, and is received by the inclined pieces or *struts* and conveyed to the extremities of the tie-beam. The tie-beam and post are thus subjected to tensile, and the struts to compressive, strain.

In order that the tie-beam shall properly receive the thrust of the struts, the former must be notched to receive

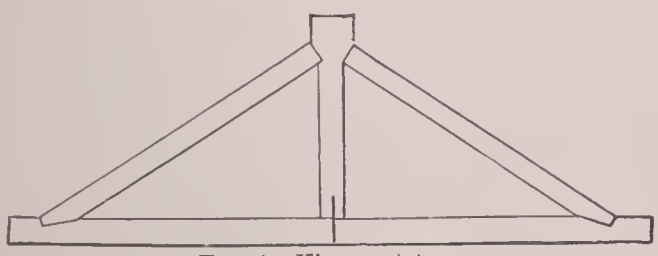


Fig. 4.—King-post truss.

the ends of the latter. Fig. 4 shows the method usually employed; an enlarged view of the ends of the strut and tie-beam is given in Fig. 5. In constructing this truss it is necessary to regard the tendency which the strut exerts to

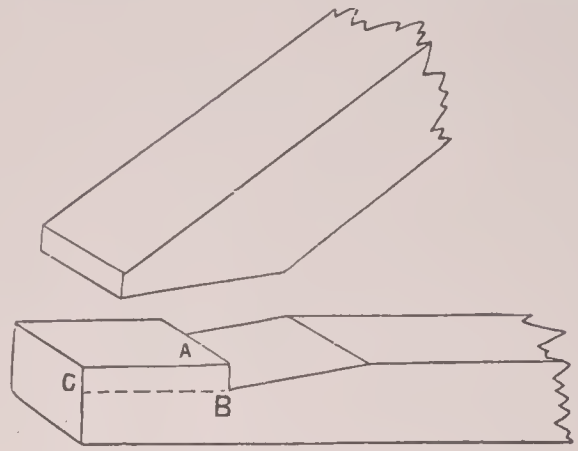


Fig. 5.—View of ends of strut and tie-beam.

split off the portion A B C. It is considered sufficiently secure in most kinds of timber if the length B C is ten times the depth A B, as, when this proportion is observed, the cohesion which resists splitting off is equal to that which resists the crushing of the fibers exposed to the direct pressure on the lesser surface. In modern bridge constructions it is quite common to substitute an iron rod for the upright post in the frame of Fig. 4, and also to employ a cast-iron shoe bolted to the tie-beam to receive the end of the strut.

When the length of the tie-beam is such as to require the uniting of two or more pieces, the skill of the carpenter is again called in requisition to produce such a joint as shall safely resist the forces to be met.

The simplest of all is the so-called *fish-joint* (Fig. 6), the strength of which depends partly upon the few fibers of the

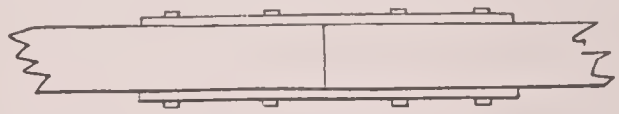


Fig. 6.—Fish-joint.

timber that bear upon the bolts, and partly upon the friction arising from the pressure of the fish-plates. These latter are made of iron, and are furnished with projections that are let or forced into the timber when bolted on.

Another and a common form is the *single-lock joint* or *scarf*, shown in Fig. 7, in which the resistance to direct ten-

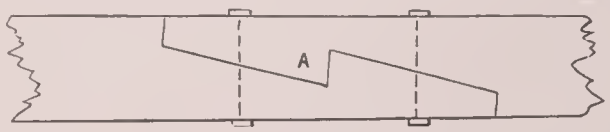


Fig. 7.—Single-lock joint.

sile strain depends upon the surfaces opposed to each other at A, and which may be one-third the sectional area of the beam. A modification of this method of scarfing is exhibited in Fig. 8, in which one-half of the beam is made available in resisting tensile strain, as the joints A and B are each one-fourth of the depth of the beam. The method of Fig. 8 has the advantage over Fig. 7 of greater strength, but it is also far more difficult of construction, as there are two bearing surfaces that must act together; the fitting of the joint therefore requires especial care. This difficulty is sometimes met by leaving spaces at A and B, into which wedges or keys are driven as the scarf is bolted together. Fish-plates are quite commonly used in connection with the methods

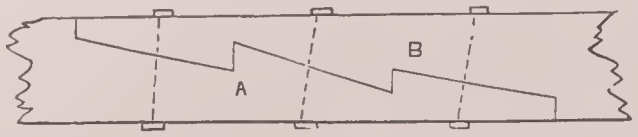


Fig. 8.—Modified single-lock joint.

represented in Figs. 7, 8, and 9. When a scarf-joint is employed in such a place as the lower beam of the frame represented in Fig. 4, the joining would obviously be made at the middle of the tie-beam.

Fig. 9 represents another form of scarf: the *key* at A is made of hard wood, and forced in so as to bring the surfaces of the scarf to a firm bearing. Of course this method of locking can be equally well applied to the methods shown in Figs. 7 and 8.

Many intricate forms of scarfing have been devised, and are exhibited in treatises on carpentry. They belong mostly to the time when but little iron was employed as an adjunct

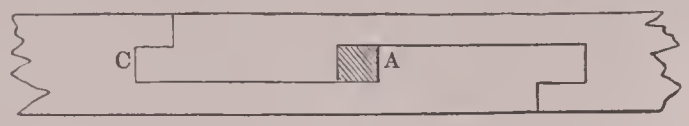


Fig. 9.—Scarf.

to timber construction; and even then most of the elaborate forms were rather fanciful than useful.

When timbers are united to resist thrust or compressive strain only, less skill is required than in the constructions just described. But little more is required than to bring the opposing surfaces fairly together, and secure them by the simplest possible means. Hence the "fished joint" shown in Fig. 6 will fully satisfy the conditions, and will employ the full available strength of the timber. Care must be taken, however, that the joint is not strained by a tendency which is manifested in long columns or struts to bend sideways when under pressure.

When a strut is joined to its neighboring member at an angle, as in the case shown in Fig. 4, the precaution is taken to so form the joint as to present either the whole of the end surface to the end pressure, as in the upper end of the strut of the king-post truss, or a part of it, as in the lower end shown more fully in Fig. 5. To prevent any displacement in such joints through accidental forces, they are secured by various methods, either a bolt, a notch, a tenon, or even a few nails, being employed according to the liability to lateral forces.

The *tenon* employed is exhibited in Fig. 10; the cut which receives it is called the *mortise*.

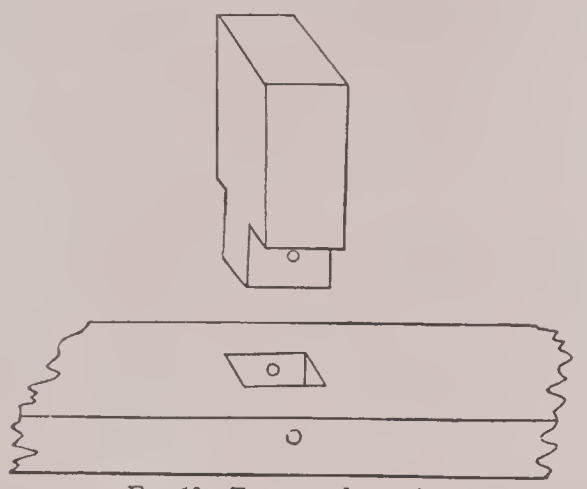


Fig. 10.—Tenon and mortise.

If the joint is liable to be urged by a force tending to pull it asunder, some security is obtained by the use of a stout

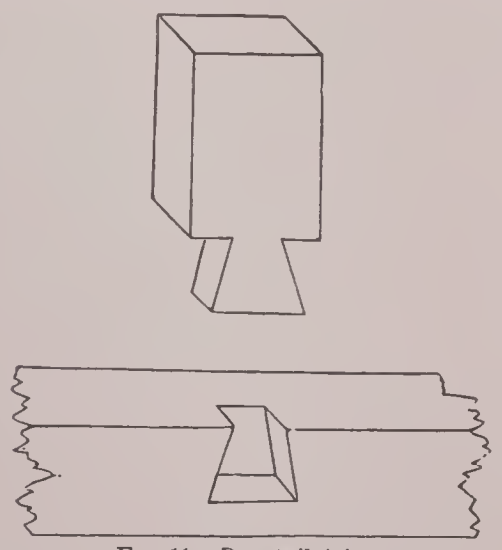


Fig. 11.—Dovetail joint.

pin through the tenon. A dovetail joint is also employed for the same purpose (see Fig. 11). This form is common in joinery.

Rigidity, a quality which was referred to as somewhat distinct from *strength* in structures, is secured by such a disposition of material that no change of form of the entire system can occur without bringing into action the tensile or compressive resistances of certain members of it. A plain square frame, fastened however securely at the corners, may be lengthened and shortened cornerwise without calling into action the strength of the materials of the framing, except such as is concerned in fastening the corners. If, however, a stick be firmly secured to the frame, diagonally across it, no change of form can take place without extending or compressing this added *brace*. A triangular frame will not admit of change of form without a change in the length of at least one of its sides. Hence diagonal braces are important members of timber framings, inasmuch as they insure stiffness or rigidity. The braces are secured by mortising, by iron straps, or more rudely by outside pieces fastened as in the joint in Fig. 6.

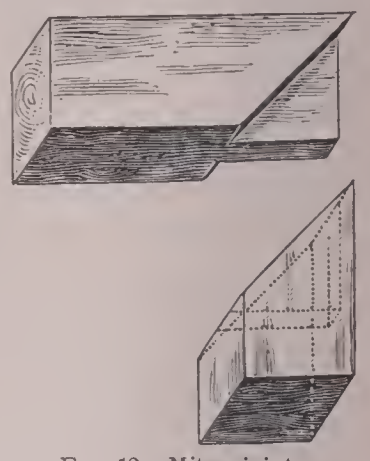
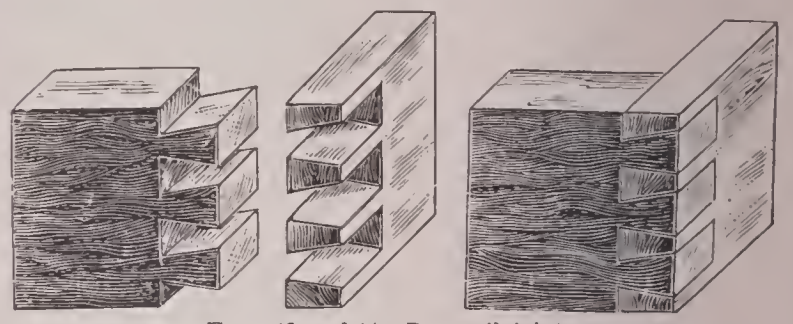


Fig. 12.—Miter joint.



Figs. 13 and 14.—Dovetail joints.

Joinery may be considered here as comprehended under the more general term of carpentry. It is, however, usually restricted to the lighter constructions in wood, such as the subordinate parts of dwellings, especially the interior woodwork and the furniture.

The work of the joiner is directed toward effecting the closest and firmest practicable union between the component parts of constructions in wood. Stiffness is an essential quality in joinery, and it is mainly secured by the more or less intricate method of uniting the parts that meet at an angle. Some of the common forms are shown herewith.

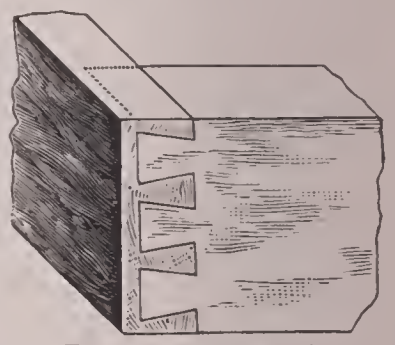


Fig. 15.—Lap dovetail.

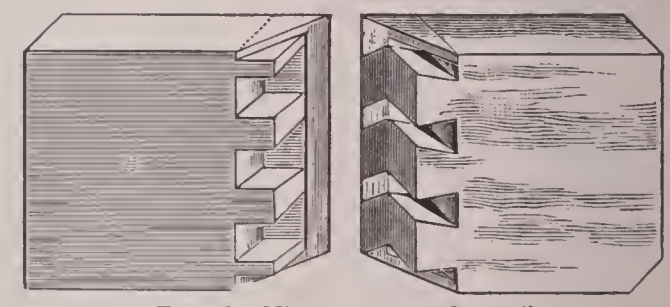


Fig. 16.—Miter or secret dovetail.

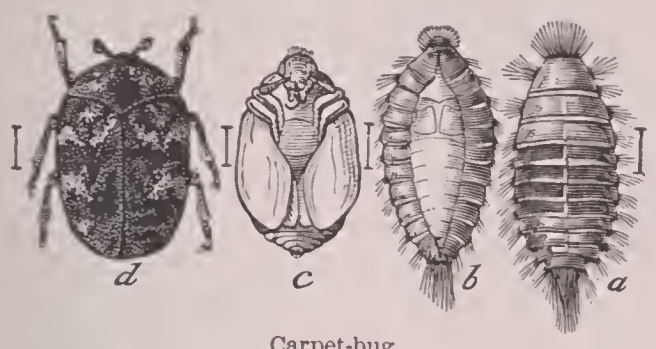
Lap and secret dovetails are employed when it is deemed desirable to partly or quite conceal the form of the joint. See Tredgold's *Carpentry*, by Hurst; also Davidson's *Drawing for Carpenters and Joiners*. Geo. W. Plympton.

Carpet-bagger: a term used in the U. S. to denote an adventurer without property interests in the State where he resided. In the West it has been applied to wildcat bankers. In the South it was used at one time to indicate a man, born and reared in the North or West, who went South with or after the Federal armies, planted himself in one of the States being reconstructed under military rule, who aided in organizing and drilling the Negroes to vote the Republican ticket. Of course the term originated with those of adverse politics, who applied it as a stigma and with considerable looseness, any one not a native of the South being denounced as a

"carpet-bagger" if an active Republican; if "native there and to the manner born," he was termed a "sealawag."

HORACE GREELEY.

Carpet-bug (*Anthrenus scrophulariæ*): a destructive beetle of the family *Dermestidæ*; popularly known as "the new carpet-bug," the name having been given to it when its ravages were first detected in the State of New York in the year 1874 and its difference from the larva of the carpet-



Carpet-bug.

moth observed. Although, if left uncheeked, it overruns houses and preys upon a variety of woolen and some other fabrics, its special home is beneath the borders of carpets, where, in the larva state shown at *a* in the figures (all enlarged), it eats large holes in the carpets, or, following the joinings of the floors, eats in straight lines through entire breadths. The cast skins of the larva, *b*, are found with the living forms in the summer months. The pupa, *c*, is formed in autumn within the split skin of the larva; and the perfect insect, shown at *d*, of a black color, marked with red along the back, and with red and white spots on the wing-covers, emerges in the winter, and may often be taken on the windows of infested rooms in the month of May. It is a very difficult insect to eradicate. Kerosene oil and benzine are probably the most efficient agents for destroying it in its earlier stages. It is of European origin, introduced many years ago into California, and by a later importation into New York. *A. lepidus* (Le Conte) is simply a Western variety of it.

J. A. LINTNER.

Carpets [M. Eng. *carpete, carpette, carpyte*, via Fr. from Ital. *carpita* (: Fr. *charpie*, lint), coarse cloth, or the dimin. *carpetta*; deriv. of *carpi're*, the Romance for Lat. *car'pere*, pluck, pull in pieces]: floor-coverings. The word carpet is by some supposed to be derived from "Cairo," probably because Egypt is the country credited with first using floor-coverings as articles of luxury in her ancient days of splendor.

As a commercial term, "carpet" or "carpeting" is the generic name for the various grades of goods in that line, whatever their material, mode of construction, or technical appellation. The original form of the carpet was that of a large rug, which was spread upon the floor when occasion required; and is still the custom in the East. The modern way of weaving carpeting in long, narrow strips, to be sewn together, doubtless had its origin in the greater convenience and cheapness which that form admits of through its adaptation to the ordinary loom.

Before the invention of the Jacquard loom, however, carpets were either of very simple pattern, or, if elaborate in their designs, necessarily very expensive. The Savonnerie, attached to the ancient royal manufactory of the Gobelins in Paris, has always occupied the first place in regard to artistic perfection. Some of the carpets produced there cost from 100,000 to 200,000 francs, requiring five to ten years for their completion. None of them have been for sale since the year 1791; they have been presented to the different sovereigns of Europe, and are only to be found in the palaces of courts. The invention of Jacquard, so peculiarly adapted to the weaving of various grades of carpets, together with the still more recent improvements in looms, has greatly facilitated the production of carpeting at once beautiful and durable, and at the same time cheap enough for persons of moderate means or economical tastes, so that the use of carpets has probably increased more during the last fifty years than that of any other commodity of equally ancient origin.

The U. S. is by far the greatest producer and consumer of carpets of all the nations of the world.

The principal grades of carpeting known to commerce (leaving out the Gobelins, Turkish, Persian, and others of similar rug-like make) are *Chenille Axminster*, *Wilton*, *Axminster*, *Moquette*, *Velvet*, *Brussels*, *Tapestry Brussels*, *Ingrain* (two or three ply), and *Venetian*, taking rank, as to value and general desirability, about in the order named.

Chenille Axminster, of which none is made in the U. S., is a very excellent carpet-fabric, of high cost because of the nature of its construction. It consists of strips of worsted chenille, so colored as to produce a pattern when woven together upon the face of a stout jute-backing. These goods are produced three-quarters of a yard wide in rolls and also in whole carpets, which may be designed to cover any style or size of room. Their importation into the U. S. is not very heavy, but shows a small, steady growth. The largest mill for their production is at Glasgow, Scotland. Several carpet-mills in the U. S. have produced chenille Axminsters in moderate quantity and good quality, but the demand for the domestic goods has never been sufficient to make it a profitable undertaking.

Domestic Axminster and Moquette are very similar in appearance and construction, and are made with a high tufted pile, thick and durable. The Axminster is finer in quality and usually made of better material than the Moquette. They are constructed with a firm groundwork of jute or cotton, upon which the pile containing the design is fastened in tufts of soft woolen yarn. As these tufts are supplied from a series of rollers corresponding in number to the picks or wefts completing one pattern, and in length to the width of the carpet, and in their action are entirely independent of the warp and woof composing the body of the fabric, the employment of an almost unlimited number of colors is admissible, and the designs in those grades are therefore generally of the most perfect and elegant description.

Wilton and Brussels are woven alike and of the same materials (linen back and worsted face); the face of both is formed by inserting wires between the warp threads in such a manner that on their withdrawal a series of raised loops of the worsted warp is formed, upon which the design appears. In Wilton these loops are cut open and sheared smooth, while in Brussels they remain uncut. The worsted portion of the carpet being exclusively in the warp, the threads of which are of continuous color throughout the piece, each particular color requires a special set of threads, worked in an independent manner by what is technically called "frame." This arrangement secures great perfection and clearness of design, for each color being brought to the surface entirely by itself, while the others are carried under or through the linen back until brought up in their turn, the work has the appearance of embroidery on canvas. But as the colors in the direction of the warp are usually limited to five (no larger number of frames being convenient), the designs in these goods are of necessity simple, and no patterns requiring elaborate shading can be attempted in them. From the number of colors thus employed the different qualities of these carpets receive the names of three, four, and five frame respectively.

Velvets and tapestry Brussels are also manufactured alike in a manner corresponding to Wilton and Brussels, with the difference that only one set of worsted warp threads is used, upon which all the colors are printed by means of color-rollers before the fabric is woven, and upon the correct proportioning of spaces of the various colors the perfection of the goods is in a great measure dependent. In designing patterns for these goods the artist is allowed free scope as to the number and arrangement of colors, and profuseness in that respect does not add very greatly to the cost; hence we find these goods usually much more elaborate of design and more lavishly colored and shaded off than Wilton and Brussels. The manufacture of tapestry (both velvet and Brussels) was commenced in England in 1842. It was soon after introduced into the U. S., but for twenty years, by reason of patent restrictions, two establishments monopolized the business. Since the expiration of the patents it has become the most important branch of carpet-manufacture in the country. Tapestry carpets are now used to an extent greater than that of all other grades combined, with the exception of ingrains.

The ingrain carpet (also called Kidderminster, after the city which formerly manufactured it largely) is the only kind of carpet made exclusively of all wool, and it may be worn on either side, though usually one side is more desirable in coloring than the other. The names "ingrain" and "three ply" are derived from the modes of their construction. The former is composed of two distinct thicknesses, interwoven or "ingrained" wherever the colors change or mingle; the latter of three layers, also interlacing each other. The design is very similar on both sides, but the

colors are reversed. Philadelphia has upward of 5,000 looms employed on ingrain carpets, and very large establishments in Connecticut, Massachusetts, and New York State turn out the better qualities. Venetian is the name given to a fabric composed of woolen warp and coarse hemp filling, usually striped in color, and made in widths suitable for stair-coverings. Philadelphia furnishes in that grade nearly all the cheap stair-carpets used throughout the U. S.

Floor oil-cloth is manufactured with a burlap foundation, upon which successive coatings of coarse paint are applied. On the face is a colored pattern printed with blocks. These blocks are made of wood, and are usually about 18 inches square. There is one block for each color applied; less than seven colors are generally used. Floor oil-cloths are made in many qualities and of various widths, ranging from 3 feet to 24 feet in width. Very much the larger business is done in the medium-weight narrow widths.

A floor-cloth with the coined name "linoleum," consisting of a mixture of oxidized linseed oil and finely ground cork pressed upon a backing of coarse burlap, is now very largely used. It is the invention of an Englishman, William Walton. Several large mills are manufacturing it in the U. S., the patents having expired, and its extended use has seriously curtailed the production of the heavier grades of floor oil-cloth.

The manufacture of carpets is confined to the States of Massachusetts, Connecticut, New York, New Jersey, and Pennsylvania. The number of factories in the U. S. in which carpets other than rag-carpets were manufactured in the year 1880 was 195. In 1890 the number had decreased to 175. But while the value of the product in 1880 was $31,792,802, in 1890 it amounted to $47,801,499. The value of land, buildings, and machinery devoted to the industry in 1890 was $18,915,634. In 1880 the average number of operatives employed was 20,371; in 1890 the number was 29,189. The total amount paid in wages in 1880 was $6,835,218; in 1890 it was $11,639,176. The cost of the materials employed in 1880 was $18,984,879; in 1890 it was $28,649,031.

WILLIAM BERRI.

Car'pi: a fortified town of Northern Italy; province of Módena; on the Canal of Carpi; 12 miles N. N. W. of Módena (see map of Italy, ref. 3–D). It is the see of a bishop, and has a citadel, a fine cathedral, a seminary for priests, and manufactures of silk. Pop. 18,856.

Carpio, MANUEL: Mexican poet; b. Mar. 1, 1791; well known in Mexico for his sacred poems, and for some others upon patriotic subjects. He was educated as a physician, and became in 1832 Professor of Physiology in the University of Mexico. He took an active part in Mexican politics, being a leader of the conservative party. He was deputy in 1825 and 1848; senator in 1851; councilor of state in 1853. As a poet he excelled in subjects like the *Destruction of Sodom*, the *Chastisement of Pharaoh*, the *Witch of Endor*, etc. His *Poesias* have been several times published—last in Vera Cruz and Paris, 1883. D. Feb. 11, 1860.

A. R. MARSH.

Carpmael, CHARLES, M. A.: superintendent of the meteorological service of the Dominion of Canada and director of the Magnetic Observatory at Toronto; b. at Streatham Hill, Surrey, England, Sept. 19, 1846; educated at Clapham Grammar School and St. John's College, Cambridge, England (where in 1869 he was classed sixth in the list of wranglers), and was elected fellow of that college in 1870. In Dec., 1870, he was a member of the British eclipse expedition to Spain. He was appointed deputy superintendent of the Canadian service and director of the Magnetic Observatory in 1872. In Feb., 1880, he became superintendent of the service. In 1882 he was appointed by the Marquis of Lorne a president of Section III. of the Royal Society of Canada. He was repeatedly elected vice-president of this society until 1886, when he became president. The meteorological service has been very prosperous under his administration. M. W. H.

Carpoc'rates, or **Car'pocras**: a philosopher in Alexandria in the reign of the Emperor Hadrian; founded a Gnostic sect about 130 A. D. He believed in the transmigration of souls, and maintained that the world was created by angels. He is accused of teaching principles that tend to subvert morality. His followers existed as late as the sixth century.

Carpogones: See CARPOPHYTES.

Car'pophytes [from Gr. *καρπός*, fruit + *φυτόν*, plant]: the fruit-tangles (*Carpophyta*); one of the branches of the vegetable kingdom, characterized by the production of antherids and *carpogones*, the latter after fertilization developing a *spore-fruit*. The carpogone consists essentially of a cell (in some cases of several cells) containing the protoplasm to be fertilized; except in the *Characeæ*, it is not surrounded by a cellular covering. Five classes may be distinguished, viz.: (1) Simple fruit-tangles (*Colechæteæ*), minute plants, with single-spored spore-fruits; (2) sac-fungi (*Ascomycetes*), degraded parasitic and saprophytic plants, with spores produced in sacs; (3) higher fungi (*Basidiomycetes*), degraded parasitic and saprophytic plants, with spores produced by protrusion from certain cells (basidia); (4) red seaweeds (*Florideæ*), mostly branching plants, with many-spored spore-fruits; (5) stoneworts (*Charophyceæ*), branching plants whose carpogones are covered by a cellular membrane, producing a one-celled spore-fruit.

CHARLES E. BESSEY.

Car'pus [Lat., from Gr. *καρπός*, wrist]: in anatomy, the series of bones between the forearm and hand. In man there are eight small bones in two rows; the upper row consists of the scaphoides, lunar, cuneiform, and pisiform; the lower, of the trapezium, trapezoides, magnum, and unciform. The upper row is articulated with the radius of the forearm; the lower with the metacarpal bones of the HAND (*q. v.*). The number and form of the bones of the carpus vary much in different animals, but rudiments of them, at least, appear in all mammals. They are quite distinct in the flipper or paddle of the whale, as well as in the foreleg of the ox and the horse.

Carp'zov: a Saxon family celebrated for learning, of which the most distinguished members were BENEDICT; b. in Wittenberg, May 27, 1595; professor at Wittenberg; author of *Definitiones forenses*, *Practica nova rerum criminalium*, *Jurisprudentia ecclesiastica*, and *Processus juris*—works which had an extended influence on German laws; d. in Leipzig, Aug. 30, 1666.—JOHANN BENEDICT; Professor of Theology at Leipzig; brother of the above, who wrote *Isagage in Libros Symbolicos*; b. in Rochlitz, June 22, 1607; d. in Leipzig, Oct. 22, 1657.—JOHANN GOTTLOB; b. in Dresden, Sept. 26, 1679; grandson of J. B.; Professor of Oriental Languages at Leipzig, whose *Introductio in Libros Canonicos* and *Critica sacra Veteris Testamenti* were epoch-making works that elevated biblical introduction to the rank of a special theological science. D. in Lübeck, Apr. 7, 1767.

Revised by HENRY E. JACOBS.

Carquines, kär-kee'nes, written also **Karquenas**: a strait of California; connects the Bay of San Pablo with Suisun Bay; lat. 38° 04′ 16″ N., lon. 122° 15′ 19″ W. It is from 1 to 2 miles wide and 7 miles long, and is navigable for steamboats. Large ships can ascend it to Benicia. The Carquines Strait forms the boundary between Solano and Contra Costa Counties.

Carr, EUGENE A.: soldier; b. in Erie co., N. Y., Mar. 20, 1830; graduated at West Point 1853; became colonel Sixth Cavalry Apr. 29, 1879. He served on frontier 1850–61; scouting against Lipan Indians 1854 (severely wounded in skirmish near Diablo Mountain); on Sioux expedition 1855, Utah 1858, and Kiowa and Comanche expedition 1860; engaged in several skirmishes. In the civil war became colonel Third Illinois Volunteer Cavalry Aug. 15, 1861; was promoted brigadier-general U. S. volunteers Mar. 7, 1862, serving in operations in Missouri 1861–62; engaged at Wilson's Creek; in command of division in pursuit of Price into Arkansas 1862; engaged at Pea Ridge (thrice wounded); in command of the army of Southwest Missouri 1862, and St. Louis district 1862–63; in command of division in Vicksburg campaign; engaged in operations against the place; at Port Gibson, Champion Hill, Edward's Station, Black River Bridge (brevet colonel), and capture of Vicksburg; in the department of Arkansas, commanding cavalry division on Camden expedition 1864, engaged at crossing of Little Missouri; in command of the district of Little Rock 1864 (brevet brigadier-general), engaged at Clarendon and Camden; in command of a division of the Sixteenth Corps in operations against Mobile 1865; engaged at Spanish Fort. Brevet major-general U. S. army Mar. 13, 1865, for gallant and meritorious services in the field; served on the frontier until promoted brigadier-general July 19, 1892; retired Feb. 15, 1893.

Carr, FRANK OSMOND: See the Appendix.

Carr, JOSEPH B.: general of volunteers; b. in Albany, N. Y., Aug. 16, 1828; educated at Troy, N. Y. On the out-

break of the civil war he was commissioned (Apr. 14, 1861) lieutenant-colonel of the Second New York Volunteers, and colonel May 10, 1861. The Second Regiment was the first volunteer regiment to leave the State. In 1862 Carr was commissioned a brigadier-general of volunteers; he was at the battle of Big Bethel, and bore a conspicuous part in all the battles of the Army of the Potomac up to the final surrender of Lee's army, Apr. 1865. He was breveted major-general Mar., 1865, and mustered out of service Sept., 1865. Engaged in the manufacture of chain-cable; elected to the office of Secretary of State for the State of New York, 1881, and re-elected in 1883. He was nominated for Lieutenant-Governor of New York by the Republican convention Sept. 23, 1885. D. in Troy, N. Y., Feb. 24, 1895.

Carr, Lyell: genre-painter; b. in Chicago in 1857. Pupil of Boulanger and Lefebvre, Paris. His later works have been scenes of life in the Southern U. S., and he has also painted landscape and figures at Greenwich, Conn., where he formerly resided. His pictures are notable for realistic truthfulness of effect, and are individual in method. Studio in New York. William A. Coffin.

Carr, Sir Robert: a British gentleman who was appointed by Charles II. in 1664 one of the royal commissioners to New England. He assisted in the capture of New Amsterdam from the Dutch, and changed its name to New York in honor of the Duke of York, afterward James II. D. June 1, 1667.

Carracci: See Caracci.

Car'rageen', or **Irish Moss** [from Carragheen in Southeast Ireland]: any one of several species of seaweed which are not mosses, but algæ. The species which yields the greater part of the carrageen of commerce is the *Chondrus crispus*, one of the red seaweeds (*Florideæ*). It is used as medicine and as an article of food, and is esteemed for its emollient and demulcent properties. It grows on the rocky coasts of several countries of Europe and on the eastern shores of North America. It is from 2 to 12 inches long, branched, cartilaginous, flexible, and reddish brown in color. It is considered easy of digestion. Jelly and blancmange are made by boiling the carrageen in water or milk, with an addition of sugar and spices. The Iceland moss (*Cetraria islandica*) is a wholly different plant, though used in a similar way. It is not true moss, but a lichen.

Carrara, kăa-raa'răa (anc. *Cararia*): a town of Italy; in the province of Massa-Carrara; on the Avenza; near the Mediterranean; 133 miles by rail N. W. of Pisa (see map of Italy, ref. 4–C). It has an old collegiate church, a ducal palace, and an academy of fine arts. Here are celebrated quarries of white statuary marble, which have been worked for two thousand years or more. Many foreign artists come here to work, in order to save the expense of transporting the marble. The quarries, of which there are more than thirty in the vicinity, are in high hills or mountains formed chiefly or entirely of marble. Pop. of commune, 30,143.

Carratra'ca Springs: a village of Plantagenet township, Prescott co., Ontario, Canada; has large hotel accommodations, and a copious mineral spring whose waters are very highly esteemed for their alterative effect. The county is bounded on the northern side by the Ottawa river. The township is of comparatively new growth.

Carrel, kăar'rel', Nicolas Armand: writer and leader of the Republican party; b. in Rouen, France, May 8, 1800. He served in the army in his youth. He gained distinction by an able *History of the Counter Revolution in England*. Carrel, Mignet, and Thiers became in 1830 chief editors of the *National*, a liberal daily paper of Paris. In 1830 Thiers and Mignet retired from the editorship, and Carrel obtained the control of the *National*, which he edited with great ability. He was an eloquent and popular writer, and by sound judgment and moderation was qualified to be the leader of a party. He was mortally wounded by Émile de Girardin in a duel, and died two days after, July 24, 1836.

Car'rell, George Aloysius, D. D.: Roman Catholic bishop; b. in Philadelphia, Pa., June 13, 1803; studied at Mt. St. Mary's College; became in 1829 a Roman Catholic priest; was stationed in Philadelphia, Pa., Wilmington, Del., and St. Louis, Mo., where he was a professor and afterward rector in the university 1845–48; in 1851–53 was president of the Purcell Mansion College at Cincinnati, O.; in 1853 he was consecrated Bishop of Covington, Ky. D. in Covington, Ky., Sept. 25, 1868.

Carreño, kăar-rān'yō, Teresa: pianist; b. in Caracas, Venezuela, South America, Dec. 22, 1853; first instructed by her father and next by Julius Hoheni. Appeared first in New York in 1862, and then took some lessons from Gottschalk, whose compositions she plays especially well. In 1866 went to Europe professionally, and while there married Émile Sauret, the violinist, from whom, however, she soon separated. Subsequently she married Giovanni Tagliapietra, the baritone, and later Eugen d'Albert the pianist. She has made many concert tours with success, and is a pianist of great merit. D. E. Hervey.

Carre'ra, José Miguel, de: Chilian revolutionist; b. at Santiago, Oct. 15, 1785. He entered the Spanish army and served in Europe for several years. Returning in 1811, he headed the Chilian revolution which had already broken out, and was elected first president of the country. He promulgated a constitution (1812), established schools and printing-presses, and opened an era of improvement. On the approach of a Spanish army from Peru (1813) he was deposed in favor of O'Higgins. The quarrels of these rival leaders greatly weakened the patriots, and though they finally united against the common foe they were defeated at the battle of Rancagua (Oct. 12, 1814). Carrera fled across the Andes, and in 1815 went to the U. S. In 1816 he returned to Buenos Ayres, intending to lead the invasion of Chili, but was forbidden by Pueyrredon to cross the border; his brothers, who tried to do so, were captured and shot (Apr., 1818). Maddened by this, Carrera engaged in a series of wild revolutionary attempts against the government of Buenos Ayres. For a time he was driven to take refuge among the Indians. Finally he was betrayed by his own men, and shot at Mendoza, Sept. 4, 1821. See Vieuña Mackenna, *El Ostracismo de los Carreras* (Santiago, 1857).
Herbert H. Smith.

Carrera, Martin: Mexican general; b. in Mexico city, 1807. He early entered the army and attained the highest rank. He was a member of the legislative junta in 1841, senator in 1843 and 1845, and was military and civil commandant of the federal district when Santa Anna fled in Aug., 1855, leaving the country on the verge of anarchy. In these critical circumstances Gen. Carrera accepted the post of acting president (Aug. 15, 1855), and did much to maintain order, but resigned Sept. 11, to prevent the continuance of civil war. Herbert H. Smith.

Carrera, Rafael: a Guatemalan general; b. in Guatemala city, 1814. He was a workman of mixed Indian and Negro blood, and entirely uneducated, but possessed of genius and energy. In 1837 he joined the revolt against Morazan and the federalists, rose to the command of the insurgents, and, though several times defeated, was finally victorious in 1840. On Mar. 9 of that year he was proclaimed dictator at Guatemala, and thenceforth ruled with absolute power. He was elected president in 1844, and president for life in 1854. Carrera was supported by the landholders and the Church party, and generally legislated in their interests. He recalled the Jesuits, who had been banished since 1767. In 1863 he interfered in the affairs of Salvador, and after several months of war deposed Barrios and made Dueñas president. D. at Guatemala, Apr. 14, 1865.
Herbert H. Smith.

Carriacou, kăr'i-a-koo': See Grenadines.

Carriages: wheeled vehicles of whatever kind used for carrying or conveying persons or things on land, including coaches, chariots, wagons, carts, cars, etc. The name, however, is now commonly restricted to vehicles for the conveyance of persons, on business or for pleasure. It is probable that the idea of a vehicle with wheels, to be drawn by animals, must have occurred to man soon after the domestication of the horse and the ox. The first attempts in this direction must have been very rude, much like the bullock-carts of India and South Central Africa of the present day—the wheels solid pieces of wood, thin slices of the trunk of a tree, and the axle a solid beam, with the ends rounded and thrust through the rude wheels, which creaked as they revolved. From this cumbrous axle a pole or shafts extended forward, while attached directly to it was the body of the cart or wagon, no springs or intervening elastic substance mitigating its inevitable jolting. The cart was undoubtedly of earlier origin than the chariot; but though progress in those days was slow, yet within 600 years after the flood the Egyptians, and probably the Assyrians also (for the two nations kept pace with each other in mechanical inventions),

were constructing both chariots and carts or wagons, which indicated a great advance in mechanical knowledge. They were at first, and indeed for several centuries, two-wheeled vehicles, but the wheels were no longer solid pieces of wood, but had a hub in which the axle was inserted, and at first four, then six, then eight, and finally (though not till near the close of the Assyrian or Medo-Persian monarchy) twelve spokes, the diverging ends of which were inserted in a rim of wood, which was bound with a tire of bronze. Whether this rim was originally whole or composed of several pieces or felloes is uncertain, but at the period of the Assyrian monarchy felloes were in use. The chariot was box-shaped, but opened in the rear, the front being about 4 feet in height. It was probably 300 or 400 years later that those intended as state carriages were provided with a back, and a seat in which the nobles or royal personages sat or reclined, while a charioteer stood in front and drove the horses.

The chariots were used for two purposes: first, as an evidence of the great dignity and exalted station of the king or prince who occupied them, as when Pharaoh made Joseph "ride in the second chariot which he had" (Gen. xli. 43), and as when the funeral procession for Jacob went up out of the land of Egypt, and "there went up with Joseph both chariots and horsemen," in token of the high rank of the deceased (Gen. l. 10). It is noteworthy that during the time which elapsed between these two incidents we find Joseph sending wagons (probably carts, or simple two-wheeled vehicles, drawn by oxen) from Egypt to Canaan for his brethren to bring their wives and children to Egypt (Gen. xlv. 19). A second use of these chariots was for war purposes. It is hardly probable that they were used in this way so soon as for regal pomp and display. There is a tradition that Erichthonius of Athens built the first war-chariot about 1586 B. C. At the time of the Exodus (B. C. 1491) Pharaoh had 600 war-chariots, and it is implied (Ex. xiv. 7) that besides these there were other chariots in Egypt which were employed for the same purpose. These war-chariots had on their sides cases for the bow and sheaf of arrows, and also for the spears or lances, and usually an archer or a spearman stood on either side of the charioteer, and shot his arrows or hurled his spears at the enemy as the charioteer drove furiously to the conflict. The Canaanitish kings and the Kings of Moab in the next 150 years after the Exodus are often spoken of as having numerous chariots of iron; by which is generally understood, not chariots constructed of iron, but with iron or bronze scythes attached to the axles of their chariots. These, driven at great speed against a force of footmen or cavalry, proved terribly destructive. The Israelites under the theocracy were prohibited the use of chariots, but in the time of David, and still more in that of Solomon, they began to accumulate them, and Solomon maintained a force of 1,400 chariots: these and the horses which drew them were mostly imported from Egypt at a cost of about 1,050 shekels for each chariot—about $650, or, reckoning the difference in the value of money then and now, equivalent to at least $3,000 of our money; so that his force of chariots must have been worth at least $4,200,000. But other items in the cost of these establishments were the richly embroidered housings and trappings for the horses and the cloths for the chariots, manufactured for a long period in Tyre or in some of its tributary states (Ezekiel xxvii. 20).

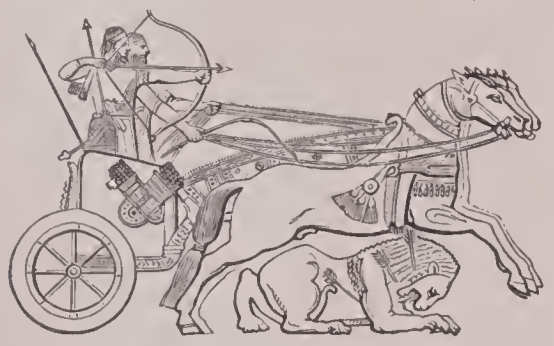


FIG. 1.—Assyrian war-chariot.

Until near the close of the Assyrian monarchy the chariot was generally drawn by three horses. At that time the third horse was withdrawn, but the Persians a little later drove four horses, attached, like our stage-horses, to the chariot in pairs. The chariot continued to be a two-wheeled vehicle until near the Christian era, when its use for war purposes was discontinued, and among the Romans, Greeks, and the sybaritic nations of the Orient it became the synonym of luxury and effeminacy. It was mounted on four wheels and drawn by four or six horses elegantly caparisoned, and the chariot itself was trimmed and cushioned with the most luxurious embroidered cloths of the East. Usually but two persons besides the driver occupied it, though there was often room for six. There were chariot-races in the Olympian and Isthmian games, and the nobles of Greece and Rome drove at full speed along the magnificent Roman roads and highways. It was probably in one of the more modest of these vehicles that the Ethiopian treasurer of Candace, Queen of Ethiopia, was returning to his country from his visit at Jerusalem when he met Philip (Acts viii. 27, 28). During the period of the later Roman empire and the decline of its power these richly decorated carriages multiplied, with the other indications of the luxury and effeminacy of the people. There was not, however, even in the most costly of these vehicles, anything answering to the springs of our modern coaches and carriages. Leather and steel of the best quality were both abundant, but the idea of using either for rendering the motion of these carriages easier did not occur to the carriage-builders of those days.

During the Dark Ages the roads were so rough and poor that carriages were almost entirely abandoned as a means for the conveyance of persons, the only method of land-travel being on horseback, and even the broad-wheeled heavy wagons or wains, used to some extent for the transportation of goods, moved over the highways with the greatest difficulty. On the Continent, asses, mules, and the large but slow and sure-footed Norman horses were used for the moving of goods from one country to another, the huge panniers on either side of the animal almost concealing him from sight. In 1280, according to Beckman, Charles of Anjou and his queen entered Naples in a *caretta*, a small but highly decorated chariot. Fourteen years later, in 1294, Philip the Fair issued an ordinance forbidding the wives of citizens to use carriages, or perhaps more accurately *cars*, probably open two or four wheeled vehicles, which seem to have come into use about that time. For the next 200 years their use was very infrequent, and seems to have been confined to royal personages. Yet in this time there had been introduced one change which was perhaps an improvement. The canopy (probably borrowed from the Oriental umbrella held over the monarch in his chariot), which had hitherto been sustained by four pillars, and had been open at the sides, now gave place to a close drapery which concealed the occupant from view except when looped up. The Emperor Frederic III. attended the council or diet at Frankfort in 1474 and 1475 in close or covered carriages, that of the latter year being magnificently decorated. Soon after this time the German princes seem to have entered upon a rivalry to outshine each other in the splendor of their equipages. In 1509, at a tournament in Rappin, the Electress of Brandenburg's carriage was completely covered with gold, and those of the other duchesses were ornamented with crimson and purple curtains and draperies of the richest satin. From this time the use of coaches by the nobility, and especially by the feudal lords, spread gradually over continental Europe; but, though the coaches were low and broad-wheeled, the condition of the roads was a serious obstacle to their use. In 1550 there were only three

FIG. 2.—Henry IV.'s coach.

FIG. 3.—Queen Elizabeth's state carriage.

coaches in Paris. In 1610 Henry IV. was assassinated in his coach. Rude carriages, called whirlicotes, two-wheeled vehicles without straps or springs, and having the horses attached to them by ropes, had been occasionally seen in England as early as the time of Richard II. (1377–99), and it is recorded that his mother was conveyed in one at the time of the rebellion of 1399. But the state coach was first introduced in the time of Queen Elizabeth, in the year 1555, it is said, by Walter Rippon, a Dutchman, who built one in that year for the Earl of Rutland, and in 1564 another for the queen, who made him her coachman. On page 92 we give an illustration of this coach, and of a later one built for her when attended by her maids of honor or her ministers, copied from Höfnagel's print of Nonsuch Palace. These coaches were without springs of any kind, though that of Henry IV., figured on same page, appears to have been suspended on heavy bands of leather or steel.

The English nobility soon set up their carriages, and, as Buckingham quaintly expresses it, "within twentie years there became a great trade of coachmaking." Some of the nobles increased the number of horses attached to these coaches to six, or even eight. The use of private carriages was confined to the aristocracy for the next hundred years, but a few hackney-coaches (so called from the French *coche-à-haquenée*, a vehicle with a hired horse) were kept for hire after 1625. Fifty years later there were twenty of these in

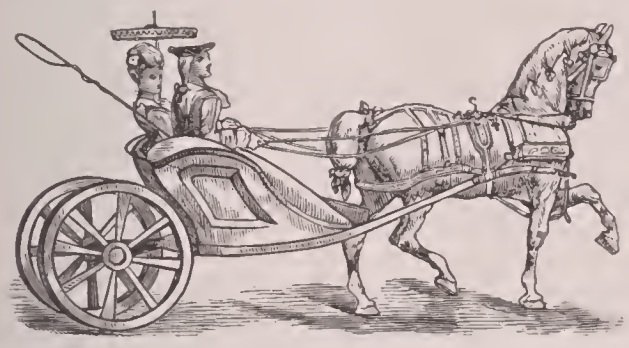


Fig. 4.—Private carriage of the seventeenth century.

Edinburgh, but such was the condition of the roads and streets that there was not much demand for them, and a hundred years later the number had dwindled to nine. During nearly the whole of the eighteenth century these hackney-coaches, the heavy and slow-going stage-coaches, and the post-chaises were the only vehicles in England for the accommodation of those travelers who did not own horses or coaches. There was, indeed, one other mode of traveling, very slow and inconvenient, which was resorted to by the common people, and sometimes by the middle classes. The huge broad-wheeled, covered wagons used for the transportation of goods, and drawn by six, eight, or twelve of the great Normandy horses, had a space partitioned off at the hinder end and strewn with straw, in which they could carry six or eight passengers, all of whom had to sit on the straw on the floor of the wagon. This was called "riding in the tail of the wagon." But even this limited accommodation was to be found only on the great thoroughfares, as away from these goods were carried on pack-horses. Even as late as 1750 the journey from London to Birmingham by stage-coach, a distance of 116 miles, occupied nearly the whole of three days and nights. In 1754 the first line of stage-coaches was established between London and Edinburgh, and the advertisement stated that "a two-end glass coach machine, hung on steel springs, exceeding light and easy, would go through in ten days in summer and twelve in winter, the passengers lying over during the Sabbath at one of the villages on the route." The distance between the two cities is about 400 miles, and it is now run by the ordinary fast trains of the Great Northern Railway in ten or eleven hours. The introduction of steel springs for coaches dates from about 1750, but these were not at that time the elliptic or the C spring, but a bow of steel, the two ends of which were secured to the axle, and the center reenforced by shorter strips of steel, much like the heavy springs to be seen on some of the passenger cars on the railways. The leather thorough-braces, whether attached to a crossbar, as they were at first, or to the C spring, as was done later, did not come into use till near the close of the eighteenth century.

The great improvement in the public highways in Great Britain, which was the result of the labors of Macadam, Telford, and other civil engineers at the close of the eighteenth century and the beginning of the nineteenth, and the reorganization of the postal arrangements, led to the establishment on all the principal thoroughfares of those lines of stage-coaches which De Quincey has so eloquently described as "the glory of England" and "the poetry of motion." These coaches were well built, strong, and so well provided with springs that their motion was easy, and did not weary the traveler even on long journeys. They were run by time-tables, and made ten miles an hour regularly. From about 1795 to 1835 these vehicles were the favorites of travelers, and carried hundreds of thousands of passengers annually; but when the railway lines were constructed between the large towns the stage-coaches began to fall into disuse, and they are now employed only on short and subordinate routes in the more sparsely settled localities. But with their decrease there has been a vast increase in the number of private carriages of all descriptions, varying in style and capacity from the skeleton or sulky for a single passenger, who is his own driver, to the family coach, phaeton, or carryall, into which from eight to a dozen can be stowed. The hackney-coaches have very generally given place to cabriolets or *cabs* (introduced about 1820), which are drawn by one horse and carry from two to four passengers besides the driver, and the hansom-cab, an invention dating from about the year 1835. Omnibuses were introduced about 1831 from France, and are very extensively used, notwithstanding the introduction of street railways.

In North America the prevalent mode of traveling for the first two centuries was on horseback, the roads preventing any very extensive use of wheeled vehicles. There were, however, even at the time of the Revolution and for some decades before, a few family coaches maintained by the wealthy and aristocratic families of the larger towns. These were heavy, lumbering affairs, drawn by six large horses, and seldom moved faster than a very slow trot. In New York, Pennsylvania, and New Jersey the great Conestoga wagon, broad-wheeled, and with its huge canvas-covered body elevated both in front and rear, drawn sometimes by Normandy horses, sometimes by four or six yokes of oxen, crept

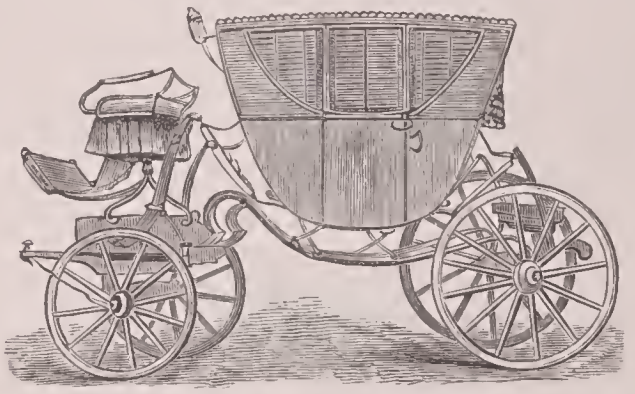


Fig. 5.—Washington's carriage.

at a slow pace over the rough roads to carry goods from the seaports into the rural districts. These same wagons in our times have been used in the Mississippi valley and on the Western plains, as well as in Western Pennsylvania, West Virginia, the mountain districts of North and South Carolina, Georgia, and East Tennessee, to transport both goods and emigrants, and have received the name of "prairie schooners." At the time of the Revolution the stage-coach was unknown in America. In 1791 there were only 1,905 miles of post-roads in the U. S., and over the greater part of these the mails were carried in heavy wagons, occupying three or four days in the trip from Philadelphia to New York, or making the round trip in a week, while they took ten days for the journey from New York to Boston. The improvements in the roads led to improvements in the vehicles, and on the great thoroughfares from 1810 to 1845 the stage-coaches were, of their kind, admirable vehicles. Accommodating nine inside, and usually six, including the driver, on the outside, with a good supply of baggage covered with a heavy leather boot in the rear, and drawn by four or six spirited horses, these vehicles, though not making quite as good time as the British stage-coaches, were the admiration of all beholders. Troy, N. Y., became celebrated for its coaches, as it has since for its cars for street-railway use, and the stage proprietor who could assure his customers that he used only the best Troy coaches was sure of ample patronage. For the travel in newer regions and over somewhat rougher roads what were called the Concord wagons or

coaches, originally made in Concord, N. H., were preferred. Most of the coaches in use in the Pacific States are of this description. They are furnished with strong brakes to check their too rapid descent of the mountain declivities.

The omnibus has not been used to any great extent except in cities and large towns, but in these, until the advent of the street railway, it was the favorite vehicle for public travel.

Modern Carriages.—Carriages may be classified in several ways, according as we regard the number of wheels, the method of entering, or the number of seats, and the method of seating the occupants. Among two-wheeled vehicles may be mentioned the cart, the gig, the sulky, the hansom-cab, the Irish jaunting-car, and the Japanese jinrikisha; among four-wheelers the wagon, the cab, coach, buggy, barouche, etc. Some are entered at the side, as the coach, the buggy, etc.; others at the rear, as in the omnibus, the wagonette, and the herdic. In some the occupants are seated facing one another along the sides, as in the street-car and the wagonette; in others they are back to back and face outward, as in the jaunting-car. But the usual way is to place the seats crosswise, with the occupants all facing one way, as in the break, the phaeton, the brougham, and the surrey, or back to back, as in the dogcart, or face to face, as in the ordinary family coach.

Two-wheeled Carriages.—Vehicles with only two wheels require shafts which are more or less rigid, as the horse has to bear part of the load. In four-wheeled vehicles the animals have simply to draw. Of the two-wheeled vehicles now in use in the English-speaking world the gig is probably the oldest and most typical. It is a one-horse conveyance, the body of which usually rests on two or more semi-elliptical springs, and may or may not have a hood. It is intended to carry only two persons. Its best-known varieties are the stanhope and the tilbury. The dogcart is also a two-wheeled vehicle for one-horse or for tandem driving, and accommodates four persons back to back. The body rests on half-elliptical springs, and is furnished with appliances for shifting the body or the seat so that the load may be balanced and the weight taken as far as possible from the horse's back. This form of conveyance was originally intended for hunting purposes and carried dogs, hence the name. The whitechapel cart is one of the best-known varieties of the dogcart. The trotting-sulky, like the trotting horse itself, is peculiarly a U. S. product. It is of very slight build, has two wheels, seats one person, and is generally used in speeding trotting horses. In 1892 the rubber pneumatic tire, so successfully used on the bicycle, was applied to the sulky and the trotting record at once lowered by about four seconds. The road-cart, which is constructed in a variety of forms, is a cheap modification of the sulky, with the addition in some kinds of conveniences for carrying articles of greater or less bulk. It is light in construction, is hung low, and is extensively used in the agricultural regions of North America. The Irish jaunting-car differs from almost all other two-wheeled vehicles in having very low wheels, over which the body is placed, the occupants being seated back to back and facing outward, thus traveling sideways. The hansom-cab is one of the most useful public conveyances, and is admirably adapted for the crowded streets of great cities, such as London, where it has had its chief development. It was invented in 1835 by an Englishman named Joseph Hansom. It has two wheels, with the body (with paneled hood) hung very low between them. The coachman's seat is behind and above the body, to enable the driver the more readily to control his horse, and the whole is so balanced that little if any weight rests on the horse's back. The jinrikisha, or "man-power carriage" of Japan, is but a miniature hansom-cab with a folding hood, without the driver's seat at the back, and with a man in the shafts instead of a horse. Hundreds of thousands of these handy conveyances are in every-day use in Japan, in China, and India. The invention has always been claimed by a Baptist missionary from the U. S. named Jonathan Goble. See Japan.

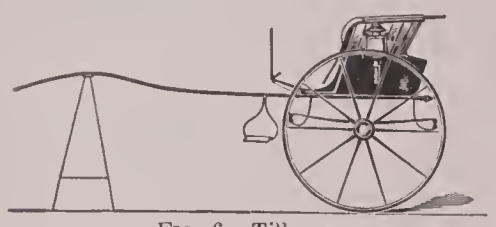


Fig. 6.—Tilbury.

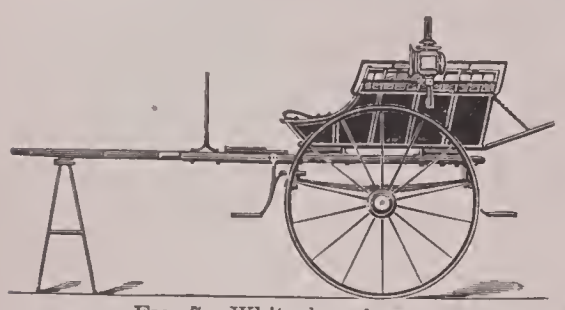


Fig. 7.—Whitechapel cart.

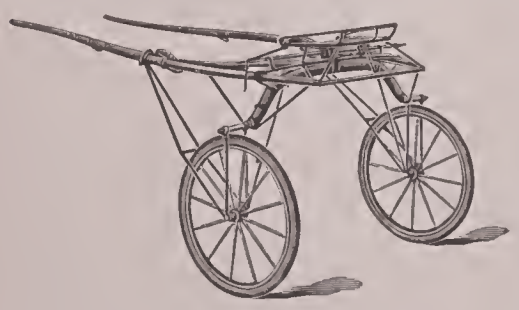


Fig. 8.—Pneumatic-tire sulky.

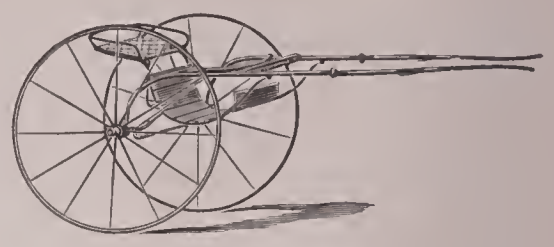


Fig. 9.—Road-cart.

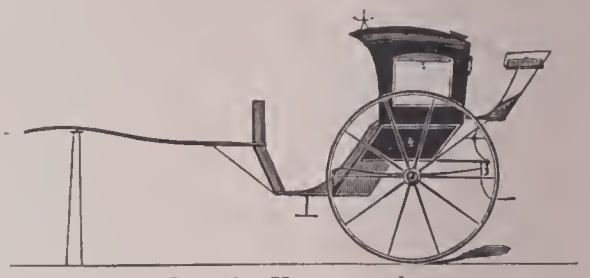


Fig. 10.—Hansom-cab.

Four-wheeled Carriages.—Among four-wheeled covered vehicles may be mentioned the coach, the landau, the brougham, and the rockaway. The coach is a family carriage with either full paneled body or with quarter panels, and is intended to carry four inside and two on the coachman's seat in front. The body is suspended on elliptical springs alone or in combination with curved C springs back and front. This latter method of suspension is called "double suspension." The coach is sometimes constructed with additional outside seats, and used with four horses as a road coach, and is then known as a "mail-coach," "drag," or "tally-ho." The landau is a carriage of the coach family and takes its name from the town in Bavaria, where it is supposed to have been first built. It differs from the coach only in having a falling top, made either entirely of leather, when it is called a "leather-quarter landau," or with glass quarters, when it is called a "glass-front landau," a "five-glass landau," or a "glass quarter landau," according to the number of the glasses. The brougham, named after Lord Brougham, for whom the first of this type of carriage is said to have been built, is a low-hung, close, paneled, straight

Fig. 11.—Berlin, or town coach.

Fig. 12.—Crown brougham.

Fig. 13.—High door curtain rockaway.

glass-front carriage, for two persons inside and a paneled seat for the coachman in front. Sometimes the body is extended to make room for two more persons inside. It is then known as an "extension-front" brougham. The French carriage of this kind, called the coupé, is sometimes made with curved glass front instead of straight. The clarence has a curved glass front and inside seats for two or four persons.

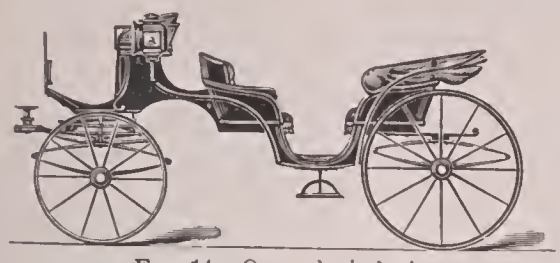


Fig. 14.—Osgood vis-à-vis.

The rockaway is a covered four-wheeler, with sides either curtained or paneled, the roof extending over the driver's seat, which is on the same level as the inside seats. It is made to carry four or six persons. The body is hung on two, three, or four elliptical springs. It was originally a cheap, light carriage made in Jamaica, N. Y., and is named after a popular resort on Long Island, in that State. It was afterward frequently called a "carryall" and a "germantown." This type of carriage has been greatly developed, and is now much used as a family carriage under the names of coupé rockaway and rockaway coach.

Fig. 15.—Cabriolet.

Hooded Carriages.—The barouche may be considered as a coach with the upper half of the body cut off, and furnished with a leather hood over the back seat. This carriage is now made without doors, and is called a *vis-à-vis*, or sociable. The cabriolet, originally an Italian gig, is now a leather-hooded carriage for two passengers, with a paneled driver's seat and no door. An English type of carriage, in all respects similar to the cabriolet, is the victoria, except that instead of a paneled driver's seat in front, the body is provided with iron loops which connect it with the front carriage. On these loops is constructed the driver's seat (an iron framework), and across them is stretched a wide leather dashboard. Sometimes the driver's seat is made to shift to the rear of the body, in which case it is called a "duc." The mail phaeton is a heavy square box-body carriage, with hooded seat for two in front and a seat for grooms behind. A modified form of the mail phaeton is known as the demi-mail phaeton and stanhope phaeton. The spider phaeton is used for the same purposes as the mail phaeton. The front seat is supported on two iron loops which connect with the hind carriage and aid in supporting the groom's seat, which is either an iron frame or paneled. The calèche, or calash, which is used to some extent in Canada, is a two-wheeled hooded vehicle, with a seat for two behind and a seat on the splashboard for the driver.

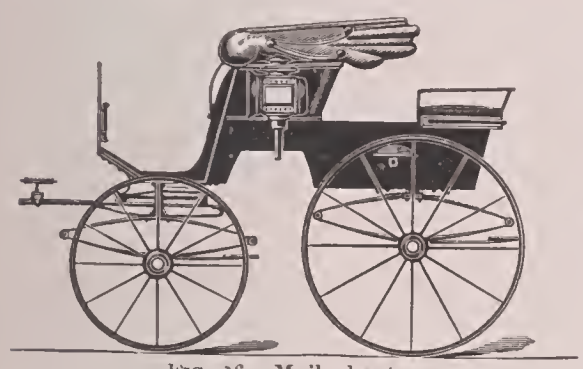


Fig. 16.—Mail phaeton.

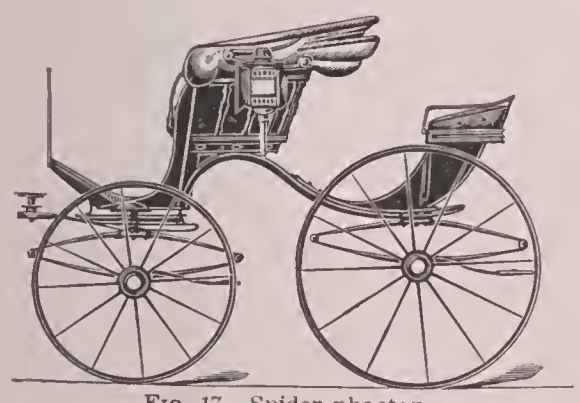


Fig. 17.—Spider phaeton.

Open Four-wheeled Vehicles.—The break, which is a member of the phaeton family, was originally used in Great Britain in "breaking" colts. The name is now applied to a heavy phaeton for gentlemen's driving, and seats from six to twelve persons, including grooms. The buggy is a peculiarly North American carriage, though the name is of Anglo-Indian origin (from Hindi, *bag*, pronounced bŭg, to move), and is used in India to designate "a kind of gig with a hood to screen the traveler from the rays of the sun." As used in the U. S. and Canada the name designates a light four-wheeled vehicle with one seat, drawn by one horse, and with or without a hood. Formerly the buggy was hung high on elliptical springs, and had a top-heavy appearance. As now generally made it is hung low on side-bars of wood, attached at their ends to semi-elliptical springs. A variety of the buggy called a buckboard is one of the simplest kinds of carriage, requiring hardly anything in its construction but the four wheels, the axles, a king-bolt, and a long springy plank. This plank is rigidly attached to the hind axle, and to a cross-bar in front to which the front axle is fastened by a king-bolt, about which the front axle swings in turning the vehicle. At a proper distance between the front and the back a box is placed on the springy plank, and upon that box rests the seat for the occupants. Born of necessity in the sparsely settled hilly regions of the New England and Middle States of the Union, when money was scarce and roads bad, the buckboard successfully met the demand for a vehicle of simple construction the constituent parts of which should, as far as possible, be home-made, and received its name from its ability to "buck" successfully against the rocks and inequalities occurring in the roads. It is now a somewhat fashionable conveyance in regions where roads are good and the country level. The surrey is another member of the buggy family. It is a side-bar vehicle intended to accommodate four persons, and is made in a great variety of styles. The body is suspended in the same way as the modern buggy, and is of three general patterns: one of longer gear to allow of stepping in and out between the front and back wheels; another coupled somewhat shorter in which entrance to the back seat is made by lifting half of the front seat; and a third made like the second, but with the additional convenience of dropping the back panel, and so shifting the back seat as to permit riding back to back when desirable. See Diligence, Droschky, Tarantass, etc., and Stratton's *World on Wheels*.

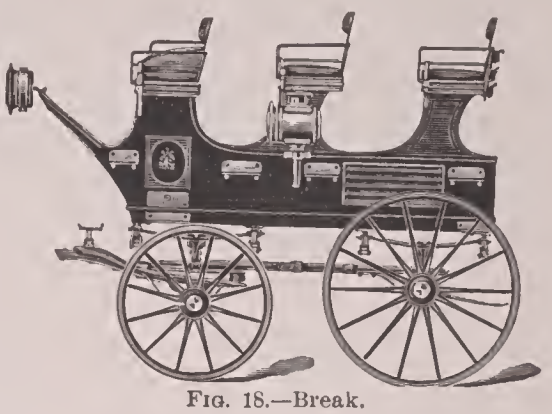


Fig. 18.—Break.

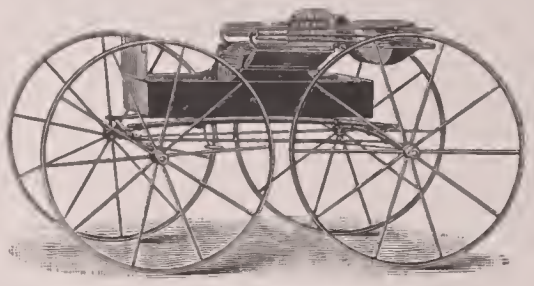


Fig. 19.—Buggy.

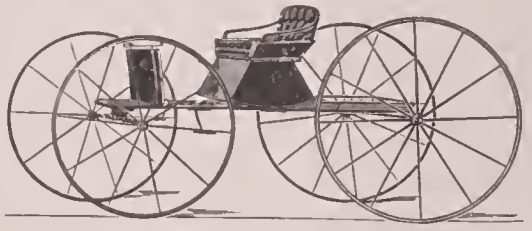


Fig. 20.—Buckboard.

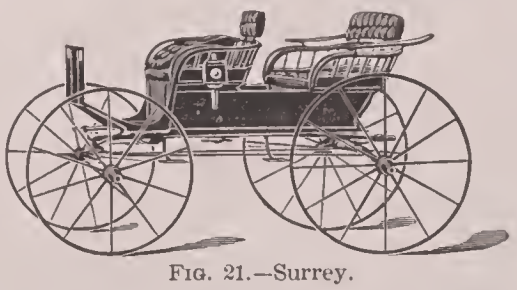


Fig. 21.—Surrey.

Revised and enlarged by R. Schuyler Tucker.

Carrical: See KARIKAL.

Carrickfer'gus: a seaport-town and borough of Ireland; on the north shore of Carrickfergus Bay or Belfast Lough; 10 miles by rail N. N. E. of Belfast; in the county of Antrim, but forms a county by itself, called "the county of the town of Carrickfergus" (see map of Ireland, ref. 4–J). The town extends about a mile along the shore of Belfast Lough. It has a fine old parish church, said to have been founded in 1164. It contains also Presbyterian, Methodist, and Dissenting meeting-houses, a Roman Catholic church, a town-hall, court-house, etc.; also several spinning-mills and manufactures of linen and starch. It was formerly a place of great strength. Here is a remarkable and picturesque castle, supposed to be 700 years old, standing on a high rock and on the sea, on which three sides of it are situated. It is used as an arsenal, barracks, and a fort for the defense of the harbor. King William III. of England landed here June 14, 1690, sixteen days before the battle of the Boyne. In 1760 it was surrendered to a French naval force under Thurot, who evacuated it on the appearance of the British squadron under Commodore Eliot soon after, which captured Thurot's squadron. Capt. Paul Jones captured the sloop-of-war Drake in Carrickfergus Bay Apr. 24, 1778, but made no attempt to seize the town. The surface of the county is generally hilly, and its chief crops are oats and potatoes. This locality has long been noted for its cheese. Carrickfergus has important fisheries, and is celebrated for its oysters, lobsters, and scallops. It has considerable trade with Liverpool, though its harbor is shallow and poor. The people are mostly Protestants of Scotch descent. A part of the ancient wall is still standing. The town is connected with Larne by railway. The rural district contains Lough Morne, which has an area of about 90 acres, and is situated at an elevation of 556 feet above the level of the sea. The port of Carrickfergus was for a long time the chief market on this part of the coast. It returns one member to Parliament. There are mines of salt in the vicinity. Pop. 10,000.

Carrickmacross': an inland town of Ireland; in the county of Monaghan, province of Ulster; 46 miles N. W. of Dublin (see map of Ireland, ref. 7–H). The town consists mainly of one long street. One of its churches serves as the cathedral for the Roman Catholic Archbishop of Clogher. The town has a savings-bank, a Presbyterian meeting-house, a house of correction, and a well-endowed grammar school, and has a fair, held five times a year. Pop. 7,000.

Carrick-on-Shannon: an inland town of Ireland; capital of County Leitrim, province of Connaught; situated on both sides of the Shannon river; 85 miles W. N. W. of Dublin (see map of Ireland, ref. 7–F). The town lies principally on the Leitrim bank of the Shannon; is connected by a bridge with that part of the town which is on the Roscommon side; is on the Midland Great Western Railway. It has a church, a Roman Catholic chapel, two Methodist meeting-houses, and a county infirmary and dispensary. It also contains the county court-house, jail, and house of correction, and has considerable trade, chiefly in provisions. A canal has been cut from this place to Lough Erne. Pop. 1,384.

Car'rick-on-Suir: an inland town of Ireland; in the south riding of the county of Tipperary, province of Munster; on the river Suir; 13 miles by rail E. of Clonmel (see map of Ireland, ref. 12–G). It has an old bridge, a parish church of high antiquity, a Roman Catholic chapel, a hospital, a convent, and a picturesque ruined castle built about 1310 by an ancestor of the Earl of Ormond. The town is situated near the junction of the counties of Tipperary, Kilkenny, and Waterford. Grain and other products of the soil are exported from this place by the navigation of the river. It has linen and woolen manufactures. Slate is extensively quarried in the neighborhood. Pop. 6,000.

Car'rick's Ford: a point on the Cheat river near St. George, Tucker co., West Va. The Confederate forces under Gen. R. B. Garnett, in retreat from Laurel Hill, where they had abandoned most of their artillery and stores, were here attacked by three regiments of Federal troops under Gen. T. A. Morris. A brisk engagement ensued, in which the Confederates were routed and Gen. Garnett killed. The Federals captured the Confederate wagon-train and one piece of artillery. This affair occurred July 13, 1861.

Car'rier, AUGUSTUS STILES, B. A.: Professor of Hebrew and the Cognate Languages in McCormick Theological Seminary; b. in Ripley, N. Y., Dec. 30, 1857; graduated from Yale College 1879, and took the theological course at Andover and Hartford Seminaries. He was pastor of a Presbyterian church in Bloomington, Ind., 1884–85; became instructor in McCormick in 1887, and professor in 1892. He published *The Hebrew Verb: a Series of Tabular Studies* (Chicago, 1891).

Carrier, kăăr'ri-ay', JEAN BAPTISTE: a Jacobin notorious for his cruelty; b. at the village of Yolai, near Aurillac, in Haute-Auvergne, in 1756. At the commencement of the French Revolution in 1789 he was only an obscure attorney, but was brought into notice by its progress, and was sent to the National Convention in 1792. He was sent to Nantes in Oct., 1793—where he found many Vendean prisoners—to assist in repressing the civil war commenced by the priests and royalists in La Vendée. He selected a committee in order to give the appearance of legal sanction to his cruelties, but took them from the lowest and most vicious class of the people. He soon dispensed with all formality, and executed his prisoners in large numbers at one time. He murdered multitudes of men, women, and children by various modes. Many of these victims were crowded into boats which were scuttled and sunk in the river Loire. This was called "Republican baptism." The cruelties and obscenities related of this worst of Jacobin leaders are almost incredible. More than 16,000 persons were put to death by him in a single month. Soon after the fall of Robespierre the public called for justice against Carrier, and he was finally recalled by the committee of public safety, and condemned by the revolutionary tribunal. He was guillotined Dec. 16, 1794.

Carrier, JOSEPH AUGUSTE: a French painter of portraits, miniatures, and forest scenery; b. in 1800 at Paris, and studied under Gros, Prud'hon, and the chevalier Saint. He first exhibited in 1824, won several medals, and in 1866 was decorated with the cross of the Legion of Honor. D. in Batignoles, Feb. 21, 1875.

Carrière, kăă'ri-ār', EUGÈNE: contemporary genre-painter of the French school; b. at Gournay-sur-Marne (Seine-et-Oise); pupil of Cabanel; second-class medal, Paris Exposition, 1889; Legion of Honor 1889. *The Sick Child* (1885), museum of Montargis, and *The First Veil* (1886) are two of his most important works. He paints in a general gray tone almost devoid of color, and envelops his figures in a misty sort of atmospheric effect. He has a considerable following among the younger French artists, but his methods have a pernicious influence, as they tend to eliminate both color and exactness of form. Studio in Paris.

WILLIAM A. COFFIN.

Carrière, MORITZ: German author; b. at Griedel, in Hesse, Mar. 5, 1817; studied philosophy at Giessen, Göttingen, Berlin, and in Italy. In 1849 he became Professor of Philosophy at Giessen, and after 1853 held that position at Munich. He published *Der Kölner Dom als freie deutsche Kirche* (Stuttgart, 1843); *Abälard und Heloise* (Giessen, 1844); *Die Religion in ihrem Begriff*, etc. (1841); *Die philosophische Weltanschauung der Reformationszeit* (1847); *Die letzte Nacht der Girondisten* (a poem, 1849); *Religiöse Reden und Betrachtungen für das deutsche Volk* (1850); *Das Charakterbild Cromwells* (1851); *Das Wesen und die Formen der Poesie* (1884); *Deutsche Geisteshelden im Elsass* (1871); *Die Kunst im Zusammenhang der Kulturentwickelung und die Ideale der Menschheit* (1863–71); *Geschmack und Gewissen* (1882); and other works. He defended Christianity, opposed Ultramontanism, and was of the liberal school. As an art critic he took a high rank. D. at Munich, Jan. 19, 1895.

Carrier Indians: See ATHAPASCAN INDIANS.

Carrier-pigeon: See PIGEON.

Carrières, kăăr'ri-ār', LOUIS, dc: a Roman Catholic theologian; b. in 1662 in Cluvilé, near Angers, France. He became a soldier, and in 1689 joined the Congregation of the Oratory. He became distinguished as a theologian, and published, at the request of Bossuet, a *Commentaire Littéral* (24 vols. 12mo, 1701–16). This work is very popular in France even at the present day. Most of the comments are made in the translated words of the Bible itself, and are interwoven with the text. It has been often reprinted, e. g. Paris, 1872, *seq.* D. in Paris, June 11, 1717.

Carriers, Common: those who undertake for hire to transport from one place to another the goods or persons of such as choose to employ them. They are distinguished from *private* carriers by this readiness to afford accommodation to the public generally, and are subjected in law to a different responsibility. They may be either carriers by land or carriers by water. Familiar examples of the former kind

are stage-coach proprietors, railway companies, express companies, wagoners, and teamsters, etc.; of the latter, the owners and masters of steamships, ferry-boats, and vessels of all kinds engaged in a general transportation business. The principles of law exhibiting the rights and duties of common carriers form a subordinate department under the general subject of BAILMENT (*q. v.*), and, as in other varieties of the same legal relation, the degree of care necessary in the custody and treatment of whatever is received by the bailee is not dependent in all respects for its determination upon the contract of the parties, but arises by force of established legal rules. The difference in these requirements, depending upon the circumstance whether there be a carriage of goods or a carriage of passengers, demands that these two branches of the subject be examined separately.

Common carriers of goods are placed under a responsibility of excessive stringency. They are held liable for all loss or damage which occurs during transportation except that occasioned by "the act of God or the public enemy." They are made virtually insurers of the goods against all perils except those arising from these two sources, and the infrequency of exemption must be so great as to afford relief but very rarely. The reasons for imposing a duty so severe grow out of considerations of public policy. The facility with which the carrier or those who may collude with him can purloin or injure goods intrusted to his oversight and disposal, and the difficulty of ascertaining the true cause of the loss, are thought to place the members of the community so entirely at his mercy that their interests demand the most ample protection. Moreover, the fact that the application of this rule has not proved detrimental to the growth and prosperity of transportation companies indicates that its apparent undue severity, while conducing greatly to the advantage of the public, has worked no practical injustice even to the carriers themselves. The phrase "act of God" is held to extend only to such inevitable accidents as occur without the intervention of human agency. Thus losses directly occasioned by winds, floods, lightning, and earthquakes properly would be included under this designation, and the carrier would be relieved from liability. But robbery, even if committed unexpectedly and by an irresistible force, or fire occasioned by some incendiary, wholly without the carrier's negligence or connivance, would be causes of loss containing that element of human agency which makes the exemption inapplicable. Damage resulting from natural causes, such as frost, fermentation, evaporation, the natural decay of perishable articles, or the inherent viciousness of animals, is placed upon the same footing as losses caused by the "act of God." By the phrase "public enemies" is meant those with whom the nation is at war or pirates on the high seas. Thieves, robbers, and mobs would not be included under this term.

It is a carrier's duty to receive for transportation all goods offered of the kind which it is his usual custom to carry. He may, however, demand the payment of freight in advance, and may refuse all articles of a dangerous quality. All persons who engage his services must be charged for the same service equably. Suitable vehicles for transportation must be provided, in charge of competent servants; the goods must be carried safely to the proper place of destination by the usual route and with all reasonable dispatch, and there delivered, or held ready for delivery, to the owner or consignee. Reasonable instructions given by the owner or his agent relative to the mode of carriage of the goods must be followed, unless compliance is impracticable. The carrier is also held accountable for all acts of his employees within the scope of their employment, even though they violate his instructions as to the mode of performance. He can not escape from his obligations as to the carriage of the goods by attributing default to his own agents.

The responsibility of common carriers begins upon the delivery of the goods for transportation. A delivery at the usual place of receiving freight or to the employees in the usual course of business is sufficient. But where goods are transferred to carriers with instructions not to transport them until further notice, the extraordinary liability already considered does not attach in the meantime, and it is only necessary that the ordinary care which is obligatory upon warehousemen be exercised until carriage really commences. The responsibility terminates when the goods have reached their destination and been actually delivered. But if, upon the lapse of a reasonable time after arrival, they are not claimed and removed, the carrier's liability is not entirely ended, but only modified in degree. It is then his duty to store the property in a safe and secure warehouse to await the owner's demand, and he is only accountable thereafter for ordinary care. Important distinctions are drawn between various classes of carriers in reference to the proper mode of delivery. These are rendered necessary by the different kinds of transportation adopted in the several cases. Thus express companies employ conveyances which can be readily sent from dwelling to dwelling, and they are consequently held bound to make actual personal delivery at the owner's place of business or residence. Carriers by water, on the other hand, can proceed no farther than the wharf. Hence, according to a well-settled usage clearly applicable to sea-going ships, no other delivery is demanded than can be made there; but the convenience of the consignee is still regarded, as far as practicable, by imposing upon the carrier the obligation, rendered necessary by the uncertain time of arrival, that notice be given when the vessel has reached her place of discharge of the cargo. In railway transportation, again, the circumstances are still different. The cars are confined to a given line, have a regular terminus, and trains are run uniformly in accordance with published time-tables. Hence, according to some authorities, personal delivery is so completely excused that not even notice of arrival is necessary. The better opinion seems to be that notice is required, and that the consignee has a reasonable time within which to take the goods before the strict liability of the carrier is modified into that of the warehouseman.

The purpose of these various regulations manifestly is that the interests of both carrier and owner be promoted. The "reasonable time" after arrival during which the carrier's heavy responsibility as insurer is to continue will be most speedily terminated when the owner has immediate knowledge that the goods lie at his disposal.

There are instances, however, in which delivery is sufficient to discharge the carrier, though not made to the owner himself. This occurs when several parties are engaged successively in the transportation of the same articles. The liability of each, in the absence of special circumstances, terminates when the next undertakes the duty of carriage. At least such is the doctrine upheld generally by the decisions of the American courts. In England, on the contrary, the rule is maintained that the first carrier who receives the goods, if he accepts them for a destination beyond his own route, continues liable until the entire journey is completed, and the subsequent parties, though the injury or loss may occur on their own lines of travel, are exempted from liability on the contract. This proceeds upon the notion that the contract for transportation is tacitly made with the first carrier. According to the prevailing opinion in the U. S., the cases in which these views should be followed are those in which the first carrier engages by special contract for the entire route. It should be added that there may be such a business connection between various parties concerned in continuous transportation as to make them all liable as partners for the entire transportation.

Questions of much importance arise as to how far a carrier's duty and responsibility may be modified by usage or custom, or by specific contract entered into with the owner, or by notice given him. It is well established that common usage, if uniform and reasonable, may be pleaded in justification of peculiar regulations adopted. Thus the nature of the goods which will be received or the route which will be generally pursued may be determined in this manner.

But these common modes of reducing responsibility are comparatively insignificant in view of those qualifications established by contract or notice. The policy of allowing the carrier to so limit his liability has been much questioned, but the validity of such agreements is now generally recognized. Bills of lading and instruments of an analogous character, given by the carrier on accepting goods for transportation, contain almost invariably stipulations in regard to exemptions from loss by fire and other enumerated perils, and are regarded as constituting a contract between the carrier and shipper. In like manner, notice brought home to the knowledge of the owner of the goods and assented to by him will have in general the same effect. At this point there is a great practical difficulty. The question is: What will be sufficient evidence of assent on the owner's part to a notice? It is plain, at least, that the notice must be so given by the carrier as naturally to attract the attention of the shipper, and must be so precise and clear that he can readily acquaint himself with its contents. Assuming this to be so, *can the carrier shake off his*

extraordinary responsibility by notice? It is now quite clear that he can not. He may make in this manner reasonable regulations in the nature of by-laws, pointing out the articles that he will carry, or requiring a statement of their value, so as to know what care will be properly demanded of him, and what reasonable charge he should make. But when all this is done he can not shake off his character of insurer by notice. To do this there must be a contract—some evidence of assent; and notice by the carrier is no evidence of assent by the shipper. He, by his silence, should fairly be assumed to insist on the carrier's common-law responsibility. The English courts held otherwise at one time, but the salutary doctrine here maintained is now substantially established in England by statute. Under its legislation the carrier may relieve himself to a considerable extent by notice, but can not escape entirely the consequences of his own neglect or misconduct. The notice must not only be really or presumptively known to the owner of the goods, but must also be reasonable in its character.

Common Carriers of Passengers.—These are not held to as stringent a liability as carriers of goods. They are not made insurers of the passenger's safety, but are nevertheless required to use the utmost care, and are responsible for even the slightest negligence. The reason for this difference is that they can have no such complete control over persons as over goods. Passengers must largely retain freedom of movement and self-direction. It is no more than just, therefore, that the carrier's duty should be correspondingly modified. Extreme vigilance may be demanded, but not the duty of preventing injuries to which the passenger's own heedlessness may expose him. In accordance with this principle, injuries occurring from any defect in the construction of machinery or vehicles which proper care should have guarded against, or from their unskillful management, subject the carrier to responsibility. He is answerable for the acts of his agents, whether negligent or willful, done within the scope of their employment. It is his duty to exclude lawless and disorderly persons from his conveyances, or, failing to do so, he may, according to some authorities, be held responsible for any violence they may perpetrate on the passengers.

When, however, the passenger's own negligence is the proximate cause of the injury the carrier is not liable. Thus if an attempt should be made to get upon a train while the cars were in motion, or a passenger's head or arm should be thrust from a window, and accidents occur in consequence, his own imprudence would be fatal to any claim for damages. This proposition leads to an important branch of the law termed "contributory negligence," which may be defined to be that negligence without which the injury would not have happened, while at the same time, on the part of the carrier, on being made aware of the passenger's negligence, there must be reasonable care used to avert its effects.

The common duties of passenger carriers are to receive all who offer to take passage as long as their vehicles suffice, to carry them the entire route, to treat all with civility and propriety, and bring them to their destination within the stipulated time. They are not, however, compelled to receive persons of offensive or disorderly conduct, or any who by reason of disease or disgusting habits are unfit associates for the other passengers. Reasonable regulations may be adopted concerning the control of passengers, such as that fares must be paid in advance, tickets must be exhibited when called for, and the like. Expulsion of persons in a suitable manner and without necessary force from their vehicles for refusing to comply with such rules are considered justifiable.

The liability of passenger carriers for baggage committed to their charge is in general the same as that of common carriers of goods. In other words, they are held bound as insurers. If, however, the passenger prefers to retain exclusive control of his own property, as a coat, an umbrella, or a satchel, the carrier's responsibility is modified. The liability continues until delivery is made, either to the owner at the final destination or to another carrier in a continuous line of transit, and the duty of storing and preserving goods is the same that has been already detailed in the ordinary case of carriage of goods. The effect of contract or notice is also similar. The obligation to convey baggage arises independently of any special agreement in relation thereto, being considered as incidentally connected with the undertaking to carry the passenger himself, and no additional payment is necessary. But some measure of relief is granted to the carrier on account of this lack of remuneration by defining his accountability more narrowly. He is only liable for articles properly denominated baggage, and not for everything which the passenger may choose to consider such. Articles of necessity or personal convenience are reasonably included within the meaning of the term, but not merchandise or large sums of money or silver plate, and the like. For instance, jewelry used for personal ornament, a reasonable amount of money for traveling expenses, the instruments of a surgeon required in practice in the course of his journey, have all been considered "baggage," and the carrier made accountable for the loss. But the samples of a traveler acting for a commercial house would not be baggage, but merchandise, unless the carrier was made aware of their nature, and then without objection received them as baggage. The principle governing this matter is that concealment of the true nature of the package presented as baggage is a fraud on the carrier. All inference of fraud is dispelled if the contents be disclosed, and there is no objection to the carrier accepting merchandise in trunks if he see fit.

Appropriate remedies exist in favor of carriers. They may detain goods for the freight. They have an action against strangers who interfere with their possession, and may even recover the full value of the goods, holding the surplus above their charges in trust for the owner.

In this brief summary of the rights and duties of common carriers attempt has only been made to exhibit common-law provisions and principles. Statutory enactments exist in the United Kingdom, and in various States, relating to the subject. The subject is treated in much detail in such works as Redfield *On Railways* and Angell *On Common Carriers*. The rules of damages will be found in Sedgwick or Mayne *On Damages*.

T. W. Dwight.

Carrillo, kaăr-reel'yō, Braulio: a statesman of Costa Rica; b. at Cartago, 1800. He was a member of the Federal Congress of Central America 1834, and twice president of Costa Rica (May, 1835, to Mar., 1837, and May, 1838, to Apr., 1842), his administration being marked by wisdom and prosperity. In 1836 he suppressed a rebellion. Carrillo's government was overturned by Morazan in 1842, and he was driven into exile. He was murdered at San Miguel, Salvador, in 1845.

Herbert H. Smith.

Car'rington, Edward: b. in Virginia, Feb. 11, 1749; commissioned lieutenant-colonel of Harrison's artillery regiment in the Revolutionary army Nov. 30, 1776; served under Gens. Gates and Greene, and became the quartermaster-general of the latter; commanded the artillery with success at the battle of Hobkirk's Hill, Apr. 24, 1781, and at Yorktown. He was a delegate to the Continental Congress from Virginia in 1785–86, and was foreman of the jury in Aaron Burr's trial for treason. D. Oct. 28, 1810.

Carrington, Henry B., LL. D.: b. at Wallingford, Conn., Mar. 2, 1824; graduated at Yale 1845; studied law at Yale Law School; professor in New Haven Collegiate Institute; in 1848 commenced practice of law in Columbus, O.; in 1857, being on the staff of Gov. Chase, aided in the organization of the State militia; at the opening of the civil war was made colonel of the Eighteenth U. S. Infantry, and soon after brigadier-general of volunteers. After the close of the war he joined his regiment, and served on the plains in the West until 1868; in 1869 was Professor of Military Science in Wabash College, Crawfordsville, Ind. Wrote *Absaraka, the Home of the Crows*; *History of the Battles of the American Revolution*, etc.

Carrington, Paul: brother of Edward Carrington, noticed above; b. in Virginia, Feb. 24, 1733; graduated at William and Mary College, Virginia; was engaged in 1736 in the expedition under Col. Byrd to establish the boundary line between Virginia and North Carolina; practiced law; was a member of the house of burgesses 1765–75, and voted against the Stamp-Act resolutions of Patrick Henry; was a member of the house of delegates, from which he passed to the bench of the general court in May, 1779; he became a member of the court of appeals, and held that office until 1811; was a member of the committee of safety throughout its existence, and in the Virginia convention voted for the adoption of the Constitution. D. June 22, 1818.

Carrington, Paul: son of the above; b. in 1764. He was distinguished as a Revolutionary soldier in the battles of Guilford Court-house and Green Spring; was a graduate of

William and Mary College, Virginia; member of the house of delegates and of the Virginia Senate; was judge of the superior court. D. Jan. 8, 1816.

Carrion Flowers: the flowers of several species of *Stapelia*, which smell like carrion. They are natives of the Cape of Good Hope.

Car'roll: town (founded in 1867); capital of Carroll co., Ia. (for location of county, see map of Iowa, ref. 5–E); on C. and N. W. R. R. (main line and 3 branch lines); 93 miles E. of Council Bluffs; has 9 churches, 4 schools, fine county buildings, and hotels. The town has manufacturing and wholesaling industries, but derives its support chiefly from agriculture. Pop. (1880) 1,385; (1890) 2,448; (1900) 2,882.
EDITOR OF "SENTINEL."

Carroll, BENAJAH HARVEY, A. M., D. D.: Baptist minister; b. in Carroll co., Miss., Dec. 27, 1843, and educated at Baylor University, Independence, Tex. He has been pastor of the Baptist church in Waco, Tex., since 1870, and is a noted orator of his denomination. Among his addresses may be mentioned: *Then—Now—Hereafter*; *The Good and True Orator*; *Philosophy of Composition*; *Discourses on Prohibition*; *Spurgeon Memorial*; *Personal Liberty*; *Missions of the Southern Baptist Convention*; *Canon of the Bible*; *The Manuscripts*; *Creeds*. The following are some of his published sermons: *Watching Christ on the Cross*; *Communion*; *The Dance*; *Repentance*; *Love*; *Two Plans of Salvation*; *God's Control of the Gospel*; *God's Order in the Gospel of his Son*; *The Agnostic*; *The Treasury*; *How I Escaped from Infidelity*.

Carroll, CHARLES, **of Carrollton**: an American patriot; b. at Annapolis, Md., Sept. 20, 1737. He inherited a large estate in land, and was regarded as the richest man in Maryland. He was chosen as delegate to the Continental Congress in 1776, and signed the Declaration of Independence. To distinguish himself from another man of the same name, he signed himself "Charles Carroll of Carrollton." He was elected to the Senate of the U. S. in 1788. He was of the Roman Catholic faith, and was a man of great dignity and worth. He was a lawyer by profession, educated in France and England, and was especially honored as the last survivor of the signers of the Declaration of Independence. D. in Baltimore, Nov. 14, 1832.

Carroll, HENRY KING, LL. D.: journalist; b. at Dennisville, N. J., Nov. 15, 1848; became assistant editor of the Methodist Episcopal *Hearth and Home*; religious and political editor of the *Independent* (New York, 1876); special agent of the eleventh census in charge of the division of churches; chief editor of *Papers and Proceedings of the Centennial Methodist Conference* (New York, 1885); *The Religious Forces of the United States* (New York, 1893), etc.

Carroll, JOHN, D. D., LL. D.: first Roman Catholic bishop of the U. S., and cousin of Charles; b. at Upper Marlborough, Md., Jan. 8, 1735; educated by the Jesuits in Belgium; ordained priest in 1759; from 1759 till 1771 Professor of Moral Philosophy in St.-Omer and Liège; became a Jesuit 1771; in 1773 prefect to the Jesuit college at Bruges, in Belgium, and when the pope suppressed the society that year went to England, and to America in 1774. In 1784 he was, at the instance of Franklin, appointed superior of the clergy of the U. S., and in 1790 he was consecrated as Bishop of Baltimore. In 1791 he founded Georgetown College. In 1808 his see was made an archiepiscopal one, and he became Archbishop of Baltimore. D. in Georgetown, D. C., Dec. 3, 1815.

Carroll, LEWIS: See DODGSON, CHARLES LUTWIDGE.

Carroll, WILLIAM: b. in Pittsburg, Pa., in 1788; emigrated to Nashville, Tenn., in 1810; captain and brigade inspector under Gen. Andrew Jackson Feb. 20, 1813; colonel and inspector-general Sept., 1813, to May, 1814; fought a duel in 1813 with Jesse, a brother of Col. Thomas H. Benton; major-general Tennessee militia Nov. 13, 1814, to May 13, 1815; famous for his services in defense of New Orleans, especially in the battle of Jan. 8, 1815; Governor of Tennessee 1821–27 and 1829–35. D. Mar. 22, 1844.

Carrollton: town; capital of Carroll co., Ga. (for location of county, see map of Georgia, ref. 3–F). It is on the Little Tallapoosa river, and that branch of the Central Ga. R. R. which runs from Savannah, Ga., to Chattanooga, Tenn.; has six churches, and public schools for all classes. Its principal interests are mercantile, and it has a large trade with the surrounding country. Pop. (1880) 926; (1890) 1,451; (1900) 1,998.
EDITOR OF "FREE PRESS."

Carrollton: city (founded in 1821); capital of Greene co., Ill. (for location of county, see map of Illinois, ref. 7–C); on Ch. and Alt. and Litch., Carr. and West. R. Rs.; 34 miles N. N. W. of Alton. It has a fine public school, handsome court-house, various manufactures, and an excellent system of water-works. Pop. (1880) 1,934; (1890) 2,258; (1900) 2,355.
EDITOR OF "PATRIOT."

Carrollton: city; capital of Carroll co., Ky. (for location of county, see map of Kentucky, ref. 2–H); on Cleve., Cant. and South. R. R., and on Ohio river at the mouth of Kentucky river; 80 miles from Cincinnati, O., and 62 miles from Louisville. Here are churches of five denominations, excellent graded school, court-house, large furniture-factory, woolen-mill, sawmills, grist-mill, pantaloon-factory. The city is situated in a rich agricultural region, and has a very large trade in leaf-tobacco. Pop. (1880) 1,332; (1890) 1,720; (1900) 2,205.
EDITOR OF "DEMOCRAT."

Carrollton: village (incorporated in 1869); Saginaw co., Mich. (for location of county, see map of Michigan, ref. 6–J); on three railroads, and on Saginaw river; 3 miles from Saginaw; has 2 churches, public school, and 3 lumber-mills. Pop. township (1890) 2,075; (1900) 1,952.
ROBERT J. ABBS, TOWNSHIP CLERK.

Carrollton: city; on railroad; capital of Carroll co., Mo. (for location of county, see map of Missouri, ref. 3–F); 66 miles E. N. E. of Kansas City; has 2 schools, mower and hay-stacker factory, furniture-factory, tile-factory, 3 cigar-factories, 2 flour-mills, a woolen-factory, etc. Pop. (1880) 2,313; (1890) 3,878; (1900) 3,858. EDITOR OF "DEMOCRAT."

Carrollton: on railroad; capital of Carroll co., O. (for location of county, see map of Ohio, ref. 4–I); is about 90 miles S. E. of Cleveland. Carrollton has five churches and a good school. Its principal industry is agriculture. There are large deposits of iron ore in the vicinity. Pop. (1880) 1,136; (1890) 1,228; (1900) 1,271.

Carronade: a short iron cannon for naval service, invented by Mr. Gascoigne, and named after the Carron ironworks in Scotland, where it was first made in 1779. It was lighter than the ordinary guns, and had a chamber for powder like a mortar. Carronades are now obsolete.

Carrot: a plant of the genus *Daucus* and order *Umbelliferæ*. The common carrot (*Dau'cus caro'ta*) is a biennial plant, a native of the East, but naturalized both in Europe and America. In many parts of the Eastern U. S. it has become a pernicious weed. Its leaves are pinnately compound; the flowers creamy white. The root of the cultivated plant is much thicker and more agreeable to the taste than the wild. It is largely given to cattle, for which, as well as for men, it is a wholesome and moderately nutritious article of food. The plant has some beauty, its leaves having been worn in England by ladies instead of feathers during the reign of Charles I. The root is also used for poultices. The cultivation of carrots is similar to that of beets.

Carruth'ers, ROBERT: b. at Dumfries, Scotland, Nov. 5, 1799; was apprenticed to a bookseller; became in 1828 editor, and in 1831 proprietor, of the Inverness *Courier*; published with Robert Chambers the *Cyclopædia of English Literature*, and alone an annotated edition of Boswell's *Journal of a Tour to the Hebrides*, etc. D. May 26, 1878.

Car'son, ALEXANDER, LL. D.: minister and author; b. in County Tyrone, Ireland, 1776; educated at the University of Glasgow; settled as pastor of the Presbyterian church at Tubbermore. Carson was so much affected by the notions of Haldane and Ewing that on Jan. 1, 1805, it was necessary for him to quit his place in the Presbyterian church and ministry. A large portion of the society to which he ministered followed him. In 1814 Dr. Carson was induced to examine the question and decided to quit the party of Ewing and Wardlaw, and to submit to immersion. After going over to the side of the Haldanes, he received pecuniary assistance from Robert Haldane. Throughout the remainder of his life he adopted the type of Sandemanian church order. The kiss of charity was observed every Sunday; there was weekly communion, and weekly exhortation by the brethren, in case any of them should desire it. At the time of his death he was claimed as an adherent by William Jones, the leader of the so-called Scotch Baptists in England. He was never in ecclesiastical fellowship with the regular Baptists of England. D. at Belfast, Ireland, Aug. 24, 1844. Of his books the best known is *Baptism, its Mode and Subjects* (Edinburgh, 1831; reprinted by the American Baptist Publication

Society, Philadelphia). See *Life of Alexander Carson, LL. D.*, by George C. Moore (New York, 1853).

WILLIAM H. WHITSITT.

Carson, CHRISTOPHER: trapper; commonly called KIT CARSON; b. in Kentucky, Dec. 24, 1809. He served as a guide to Fremont in his Rocky Mountain explorations. He was an officer in the U. S. service in both the Mexican war and the great civil war. In the latter he received a brevet of brigadier-general. D. at Fort Lynn, Colorado, May 23, 1868.

Carson City: capital of Nevada, and of Ormsby co., Nev. (for location of county, see map of Nevada, ref. 5–E); on Va. and Truckee R. R.; 15 miles S. W. of Virginia City, 3 miles W. of Carson river, and 12 miles N. E. of the picturesque Lake Tahoe. The city is situated in a plain surrounded by rugged mountains, some of them snow-capped during the entire year. There are here hot springs, which are resorted to by many invalids. In the quarries of the State prison fossil footprints of gigantic animals have been discovered, and are of great scientific interest. Carson was founded in 1858, and derives its support from mining, lumbering, and farming industries. It has State and U. S. public buildings. Pop. (1880) 4,229; (1890) 3,950: (1900) 2,100.

EDITOR OF "MORNING APPEAL."

Carson River, Nevada: rises in the Sierra Nevada; flows nearly northeastward; passes through Ormsby and Lyon Counties, and enters Carson Lake in Churchill County. Length, estimated at 150 miles. Carson Lake has no outlet, and is about 15 miles long.

Car'stairs, or **Carstares**, WILLIAM: b. near Glasgow, Scotland, Feb. 11, 1649. He became chaplain to William, Prince of Orange, who trusted him as a confidential adviser in affairs relating to Great Britain. Having been sent to England in 1682 as the secret agent of William of Orange, he was arrested as an accomplice in the Rye House plot, and was put to the torture, which could not extort from him any confession, although he was the depositary of important secrets. After the accession of William to the throne Carstairs had great influence in Scottish affairs, and was five times chosen moderator of the General Assembly. He became minister of Gray Friars church, Edinburgh, in 1704. D. Dec. 28, 1715. His virtues and abilities are highly extolled by Macaulay. See McCormick, *Life of W. Carstairs* (1774).

Cart: See CARRIAGES, etc.

Cartage'na: a city and fortified seaport of Spain; province of Murcia; on a bay of the Mediterranean; 27 miles S. S. E. of Murcia; lat. 37° 36′ N., lon. 1° 1′ W. (see map of Spain, ref. 19–H). It occupies the declivity of a hill and a small plain which is between the hill and the sea. The harbor, which is one of the best in the Mediterranean, is capacious enough to hold the largest fleets, and is protected from winds by highlands which inclose it on several sides. The entrance to the harbor is defended by a fortified island. Cartagena was formerly the chief naval arsenal of Spain. It has a Moorish cathedral, numerous churches and convents, a theater, and an observatory; also manufactures of sailcloth and glass. Red marble is abundant here, and is used for building. Mines of silver and lead have been opened in the vicinity. Pop. (1887) 84,171. The ancient *Carthago Nova* was founded by Hasdrubal in 242 B. C. See CARTHAGO NOVA.

Cartagena: a seaport-city of Colombia; capital of the department of Bolivar; on a low island of the Caribbean coast at the entrance of Cartagena Bay (see map of South America, ref. 1–B). It was founded by Pedro de Heredia in 1533, and during the colonial period was one of the most important ports and strongholds of Spanish America, having the monopoly of a vast commerce. It was several times sacked by buccaneers and English corsairs, and in the effort to make it impregnable the Spanish Government spent nearly $60,000,000 on its defenses. During the war of independence it was taken by the Spaniards, after sustaining an heroic siege of four months (1815). Cartagena is an episcopal city. It has a fine cathedral and several other churches, a hospital, theater, and many convents and other old buildings of historical interest. The city is surrounded by thick walls. The bay is a large and deep landlocked harbor, with two main entrances; of these the larger was artificially obstructed in the eighteenth century, and ships use the smaller one, which is very narrow and 8 miles distant from the city. There are two old Spanish castles at this entrance, and another within the harbor. Owing to its hot and often unhealthy situation, and the lack of good water, the prosperity of Cartagena has declined. A railroad to Calamar on the Magdalena river is in course of construction (1893). The principal exports are hides and tobacco. Pop. (1892) about 12,000.

HERBERT H. SMITH.

Cártago: a city of Costa Rica; near the center of the republic, in a valley at the foot of the Irazú volcano; 4,900 feet above the sea (see map of Central America, ref. 8–J). It was founded by Coronado in 1565, on the site of an Indian town, and was the capital of Costa Rica until 1823. It was nearly destroyed by an eruption of the volcano in 1723, and was ruined by an earthquake Sept. 2, 1841, but soon rebuilt. The streets are wide and well paved, and the houses substantial; the water-supply is excellent, with several fountains and separate pipes to dwellings. There are several churches, a college, large barracks, and a hospital. The railroad from Limon to Alajuela passes through Cartago. The hot mineral springs of Bella Vista, 3 miles distant, are much frequented by invalids. Pop. (1892) about 12,000. Cartago is the capital of a province of the same name, containing about 200 sq. miles; pop. (1888) 33,887. HERBERT H. SMITH.

Cartago: a town of the republic of Colombia; in the state of Cauca, and on the river Cauca, about 135 miles W. of Bogotá (see map of South America, ref. 2–B). It has a cathedral, and a trade in coffee, cocoa, dried beef, tobacco, etc. Pop. 7,696.

Carte, THOMAS: historian; b. at Clifton, near Rugby, England, in Apr., 1686; educated at University College, Oxford. He became a priest and Jacobite. During the rebellion of 1715 a large reward was offered for his arrest, but he escaped to France. His chief work is a *History of England* (4 vols., 1747–55), which is prized for its facts, but is not well written. Many volumes of his manuscripts are preserved in the Bodleian Library at Oxford. D. Apr. 7, 1754.

Car'tel [Fr., from Ital. *cartello* or Span. *cartel*, dimin. of *carta*, letter, card]: an Anglicized French word which in France signifies a "challenge." As a military term it is used to denote an agreement between two belligerents for the exchange of prisoners. A vessel used in exchanging prisoners or carrying proposals to an enemy is called a cartel-ship.

Car'ter, FRANKLIN, Ph. D., LL. D.: president of Williams College: b. in Waterbury, Conn., Sept. 30, 1837: educated at Yale College and Williams College, and in University of Berlin; Professor of Latin, Williams College, 1865–72; Professor of German in Yale College in 1872–81; president of Williams College 1881; has published an edition of Goethe's *Iphigenia*, *Study of Mark Hopkins* (1892), and articles and essays in various magazines.

Carter, JAMES C.: See the Appendix.

Carter, SAMUEL POWHATAN: rear-admiral U. S. navy; b. in Elizabethtown, Carter co., Tenn., Aug. 6, 1819; entered the navy as a midshipman Feb. 14, 1840. He served on the east coast of Mexico during the Mexican war. While attached to the steamer San Jacinto in 1856 he participated in the attack on the Barrier Forts at the mouth of the Canton river, China, which resulted in their capture. In July, 1861, Carter was ordered to report to the Secretary of War for duty, and proceeded at once to East Tennessee, where he organized the Tennessee brigade. He was appointed a brigadier-general of volunteers, and continued on active duty with the army during the entire war, doing most important and gallant service in Tennessee, Kentucky, Virginia, and North Carolina, and receiving the brevet of major-general for gallant and distinguished services. He was appointed a rear-admiral on the retired list May 16, 1882. D. May 26, 1891.

Carteret, JOHN: See GRANVILLE, EARL.

Carteret, PHILIP: navigator. Immediately after the return of Commodore Byron, George III. ordered a new expedition for the exploration of the southern hemisphere, and Aug. 22, 1766, the Dolphin, the Swallow, and the Prince Frédéric left Plymouth under the command of Capt. Samuel Wallis; Carteret commanded the Swallow. On Dec. 17 the fleet entered the Strait of Magellan; when it again sallied forth, Apr. 11, 1767, it was overtaken by a hurricane, and the Swallow was separated from the two other vessels. Carteret continued the voyage, discovered Pitcairn island, the island of Gloucester, the island of Queen Charlotte, and Solomon's islands, explored the strait between New Britain and New Zealand, drew a map of the western coast of the

Celebes, and reached Batavia June 3, 1768. On Jan. 6, 1769, he doubled the Cape of Good Hope, and on Sept. 20 he reached Spithead, having accomplished almost marvelous results in view of the small means at his disposal. See Hawkesworth, *An Account of the Voyages Undertaken by the Orders of His Present Majesty* (London, 1773).

Cartersville: city; capital of Bartow co., Ga. (for location of county, see map of Georgia, ref. 2–F); on Wilm., Colum. and Aug. R. R.; 48 miles N. N. W. of Atlanta; has six churches, schools for white and colored children, ocher and brick works and iron mines. Gold, copper, etc., are found in this vicinity. Among its industries are also the raising of cotton, corn, wheat, clover, and stock. Pop. (1880) 2,037; (1890) 3,171; (1900) 3,135.

PUBLISHERS OF "COURANT AMERICAN."

Carterville: city; Jasper co., Mo. (for location of county, see map of Missouri, ref. 7–D); on Mo. Pac. R. R.; 10 miles S. W. of Carthage; has 4 churches and 4 schools. Its chief industry is mining, and in the year 1892 there were produced 92,669,140 lb. of zinc ore and 6,217,380 lb. of lead ore, of a total value of $1,290,568. Pop. (1880) 483; (1890) 2,884; (1900) 4,445.

EDITOR OF "REPUBLICAN."

Carte'sian Philos'ophy: the system of philosophy brought forward by Réné Descartes (1596–1650), one of the most original thinkers of France or of any country. (See DESCARTES.) The scholastic philosophy which had prevailed in the Middle Ages, though based upon the teachings of Aristotle, had so far departed from the spirit of its great master as to have become almost vain and fruitless. What Descartes and his contemporary, Bacon, did, was, each in his own way, to help arouse a spirit of independent research in philosophy and in science. It must not be forgotten, however, that the independence of Bacon and Descartes was a result as well as a cause of this new spirit. The new current had begun to flow before their day, but they each contributed largely to swell that current.

Descartes proposed as a basis for his system, and as a ground for all knowledge, the act of conscious thought, as necessarily involving the idea of existence. His celebrated dictum, *Cogito, ergo sum*—i. e. I think, therefore I exist—is the starting-point of his philosophy. And although the dictum itself has been severely criticised, it may be fairly questioned whether the fault be not in the expression rather than in the thought intended to be expressed, and whether the appeal to our consciousness be not indeed the ultimate ground of philosophy. Those writers who deny the validity of the testimony of consciousness are nevertheless continually appealing to the same testimony when it serves their purpose. Descartes was a firm believer in the existence of a personal God, and attributed all the phenomena of nature to the continual and actual presence of an all-pervading Deity.

The great value of his philosophy has been in the grand stimulus of thought which it has given to others. It is a philosophy of method chiefly. Spinoza, Malebranche (*q. v.*), and even the modern German philosophers, are confessedly much indebted to him.

Revised by W. T. HARRIS.

Cartesians [from *Cartesius*, the Latin name of DESCARTES]: the disciples of Descartes, or those who adopted his system of philosophy. In the seventeenth century nearly all the philosophers of France were ranged under two parties, as Cartesians and Gassendists.

Car'thage (in Gr. ἡ Καρχηδών; Lat. *Carthago*): an ancient and celebrated commercial city of Africa, and the capital of the republic of Carthage; a Phœnician colony founded by emigrants from Tyre about 850 B. C. It was situated on a bay of the Mediterranean about 20 miles S. of Utica, and near the site of the modern town of Tunis. Lat. about 36° 47′ N., lon. 10° 6′ E. The Punic or native name of Carthage is said to have been *Carthada* or *Karth Hadtha*. According to a tradition which has been immortalized by the genius of Vergil, it was founded by Dido, a sister of Pygmalion, King of Tyre, and she purchased of the natives the site of the new city. Ancient authorities concur in affirming that it was founded many years later than Utica, which was also a Phœnician colony. No record of the early history of Carthage has been preserved. "This great city," says P. Smith, "furnishes the most striking example in the annals of the world of a mighty power which, having long ruled over subject peoples, taught them the arts of commerce and civilization, and created for itself an imperishable name, has left little more than that name behind it, and even that in the keeping of the very enemies to whom she at last succumbed. Vast as is the space which her fame fills in ancient history, the details of her origin, her rise, her constitution, commerce, arts, and religion, are all but unknown. Of her native literature we have barely the scantiest fragments left. The treasures of her libraries were disdained by the blind hatred of the Roman aristocracy, who made them a present to the Princess of Numidia, reserving only the thirty-two books of Mago on agriculture for translation, as all that could be useful to the republic." Our information respecting the Carthaginians is derived mostly from Roman historians, who were deficient in impartiality, and from Polybius, who has preserved some genuine Punic documents.

Carthage seems to have been almost from its foundation independent of Tyre, but friendly relations were maintained between the colony and the metropolis, and the religious supremacy of the latter was recognized by an annual offering to the temple of Hercules at Tyre of a tithe of all the revenues of Carthage. The Carthaginians gradually acquired a dominion over the other Phœnician colonies of Northern Africa, and also over the Libyans and Numidians or nomadic tribes who occupied this region before the foundation of Carthage. This city became one of the greatest commercial emporiums of the world before the first Punic war. During the period of her greatest prosperity Carthage was probably the greatest maritime power in the world. The population of the city amounted to about 700,000 in 150 B. C. The Carthaginian (or Punic) language resembled the Hebrew, and belonged to the Semitic or Aramaic family. The government was a republic or an oligarchy, in relation to which our information is very scanty.

A condensed summary of all that is known on this subject is given by Grote, from which we extract the chief points: "Respecting the political constitution of Carthage the facts known are too few and too indistinct to enable us to comprehend its real working. The magistrates most conspicuous in rank and precedence were two kings or *suffetes*, who presided over the senate. They seem to have been renewed annually, though how far the same persons were reeligible we do not know; but they were always selected out of some few principal families or *gentes*. There is reason for believing that the genuine Carthaginian citizens were distributed into three tribes, thirty curiæ, and 300 gentes. From these gentes emanated a senate of 300, out of which, again, was formed a smaller council or committee of thirty *principes*, representing the *curiæ*. . . . The purposes of government were determined, its powers wielded, and the great offices held—suffetes, senators, generals, or judges—by the members of a small number of wealthy families. In the main, the Government was conducted with skill and steadiness, as well for internal tranquillity as for systematic foreign and commercial aggrandizement. Within the knowledge of Aristotle, Carthage had never suffered either the successful usurpation of a despot or any violent intestine commotion."

At a period little later than her first distinct appearance on the stage of recorded history, Carthage possessed an imperial authority, in a greater or less degree, over the northern coast of Africa from the Pillars of Hercules to the Great Syrtis, a distance of about 16,000 stadia (2,000 miles). But the only part of this extensive territory that was entirely subject to the dominion of Carthage was the country which extended S. of the city about 90 miles, and the boundaries of which were nearly the same as those of Zeugitana, and the strip of coast along which lay Byzacium and Emporia. Like other great commercial states, Carthage found that her maritime enterprise led her on almost inevitably to engage in foreign conquests and to contend for the dominion of the sea. The first foreign province that she acquired appears to have been the island of Sardinia, which belonged to Carthage at the time of her first treaty with Rome, 509 B. C. This island was the principal emporium of her trade with Western Europe, and always ranked as the chief among her foreign possessions. Among the earliest objects of military enterprise of the Carthaginians was Sicily, then occupied by several Greek colonies. For the conquest of this island they sent a fleet of 3,000 ships, with an army of 300,000 men, commanded by Hamilcar. He was defeated by Gelon, tyrant of Syracuse, at Himera, in 480 B. C., and was killed in this action, which was one of "the decisive battles of the world," and was important in a degree which no contemporary could estimate. The Cartha-

ginians in 410 B. C. renewed the war against the Greeks of Sicily, and obtained possession of part of that island, where they were involved in a long contest with Dionysius of Syracuse. They planted colonies in Hispania (Spain), and derived much riches from the gold and silver mines of that peninsula; but their relations with the natives were peaceful, and they did not attempt to subjugate Spain before the Punic wars. Polybius states that all the islands of the Western Mediterranean belonged to Carthage at the commencement of the Punic wars, 264 B. C. In 509 B. C. a commercial treaty was concluded between Carthage and Rome. This celebrated document has been preserved by Polybius. The second treaty between these two powers was made in 348 B. C. It appears that the Carthaginians never came into hostile contact with the Athenian republic, although the latter was a great maritime power while Carthage was near the zenith of her prosperity.

The army of Carthage was composed chiefly of Libyan conscripts and slaves and foreign mercenaries. This defect in her military system was probably one of the chief causes of her ruin. This system could not afford the republic internal security, for the soldiers had little devotion to the cause for which they fought, and the enemies of Carthage found it their best policy to "carry the war into Africa." It would be an error to regard the Carthaginians as a merely commercial people. Agriculture was a favorite pursuit of the nobles, citizens, and colonists, and the soil of her African territory was extremely fertile. Her prosperity was also promoted by manufactures and mechanical arts. Gold and silver were the standard of value at Carthage, but we have no evidence that the republic coined money, as no Punic coins are now extant which were struck before the Romans conquered that state. Her merchant-ships passed beyond the Pillars of Hercules and made voyages to the British islands. The Carthaginians also carried on an extensive inland trade by caravans, which traversed the deserts to the valleys of the Nile and Niger.

Carthage and Rome were the two greatest powers of the world when their competition for the rich island of Sicily involved them in the first Punic war, 264 B. C. The Romans, who had no navy when the war began, suffered several defeats at sea, and one of their generals, Marcus Regulus, who invaded Africa, was taken prisoner. They gained a great naval victory near Lilybæum in 241 B. C., which ended the war. The Carthaginians obtained peace by ceding Sicily and Sardinia to the victors. Carthage was so impoverished by this long war that she could not pay her armies. The mercenaries revolted in 240 B. C., and were joined by most of the subject Libyans in a civil war which brought Carthage to the brink of ruin. After the suppression of this revolt the peace and stability of the state were menaced by a feud between Hanno and Hamilcar Barca, who became respectively the leaders of the aristocratic and democratic parties. The great abilities and sagacity of Hamilcar restored the prosperity of the republic by the conquest of Spain, which, says Heeren, "was then the richest country of the known world." He invaded Spain in 237 B. C., and gained several victories, but he subdued the Spaniards by kindness rather than force. Before he had conquered all the peninsula he died in 229, leaving the completion of the enterprise to his son-in-law, Hasdrubal, and his own son, the famous Hannibal. The latter succeeded to the chief command of the army in Spain in 221 B. C. His conquests provoked the hostility of the Romans, and he began the second Punic war by marching across the Alps and invading Italy in 218 B. C. After he had defeated the Romans at several places in Northern Italy, he gained a most signal and complete victory at the great battle of Cannæ in the summer of 216 B. C. The second Punic war seems to have been conducted by Hannibal rather than by the state, from which he received little aid or co-operation. By his military genius and personal resources he maintained himself in Italy for about fifteen years. (For the details of this war, which was ended by the victory of the Roman general Scipio at Zama in 202 B. C., the reader is referred to the article HANNIBAL.) The treaty which the victors dictated in 201 B. C. deprived Carthage of all her dominions outside of Africa. Hannibal, who soon obtained the ascendency in Carthage, made important reforms, which reduced the power of the aristocracy and the judges, but he was driven into exile by a hostile faction in 195 B. C. The Romans, who resolved to destroy Carthage, found a pretext to commence the third Punic war in 150 B. C. The Carthaginians made an heroic and desperate resistance, but their capital was taken and utterly ruined in 146 B. C. On the commanding site of the Punic Carthage Caius Gracchus founded in 122 B. C. a Roman town, which was called Junonia, but the colony did not prosper. In 29 B. C. the Emperor Augustus sent out another colony; the natural advantages of the site soon made themselves felt; and before long the new city stood as a rival to Alexandria and claimed rank as the second city of the empire. Herodian states that in his time it was next to Rome in population and wealth. In 439 A. D. it was taken by Genseric, who made it the capital of the Vandal kingdom in Africa. It was captured and finally destroyed by the Arabs in 647 A. D. Few vestiges of its ancient grandeur remain to indicate its site, except some broken arches of a great aqueduct which was 50 miles long. See Arnold, *History of Rome*, vol. ii.; Heeren, *Historical Researches into the Politics, Commerce, etc., of the Ancient Nations of Africa* (1824); Böttiger, *Geschichte der Carthager* (1827); Münter, *Religion der Karthager* (1821); Davis's *Carthage and her Remains*; Church, *History of Carthage* (New York, 1886); Smith, R. B., *History of Carthage* (1878). See also Freeman's *Historical Essays* (4th series, 1892).

Revised by C. K. ADAMS.

Carthage: city; capital of Hancock co., Ill. (for location of county, see map of Illinois, ref. 5–B): on Wab. and Ch., Bur. and Q. R. Rs.; 13 miles E. of Keokuk. It has a Lutheran college, electric lights, and water-works. Pop. (1880) 1,594; (1890) 1,654; (1900) 2,104.

EDITOR OF "REPUBLICAN."

Carthage: city and railroad center; capital of Jasper co., Mo. (for location of county, see map of Missouri, ref. 7–D); on Mo. Pac. and St. L. and San Fr. R. Rs., and on Spring river; in the center of the rich lead-regions of Southwest Missouri, with numerous manufactories, Presbyterian college, 2 public schools, 2 parks, and a public library. On the morning of July 5, 1861, a force of Confederates under Gov. Jackson and Gen. Price, numbering about 3,500 men, while retreating from the army of Gen. Lyon, were confronted about 7 miles E. of this town by a body of Federal troops under Gen. Sigel, numbering about 1,500. Gen. Sigel was superior in artillery, while the Confederates, largely outnumbering him, had the advantage also of a body of cavalry. Gen. Sigel, availing himself of his superior strength, opened fire with his artillery, which he continued, to the severe loss of the Confederates, for several hours, when, to avoid being outflanked by the Confederate cavalry, and to protect his baggage train, he was obliged to fall back, which he accomplished in good order, continuing his retreat to Carthage and to Sarcoxie, 15 miles eastward. The Federal loss was less than 50 killed and wounded, while the Confederate loss was reported to be 50 killed and about 150 wounded. Pop. (1880) 4,167; (1890) 7,981; (1900) 9,416.

EDITOR OF "BANNER."

Carthage: village (settled in 1794): Jefferson co., N. Y. (for location of county, see map of New York, ref. 2–G); situated on east side of Black river, at the head of Black river canal. It is the terminus of the Carthage and Adir. and Carthage, Wat. and Sack. Harb. R. Rs., and is on R., W. and Og. R. R.; 22 miles E. of Watertown. Here are churches of six denominations, public school, academy, extensive water-power, lumber-mills, furniture-factories, foundries, machine-shops, pulp-mills, marble-works, etc. Pop. (1880) 1,912; (1890) 2,278; (1900) 2,895.

EDITOR OF "TRIBUNE."

Cartha'go No'va [Lat. for New Carthage]: an ancient and celebrated city of Hispania (Spain); on the Mediterranean; was founded by Hasdrubal in 242 B. C. It had an excellent harbor, and became a great commercial city of the Carthaginians. It also derived much prosperity from its rich silver mines, in which 40,000 men are said to have been employed. In 210 B. C. it was captured by Scipio Africanus. Strabo tells us that in his time it was a great trading center. It was destroyed by the Goths before 550 A. D. The site is occupied by CARTAGENA (*q. v.*).

Car'thamin: a dyestuff obtained from the *Carthamus tinctorius*, a plant which is a native of India and Egypt, and is sometimes called saffron or safflower. This is the plant used in domestic medicine and known as saffron, but it is very different from the true saffron, or *Crocus sativus*. It is used to dye cotton and silk, to which it imparts a beautiful red color which is not very permanent.

Carthamus: See CARTHAMIN and SAFFLOWER.

Carthu'sians (in Lat. *Carthusiani*; Fr. *Chartreux*, fem. sing. *Chartreuse*): a monastic order founded by St. Bruno (*q. v.*) in 1084, in the wilderness of Chartreuse, France, 14 miles N. of Grenoble. It was sanctioned by the pope in 1170, and was propagated in Germany, Spain, England, and Italy. The original structures of Bruno were superseded by the present one of vast extent, known as La Grande Chartreuse, built in 1676. It is now famous as the place of manufacture of the liqueur which bears its name. The prior of this monastery is the head of the order; there is also a proctor-general, who resides at Rome. The monasteries of these monks in England, where they were established in 1180, were called Charterhouses, a corruption of the French *Chartreuse*. The very austerity of the rules was a great attraction, and by special enactment members of any of the mendicant orders were allowed to become Carthusians. But no Carthusian was allowed to exchange his order for any other. Carthusians are divided into monks (*patres*) and lay-brothers (*conversi*). The former live by themselves in separate cells. Their rules require them to perform manual labor; to abstain from eating flesh, but not from drinking wine; and to observe ascetic practices, among which is a vow of continual silence. Carthusian nuns made their appearance in the twelfth century. There are few houses of either monks or nuns now existing. The ordinary dress is white, but outside of the monastery a long black cloak with a hood is worn. See Charterhouse.

Cartier, kaär'ti-ay', Sir George Étienne, Bart.: Canadian statesman; b. at St. Antoine, P. Q., Sept. 6, 1814; educated at St. Sulpice College. He was admitted to the bar in 1835; aided the rebels in 1837; and entered Parliament in 1848. He was Provincial Secretary in 1855; Attorney-General for Lower Canada in 1856, and, with Sir John A. Macdonald, formed the Macdonald-Cartier Government in 1857. He was one of the most active promoters of Confederation, and in 1867 became Minister of Militia in the first Dominion cabinet. He was made a baronet in 1868. D. in England, May 20, 1873. A monument has been erected to him in the Parliament grounds, Ottawa. Neil Macdonald.

Cartier, Jacques: a French navigator; b. at St.-Malo, Dec. 31, 1494. He discovered the river St. Lawrence in 1534, and ascended it as far as the site of Montreal. He returned to France in 1536, taking with him Donnacona, an Indian chief, and several other Indian leaders, whom he treacherously carried off. He joined Roberval's expedition and sailed again in 1541, exploring the rapids above Montreal, but the next year he abandoned Roberval at St. John and sailed for St.-Malo. The King of France ennobled him for his discoveries. D. about 1554.

Car'tilage [from Lat. *cartilago*, gristle]: a variety of connective tissue of more or less elastic and translucent character and whitish or yellowish in color; commonly known by the name of gristle. In structure, cartilage presents two distinct varieties. One known as hyaline, the other as fibrous or fibro-cartilage. In the former there is found a homogeneous translucent matrix in which are embedded the proper cartilage cells. The latter are large ovoid or irregular-shaped cells, having a large nucleus and lying in groups of two to three or four inclosed within a capsule. In the case of fibro-cartilage the intercellular matrix contains a greater or less abundance of fibrous stroma, and in some cases the latter is largely composed of yellow elastic fibrils. Cartilage may be classified as *temporary* or *permanent*; and we may distinguish that which is connected with bone or which leads to bone formation, and that which is independent of bone or bone formation. Temporary cartilage is the basis of all ossification, and in an infant or youthful person the majority of all bones consists mainly of cartilage. As age advances the formation of true bone increases, and by the twentieth or twenty-fifth year the process is usually complete. There are left, then, only the cartilages which form the articular ends of bones. Even these may become partially ossified in advanced life. The sternum, the costal cartilages, the larynx, the cartilages of the nose, ear, and bronchi rarely become ossified. See the articles Bone and Histology.

Cartilag'inous Fishes: those fishes whose skeletons are destitute of true bone, as the sharks, skates, sturgeons, etc. See Fish.

Cartography: See Map.

Cartoon' [Fr. *carton*, from Ital. *carto'ne*, stout paper, augmentative of *carta*, paper]: in the fine arts, a design drawn on strong paper or other material, and used as a model for a picture to be executed in fresco, oil color, tapestry, or glass. The cartoon is drawn the same size as the picture to be executed, this method enabling the artist to alter the drawing or composition readily. The drawing is made either in chalk or distemper, and is sometimes primed or washed with ground-color. The cartoon is transferred to canvas or plaster, either by tracing the lines with a hard point or by pricking them with pins. In the first instance the back of the cartoon is first covered with some coloring-matter; in the second a bag of pulverized charcoal or colored powder is passed over the perforations, pouncing the design onto the surface to be worked on. If the picture is to be placed at a great distance from the eye of the spectators, allowance must be made for this in drawing the cartoon.

The use of cartoons is particularly important in fresco paintings, of which only a small portion can be executed at a time, because the plaster must be moist when the pigment is applied to it, and it would be impossible to sketch the whole design on the plaster in the first instance. Therefore the cartoon must be traced in compartments so small that the artist can finish one before the plaster becomes dry. The most famous cartoons at the present day are seven by Raphael which are preserved in the South Kensington Museum, London. These are a part of a set of twenty-five which were sent to Flanders to be copied in tapestry for Pope Leo X. After the fabrication of the tapestry, which is said to be extant in Rome, the cartoons lay neglected at Brussels, and many of them were destroyed. Seven were purchased by Rubens for Charles I. of England, representing the following subjects: 1, St. Paul preaching at Athens; 2, the death of Ananias; 3, Elymas, the sorcerer, struck with blindness; 4, Christ delivering the keys to St. Peter; 5, the sacrifice at Lystra; 6, the apostles healing the sick in the temple; 7, the miraculous draught of fishes. These have been engraved by Dorigny and Audran. When the collection of Charles I. was sold these cartoons were purchased for the nation by Cromwell's special command.

The full-page political sketches in comic papers also are called cartoons.

Cartridge [from Fr. *cartouche*, small paper bag, a roll containing a charge for a pistol, cartridge; Ital. *cartoccio*, deriv. of Lat. *charta*, paper]: a case containing the proper quantity of powder or ammunition required to charge a gun or firearm. Cartridges for muskets are usually paper tubes, each containing a small amount of powder and a leaden ball. These are called ball cartridges. The paper used for this purpose is strong, and is made into a tube by means of a mandrel. Thinner paper is applied to certain parts of the tube, so that the powder has two or three thicknesses of paper around it, but the ball has only one. Besides this form there are several patent cartridges. A cartridge which contains powder only is called a blank cartridge. Cartridges for cannon or large guns are chiefly made of serge or flannel sewed up in the form of a bag, which, filled with a given weight of powder, is tied around the neck and strengthened by iron hoops. Cartridges for pistols are usually copper cylinders, having at the base the proper amount of fulminating powder, which inflames the charge of gunpowder upon being struck by the hammer, and these cartridges are used in most breech-loading firearms. See Blasting.

Cart'wright, Edmund: clergyman; noted as the inventor of the power-loom; b. at Marnham, England, Apr. 24, 1743. He wrote *Armine and Elvira* (London, 1771; 9th ed. 1803) and other poems. He was rector of Goadby Marwood, Leicestershire, from 1779 to 1809. In 1785 he exhibited his first power-loom, the introduction of which was violently opposed by the operatives, who burned a mill containing 500 of his looms. In 1809 he received a gift of £10,000 for his invention. D. in Hastings, Oct. 30, 1823. See his *Life* by his daughter (London, 1843).

Cartwright, Peter, D. D.: Methodist preacher: b. in Amherst co., Va., Sept. 1, 1785. He began to preach as a "local" in 1801, labored with great success for upward of sixty years, and is said to have preached 18,000 sermons. Many stories are told of his dauntless courage and ready wit. He was defeated for Congress in 1846 by Abraham Lincoln. His labors were chiefly in the Mississippi valley. D. near Pleasant Plains, Sangamon co., Ill., Sept. 25, 1872. See his *Autobiography* (New York, 1856).

Cartwright, Sir Richard John: statesman; b. at Kingston, Ont., Dec. 4, 1835, and was educated at his native place

and at Trinity College, Dublin, Ireland. Engaging in politics, he represented Lennox and Addington in the Canadian Assembly 1863–67, and represented Lennox in the Dominion Parliament from 1867 till 1878, when he was elected for Huron. He was elected for South Huron in 1883, and has been returned for that constituency at all subsequent elections up to and including that of 1891; was Minister of Finance of Canada from Nov. 7, 1873, till October, 1878; was a delegate to Great Britain on public business in 1874, 1875, and again in 1876; and was knighted in 1879. Sir Richard began his political life as a Conservative, but through a disagreement with Sir John A. Macdonald he deserted to the Liberals. He has a high reputation as a parliamentary debater, and was at one time prominent in banking affairs.

NEIL MACDONALD.

Cartwright, THOMAS: Puritan controversialist; b. in Hertfordshire, England, about 1535: was forced to leave Cambridge University on account of his reformed doctrines; returned there on the death of Queen Mary and taught theology 1569. Cartwright took the extreme Puritan view, which insisted on Divine sanctions for his polity and which it was heresy to resist, demanding that the Established Church should conform to his teachings. He was deprived of his preferments by Whitgift, was several times in prison and in exile, and was pastor of a church in Antwerp. D. in Warwick, Dec. 24, 1603.

Carn'pano: a seaport-city of Venezuela; in the state of Bermudez (see map of South America, ref. 1–D). It is built almost entirely on a single street parallel to the water's edge, nearly 2 miles long and traversed by a tramway. The buildings are good, but unpretentious, generally of one story. The mean annual temperature is 81° F. The harbor is a safe one, but the entrance is obstructed by some dangerous banks. Back of Carupano there is a break or pass in the coast chain, giving access to the rich valleys of the interior. The principal exports are chocolate-beans and coffee. Pop. (1891) 12,389.

HERBERT H. SMITH.

Carus, kaa'roos, KARL GUSTAV: German physiologist; b. in Leipzig, Jan. 3, 1789. His lectures on comparative anatomy, delivered in his native town in 1812, attracted great attention, and still more his book on the circulation of the blood in insects. His publications include works on subjects belonging partly to science, partly to art—as, for instance, *Psyche*, *Physis*, *Natur und Idee*. He gathered about him in Dresden, where he lived as court-physician, a brilliant circle of scientists and artists. D. in Dresden, July 28, 1869. His *Lebenserinnerungen und Denkwürdigkeiten* appeared at Leipzig (1865–66, 4 vols.).

Ca'rus, MARCUS AURELIUS: Roman emperor; b. about 222; prætorian prefect under Probus, on whose assassination in 282 he was proclaimed emperor by the army. He conquered the Sarmatians, and continued the campaign against the Persians which his predecessor had begun. He died suddenly in 283 on the banks of the Tigris just as he was setting out on an expedition against Persia.

Carvahal, kaăr-vaă-*k*haal', TOMAS JOSÉ GONZALES: b. in Seville in 1753; d. in Madrid in 1834. He studied law, held an office in the financial department of the Government, and was in 1812 appointed director of the University of San Isidro. Having established there a chair of international law, he was imprisoned in 1815; released by the revolution of 1820 he was exiled by the counter revolution, but allowed to return in 1824. As a writer he is a pupil of Luis de Leon. His metrical translations of the poetical books of the Bible are very celebrated.

Ca'ry, ALICE: poet; b. Apr. 20, 1820, 8 miles from Cincinnati, O. When eighteen years of age she commenced writing for the press, both in prose and verse. In 1850, with her sister Phœbe, she published a successful volume of poems. In 1851 the first series of her *Clovernook Papers* appeared. In 1852 the two sisters removed to New York and devoted themselves to literature. Besides several volumes of poetry and a great number of contributions to periodical literature, she published two additional series of *Clovernook* (1853–54); *Hagar, a Story of To-day* (1852); *Married, not Mated* (1856); *Pictures of Country Life* (1857); *The Lover's Diary* (1867); *Snowberries* (1869); and several other works. She excelled in the description of simple domestic scenes. D. in New York, Feb. 12, 1871.

Cary, ANNIE LOUISE: operatic contralto; b. in Wayne, Me., Oct. 22, 1842; began her operatic career in 1867 in Europe, and for three years sang with great success there. In 1870 returned to the U. S. and sang in the principal cities under Strakosch's management; made a second European tour, and achieved additional triumphs, especially brilliant in St. Petersburg. On her return to her native country she married Mr. Raymond, a New York banker, and in 1882 retired from public life while her voice was in its prime, and has since been heard only in private and at a few charitable concerts.

D. E. HERVEY.

Cary, HENRY FRANCIS: English poet; b. in Gibraltar, Dec. 6, 1772; was educated at Oxford. He became in 1797 vicar of Abbots Bromley. His reputation is founded on an admirable translation of Dante's *Divina Commedia* (London, 1814), which is very accurate and expressive, and is generally considered an excellent translation of that celebrated poem. He was assistant librarian of the British Museum from 1826 till 1837. D. Aug. 14, 1844. See his *Life* by his son (London, 1847, 2 vols.).

Cary, PHŒBE: a younger sister of Alice Cary; b. near Cincinnati, O., Sept. 4, 1824. One of her earliest productions, written at the age of seventeen, was the well-known poem commencing *One sweetly solemn thought comes to me o'er and o'er*. Of the first volume of poems published by the two sisters, her share was much the smaller. She published *Poems and Parodies* (1854); *Poems of Faith, Hope, and Love* (1868); besides numerous hymns and occasional contributions to periodicals. D. in Newport, R. I., July 31, 1871. See *Alice and Phœbe Cary*, by M. C. Ames (1873).

Cary, SAMUEL FENTON: b. in Cincinnati, O., Feb. 18, 1814; graduated at Miami University 1835, at the Cincinnati Law School 1837; retired from law-practice in 1845, and became a farmer; was in Congress 1867–69, serving on important committees, and was the only Republican in the House of Representatives who voted against the impeachment of President Johnson; was nominated by the Independent party at Indianapolis, May 18, 1876, for Vice-President of the U. S., with Peter Cooper as candidate for President.

Caryat'ides (in Gr. Καρυάτιδες): the Latin plu. of *Caryatis*, i. e. a woman of Caryæ (a city of Laconia); or a virgin

Caryatides, from the Erechtheum at Athens.

dedicated to the service of the Caryan Diana. The term is applied in Greek architecture to female figures which were

used instead of columns to support a roof or entablature. They were usually dressed in long robes. The corresponding male figures are called Atlantes and Telamones.

Car'yocar [from Gr. *κάρυον*, nut + *κάρα*, head]: a genus of large trees of the family *Ternstrœmiaceæ*. They are natives of Brazil and Guiana, and are sometimes called pekea-trees and butter-trees. The fruit of *Caryocar nuciferum*, called butter-nut and souari-nut, is a large drupe containing four one-seeded nuts, which have soft, edible, and delicious kernels. The drupe contains, besides a kernel, a pulp which is like butter, and is used in cookery as a substitute for it. Oil of good quality is obtained from the kernels. The timber is good for ship-building.

Caryophylla'ceæ: See PINK FAMILY.

Caryop'sis [from Gr. *κάρυον*, nut + *ὄψις*, appearance]: in botany, a fruit in which the seed and pericarp are so closely united as to be inseparable and undistinguishable. The fruit or grain of wheat, barley, maize, and other graminaceous plants is a caryopsis. It is a one-celled, one-seeded, and indehiscent pericarp.

Caryo'ta: a genus of palms sometimes called the jaggery-palm or sugar-palm, growing in India and Ceylon. *Caryota urens*, a lofty, spreading tree, yields a large amount of fermentable juice (toddy) when its spathes are incised; this is boiled down to produce sugar. Its farinaceous pith resembles sago, and its fibers are used for making ropes. The quantity of sugar produced in India from this and a few other palm-trees is very great, but the quality is inferior. The cultivation of the jaggery-palm is entirely in the hands of a caste, or sub-caste, of Sudras.

Ca'rysfort Reef: a dangerous coral-reef at the edge of the Gulf Stream; near the south point of Florida; lat. 25° 13′ 15″ N., lon. 80° 12′ 45″ W.; has an iron-pile lighthouse 112 feet high, with a flashing light of the first order 106 feet above the sea.

Casale, kă-saa'lă̆y: a fortified town of Italy; in the province of Alessandria; on the river Po; 37 miles E. of Turin (see map of Italy, ref. 3–B). It has an iron bridge across the river, an old castle, and a cathedral founded in 1474; also several convents, a college, a public library, a theater, and two hospitals. Here are manufactures of silk twist. Casale is the seat of a bishopric, and was formerly the capital of the duchy of Montferrat. Many Roman remains are found here. Pop. about 29,000.

Casano'va de Sein'galt, GIOVANNI GIACOMO: Italian adventurer; b. in Venice, Apr. 2, 1725. He traveled extensively, passed his life successively in many European capitals, and mixed with aristocratic society. He fought several duels; was confined in the dungeons of Venice for nearly two years; professed to exercise occult powers. About 1790 he became librarian to Count Waldstein in Bohemia, at whose castle he died June 4, 1798. He is said to have been witty, dissipated, and greatly addicted to intrigues. He left autobiographic memoirs, which were published in 1828–38 (Leipzig; 6th ed. Brussels, 1876).

Casareep, or **Cassareep**: a condiment prepared from the evaporated juice of the cassava root or manioc root, the root of *Jatropha manihot*, a plant much cultivated in the tropics. To the thickened juice Spanish pepper is added, and this preparation is called casareep. It is used in sauces, but mainly for the preservation of meats in the form of the so-called *pepper-pots*. The poisonous hydrocyanic acid of the fresh juice is given off on evaporation. I. R.

Casas, kaas'ăas, BARTOLOMÉ, de las: Spanish ecclesiastic; b. in Seville, 1474; graduated at Salamanca, and, according to some, went to the West Indies with Columbus in 1498, returning in 1500. It is probable, however, that he first went to Hispaniola with Ovando in 1502. He was ordained priest in San Domingo in 1510, and shortly afterward accompanied Velasquez to Cuba, witnessing the conquest of that island. He became curate of one of the new settlements, and received an *encomienda* of Indian laborers; but, reflecting on the cruelties he had witnessed, he became convinced that the whole system of treatment of the Indians was wrong. He therefore gave up his *encomienda*, and after preaching vainly against Indian slavery went to Spain to intercede with the king (1515). Ferdinand died shortly after his arrival, but the regents, Cardinals Ximines and Hadrian, favored his suit. The office of protector of the Indians was created for him, and he returned to Hispaniola with some Jeronymite monks as coadjutors (Nov., 1516). His powers were considerable, but the opposition of the colonists and crown officers thwarted him. He therefore went again to Spain (1517) to plead the cause of the Indians with Charles V. and his ministers. He had to struggle against a thousand disheartening obstacles. It was urged that the colonies would be ruined if Indian slavery were prohibited. To meet this objection Las Casas recommended that African slaves should be sent to America—advice which he afterward deeply regretted. It is a mistake, however, to suppose that this plan originated with him, as Negro slaves had already been introduced into the colonies. He proposed to send Spanish laborers to the West Indies, and even collected and sent a number; but this plan failed through bad management and the machinations of his enemies. He was finally empowered to plant a colony on the coast of Cumaná, with the object of civilizing the Indians there. He succeeded in forming a small missionary station (1521), but the missionaries, provoked by the cruelties they had already felt, fell on the post during Casas's absence and destroyed it. Disheartened by this fresh blow, Casas retired to the Dominican convent in San Domingo and took the tonsure (1522). In 1530 he resumed active work, and successively visited Mexico, Guatemala, and Nicaragua, always in the interests of the Indians. He went three times to Germany to obtain interviews with Charles V., and published a series of fervid works against the cruelties of the Spaniards. Through his efforts strong laws in favor of the Indians were promulgated in 1542, but were received with an outcry of alarm. In Mexico the viceroy did not attempt to enforce them, and in Peru they caused the formidable rebellion of Gonzalo Pizarro; in the end they were repealed. In 1544, after declining the bishopric of Cuzco, Casas accepted that of Chiapa, hoping to advance his cause; but the opposition was so great that he resigned in 1547. Thereafter he generally resided at Valladolid, Spain. D. in Madrid at the end of July, 1566. Casas's works are all written with the object of promulgating his views, and have a tendency to exaggerate the cruelties of the Spaniards, and especially of the number of Indians slain by them. Making allowances for this, they are of high historical value. The best known is the *Brevissima relacion de la destruycion de las Indias* (Seville, 1552), published in English as the *Destruction of the Indias by the Spaniards* (London, 1583, 1625). It is one of a series of tracts on the same subject. The *Historia de las Indias*, a much larger work, was only published in 1875, but had long been used in copies. Several treatises remain in manuscript.

See Llorente, *Œuvres de Las Casas* (Paris, 1822, introduction); Quintana, *Vidas de Españoles Celebres*; Helps, *Life of Las Casas* and *Spanish Conquest*; Irving's *Columbus* (appendix); Fabié, *Vida y Escritas de Las Casas* (Madrid, 1879); Sabin, *Works of Las Casas* (New York, 1870).

HERBERT H. SMITH.

Casas Grandes (i. e. great houses), or **Casas de Montezuma**: a town of Chihuahua, Mexico; about 150 miles N. W. of the city of Chihuahua, and 35 miles S. of Llanos, celebrated for the ruins of ancient buildings (see map of Mexico, ref. 3–B). They are made of *adobe*, and face the cardinal points. The walls are still standing in part, and are from 5 to 30 feet high. The largest building was 800 feet long by 200 wide, with numerous courts, rooms, and closets, and apparently it consisted of several stories. Nothing historical is known about these structures. Similar ruins are found near the Gila, Salinas, and Colorado rivers. See MEXICAN ANTIQUITIES.

Ca'sas y Aragor'ri, LUIS, de las: Spanish general; b. at Sopuerta in Vizcaya, Aug. 25, 1745. He served under O'Reilly in Portugal and Louisiana, traveled in the American colonies shortly before the revolution, was in the Russian army 1775–77, and again with O'Reilly in the Argel campaign 1778. In 1779 he assisted in the siege of Gibraltar and the conquest of Minorca, and became general of division. From July 8, 1790, to Nov. 6, 1796, he was captain-general of Cuba, and he is remembered as one of the best and most enlightened rulers of that island. The first public journal of Havana was established by him; a careful census was taken; and he endeavored, though vainly, to remove the monopolies which weighed on the commerce of Cuba. Returning to Spain, he held various civil offices and was governor of Cadiz for some years. He died at Santa Maria, July 19, 1800. HERBERT H. SMITH.

Casati, kăă-saa'tĕĕ, GAETANO: African explorer; b. at Monza, Italy, in 1838; entered the Piedmontese army at

twenty-one; resigned in 1879, and in December of that year sailed for Africa under commission from the Soeietà d'Esplorazione Commerciale d'Africa. After various wanderings in the Bahr-el-Gazelle valley, where he joined his countryman, Gessi Pasha, and in the Niam-Niam country, he found himself shut in with Emin Pasha by the operations of the Mahdi. At the request of Emin Pasha he went to live as "resident" in the territory of King Kabba Rega, son of M'tesa of Unyoro, where a part of his duty was to act as Emin's postmaster. At first kindly treated by the king, he was afterward condemned to death, but managed to escape to the Albert Nyanza Lake, where, after undergoing great hardships and peril, and losing his notes and MSS., he was reseued by Emin Pasha in 1888.

Casau'bon, Isaac: b. in Geneva, Switzerland, Feb. 18, 1559; d. in London, July 1, 1614. After the publication of the edict of Jan., 1561, his parents, who were French refugees, returned to France, and his father was settled at Crest in Dauphiny as pastor of a Huguenot congregation. The circumstanees of the family were humble, and times beeame hard. Up to his nineteenth year Isaac reeeived no other instruction than what his father could give him; he had his first Greek lessons in a mountain-cave where the family was eompelled to hide from a Roman Catholic mob. In 1578 he was sent to the Aeademy of Geneva, and so great were his aeeomplishments that in 1582 he was appointed Professor of Greek there. He held that position till 1596, and in 1592 he published his annotated edition of Theophrastus's *Characteres*, which gives a good idea of his peeuliar style as a eommentator. But he laeked books in Geneva, and in 1596 he aecepted the ehair of professor at Montpellier. The offiee of teaching, however, was not congenial to him, and in 1600 he removed to Paris as librarian, having in the meantime published his most ambitious work, the revised and annotated edition of Athenæus. The ten years he spent in Paris were the busiest and the brightest time of his life, but he allowed himself to be dragged into the theological eontroversies of the period. After the death of Henry IV. he left Franee and took up his abode in London, where he was made prebendary of Canterbury and Westminster, and where he wrote his *Exercitationes contra Baronium*, whieh were left unfinished, and his *Ephemerides*, published by the Clarendon Press in 1850. See his *Life* by Mark Pattison (London, 1875).—His son, Meric (b. Aug. 14, 1599; d. in Oxford, July 14, 1671), was edueated at Oxford, where he also taught theology. He republished editions of Terence, Epictetus, and Marcus Aurelius.

Casca, Publius Servilius: Roman conspirator; tribune at the time he assisted in the assassination of Julius Cæsar, 44 B. C. According to Plutarch, he struck the first blow. He fought in the battle of Philippi, 42 B. C., and died soon after.

Cascade Range: a chain of mountains which stretches from Southern Oregon through Washington into British North America; nearly parallel with the coast of the Pacific Ocean, and a continuation of the Sierra Nevada of California. The direetion of the range is nearly N. and S. Its distance from the seaeoast is in Oregon about 120 miles. The Columbia river breaks through this range, forming the caseades from which the name is derived. The range is constituted ehiefly of voleanic rocks, whieh were spread in great sheets and afterward upheaved; and several peaks, including all the most lofty, are extinet voleanoes. Among the highest summits of this range are Mt. Logan, 19,500 feet; Mt. St. Elias, 18,001; Mt. Hood, which rises 11,225 feet; Mt. Adams, 13,258; and Mt. Rainier (also ealled Taeoma), 14,444.

Cascaril'la [Span.; dimin. of *cascara*, bark]: the bark of *Croton eluteria*, whieh grows in the West Indies. It is a shrub of 3 to 5 feet in height, and the stem is frequently as thiek as 4 to 8 inches. It is used in medicine as an aromatic tonie, and was formerly used in the plaee of cinchona bark in the treatment of malarial fevers. It is useful in the treatment of dyspepsia, indigestion, or flatulent colic.

Cas'co Bay: in Maine; washes the shore of Cumberland County; is about 20 miles long. The city of Portland is at the western extremity of this bay, which ineloses about 300 islands.

Case, in law: an action, cause, or eontroversy, either in law or equity, submitted for deeision to a court of justiee. In particular (1) a form of action called "an action on the ease," or, more fully, "special aetion of trespass on the case." (See Trespass.) This action did not exist in the early English law, but was introduced by a statute of the reign of Edward I. (Westminster 2d). It is founded on the peculiar eircumstances of the case, and supplies a remedy for such wrongs as can not be included under the term "trespass," and which are in their nature indirect and consequential. It applies to such wrongs either committed against one's person or property, whether real or personal. The aetion is sometimes called "trespass on the case," and at other times simply "case." Out of this aetion grew the modern action of "assumpsit," which is really instituted to reeover damages for breach of contract. (2) In U. S. constitutional law the term case is applied to a civil or criminal action, as distinguished from a *controversy*, which term is applied to a civil action only. (3) A written or printed statement of facts for the opinion of counsel or for the decision of a court or judge. A question of law. The faets are sometimes presented by agreement, and at other times after being submitted to a jury. This may be either a "ease reserved" or "ease made" by which questions of law arising in the course of a trial are submitted; a "case stated," where the faets are agreed upon and the qnestion of law is submitted for deeision without a regular trial; or a "case on appeal," by which the faets which occurred at a trial are presented to an appellate court for review. If the parties fail to agree on a statement of facts, the court before which the trial oeeurred passes upon them, and is thereupon said to "settle" the ease.

Revised by F. Sturges Allen.

Case, Augustus Ludlow: rear-admiral U. S. navy; b. in Newburg, N. Y., Feb. 3, 1813; entered the navy as a midshipman, Apr. 1, 1828. He served on the east coast of Mexieo during the Mexiean war, participating in the eapture of Vera Cruz and Tobaseo. Early in 1861 Commander Case was appointed fleet-captain of the North Atlantic blockading squadron, in whieh capacity he took part in the capture of Forts Hatteras and Clarke, Aug. 29, 1861, and in the operations in the sounds of North Carolina in the winter of 1862. In 1863, in command of the Iroquois, and assisted by the steamers James Adger and Mt. Vernon, he eut out the blockade-runner Kate, under the fire of the forts and batteries at New Inlet, N. C. He was ehief of the bureau of ordnance from Aug., 1869, to May, 1873; in June, 1873, he was appointed to the command of the European squadron. Retired Feb. 3, 1875. D. in Washington, D. C., Feb. 17, 1893.

Case-hardening: a process for covering artieles of cast iron, wrought iron, or steel with a eoating of steel. It is a rapid and partial proeess of cementation, the object of whieh is to combine ability to resist surface-wear with the tenacity due to the character of the original material, which still constitutes the bulk of the article after case-hardening. It consists in packing the articles in vessels filled with some substanee yielding carbon when exposed to a red heat. This carbon alloying with the surfaee of the article converts it into a steel-like skin. After it has been heated for a proper length of time the article is plunged into water. Formerly animal matter, like hoofs, horns, bones, skins, etc., were used as the case-hardening material. Now yellow prussiate of potash is almost exelusively employed. The coating of steel is usually very thin, seldom exceeding $\frac{1}{16}$th of an inch. C. K.

Ca'sein [mod. deriv. of Lat. *caseus*, cheese]: a nitrogenous organic substanee allied to albumen, found in milk, and most abundantly in that of flesh-eating animals. It is said to be oecasionally found in the fluid of cysts. It is also found (as legumine, and probably as amandine, both being regarded as identical with it) in pease, beans, almonds, and other seeds. Vegetable and animal caseins behave exaetly alike with chemical tests, and when pure can not be distinguished by the taste. The portion in cow's milk is about 4 per eent.; in dried pease, 25 per cent. Casein is coagulated (curdled) by acids or by rennet, and is the chief constituent of Cheese (*q. v.*). It also forms insoluble precipitates with corrosive sublimate, with nitrate of silver, and with aeetate of lead. Hence copious draughts of milk afford a ready antidote in cases of poisoning with either of the above salts. Casein is also used in calico-printing. The probable proportions of the constituent elements of casein in 100 parts have been given as follows: Carbon, 53·83 parts; oxygen, 22·52; nitrogen, 15·65; hydrogen, 7·15; sulphur, 0·85, with perhaps a little phosphorus; but its composition is not exaetly known.

Casemate [Ital. *casa*, house, *matta*, foolish, also dark, dark house or room; or Gr. χασμα, ditch]: originally, a ditch defense similar to a Caponière (*q. v.*); later, a chamber with a

strong roof, usually of arched masonry, covered with a considerable thickness of earth designed to render it bomb-proof. Casemates are usually built in the rampart of a fortification and sometimes partly below ground. They are used for quarters, hospitals, storerooms, magazines, etc., and also for gun-chambers, the guns being fired through embrasures pierced through the wall of the chamber. JAS. MERCUR.

Caser'ta, or **Ter'ra di Lavo'ro**: province of Italy; stretching along the Mediterranean, N. of the province of Naples; traversed by the Garigliano and the Volturno; comprises an area of 2,206 sq. miles, with 734,884 inhabitants. Its agriculture, cattle-breeding, and manufacturing industry are flourishing. Capital, Caserta.

Caserta: a town of Italy; capital of province of same name; on a plain about 21 miles by rail N. E. of Naples (see map of Italy, ref. 7–F). It has, besides numerous churches and a military school, a magnificent royal palace, which was built by Vanvitelli about 1755, and is one of the largest in Europe. Connected with the palace is a fine park and an aqueduct. Here is a royal silk-factory, in which about 700 persons are employed. Pop. 31,400.

Case School of Applied Science: See CLEVELAND, O.

Case-shot (in Fr. *mitraille*; Germ. *Kartätschenschuss*, i. e. cartridge-shot): a projectile consisting of several balls or bullets of lead or iron packed in a case. When the case is a cylinder of tin with a wooden bottom, the whole is called cylindrical case or canister. The number of shot in each canister varies from 40 to 126. Some armies use canister with an explosive charge in the center, but more commonly it has no such charge. When the balls are affixed to a central spindle without a case, or inclosed in a canvas bag, they are called grape-shot. This is especially used in garrison artillery. Against advancing lines the effect of grape and canister at close range is often terrible, but solid shot and shell are preferred against columns. Spherical case or shrapnel (so named from its inventor) is a thin cast-iron shell, containing a chamber with a light or bursting charge of gunpowder, around which are packed bullets of lead or iron. It should burst at least 40 yards in advance of the enemy. This missile is effective at three times the range of canister, but at long distances its effect is often lost from lack of precision in the aim or in the cutting of the fuse.

Ca'sey, SILAS: soldier; b. in East Greenwich, R. I., July 12, 1807; graduated at West Point 1826; Oct. 9, 1861, became colonel Fourth Infantry, and May 31, 1862, major-general U. S. volunteers. He served on Western and Northern frontiers 1826–36; in Florida war 1837–41; engaged at Pilaklikaka; on Northern frontier 1842–47; in war with Mexico 1847–48; engaged at Contreras and Churubusco (brevet major), Molino del Rey, and Chapultepec (wounded in leading assault, and brevet lieutenant-colonel); on the Pacific frontier 1848–54; on tactical and arms boards 1854–55; at Puget Sound post 1856–61; engaged in several Indian skirmishes. During the civil war he served in preparing volunteers for the field at Washington, D. C., 1861–62; in the Virginia peninsula 1862; engaged at Fair Oaks (brevet brigadier-general); as president of board for examination of officers of colored troops 1863–65; in command at Detroit, Mich., 1865–67; commissioner to examine war-claims of Ohio. Brevet major-general U. S. army, Mar. 31, 1866, for gallant and meritorious services. Compiled and edited a system of *Infantry Tactics* for the U. S. service (1862), and *Infantry Tactics for Colored Troops* (1863); retired from active service July 8, 1868. D. in Brooklyn, L. I., Jan. 22, 1882.

Casey, SILAS, Jr.: captain U. S. navy; b. in Rhode Island, Sept. 11, 1841; graduated at the Naval Academy in 1860. In 1861 he was attached to the steamer Wissahickon, South Atlantic blockading squadron, and participated in the first attack on Fort Sumter, and in various engagements with the forts and batteries in Charleston harbor; subsequently served in equipment bureau and on lighthouse duty; commanding the cruiser Newark in 1891.

Casey, THOMAS LINCOLN: b. at Madison Barracks, near Sackett's Harbor, N. Y., May 10, 1831; graduated at the U. S. Military Academy in 1852; assigned to the corps of engineers as brevet second lieutenant, rising to be chief of engineers, with rank of brigadier-general, in 1888; served as assistant engineer on fortifications and river and harbor improvements Delaware Bay and river until 1854; assistant instructor of practical engineering 1854–57; principal assistant Professor of Engineering at the Military Academy 1857–59; in command of a detachment of engineer troops department of Oregon 1859–61: on staff of general commanding department of Virginia June 11 to Aug. 16, 1861; in charge of construction of fortifications on coast of Maine and New Hampshire 1861–67, except while on special duty with fleet during the first expedition to Fort Fisher 1864; assistant to chief of engineers 1867–79; in charge of public buildings and grounds District of Columbia 1877–81; of construction of building for State, War, and Navy Departments; of Washington Monument 1877 till its completion in 1885; chief of engineers with rank of brigadier-general 1888; retired May, 1895. D. in Washington, D. C., Mar. 26, 1896.

Casgrain, kăăs'grăñ, L'Abbé HENRI RAYMOND: Canadian author; b. at Rivière Quelle, P. Q., Dec. 16, 1831; educated at Collège Sainte-Anne de la Pocatière; was ordained a priest in 1856; was a professor at St. Anne's College and afterward at the University of Quebec. He is a member of the Royal Society of Canada, Historical Society of Boston, and the Geographical Society of Paris. Among his works are *Légendes Canadiennes* (Quebec, 1861); *Histoire de l'Hôtel-Dieu de Quebec* (1878); *Un Pélerinage au Pays d'Evangeline* (1887); and *Montcalm et Levis* (2 vols., 1891).—His brother, CHARLES EUSÈBE, M. D., b. at Quebec, Aug. 3, 1825, is a Knight of the Order of the Holy Sepulchre; was called to the Dominion Senate in 1887. Another brother, PHILIPPE BABY, Q. C., b. in Quebec in 1827, was for many years a member of the Canadian Parliament; author of *Letellier de Saint-Just et son temps* (Quebec, 1889). NEIL MACDONALD.

Cash: the name in use among foreigners in the far East for the coin in common use among the Chinese, and by them called *Tsien* (pronounced *chen*). It is a disk of an inferior alloy of copper, is slightly larger than an English shilling or U. S. twenty-five-cent piece (but thinner and lighter), and has a square hole in the middle for convenience in stringing. A string of cash usually contains 500 or 1,000, according to locality, and presents something of the appearance of linked sausages, with 50 or 100 in each division, according to the custom of the locality. Each coin has a value of $\frac{1}{10}$ to $\frac{1}{14}$ of a U. S. cent, i. e. 1,000 to 1,400 equal one dollar, according to the rate of exchange.

Cash'el: a town of Ireland; County Tipperary; 105 miles by railway S. W. of Dublin, and 49 miles N. N. E. of Cork (see map of Ireland, ref. 12–F). It is built on the slopes of an isolated limestone hill, rising abruptly from a rich plain. Cashel was the residence of the Kings of Munster, and is now a bishop's see. The top of the hill called the "Rock of Cashel" is occupied by the most interesting ruins of Ireland. These consist of a round tower 90 feet high, the palace of the Kings of Munster, a chapel of Saxon and Norman architecture, and a cathedral which was founded in 1169. Pop. (1881) 3,976.

Cashew-nut [from Fr. *acajou* < Brazilian, *acajoba*]: a tree, the *Anacardium occidentale*, related to the sumach and poison-ivy, of the family *Anacardiaceæ*, native of the West Indies, but now widely distributed throughout tropical regions. The tree attains a height of 16 or more feet, and bears oval, entire, evergreen leaves, small, reddish, sweet-scented flowers, and edible, kidney-shaped fruits, the cashew-nuts of commerce. From these nuts a sweet oil, resembling olive oil, is expressed. These proper fruits are borne upon the yellow or red enlarged and fleshy ends of the stems, which resemble pears, and are edible and of a pleasantly acid flavor. The poisonous principle, which is so virulent in some other members of the family *Anacardiaceæ*, is not absent from the cashew-nut, as shown by the fact that the fumes of the roasting nuts often cause an inflammation of the eyes and face. C. E. B.

Cashgar: See KASHGAR.

Cashmere: See KASHMIR.

Cashmere (or **Kashmir**) **Goat**: See GOAT.

Cas'imir: the name of four kings of Poland.—CASIMIR I., or KASIMIERZ I., surnamed The Peaceful, b. 1015; was brought up in France, where his mother had been forced to take refuge; was recalled to Poland in 1041, and reigned prosperously till his death in 1058.—CASIMIR II., b. about 1138; succeeded Micislaus III. 1177; d. 1194 after a wise and just rule.—CASIMIR III., surnamed The Great, b. 1309; annexed Red Russia to Poland; founded the University of Cracow; and strove to promote education. D. 1370.—CASIMIR IV., b. 1427; fought with the Teutonic Knights, whom he forced to cede West Prussia to Poland in the treaty of Thorn 1466. D. 1492.

Casimir-Perier, Jean Paul Pierre: President of the French republic; b. in Paris, Nov. 8, 1847; the grandson of Casimir Perier, the Prime Minister of Louis Philippe (see Perier, Casimir), and the son of Auguste Casimir-Perier, Minister of the Interior under Thiers; served with honor in the Franco-German war, receiving the decoration of the Legion of Honor for bravery, and after the peace entered actively into politics, holding an important office in the ministry of the Interior, of which his father was then at the head. In 1874 he was chosen councilor-general by the electors of Nogent-sur-Seine, and in 1876 was elected to the Chamber of Deputies, to which he was successively re-elected. Though suspected of Orleanist sympathies, he voted steadily with the moderate republicans, won the confidence of his colleagues, and was elected vice-president of the chamber in 1890, having in the meantime held important posts in the ministry of Public Instruction and the ministry for War. In 1893 he became president of the chamber, and was re-elected in November of the same year, but resigned Dec. 3 to become president of the council. His ministry, which lasted till May 22, 1894, was marked by its stern attitude toward disturbers of the public peace, as exemplified in the passage of a law to punish indirect, as well as direct, incitements to crime in the public prints, and in general to strengthen the hands of the authorities against enemies of the Government. On June 27, 1894, he was chosen on the first ballot by the National Congress to succeed President Carnot (*q. v.*), but resigned suddenly Jan. 15, 1895.

Casino, or **Monte Cassino**: See Cassino.

Caspari, kăăs-paa'rĕe, Carl Paul, D. D.: Lutheran theologian; of Jewish origin; b. at Dessau, in Anhalt, Germany, Feb. 8, 1814; educated at Leipzig and Berlin; went to the University of Christiania, Norway, as Professor of Theology in 1847. He wrote many works on Arabic grammar, Old Testament exegesis, etc., and translated the *Book of Concord* into Norwegian; but his chief distinction lay in the important results he attained by his diligent researches into the history of the œcumenical creeds, especially the Apostles' and the Nicene. D. in Christiania, Apr. 11, 1892.

Henry E. Jacobs.

Cas'pe: a town of Spain; in Aragon; province of Saragossa; situated near the river Ebro; 53 miles S. E. of Saragossa (see map of Spain, ref. 14–I). It has three churches, a town-hall, and manufactures of oil and soap. Pop. 9,000.

Cas'pian Sea (in Lat. *Mare Caspium*, or *Mare Hyrcanium*; Gr. Κασπία Θάλασσα): a large inland sea forming part of the boundary between Europe and Asia. It is now within Russian territory, except at the southern end, where it is margined by Persia. It is about 690 miles long from N. to S., and has an average width of near 200 miles. The area is 169,381 sq. miles. The depth of water toward the S. is nearly 3,000 feet, but toward the N. it is shallower. A submarine ridge continues the Apsheron peninsula across the sea in an easterly direction, thus dividing it into two basins. The deepest sounding of the northern basin is about 2,500 feet, but the water is very shallow for a long distance out from the shore, especially from the mouth of the Volga, where more than 100 miles away the depth is only 72 feet. The depression of the surface of the Caspian below that of the Black Sea, according to the Russian surveys, is about 97 feet. The Caspian receives several large rivers—viz., the Volga, the Ural, and the Kura. It has no outlet, and its superfluous water can escape only by evaporation. That the Caspian and the Sea of Aral were once connected is rendered evident by the nature of the rocks in the vast plains which extend from them in several directions. Great numbers of sturgeons and salmon are caught in this sea, in which various other kinds of fish are also abundant. A communication has been opened between the Caspian Sea and the Baltic by a canal which connects the Volga with the rivers Tvertza and Schlina. Steam-packets navigate the Caspian, the commerce of which is mostly in the hands of the Russians. The chief ports are Astrakhan, Derbend, Petrovsk, Baku, and Krasnovodsk.

Cass, Lewis, LL. D.: statesman; b. in Exeter, N. H., Oct. 9, 1782. He studied law, which he began to practice at Zanesville, O., in 1802, where his father owned a large land-grant bestowed upon him for his military services. Lewis, having entered the army as a colonel in 1812, served in Canada under Gen. Hull; was taken prisoner, and used his influence to secure the court martial and degradation of Hull. He was raised to the rank of brigadier-general in 1813, and appointed Governor of Michigan Territory in 1814. After he had held that office sixteen years, and negotiated many treaties with the Indians, he was appointed Secretary of War by President Jackson in 1831. He was sent in 1836 as minister to France, where he succeeded in keeping France from joining the "quintuple alliance" intended to enforce British claims to right of search on the high seas. After visiting Mediterranean ports in a U. S. frigate he returned home in 1842, and was elected a Senator of the U. S. for Michigan in 1844. Having opposed the Wilmot Proviso, he was nominated as Democratic candidate for the presidency of the U. S. in 1848, but was defeated by Gen. Taylor, the Whig candidate, who received 163 electoral votes; Gen. Cass received 137 electoral votes. In Jan., 1849, he was re-elected to the Senate of the U. S. He supported Douglas's Kansas-Nebraska bill in 1854; became Secretary of State in Mar., 1857; resigned in Dec., 1860, because the President would not re-enforce the garrison of Fort Sumter. D. June 17, 1866. His published writings are not numerous, but are well written and display much ability. See H. R. Schoolcraft, *Life of General Cass* (1848); W. L. G. Smith, *Life of Lewis Cass* (1856); A. C. McLaughlin, *Lewis Cass* (Boston, 1891).

Cassagnac, Paul Granier, de: See De Cassagnac, Paul Granier.

Cassan'der (in Gr. Κάσσανδρος): a Macedonian prince; a son of Antipater, Regent of Macedonia. When Antipater died, in 318 B. C., Cassander and Polysperchon became competitors for the regency, and appealed to arms. Cassander was victorious, and, having taken Athens, restored the aristocracy under Demetrius Phalereus in 316 B. C. He married Thessalonica, a sister of Alexander the Great; obtained possession of Alexander's wife Roxana and her infant son Ægus, whom he put to death in 309, and usurped the throne. He joined Seleucus and Ptolemy in a coalition against Antigonus, whom these allies defeated at the battle of Ipsus in 301 B. C. He died in 297, and was succeeded by his son Philip.

Cassan'dra (in Gr. Κασσάνδρα): Trojan princess; a daughter of Priam; celebrated for her prophetic inspiration. According to the poetical legend Apollo was enamored of her, and taught her the secrets of fate, but he ordained that her prophecies should not be credited. During the siege of Troy she predicted the ruin of that city, but she was regarded as a lunatic by the Trojans. She was carried away as a captive by Agamemmon, and slain by his wife Clytemnestra.

Cassandra, Gulf of (anc. *Toronaicus Sinus*): a part of the Ægean Sea; in Macedonia, European Turkey; extends between two peninsulas, the extremities of which are called Cape Drepano and Cape Pailluri. It is nearly 25 miles long. The peninsula to the W. of the gulf and a cape on its western side have the same name.

Cassano, kăăs-saa'nō: a town of Italy; province of Calabria; 30 miles N. of Cosenza (see map of Italy, ref. 8–G). It stands in the concave recess of a steep mountain, in the midst of beautiful scenery. It has a cathedral, several convents, and an old castle; also manufactures of silk, linen, cotton, and leather. Pop. 9,216.

Cassareep: See Casareep.

Cassation: See Courts.

Cassatt, Mary: figure-painter; b. in Pennsylvania. She was one of the first artists in Paris to take up impressionistic methods, and exhibited excellent work in the first impressionist exhibition in Paris in 1878. She is an etcher of great talent, and her work in all mediums is highly appreciated by French collectors; member of the Society of American Artists 1880. Studio in Paris.

William A. Coffin.

Cassa'va: a West Indian name of the plant called manioc or manihot, and of the starch or fecula prepared from its root. It is known in the U. S. by the name of Tapioca (*q. v.*). See Manioc.

Cassay': See Manipur.

Cas'sel, or **Kassel** (anc. *Castellum Cattorum*): a city of Hesse-Nassau, Prussia; once capital of the electorate of Hesse-Cassel; pleasantly situated on both sides of the river Fulda; about 132 miles W. of Leipzig, and 28 miles S. W. of Göttingen (see map of German Empire, ref. 4–F). It is connected by railways with Leipzig, Frankfort, and other towns. It has several public squares, in the largest of which, called Friedrichsplatz, stands the palace of the Electors of

Hesse. Near this palace is a handsome museum which has a library of 165,000 volumes. Cassel contains an observatory, a valuable picture-gallery, a theater, several hospitals, a normal school, and academies of painting and sculpture. It has manufactures of cotton, silk, and woolen fabrics, lace, gloves, carpets, hardware, etc. In the environs of Cassel is the royal palace of Wilhelmshöhe, with beautiful gardens and fountains. This palace was occupied by the Emperor Napoleon III. while he was a captive in the autumn of 1870 and the ensuing winter. Pop. (1885) 64,088; (1890) 72,641; (1895) 81,752.

Cassel, Douglas R.: lieutenant-commander U. S. navy; b. in Ohio, Oct. 9, 1845; graduated at the Naval Academy as ensign in 1863. While attached to the steam-sloop Brooklyn he was slightly wounded at the battle of Mobile Bay, but remained at his quarters until the close of the action. He served in the Brooklyn during both the Fort Fisher fights, and led the seamen of the Brooklyn in the assault of Jan. 15, 1865, on the fort. He died at Germantown, Pa., June 20, 1875.

Casselton: railroad junction, Cass co., N. Dak. (for location of county, see map of North Dakota, ref. 3–F); on Northern Pacific R. R.; in Red River Valley of the North; in a fine hard wheat-producing region; has graded school, several churches, etc. Pop. (1880) 361; (1890) 840; (1900) 1,207. Editor of "Reporter."

Cas'sia [from Gr. *κασία*, a Semitic loan-word]: a fragrant bark mentioned in the Bible, and supposed to be the cassia-bark of the shops; a coarse variety of cinnamon from China, Annam, and other Eastern countries. It is generally sold as cinnamon, which it much resembles, though cheaper and generally inferior in quality. It yields the oil of cinnamon. "Cassia buds" are the dried flower-buds which are brought from China.

Cassia is also the name of a genus of leguminous herbs, shrubs, and trees, natives of both continents. Several African and Asiatic species are valuable for their leaves, which when dried constitute the drug *senna*. The U. S. have numerous species, one of which (*Cassia marilandica*) yields leaves which have the cathartic properties of senna in a milder degree. "Cassia pulp" or "purging cassia" comes from the pods of *Cassia fistula*, a tree of India and Egypt, now naturalized in most tropical countries. It contains a large percentage of sugar, and is used in making laxative conserves for medicinal use.

Cas'sian (in Lat. *Cassianus*), John: a monk noted as a promoter of monachism and as an opponent of St. Augustine; b. about 350 A. D. He founded a large monastery at Marseilles (about the year 415), which was a model for many others in Gaul and Spain. He differed from St. Augustine respecting grace, and taught doctrines which were called Semi-Pelagian. The distinction between him and St. Augustine and Pelagius is thus aptly put: St. Augustine regards man in his natural state as dead, Pelagius as sound and well, Cassian as sick. Among his works are the famous treatises on monastic institutions, *De Institutis Renuntiantium* and the *Collationes Patrum in Scithico eremo commorantium*. D. in Marseilles, about 445. His works are found in Migne, *Pat. Lat., XLIX.* and *L.*

Cas'sican: a name applied to the barita of Australasia and other birds, but properly a bird of the genus *Cassicus*, resembling the oriole. The best-known species is the *Cassicus cristatus* of South America, 20 inches long, which makes a large nest, exhibiting great skill in construction. The nests are often 3 feet long, and are hung upon the branches of trees. They are gregarious birds, and often build several of their huge nests upon the same tree.

Cas'simere [another form (also formerly written *kerseymere*) of *cashmere*, received through Fr. *casimir* or Span. *casimiro*]: a twilled woolen or cotton and woolen fabric, either plain or figured, much used for men's clothing. Cassimeres are largely woven in England and the U. S., but especially on the continent of Europe.

Cas'sin, John: ornithologist; b. near Chester, Pa., Sept. 6, 1813; d. in Philadelphia, Jan. 10, 1869; devoted himself to the technical description and systematic arrangement of birds rather than to their habits. In the words of Coues, "His distinctive place in ornithology is this: he was the only ornithologist this country has ever produced who was as familiar with the birds of the Old World as with those of America." Among his more important works are the *Mammalogy and Ornithology of the Wilkes Exploring Expedition*; *Ornithology of Perry's Expedition to Japan*; and *Illustrations of the Birds of California, Texas, Oregon, British and Russian America*. He and Mr. George N. Lawrence were associated with Prof. Baird in the publication of a monograph of the birds of North America N. of Texas, which appeared as vol. ix. of the *Pacific R. R. Reports*. F. A. Lucas.

Cassini, kăăs-see'nē. Giovanni Domenico: astronomer; b. near Nice, then an Italian city, June 8, 1625. He discovered in 1665 that Jupiter performs a rotation in nine hours and fifty-six minutes, and published in 1668 his ephemerides of the satellites of Jupiter. Invited by Colbert, he removed to Paris in 1669, and became director of the observatory of that city. In 1684 he discovered four satellites of Saturn, also explained the causes of lunar libration, and took part in measuring an arc of the meridian. His descendants for several generations were able astronomers. D. in Paris, Sept. 14, 1712. See his *Autobiography*; also Fontenelle, *Éloge de J. D. Cassini*.

Cassino: game at cards; played by two, three, or even four persons. Four cards are dealt each player, and four (the *lay-out*) are turned face up on the board; the hands are played one card each turn, beginning with the eldest hand; four more cards are then dealt each player; so on until the pack is exhausted. A card is played (1) by adding it to the layout; (2) by *taking* with it from the lay-out cards of the same denomination and (in the case of pip-cards) combinations such that the number of pips is that of the card played; (3) by *building*, i. e. combining it with cards in the lay-out so that the number of pips equals that of another card in the player's hand, the build being then treated exactly as a card of that denomination, except that it can not be built higher with merely lay-out cards, nor at all by the immediate builder; or (4) by *duplicating*, i. e. combining it with one or more cards or builds, so as to form two or more cards or combinations each equivalent to another card in the hand. A duplication may be further duplicated, but not built. A player who has a build or duplication in the lay-out can not make play No. 1 before taking it. Cards left in the lay-out after the last hand belong to the last player who made play No. 2. On being taken, big cassino (ten of diamonds) counts 2; little cassino (two of spades), 1; each ace, 1; the greatest number of cards, 3; the greatest number of spades, 1. Each sweep (play No. 2 leaving no cards in the lay-out) counts 1. Game is either the highest number of points scored in the deal or, more usually, 21 points, thus requiring several deals for one game.

In one variation of cassino the knave, queen, and king are treated as pip-cards, i. e. as the eleven, twelve, and thirteen, respectively.

Cassino, kăăs-see'nō: a town of Italy; in the province of Caserta; 49 miles by rail N. W. of Caserta (see map of Italy, ref. 6–E). Large ruins of Roman theaters and palaces are in the neighborhood. Just above the city, on a high mountain, is the celebrated monastery Monte Cassino, founded in 529 A. D. by St. Benedict, with a seminary, a gymnasium, and a large library containing many valuable manuscripts. A few monks still remain. Pop. of town, 12,200.

Cassiodo'rus, Magnus Aurelius: a Latin historian and minister of state; b. at Scylacium (Squillace, Calabria, the extreme southwest division of Italy), about 468 or 480 A. D.; entered service of Theodoric, King of the Ostrogoths, about 497; became his chief minister. He had a high reputation for ability and learning, and continued in power for many years. At the age of seventy he retired to the monastery of Viviers, in Calabria, which he had founded and endowed. There he instituted the practice, afterward so widely followed, of adding the copying of MSS. to the list of monastic duties. This practice has been of inestimable importance. To it we owe our knowledge of the classics. He had himself a large library which he transferred to his monastery. He wrote, besides works on grammar and rhetoric, a *History of the Goths*, now extant only in the abridgment of Jornandes; a valuable collection of state papers entitled *Variarum Epistolarum Libri XII.*, which was first printed in 1533, and the chief source of our knowledge of Italy in the sixth century. D. in Viviers about 568. See his works in Migne, *LXIX.–LXX.* Thomas Hodgkin published a condensed translation of the *Variarum Letters* (Oxford, 1886). See his *Life* by A. Franz (Breslau, 1872).

Cassiope'a, or **-pia**, **Cassiepe'a**, or **Cassi'ope** (in Gr. Κασσιόπεια, Κασσιέπεια, Κασσιόπη): in classic mythology, the

wife of Cepheus and the mother of Andromeda. She was said to have been transformed into a constellation.

Cassiopeia, or **Lady in the Chair**: a constellation in the northern hemisphere; has several stars of the second magnitude. It is represented on the celestial globe as a lady sitting in a chair. Five of its most conspicuous stars are arranged in a figure like a W. In 1572 a new and brilliant star suddenly appeared in Cassiopeia. It was observed by Tycho Brahe in November, and is said to have surpassed all the fixed stars in splendor. It disappeared in Mar., 1574, after a gradual diminution of luster.

Cassiquiare, kăăs-si-kē-aa′rē, or **Cassiquiari**: a river of South America; in Venezuela; a deep and rapid stream, forming the south bifurcation of the Orinoco. It issues from the Orinoco about lat. 3° 10′ N. and lon. 66° 20′ W., and, flowing southwestward about 130 miles, enters the Rio Negro near San Carlos. This remarkable river opens a navigable communication between the Orinoco and the Rio Negro, but above the middle rapids of both rivers. It is 600 yards wide at its entrance into the latter.

Cassiter′ides [name applied by Herodotus and later writers to the islands (Great Britain) whence were procured the early supplies of tin; deriv. of *κασσίτερος*, tin, a word probably of Assyrian origin. Cf. Assyr. *Kāsazatirra*]: the ancient name of certain islands, supposed by some to be the Scilly isles, and by others some little islands of Vigo Bay on the Spanish coast, from which the Phœnicians procured tin.

Cassit′erite [from Gr. *κασσίτερος*, tin + suff. *-ite*]: native peroxide of tin; composed when pure of 21·62 per cent. of oxygen and 78·38 of tin. It is the common ore of tin, and the only one from which the metal is obtained. It occurs massive (as tin-stone), disseminated and fibrous (as wood tin), in rolled pieces, and in grains as sand (stream tin); also crystallized in quadrangular prisms, terminated by four-sided pyramids. Its luster is splendent. It is obtained chiefly in Australia, Cornwall, the Malay Peninsula, Banca, the Black Hills of South Dakota, Virginia, and California.

Revised by C. Kirchhoff.

Cas′sius Longi′nus, Caius: Roman conspirator and general; a friend of Marcus Brutus, whose sister he married. He served as quæstor under M. Crassus, and distinguished himself in the expedition against the Parthians in 53 B. C. After the death of Crassus he defeated the Parthians. In the civil war that ensued he fought for Pompey against Cæsar, and after their defeat at Pharsalia was pardoned by the victorious Cæsar. He was one of the conspirators who killed Cæsar in 44 B. C., soon after which event he commanded with success in Syria. His army was subsequently united with that of Brutus. Brutus and Cassius, who were the principal leaders of the republican party, were defeated by Antony and Octavius at Philippi in 42 B. C., and then killed themselves. See Plutarch, *Life of Brutus*.

Cas′sius Parmen′sis, or **Ca′ius Cas′sius Seve′rus**: a Latin poet who wrote epigrams and elegies. He was one of the conspirators who killed the dictator Cæsar, 44 B. C. Having entered the service of Mark Antony, he fought against Augustus, by whose order he was put to death about 30 B. C. Only small fragments of his works are extant.

Cassivelau′nus, or **Cassibelau′nus**, sometimes Anglicized as **Cassib′elan**: a chief of the ancient Britons who ruled over the country N. of the Thames. He fought bravely against Cæsar when the latter invaded Britain in 54 B. C.; but Cæsar took his capital and compelled him to pay tribute.

Cassock: a tightly fitting garment as regards the body, but loose and flowing below, worn by ecclesiastics of all orders. It varies in color. In the Church of England the clergy of all orders wear black; bishops on state occasions frequently wear purple. In the Roman Catholic Church, priests, deacons, and sub-deacons, with persons in the minor orders, wear black cassocks; bishops wear purple. Scarlet cassocks were worn by doctors of divinity and civil law and are still part of the dress of cardinals. The Bishop of Rome alone wears a white cassock. The mediæval Church of England cassock was without buttons, and was usually gathered in at the waist with a girdle or cincture of the same material quite similar to that now in use.

Cassop′olis: capital of Cass co., Mich. (for location of county, see map of Michigan, ref. 8–H); on Mich. Cent. and Gr. Trunk R. Rs.; 98 miles S. W. of Lansing, and 100 miles E. of Chicago. The principal industrial enterprises are a flouring-mill, wooden-bowl factory, cooper-shop, lumber-mill, and a combination wire-and-slat fence factory. Cassopolis was founded in 1836, and is situated between Diamond and Stone Lakes in a fertile agricultural county. It is a place of summer resort. Pop. (1880) 912; (1890) 1,369; (1900) 1,330. Publisher of "National Democrat."

Cas′sowary: the common name of several large flightless birds of the genus *Casuarius*; related to the ostriches, but generally placed together with the emus in an order Casuarii (*q. v.*). The plumage is loose and coarse, the wings small, the quill feathers represented by four to six strong bare shafts. The inner toe bears a long, straight claw, which makes a formidable weapon, the more that the kick of one of these birds is sufficiently powerful to knock a man down. Parts of the head and neck are naked and colored bright red and blue or blue and yellow. The neck bears wattles, and the head is furnished with a conspicuous compressed helmet-like excrescence formed of very thin bone, covered with thin but firm horny skin. The ten or twelve members of the genus are confined to New Guinea and the adjacent islands; one species occurs in Northeastern Australia. They frequent dense thickets, are wary and fleet of foot, fond of fruit and berries, but eat worms and insects of various kinds. The nest is a mere depression amid fallen leaves; the eggs are green and usually five in number. The best-known species is the helmeted cassowary (*Casuarius galeatus*) from Ceram. Bennett's cassowary (*C. bennettii*) is from New Britain and *C. australis* from Australia.

F. A. Lucas.

Casta′lia, or **Cas′taly** (in Gr. Κασταλία): a fountain which issued at the base of Mt. Parnassus, near Delphi; was sacred to Apollo and the muses. The ancient poets imagined that it filled the minds of those who drank of it with poetic inspiration. All persons who visited the temple of Delphi for any religious object were obliged to purify themselves by bathing their bodies or their hair in this sacred fountain. It is now called the fountain of St. John.

Castalio, kăăs-taa′li-ō, or **Castel′lio**, Sebastian: b. at Chatillon, a village of Savoy, 1515; d. in Basel, Dec. 29, 1563. He pursued the common humanist studies of the time; acted for several years as a tutor in a noble French family; was in 1541, on Calvin's nomination, made rector of the Latin school in Geneva, but publicly dissented from Calvin on predestination, and resented the restraints put upon private liberty; was banished by the syndics for calumniating the clergy 1544; went to Basel, where in 1553 he was appointed Professor of Greek. His history of the Bible in the form of *Dialogues* was often reprinted and used as a text-book; translated into English under the title *Youth's Scripture Remembrancer* (London, 1743). His Latin translation of the Bible he dedicated to Edward VI. of England; his French translation to Henry II. of France. These translations are very characteristic for their humanist standpoint, but do not deserve the merciless criticisms which they received from the hands of Calvin and Beza. Castalio deserves to be remembered because he was one of the very few advocates of religious toleration in that age. His life was written by J. Mähly (Basel, 1862), and most elaborately by Ferd. Buisson (Paris, 1892, 2 vols.).

Casta′nea: the Latin name of the chestnut; also the botanical name of a genus of trees of the family *Cupuliferæ*. Three species of chestnuts are indigenous in the U. S.—viz., *Castanea sativa*, var. *americana* (chestnut-tree), the *Castanea pumila* (chinquapin), and the golden chinquapin, or chestnut of the Pacific coast, now referred to an allied genus, *Castanopsis* (*C. chrysophylla*). See Chestnut.

Cas′tanets [from Span. *castañeta*, deriv. of *castaña* < Lat. *castanea*, chestnut]: a musical instrument consisting of a pair of concave shells of ivory or wood, originally chestnut, which are loosely fastened together by a band which is passed over the thumb, and used in beating time to music and dancing, and much employed by the Moors and Spaniards as an accompaniment to the guitar. In most countries they have been introduced on the stage, especially in opera.

Castanheda, kăăs-tăăn-yā′dăă, Fernão Lopez, de: Portuguese historian; b. probably about the year 1500; d. in 1559; went to India with his father in 1528, and devoted many years to study, personal examination of local records and scenes of important events, and to the composition of

his valuable *Historia do Descobrimento e Conquista da India pelos Portuguezes*, the several books of which (as far as completed) were printed in different years from 1551 to 1561. The publication of the first and second books preceded that of the first decade of *Asia* of Barros, but by so short an interval that the work of Castanheda could hardly have been used by Barros, who no doubt derived his material chiefly from original sources. For some not obvious reason, the *Historia* of Castanheda seems to have made a greater impression on the European public than the more attractive labors of Barros, for the first book of the *Historia* was translated into French in 1553, and the whole work into English some years later, while Barros, we believe, has never been translated into either language, and even Camoëns is said by Portuguese critics to have drawn his historical facts altogether from Castanheda. Castanheda has the merits of fullness of detail, clearness of exposition, and fidelity to the best authorities, and, though inferior as a writer to his distinguished rival, he is by no means superseded as a source of information on his subject.

Castaños, kăăs-taan'yōs, Francisco Xavier, de: Duke of Baylen; general; b. in Madrid, Spain, Apr. 22, 1756. He obtained the command of a corps in 1808, and defeated the French general Dupont at Baylen in July of that year. Dupont then surrendered his army, amounting to 18,000 men, but Castaños was defeated the same year at Tudela by Lannes. He distinguished himself at the battles of Albuera, 1811, Salamanca, 1812, and Vitoria, 1813. He was appointed captain-general in 1823, and opposed the Carlists. D. Sept. 24, 1852.

Caste [from Span. Ptg. *casta*, race, breed; subst. use of fem. of adj. *casto* < Lat. *castus*, pure]: This term, though often used loosely to indicate a class distinction of any sort, was originally employed to denote divisions of the social system in India. The word is etymologically from the Latin (*castus*, pure); historically, a Portuguese equivalent of class-division. The earliest European settlers in India were from Portugal, and they gave the name to the social system found there. But that system was known and explained by Greek writers from the time of Alexander the Great. Our earliest information in regard to caste comes, however, from the Hindus themselves, who in the *Vedas* and in their law-books have first expressed the consciousness of the distinctions involved and then elaborately systematized the whole state of society according to formal divisions of occupation. Legend says that the highest god created four castes: the priest from his mouth, the warrior from his arm, the husbandman from his thigh, the slave from his foot. But the native Sanskrit word for caste is *varna*, color, and this alone sufficiently indicates the chief factor of distinction between the castes as originally organized. The distinction is historically this: The Aryan invaders of India were of a different type from the aborigines; the latter were dark, the former were light; the primary distinction of caste was no more than this, a separation of the two great bodies of inhabitants into two classes, the light-skinned Aryan conquerors and the dark-skinned natives, whom the former had subdued and reduced to slavery or driven into the hill country to live as savages. The consciousness of this racial difference is very strongly marked in the earliest literature (e. g. the Vedas), where indeed without caste designation there is even a stronger caste feeling in its literal sense than in later times, a greater hate of the un-Aryan native, and a more pronounced consciousness of racial difference. For, as time went on and the contest between the nation of the conquerors and that of the conquered grew less, inasmuch as custom and social usage tended to unite the two, national antagonism sank into social antipathy, and the position of conqueror and defeated became changed to that of master and servant. Such was in general the origin of the whole caste system. But other factors of great national importance came into play. The later rule makes out four regular castes and thirty-six lowest castes, the latter being too degraded and too recent in origin to be included among the "regular" form of the system. In point of fact the rise of new plebeian industries was the real cause of producing many of the new "low" castes, for, as caste was inseparable from occupation, each new industrial development gave rise to a new social order. This fact is commonly stated incorrectly, in that the new caste is assumed to give rise to the new occupation, which is the unhistorical native point of view.

The four castes of the completed system were: 1. The *Brāhmana*, or *Brahmin*; 2. The *Kshatriya*, or warrior; 3. The *Vaiçya* (Vaisya), or farmer and husbandman; 4. The *Çûdra* (Sudra), or slave. All other castes were either "mixed," or "outcasts," i. e. degraded members of the four castes who had been expelled from society. Of the four castes here enumerated we find in the early period of the *Rig-Veda* no formal mention, yet not a few indications that caste feeling was already beginning to meet us in various passages of this same work. Thus the distinction between the priest (Brāhmana) and king as representative of the warrior (Kshatriya) caste is clearly marked, and, as stated above, the general antagonism to the "robber" and "slave" makes it evident that the three first classes of priest, warrior, and husbandman regarded themselves as a group apart from the fourth class, which later became incorporated into the caste system as the Çûdra (Sudra) or slave caste. But the only formal recognition of four social divisions to be found in the *Rig-Veda* is the sentence quoted above on the origin of the priest from the mouth of the god, Brahmā, etc. Before describing the duties and privileges of these castes, however, it is necessary to show how the third caste arose, for, as already said, the distinction between priest and warrior was already so strongly felt in the earliest time that the difference amounted practically to a caste differentiation, although it was not yet sufficiently established to preclude a warrior from exercising priestly functions or a priest from entering battle as a participant in the fray.

The third caste of Vaiçyas (Vaisya), or husbandmen, arose gradually. No trace of such a class as a caste meets us in the *Rig-Veda*. It is firmly established in the next period, that of the Brāhmanas. Whence arose the caste? Although nothing save a rather absurd tradition is extant in the way of historical evidence, the real genesis of the Vaiçya (Vaisya) caste is not difficult to discover. It is, in fact, not a caste formed by separation from the two higher castes, but the result of eliminating these castes from the working body politic, the residuum of the Aryan people left by the self-exclusion from the general body of those who arrogated to themselves the rights of priest and warrior respectively, thus leaving to all those not entering these ranks the duties and privileges of the working-classes. This development came as a result of the gradual settlement of the country. When the Aryans first entered India they did so as an invading army; every man was for himself warrior and cattle-lifter. The conquerors drove before them the native barbarians, settled down and became a cattle-raising, ultimately an agricultural people. It was at this juncture that those of the people at large who had more taste for war than for peaceful pursuits began to segregate themselves as a warrior caste, a standing army at the service of the king; and in the elimination of the warrior and the gradual separation of the priests from all the other castes is to be found the origin of the so-called caste of husbandmen; they were the people divested of priestly and fighting elements, and it was mainly from this caste that the "mixed" castes naturally arose.

These four castes, partially foreshadowed in the era of the early Vedic songs, were established and their position formulated in the next period, that of the first prose writings (the Brāhmana period).

(1) *The Brāhman, or Priest.*—His duty was to make sacrifices, to teach members of the three upper castes, and to study. His privilege was to take gifts in return for making sacrifice, and receive daily alms of members of the pure castes. In the early period he was permitted to be a soldier, but later this is forbidden, except in case of necessity, when it is even enjoined upon him to bear arms. His person is regarded as sacred, and he is even identified with the god whom he worships. He may not change his mode of life, unless in danger of starvation, in which case he may temporarily assume the life of a workingman. He is regarded as the sole authority in all questions of law and right, and in later times is often found as minister and judge. He is not responsible for his acts to any one, according to the traditional list of his privileges; but since the law provides fines, and even imprisonment, for a priest who has offended against the laws, this statute is clearly nugatory. It was, however, at no time permissible to put a Brāhman to death; and the king is expressly forbidden to tax his property.

(2) *The Warrior.*—His one duty was to fight. He was the king's soldier, lived at the king's expense, and was liable at any time to be called into the field. His rights, so far as caste goes, were to study the *Vedas*, a very highly esteemed privilege, and command the two lower castes.

Like the priest, in case of necessity the warrior may assume the manner of life of the lower castes, but in no case may he exercise the duties of a priest. Yet interchange between the two castes was not unknown prior to the period of formal law. In war the personal reward of the warrior, besides his monthly pay, is the possession of whatever he wins in battle, arms, jewels, etc., after the "king's share" has been deducted.

(3) *The Husbandman.*—The third caste shared with the two upper castes the privilege of studying the sacred writings (see SANSKRIT LITERATURE) and attendance on sacrificial rights; otherwise his position was practically much lower than that of the priest and warrior. He tended flocks, tilled the land, paid a large share of his gains into the king's treasury to support the military caste, and was in person superior only to the Çûdra (Sudra), or slave-caste, with which caste he seems often to be on more familiar terms than with his Aryan brothers of the upper castes. In the Epic period, which represents the completed caste-system, he is the prey of the king's officers, and retains little more than a nominal superiority to the lowest orders.

(4) *The Slave Caste.*—The Çûdra (Sudra) was the slave of every caste above him, but was regarded as more particularly the servant of the priest. He had no rights whatever. His slightest offense against the upper classes was severely punished, often with death. He could possess no property save what was given him by his master, and that was liable to be taken away without redress by any member of the pure castes. In distinction from these pure castes, called regenerate, or *twice-born* (the "second birth" being the formal initiation as a member of the pure castes), the Çûdra (Sudra) was called unregenerate, or "once-born." He was not permitted to study or even hear the *Vedas* recited. As the descendant of the barbarian native he was regarded as outside the pale of society, and was permitted to come into contact with it only to serve its necessities. The mixed castes, resulting from intermarriage of the slave with the regenerate castes, were regarded as too low even to serve the "twice-born." They lived apart, practiced the lowest trades, and mingled with the upper castes only as soldiers, herded together under the command of a real "warrior." It is not till the later literature that they make any figure in the social scheme, and they are then mentioned only to be disparaged. The "outcasts," or Pariahs, consisted of all the members of the pure castes who for any reason had been expelled from the social world into which they were born. The usual cause was *mésalliance* with a lower caste; and while the offspring of the *mésalliance* were Pariahs, the descendants of the Pariahs themselves were usually incorporated into a "mixed caste." Yet there was practically no distinction between outcast and lowest caste.

WASHBURN HOPKINS.

Castelar', EMILIO: statesman and author; b. in Cadiz, Spain, Sept. 8, 1832. He was appointed Professor of Philosophy and Literature at Madrid in 1857; and in 1864 founded a radical journal called *La Democracia*, wherein he developed his political principles. Involved in the insurrection of June 22, 1866, he was obliged to flee to France. Upon his return to Spain two years later he was elected a member of the Cortes, and became one of the most eloquent parliamentary orators. After the abdication of Amadeus in 1873 he took charge in the cabinet of Foreign Affairs. From Sept. 9, 1873, to Jan. 2, 1874, he was president of the Spanish republic with dictatorial power. During this time he put down with energy an uprising of the communists at Cartagena, and effected a reorganization of the army. Since 1875 he had been the leader of the Posibilistas, or the moderate faction of the Republican party. The following are some of his more important works: *La civilisación* (1865); *Questiones politicas y sociales* (1870); *El ocaso de la libertad* (1877); *Tragedias de la historia* (1883); and a *Life of Columbus*, printed in the *Century Magazine* for 1892. D. in Pueblo, Spain, May 25, 1899. HENRY R. LANG.

Castelbuono, kăăs-tel-boo-ō'nō (i. e. good castle): a town of Sicily; in the province of Palermo; in the Madonian Mountains, 4 miles S. S. E. of Cefalú (see map of Italy, ref. 9–F). It has mineral springs, and a trade in manna. Pop. 9,062.

Castel'-Gandol'fo: a village of Italy; picturesquely situated on the northwest side of Mont Albano; about 13 miles S. E. of Rome (see map of Italy, ref. 6–E). Here are numerous villas and the pope's summer residence. Pop. 2,000.

Castellamare del Golfo: a seaport-town of Sicily; in the province of Trápani; on a gulf of its own name; 20 miles E. of Trápani; near the site of the ancient *Segesta* (see map of Italy, ref. 9–E). It exports cotton, wine, fruit, and manna. Pop. 16,600.

Castellama're (i. e. fortress on the sea) **di Stabia**: a fortified city and seaport of Italy: in the province of Naples; finely situated on the Gulf of Naples; 17 miles by rail S. E. of Naples (see map of Italy, ref. 7–F). It has a royal palace, a cathedral, several convents, a military hospital, and a royal dockyard; also manufactures of cotton, linen, silk, and sailcloth. The castle from which the town takes its name was built in the thirteenth century by the Emperor Frederic II. It is near the site of the ancient *Stabiæ*, where Pliny was killed by an eruption of Vesuvius in 79 A. D. Pop. 34,064.

Castellanos, kăăs-tel-yaa'nōs, JUAN, de: a Spanish priest and poet of the sixteenth century; b. in Seville. He was curate at Tunja, in New Granada, where he probably died. His *Elejías de varones illustres de las Indias* is an account in verse of the exploits of Christopher and Diego Columbus, Bobadilla, Aguirre, and others, and is of historical value and considerable poetical merit. The first part was published at Madrid 1589, the second part some years later, and a reprint with the third part added 1847–50. A fourth part is lost, as is the *Historia Indiana* of the same author, in prose.

HERBERT H. SMITH.

Castellar, COUNT OF: See CUEVA, BALTAZAR DE LA.

Castellon, kaas-tel-yōn': a town of Spain; capital of the province of the same name; in an extensive and fertile plain; about 2 miles from the Mediterranean, and 40 miles N. N. E. of Valencia, with which it is connected by a railway (see map of Spain, ref. 16–I). It is well built, with wide and straight streets, and is supplied with water by a magnificent aqueduct. It has a handsome episcopal palace, a theater, a hospital, and several convents; also manufactures of linen, woolen, and hempen fabrics, sailcloth, paper, firearms, glass, soap, etc. Francisco Ribalta, the famous painter, was a native of this town. Pop. (1887) 25,193.

Castellon' de la Pla'na (dăy-lăă-plaa'năă), or **Castellón**: a province of Spain; bounded N. by Tarragona, E. by the Mediterranean, S. by Valencia, and W. by Teruel. It is a wild mountainous region, and contains many mines and mineral springs. Area, 2,447 sq. miles. Capital, Castellon. Pop. (1887) 292,437.

Castelnau, FRANCIS, Count: a French traveler; b. in London, 1812. From 1837 to 1841 he traveled in Canada, the U. S., and Mexico. In 1843 he undertook an exploration of South America under the auspices of the French Government. He was accompanied by M. Eugène d'Osery, mineralogist, M. Hugues Weddell, botanist and physician, and M. Émile Deville, taxidermist. Starting from Rio de Janeiro he traveled through Minas Geraes to Goyaz, explored the upper Tocantins and Araguaya, went overland to Cuyabá, whence he visited the upper Tapajós and explored the Paraguay to the frontiers of Brazil; then, passing through Bolivia and Peru, he descended the Ucayali and Amazon. M. Weddell undertook a separate exploration of Bolivia, and M. d'Osery, who was descending to the Amazon by another route, was killed by his Indian canoemen. Returning to France in 1847, Count Castelnau published his *Expédition dans les parties centrales de l'Amérique du Sud* (Paris, 1850–51, 6 vols. 8vo. including a volume by M. Weddell). This work is rich in geographical and ethnological information, as well as very interesting. The atlas and the scientific results were published separately. Count Castelnau subsequently traveled on the coast of Arabia, and was successively consul at Bahia, Cape of Good Hope, and Singapore, and consul-general at Melbourne, Australia, where he died Feb. 4, 1880. HERBERT H. SMITH.

Castelnau, kăăs'tel'nō', MICHEL, de: diplomatist and general; b. in Touraine, France, 1520; fought against the Protestants at Rouen, Dreux, etc., 1562–63; executed numerous and important diplomatic missions for Henry II. and Charles IX., and was minister to England 1574–84. D. at Joinville in 1592. His *Memoirs* (1731) are impartial and accurate.

Castelnaudary, kăăs'tel'nō'dăă'ree' (anc. *Sostomagus*): a town of France; department of Aude; on an eminence near the Canal du Midi; 22 miles W. N. W. of Carcassonne (see map of France, ref. 9–F). It has manufactures of silk and woolen fabrics and earthenware. The canal here expands

into a commodious basin 1,300 yards in circumference. This town was founded on the site of *Sostomagus* by the Visigoths, who called it *Castrum Novum Arianorum*. It was taken by the English Black Prince in 1355. Pop. (1896) 9,720.

Casteltermini: a town of Sicily; in the province of Girgenti; 16 miles N. of the city of Girgenti (see map of Italy, ref. 10–E). It has mines of rock-salt and sulphur. Pop. 9,842.

Castelvetrano, -văy-traa'nō: a town of Sicily; province of Trápani; 23 miles S. E. of Trápani (see map of Italy, ref. 9–E). It has several convents and an old castle and cathedral. Articles of coral and alabaster are made here. Pop. 20,100.

Casti, kaas'tĕe, Giovanni Battista, or Giambattista: Italian poet; b. at Prato, 1721; took orders, but after being presented to Joseph II. of Austria about 1769 devoted himself to court life; poet-laureate of Austria 1782–90; author of forty-eight spirited but somewhat licentious *Novelle Galanti* in verse (1793); the political satire *Gli Animali Parlanti* (1802); and various comic operas. D. at Paris, where he had lived since 1798, Feb. 6, 1803.

Castiglione, kaăs-tĕel-yō'naȳ, Baldassare: Italian statesman and author; b. at Casatico, near Mantua, Dec. 6, 1478; became a favorite at the court of the Duke of Urbino, by whom he was sent as envoy to Henry VII. of England in 1505, and whose interests he represented with Popes Leo X. and Clement VII.; employed by Clement on an embassy to Charles V. of Spain 1525. Author of *Il Cortegiano* (1528); several Latin and Italian poems; and two volumes of *Letters* (Padua, 1769–71). D. at Toledo, Feb. 2, 1529.

Castiglioni, -nĕe, Carlo Ottavio, Count: an Italian philologist; b. in Milan, 1784; known as the editor of Ulfila's Gothic Bible (1819). He also wrote a memoir upon the history of the Arab cities of Africa (1826). D. in Genoa, Apr. 10, 1849. See his *Life* by Biondelli (1856).

Castile (in Sp. *Castilla*, the land of castles): a former kingdom of Spain; occupied the central table-land of the peninsula, and was the nucleus and central seat of the Spanish monarchy. It first became an independent country in 762, and remained so until 1028, when it was conquered by Sancho III., King of Navarre. The kingdom of Castile was founded about 1035 by Ferdinand I., who conquered Leon and annexed it to Castile. By the marriage of Ferdinand the Catholic with Isabella of Castile in 1469, Castile and Aragon were united into one kingdom. The Castilians have long been distinguished for their pride or haughtiness. The Castilian dialect is considered purer than the dialects spoken in other parts of Spain. Pop. (1887) 3,205,114. Castile was divided into two portions, geographically as well as politically, New and Old Castile (*q. v.*).

Castile, kaăs-tīl: village; Wyoming co., N. Y. (for location of county, see map of New York, ref. 5–D); on N. Y., L. E. and W. R. R.; 57 miles S. E. of Buffalo; has four churches, and manufactories of agricultural implements and salt. Its principal industry is farming. Castile is situated on the highest point of the Erie R. R. between New York and Buffalo, is noted for the beauty of the scenery in the vicinity, and has a well-known sanitarium for women. Pop. (1880) 965; (1890) 1,146; (1900) 1,088. Editors of "Castilian."

Castile, New (Sp. *Castilla ta Nueva*): old province of Spain; the south portion of the kingdom of Castile; has an area of 20,178 sq. miles. Former capital, Madrid. It is a table-land, bounded N. by the Sierra Guadarrama and S. by the Sierra Morena. This range of mountains is rich in minerals. The soil of this region is partly sterile and not well watered. The plains receive little rain, and are nearly destitute of trees. Large flocks of sheep are raised here. New Castile is divided into four provinces—viz., Madrid, Toledo, Cuença, and Guadalajara. Pop. (1887) 1,487,712.

Castile, Old (Sp. *Castilla ta Vieja*): old province of Spain; bounded N. by the Cantabrian Mountains, E. by Aragon, S. by New Castile, and W. by Leon. Area, 25,408 sq. miles. The surface is diversified by several ranges of mountains and high table-lands, which are arid and nearly destitute of forests. The soil in many parts is rendered sterile by deficiency of water. The chief rivers of this region are the Douro and the Ebro. Sheep and cattle constitute the principal riches of the inhabitants. Old Castile is divided into the provinces of Burgos, Valladolid, Palencia, Avila, Logroño, Segovia, Santander, and Soria. Pop. (1887) 1,717,402.

Castilho, kaăs-tĕel'yō, Antonio Feliciano: Portuguese poet; b. in Lisbon, Jan. 26, 1800; began even as a student of law at Coimbra to write verses of an idyllic character, *Cartas de Echo e Narciso* (1821); *A Primavera colteção de poemetos* (1822). During the rest of his life he published many translations from ancient and modern tongues, distinguished more for style than for accuracy; and also several volumes of original verse: *Amor e metancotia, ou a novissima Heloisa* (1828); *A Noute do Castello e os Ciumes do Bardo* (1836); *Excavacões poeticas* (1844); *Mit e um Mysterios, Romance dos Romances* (1845); *O outono* (1863). See Th. Braga, *Historia do Romantismo em Portugal* (1880); and *Memorias de Castitho* (1881), by his son Julio de Castilho. D. in Lisbon, June 18, 1875. A. R. Marsh.

Castilla del Oro, or **Castilia del Oro**: a name first officially given to the part of Central America between the Gulf of Urabá (Darien) and Cape Nombre de Dios, which was granted to Nicuesa in 1508. It was later transferred to that portion of the South American coast lying between the Gulf of Urabá and Santa Martha, the interior extent being undefined. The name frequently appears in works and maps of the sixteenth century, but was merged later into that of New Granada. Herbert H. Smith.

Castilla, Ramon: Peruvian soldier and statesman; b. at Tarapaca, Aug. 30, 1796. He joined the Spanish army in 1816, and fought against the revolutionists in Chili until captured by them at the battle of Chacabuco (Feb. 12, 1817). Taken to Buenos Ayres he was soon released, returned to Peru, joined the patriots in 1821, and was a colonel at the battle of Ayacucho (Dec. 9, 1824), where he was wounded. Following the fortunes of Gamarra, he was exiled in 1835; returned with Gamarra and the Chilians in 1837, and was one of the principal generals in the campaign against Santa Cruz (1837–38). In 1841 he marched with Gamarra to invade Bolivia, and was taken prisoner at the fatal battle of Yugavi (Nov. 20, 1841), where Gamarra was killed. On his release (June, 1842) he found Peru distracted by civil wars between the factions of Menendez, La Fuente, Torrisco, Vidal, and Vivanco, the latter having possession of Lima. Castilla declared for Menendez, the constitutional acting president. Gathering an army in Southern Peru, he captured by a ruse the force which Vivanco sent against him (Oct. 28, 1843), defeated a second army at Carmen Alto (July 17, 1844), entered Lima, and restored Menendez to his post of acting president. A congress was then called, which elected Castilla president of Peru, with the title of grand marshal (Apr. 20, 1845). Disorders at once ceased, a general amnesty was declared, and an era of prosperity was opened. After a peaceful term Castilla was regularly succeeded by Echenique in Apr., 1851. The unpopular and arbitrary measures of Echenique led to revolts, and after much hesitation Castilla consented to head the armed opposition. He gathered forces at Cuzco and Arequipa, took the title of provisional president, decreed the liberation of Negro slaves and the abolishment of Indian tribute, defeated Echenique's army at the battle of La Palma (Jan. 5, 1855), and occupied Lima, Echenique leaving the country. The congress which was at once called re-elected Castilla president (July 14, 1855), and confirmed his emancipation decrees. His second term was disturbed only by a local rebellion at Arequipa, which was put down after some fighting. The revised constitution was ratified in 1860, and is still in force (1893). Succeeded by San Roman in 1862, Castilla lived in retirement until 1865, when he was made president of the senate. Owing to a quarrel with the president, Pezet, he was banished soon after. Returning, he declared against Prado, who had seized the presidency, and was preparing to march against him when he died suddenly in the desert of Tarapaca, May 30, 1867. Herbert H. Smith.

Castillo, Bernal Diaz del: See Diaz del Castillo, Bernal.

Castillo, kaăs-teel'yō, P. Francisco, del: Peruvian Jesuit; b. at Lima, Feb. 9, 1615. He entered the order in 1632, and his life was devoted to charitable works. He was one of the most reverenced preachers in Spanish America, and his influence over some of the viceroys was very great. D. at Lima, Apr. 11, 1673. See his biography by P. José de Buendia. H. H. S.

Castine, kăs-teen': a port of entry of Hancock co., Me. (for location of county, see map of Maine, ref. 8–E); on the east side of Penobscot Bay; at the mouth of the Penobscot river; 34 miles S. of Bangor. It is 9 miles E. of Belfast. It has a good harbor, a custom-house, and manufactures of boats, ships, and ship furniture, cordage, brick, etc. It has

a State normal school. Pop. of Castine township (1880) 1,215; (1890) 987; (1900) 925.

Castings: See Metallurgy and Molding.

Casting Vote: the vote of the president or chairman of a public assembly, or of the Speaker of a legislative body. This vote decides the question whenever there is a tie—i. e. when the votes of the assembly are equally divided. The Vice-President of the U. S. never votes except in case the Senators are equally divided. The Speaker of the British House of Commons never votes except in a similar contingency. In the U. S. Congress the Speaker votes on ballot as representative of a district, and on a tie vote as presiding officer. It is usual for the Speaker to give a casting vote in such a way that the House will have an opportunity of reconsidering its decision.

Cast Iron: See Iron.

Castle [from Lat. *castellum* (> Fr. *château*), dimin. of *castrum*, fort]: a fortified residence; especially applied to a class of structures erected by the feudal lords and princes of the Middle Ages, and to certain palaces and manor-houses of the early Renaissance in which the plan or forms of the feudal castles were retained. The Normans were the great castle-builders of the eleventh and twelfth centuries, maintaining themselves in the conquered territories of France and England by means of strongly intrenched and massive structures resembling fortresses rather than residences. In the twelfth and thirteenth centuries the baronial castle became a most formidable and elaborate mass of buildings; but its further development was checked in the fourteenth century by the growth of the royal power and that of such princes as the Dukes of Burgundy, Orleans, and others. Castles were then built in which the idea of the palace begins to assert itself prominently. The feudal castle usually occupied a bluff or hill, difficult of access, or in some cases an island in a lake. The earlier type consisted of a massive tower or "donjon," sometimes circular, sometimes square, or even of irregular plan, standing in the middle or at one side of a court or bailey, surrounded by a high wall with an exterior moat, crossed at the one fortified entrance-gate by a drawbridge. The gate, defended by towers, was closed by a "portcullis" raised and lowered by chains and weights, in addition to its iron-bound doors or valves. In the thirteenth century the circuit-walls were made of exceeding strength, with numerous towers, and the gates, posterns, barbicans, and advanced works were planned with great skill and shrewdness to resist the prevailing methods of attack, while interior walls and trenches furnished a second stand, and the donjon a final refuge in case the besiegers carried the gates. With the dawn of the Renaissance the castle becomes a palace, but retains many of the detailed arrangements of the feudal structures, such as the moat and drawbridge. The castles of Coucy, Pierrefonds, and Chambord, in France, and Rochester, Warwick, and the earlier manor-houses in England, illustrate the stages of this development, while in Germany one may trace them all in the beautiful castle of Heidelberg on the Rhine.

Many of the castles of robber-barons and rebel lords were destroyed by the growing power of the monarchy, and their imposing ruins are among the most picturesque objects in European landscapes. See Fortress.

A. D. F. Hamlin.

Castle (in Latinized form *Castellus*), Edmund: Orientalist; lived about 1606–85: a member of the group of men who adorned English scholarship in the second half of the seventeenth century. His life was spent mainly in the compilation of his *Lexicon Heptaglotton Hebraicum, Chaldaicum, Syriacum, Samaritanum, Æthiopicum, Arabicum et Persicum* (London, 1669), of which the Syriac part (ed. J. D. Michaelis, Göttingen, 1788) is still valuable; and he aided Walton in the preparation of his *Polyglot*. C. H. Toy.

Cas'tlebar: a town of Ireland; capital of the county of Mayo; on the Castlebar river; about 160 miles W. N. W. of Dublin (see map of Ireland, ref. 7–D). It has an old castle, once a stronghold of the De Burgh family; also manufactures of coarse linen. The Earl of Lucan has a county-seat near this town. Castlebar was taken by the French under Humbert in 1798. Pop. 3,500.

Castle Garden: a building at the southern extremity of New York city, which was originally a fort, but has served successively as a public garden and play-house and a landing dépôt for immigrants. It was built in 1807 by the U. S. Government as a fort at a point then 300 yards from the shore, but this space is now occupied by made land. Castle Clinton, as the structure was then called, was ceded to New York city in 1822, and subsequently was leased to private parties, who transformed it into an indoor garden and theater, and renamed it Castle Garden. Here Jenny Lind made her first appearance in America under the management of P. T. Barnum. In 1855 the immigration authorities obtained the building for use as a landing dépôt for immigrants, and kept it for that purpose till Dec. 31, 1890, when it was formally surrendered to the city, and placed in the control of the park commissioners. It has since been turned into an immense aquarium with a number of very large tanks for large fishes, and numerous smaller ones.

Cas'tlemaine: a city in Australia; province of Victoria; in the neighborhood of rich gold mines; connected by rail with Melbourne, 70 miles distant (see map of Australia, ref. 8–H). Pop. (1891) 6,082.

Castle Peak, California: a peak of the Sierra Nevada; about lat. 38° 10′ N. Its height is estimated at 13,000 feet.

Castlereagh, kăs'l-rāy, Robert Stewart, Viscount: Marquis of Londonderry; Tory statesman; b. in County Down, Ireland, June 18, 1769. He was the eldest son of the first Marquis of Londonderry; entered the House of Commons in 1794, and efficiently promoted the union of Ireland with England in 1800. In 1802 he was appointed president of the board of control by Mr. Pitt; became Secretary of State for the Department of War and the Colonies in 1805; fought a duel with George Canning in 1809. About this time he was the favorite leader of the Tory party, and a political rival of Canning. He entered the ministry of Lord Liverpool as Secretary for Foreign Affairs in Feb., 1812, and as such was a powerful director of the coalition against Napoleon. He represented Great Britain at the congress of Vienna, 1814, and the congress of Paris, 1815. On the death of his father, in 1821, he inherited the title of Marquis of Londonderry. He committed suicide, Aug. 12, 1822, and left no issue. See *Lord Castlereagh's Correspondence and Dispatches*, by Sir Charles Stewart (12 vols., 1847–53).

Castleton: village; Rutland co., Vt. (for location of county, see map of Vermont, ref. 7–B); on Del. and Hud. Canal Co.'s R. R., and on Castleton river; 11 miles W. of Rutland; is the seat of a State normal school; has manufactures of plows, marbleized slate, carriages, and cheese; good public school and four churches. Fort Castleton commanded the valley in 1775, and here Ethan Allen mustered his forces for the capture of Fort Ticonderoga. Pop. of township (1880) 2,605; (1890) 2,396; (1900) 2,089.

Abel E. Leavenworth, A. M.

Castletown: ancient capital of the Isle of Man (see map of England, ref. 6–D). Castle Rushen, now used as a prison, stands on the site of an old Danish fortress destroyed by Robert Bruce in 1313. King William's College is also located here. Pop. 2,200.

Castor: See Beaver.

Castor: a remarkable binary or double star of the second magnitude in the constellation of Gemini; called also α Geminorum. The two stars rotate around their common center of gravity.

Castor and **Pollux** (in Gr. Κάστωρ and Πολυδεύκης), heroes of classic mythology; called also **Dioscu'ri** [Gr. Διός, of Jupiter, κοῦρος, κόρος, boy, son]: were twin-brothers and the offspring of Leda by Jupiter, who visited her in the guise of a swan. According to one version of the myth, Leda brought forth two eggs, from one of which the two immortal babes, Pollux and Helen, were born, and from the other the mortal, Castor and Clytemnestra. The principal exploits of the twin-brothers were their expedition to Attica to rescue their sister Helen from Theseus, their participation in the hunting of the Calydonian boar and in the Argonautic expedition, and their combat with the sons of Aphareus. Castor was killed in the combat, and when Pollux found him dead he implored Jupiter that he too might die, in order to be together with his brother. Jupiter was moved with compassion for Pollux, and, according to Homer, restored life to Castor on the condition that both of them should on alternate days descend to Hades, or, according to another version of the myth, placed them both together among the stars. Generally the Dioscuri are represented in art as mounted on fiery steeds, with egg-shaped helmets ornamented with stars and spears. They presided over the public games; Castor was the god of equestrian exercise, Pollux of boxing. But they were also the patrons of

hospitality, ready to befriend any one who approached them with sincerity. They were chiefly worshiped by people of Dorian descent, and Max Müller thinks that the deification of some of the Tyndaridæ forms the true nucleus of the whole myth. They were also worshiped with great devoutness in Rome, where they had a magnificent temple in the Forum.

Castor and Pollux: the name given to an electrical meteor which sometimes appears at sea, attached to the extremities of the masts of ships, under the form of two balls of fire. Sailors consider this phenomenon a sign of fair weather, but a single ball, which is called Helena, is supposed to portend a storm.

Casto'reum, or **Cas'tor**: a substance secreted in glandular sacs closely connected with the reproductive organs of the beaver (*Castor fiber*). Each beaver produces two of these sacs or pouches. This substance is used by perfumers, and was formerly esteemed a valuable remedy for hysteria, catalepsy, and other diseases. It is an anti-spasmodic.

Castor Oil: a fixed oil derived by expression from the seeds of *Ricinus communis* or castor-oil plant. This plant frequently grows, in the East Indies and in Africa, to the height of 30 or 40 feet, forming a tree, but in the U. S. and countries possessing a similar climate it practically never reaches a size greater than that of a shrub. The seeds, which are oval and very smooth and shining, marbled, and of an ashy color, possess a rather agreeable nutty taste. They are, however, distinctly poisonous, as they contain a substance known as ricinoleic acid or ricin, which is capable of producing severe inflammation of the stomach and bowels in man and the lower animals. The oil itself probably depends for some of its purgative properties to a slight extent upon the presence of small quantities of ricinoleic acid, but does not possess enough of this irritant ever to produce any irritation in the gastro-intestinal tract of man. On the contrary, castor oil is recognized as being a gentle purgative in cases where the bowels are inflamed or irritated. The dose for ordinary purgative purposes varies from one to two tablespoonfuls. Very little of the castor oil used in the U. S. is imported. In addition to being used in medicine, the lower grades abstracted by processes, which also extract the irritant properties of the castor-oil bean, are used as lubricants, particularly for light-running wagons. H. A. H.

Castor-oil Plant: a well-known and widely cultivated plant of the Spurge family (*Euphorbiaceæ*), known to botanists as *Ricinus communis*. Its nativity is doubtful, but it is now held by De Candolle to have been originally native to tropical Africa. It was early cultivated by the Egyptians under the name of *kiki*, and the seeds have been found in their tombs. It is immensely variable, and several species have therefore been made of it; but botanists are now generally agreed that the genus *Ricinus* is monotypic. Several of these reported species, differing in stature, shape, and color of leaves, are in cultivation for ornament. The chief use of the castor-oil plant is the oil contained in the handsome variegated seeds. For this purpose it is grown in nearly all tropical countries, and in the U. S. it is grown to an important extent in Kansas, Illinois, and Missouri. The plant was early introduced into the West Indies, and in Jamaica it was called *agno casto* by the Portuguese, having in some way become confounded with *Vitex agnus-castus*, a shrub of the verbena family. The English planters are said to have made "castor" out of *casto*, and thus the present English name of the plant arose. Castor-seed pomace is valued as a nitrogenous fertilizer. L. H. B.

Castrén, Matthias Alexander: a Finnish linguist and ethnologist; b. in Tervola, Dec. 2, 1813; d. May 7, 1852. He traveled extensively to gather materials for a Finnish mythology and for his translation of *Kalevala*, published in 1841. He died before he had time to utilize the valuable materials collected on his travels. This was afterward done by Anton Schiefner, the German translator of *Kalevala*, in a series of volumes entitled *Castrén's nordische Reisen und Forschungen* (1853–62). Castrén also published grammatical treatises, particularly concerning Uralaltaic languages. R. B. Anderson.

Castres, kaast''r: an ancient town in the south of France; department of Tarn; on the river Agout; 34 miles by rail N. E. of Castelnaudary (see map of France, ref. 9–F). It is the most populous town in the department, and is the seat of a Protestant consistory, having been one of the strongholds of the early Huguenots. Castres has important manufactures of cassimeres, military clothing, cotton goods, paper, soap, and copper-ware. Pop. (1896) 28,204.

Castro Andrade y Portugal, Pedro Antonio Fernandez, de: tenth Count of Lemos; Spanish nobleman; b. in 1634. In 1666 he was made Viceroy of Peru, and reached Lima Nov., 1667. In 1668 he went with an armed force to put down disturbances which had broken out in mining towns near Lake Titicaca. The offenders were treated with great severity, over forty being executed, and one of the towns was razed to the ground. On his return to Lima his confessor expostulated against these acts as needlessly harsh and cruel. Struck with remorse, the viceroy had masses said for his victims and even performed public acts of penance. He died at Lima, Dec. 6, 1672.

Herbert H. Smith.

Castro, Inez de: See Inez de Castro.

Castro, Dr. José Maria: a statesman of Costa Rica; b. at San José, Sept. 1, 1818. He graduated at the University of Leon, Nicaragua, and from 1842 held high positions under the government of Costa Rica. Was vice-president and acting president in 1846. Elected president in 1847, he put down an incipient rebellion, but proclaimed an amnesty for the offenders. In 1848 Costa Rica finally withdrew from the Central American states, and a new constitution was promulgated. Dr. Castro resigned the presidency in Nov., 1849; held various diplomatic positions, and was again president from May, 1866, to Nov., 1868, when his government was supplanted by Jiménez. He received the title of "Founder of the Republic of Costa Rica," with the military grade of general of division. Herbert H. Smith.

Castro del Rio, del-ree'ō: a town of Cordova, Spain; on the river Guadajoz; 21 miles S. E. of Cordova (see map of Spain, ref. 18–E). The streets are mostly wide and regular, and lined with well-built houses. It has a spacious church with a high tower, 2 colleges, 2 hospitals, and several convents; also manufactures of linen and woolen fabrics, brandy, wine, etc. Pop. (1887) 11,290.

Castro Giovanni, jiō-vaan'nēē (anc *Enna*): a town of Sicily; in the province of Caltanisetta; on a fertile plateau 4,000 feet above the level of the sea; 14 miles N. E. of Caltanisetta (see map of Italy, ref. 10–F). Here is a feudal fortress of Saracenic origin. The ancient *Enna* was the site of the most famous temple of Ceres, and was supposed to be a favorite resort of that goddess. Pop. 19,800.

Castro, Guillem, de: Spanish poet; b. in Valencia in 1569; a friend and imitator of Lope de Vega. He has left us nearly forty plays, of which two are responsible for most of the poet's fame, both being devoted to the *Youthful Adventures of the Cid* (*Las Mocedades del Cid*; *Las Hazañas del Cid*). From these plays Corneille got the hint and much of the matter for his play *Le Cid*. D. July 28, 1631.

A. R. Marsh.

Castro, João, de: general: b. at Lisbon, Portugal, 1500; became proficient in mathematics and languages; commanded a vessel in Noronha's expedition to India 1538; aided in the exploration of the Red Sea 1540; headed a small expedition to the Indies 1545, and gained a brilliant victory over the Moors at Diu; Viceroy of India 1547. D. June 6, 1548.

Castro, Lope Garcia, de: Spanish lawyer and administrator; member of the council of the Indies, and from Sept., 1564, to Nov., 1569, governor and captain-general of Peru. His term was uneventful, and after his return to Spain he resumed his seat in the Indian council. The dates of his birth and death are unknown. H. H. S.

Castrovilla'ri: a fortified town of Italy; province of Cosenza; 32 miles N. of Cosenza (see map of Italy, ref. 8–G). It has an old castle, and a trade in silk, manna, and wine. Pop. 11,800.

Casua'rii [pl. of Mod. Lat. *casuarius*, a cassowary]: an order of birds related to the ostriches and containing the Cassowaries and Emus (*q. v.*); characterized by the absence of a keel to the sternum, and the extreme reduction of the wings. Neither the ischia nor pubes unite below. The feathers have long aftershafts, and the toes are three in number, directed forward. F. A. Lucas.

Casuari'na: the beefwoods or cassowary trees; a genus of trees of the family *Casuarinaceæ*, usually considered as somewhat related to the oaks, galeworts, etc., but probably having affinities rather with the gymnosperms. They are

mostly natives of Australia; some of them are large trees, producing hard and heavy timber of excellent quality, which is called beefwood, from its resemblance to the color of raw beef. One species, the *Casuarina equisetifolia*, grows wild in the South Sea islands, the peninsula of Malacca, and other places. It is a lofty tree, valued in India for its timber, which is very durable and hard. All the trees of this genus have a peculiar appearance, having long, slender, creeping or drooping branches, which are jointed, and bear scales instead of leaves. The flowers have neither calyx nor corolla, and the stamens and pistils are in separate flowers.

Revised by CHARLES E. BESSEY.

Casuistry [deriv. of *casuist*, to Lat. *casus*, case]: means the application of juridical methods of reasoning to moral questions, or, better, to special cases of practical morality. It may develop spontaneously as the necessary result of given circumstances. It thus developed among the Jews. As the Greeks never learned the absolute distinction between morals and æsthetics, so the Jews never knew the absolute distinction between morality and legality. Their moral code and their civil law were one and the same thing. In that preliminary stage of civilization casuistry became necessary to guide people to a strict fulfillment of the law. It can, however, under other circumstances, develop as the result of moral decadence, and its latent purpose is then to help people to circumvent the authority of conscience. It thus developed in the Græco-Roman civilization during the first two centuries of the Christian era, when treatises on the right to commit suicide, on the possible collision between the duties of citizenship and friendship, etc., began to engage attention. But its most characteristic development it received from the hands of the Jesuits. Traces of casuistry are met with very early in the history of the Christian Church, and the *De Mendacio* and *Contra Mendacio* of St. Augustine of Hippo may be classed as treatises on casuistry. A great impulse was given to this art by the Lateran Council, 1215, which directed confession of every mortal sin to be made to a priest, who was supplied with a penitential book. It crept into the Church through the sacrament of confession; it found its recognition in the *Libri pœnitentiales*; it molded the form of the whole mediæval treatment of sins as a science of moral theology; and it still prevails in the Roman Catholic Church. Traces of it may be found in the Reformed Churches, as in the writings of Jeremy Taylor and Amesius. (See also Melanchthon's *Concilia* and Perkins's *Cases of Conscience*.) But all this is simply the casuistry of unripeness, after the Jewish type. A new development came with the Probabilism of the Dominican MOLINA (*q. v.*) in the sixteenth century, which received great expansion in the eighteenth century at the hands of LIGUORI (*q. v.*), on whose treatises most modern manuals in use are based. He was especially followed by Seavini, Gury, Lehmkuhl. For writers of the seventeenth century, see Escobar's *Moral Theology* (1646) and *Cases of Conscience* (1626), and Caramuel de Lobkowitz.

Ca'sus Bel'li (a case of war, or, in other words, a case justifying war): a Latin phrase used to denote an act or event which involves war or justifies its declaration.

Cas'well, ALEXIS, D. D., LL. D.: b. in Taunton, Mass., Jan. 29, 1799; graduated at Brown University 1822; taught the classics in Columbian University, Washington, D. C., 1823–27; ordained in Baptist denomination and held pastorates in Halifax, N. S., and in Providence, R. I.; was a Professor of Mathematics, and later of Natural Philosophy, which at the time included the whole scientific curriculum of the college, in Brown University from 1828 to 1864; was president of that institution from 1868 to 1872; also of the board of trustees of the Newton Theological Seminary; one of the incorporators of the National Academy of Sciences. He gave much attention to meteorological investigations. D. in Providence, R. I., Jan. 8, 1877.

Cat [O. Eng. *cat*: O. Norse *köttr*: (fem. gender) O. H. G. *chazzā* > Mod. Germ. *Katze*. The Norm. Fr. also brought the word to Eng., N. Fr. *cat*: Fr. *chat*: Ital. *gatto*: Span. *gato* < Lat. *cattus*, also *catta*, late Gr. κάττος, κάττα. The word makes its appearance in Gr. and Lat. after Chr. era, and may have been introduced from Teutonic]: any member of the family *Felidæ*, including the lion, tiger, lynx, etc., but the name is sometimes limited to the smaller species of that family.

The original abode of the domestic cat (*Felis domestica*) is not certainly known, but probably it is descended from the domestic cat of ancient Egypt, which was considered an object of veneration, and the records of which run back to a very early period. It not unfrequently escapes to a wild state, but no properly wild species exactly resembles it. The cat is scarcely mentioned in the authors of ancient Greece,

European wild cat.

Rome, and Judæa, and it is known that in the earlier mediæval period of Europe cats were comparatively rare and costly animals. They seem to have been long known in China, which affords a fine variety with a soft and beautiful fur and pendulous ears. Among the more remarkable varieties are the Manx or Cornish cat, with a merely rudimentary tail; the Angora cat, with long hair; the Maltese and Chartreuse cats, of a bluish-slate color, etc. See St. George Mivart, *Cats* (1880), and Mrs. Hoey's translation of Champfleury's *Cats, Past and Present* (1885).

Revised by D. S. JORDAN.

Catacaus'tics [Mod. formation from Gr. κατά, down, back + καυστικός, deriv. of καίειν, burn]: the caustic curves formed by the reflection of rays of light, and so called to distinguish them from the diacaustic, which are formed by refracted rays. See CAUSTIC.

Cat'acombs [from Ital. *catacomba*; etym. obscure]: a series of subterranean sepulchral galleries; especially the series in Rome supposed to have been excavated by the early Christians from Nero's time to the fall of Rome, and used by them not only for burial, but as chapels for worship and refuges from persecution. Their total aggregate length amounts to hundreds of miles, and they are said to contain the bones of 6,000,000 persons, mostly placed in niches or *loculi*, cut in the sides of the galleries. It is in the catacombs that we observe the beginnings of Christian art in the mystic symbols, figures of the Good Shepherd, etc., which adorn the sarcophagi and chambers or chapels. The catacombs have been made the object of careful researches, and abound in archæological interest.

Catacombs also exist in Egypt, Naples, Sicily, and elsewhere, and the name is also applied to certain ancient subterranean quarries in Paris, which have been used since 1786 as ossuaries or charnel-houses. See Rossi, *Roma Sotteranea Christiana* (1864, *seq.*): Kip, *The Catacombs of Rome* (1854); Northcote and Brownlaw, *Sotteranea* (1879).

A. D. F. HAMLIN.

Catalani, kăa-tăă-laa'nĕe, ANGELICA: Italian singer; b. at Sinigaglia in 1779. She had a voice of immense volume, range, and flexibility. Having made her *début* in Venice, Italy, in 1797, she afterward performed with great applause in Paris and London, and amassed large sums of money. She was married to a Frenchman named Valabrègue, with whom she resided some years in Paris. In 1827 she retired from the stage; settled in Florence in 1830, and gave free instruction to girls of musical ability. D. in Paris, June 13, 1849.

Cat'alan Language and Literature: the language and literature of CATALONIA (*q. v.*). After the consolidation of the different political jurisdictions of Spain into a single state was consummated under Ferdinand and Isabella, near the close of the fifteenth century, the predominance of Castile completely overshadowed the other provinces, and gradually threw into obscurity their languages and their litera-

ture. The local dialects were sooner or later abandoned to the populace, and Castilian became the almost universal language of culture and of public life. But the independent and insubordinate Catalans long held tenaciously to their native tongue; it was not till the close of the seventeenth century that Castilian supplanted it, and there are instances of its employment, not only for literary but for official purposes, for a century later. It has now, however, followed the fate of the other provincial dialects, and though still spoken in a great variety of forms by the inferior classes over a wide range of territory, and not unfrequently employed as a vehicle for *belles-lettres* dilettanteism, it can no longer be said to have a living status in the literature of Europe.

Considered simply as an object of linguistic study, Catalan shares with the other dialects of the Hispanic peninsula the advantage of having an approximately known origin and date. For, notwithstanding the opinion of Pers (*Historia de la lengua y de la literatura catalana*, Barcelona, 1857), who holds it to be an indigenous speech, there is no room for doubt that it originated in the dialect of the Roman camps and public officers, and of course its history begins with the Roman conquest. Hence it, as well as the other Spanish provincial tongues, is essentially younger and less primitive than the numerous local dialects of Italy, many of which are probably as old as Latin itself. Of course, Catalan, like Castilian, Galician, and the other provincial tongues, was developed under circumstances peculiar to itself, and, like them, has maintained in all its multifariousness a marked individuality. The linguistic affinities of the Catalan, or as, since the beginning of the thirteenth century, it has often been called, the Lemosin, with the Provençal, and in some points of structure even with Northern French, are greater than with Castilian, although its vocabulary, with certain wide orthoepical, orthographical, and inflectional differences, is the same as that of this latter dialect. The frequent dropping or contraction of the inflected endings shortens the words to that degree that a Catalan original ordinarily covers not more than three-fourths as much letterpress as a literal Castilian translation, and monosyllables are so common that Ballot cites a poem in ninety-six verses, each of seven words of a single syllable. The brevity of the words and their frequent consonantal endings in Catalan necessitate an abruptness of utterance and an *accent* or rhythmic modulation much less agreeable to the ear than the pronunciation of the sonorous Castilian, but this disadvantage is compensated by a simplicity, a directness, and a logical precision of periodic structure which give to it, at least as a vehicle of prose composition, a decided superiority over the periphrastic and cumbrous language of Castile.

So large a proportion of the early monuments of the Catalan and Valencian speech—for the shades of distinction between the two are slight, and we must treat them as practically one—remain still unpublished, and have not yet been subjected to thorough critical examination, that the chronology of the dialect and its literature is not definitively established. Doubtless it existed for centuries only as a spoken tongue, but its most ancient written relic yet discovered is said to be a document of the year 1037, in which Catalan words and phrases are intermixed with the Latin text. As a literary language it can not be said to have become fairly established until toward the close of the thirteenth century. At the beginning of the fourteenth century the various very closely allied dialects then grouped under the general name of Catalan composed the vernacular of so large a population in Northern Spain and Southern France that Ramon Muntaner, writing in 1325, can hardly be charged with exaggeration in affirming (*Cronica*, cap. xxix.) that "in no nation are there so many who use one and the same language as of the Catalans." The important commercial and political relations of the Aragonese kingdom with the other Spanish Moslem and Christian states, with France, with Italy, with Sicily, and finally with Greece, brought the Catalans constantly into friendly or hostile contact with all these nations, and their literary men imbibed more or less of the intellectual culture of all of them. The writings of Raimon Lul and other writers show traces of a familiarity with Arabic, and the Italian poets were studied, imitated, and translated by Catalans in the very infancy of Italian literature. But though the native character, sentiments, and habits of thought were never entirely obliterated, yet most of the Catalan poets have too little individuality and originality to make them really worthy of study for the general purposes of literary culture.

In our survey of this literature our limits of space must confine us to its published and generally accessible monuments, and as the works of Catalan and Valencian poets who either wrote in Provençal or followed Provençal models belong rather to the history of that school than to that of the native literature of Northeastern Spain, we shall but very briefly notice their productions.

Apart, then, from the linguistic interest of Catalan as a distinct and peculiar offshoot from the ancient Italic stock, its prose, and especially its historical literature, forms its chief and almost only claim to attention of the foreign general student. The oldest published work of this class we possess is the *Cronica del Rey En Pere e dels seus antecessors*, by Bernat d'Eselot. This very interesting and valuable chronicle covers the period between the early part of the twelfth century and the death of King Don Pedro in 1285, in which year it is supposed to have been written. (See D'Esclot.) The spirited and justly celebrated *Cronica Catalana* of Ramon Muntaner embraces the same period, but comes down to 1328. (See Muntaner, Ramon.) Of not inferior interest to either of these, supposing it authentic, is the *Libre dels Feyts . . . d'En Jacme lo Conqueridor*, or autobiography of King Don James the Conqueror, which, though considered genuine by the patriotic criticism of most native investigators, is thought by many foreign scholars to be a production of about the middle of the fourteenth century. (See Jacme.) The *Cronica del Rey En Pere* (Peter the Cruel, Peter the Punctilious), by himself, is, we believe, of undisputed authenticity, and carries the history down to 1380. The *Libre dels Feyts d'Armes de Catalunya*, by Mossen Bernat Boades, continues the military annals to 1420. Many original historical documents of earlier and later periods are contained in the *Colección de Documentos inedítos del Archivo-general de la Corona de Aragon*, now in course of publication at Barcelona, of which over forty octavo volumes have appeared. The principal Catalan historians since the invention of printing are Tomich, *Historia dels Reys de Arago é Comptes de Barcelona* (Barcelona, folio, 1495); Carbonell, *Chronica de Espanya* (folio, Barcelona, 1546); and Pujades, *Chronica General de Catalunya* (parte prim., Barcelona, 1609, folio; the following parts are in Castilian). The Catalan prose-writer whose name is oftenest noticed abroad is Raimon Lul (A. D. 1235–1315), a very voluminous philosophical and mystical author, best known by his *Ars Magna*, or *Lulliana*, in Latin. A Latin religious romance by him was translated into Catalan and published at Valencia in 1521 under the title *Blanquerna, qui tracta de cinq estements de persones*, etc. Many of the Latin writings of Lull are contained in an edition published at Mayence (1721–42) in i.–vi., ix.–x. volumes. His works in his own tongue remain chiefly in manuscript, though Konrad Hofmann printed in the *Transactions* of the Royal Bavarian Academy (xii. B. iii. Abth. 1872) an apologue by Lull in the original, with a German translation. This is one of 365 tales narrated in a huge work entitled *Libre de Maravelles*, and is a new, or rather old, version of the story of *Reynard the Fox*, agreeing, however, with the French and Dutch fables only in subject. The *Libre de Maravelles* has recently been again printed in the *Biblioteca Catalana* mentioned below, as well as the *Libre del orde de cavayleria*. Lull's Catalan poetry was published by Rossello at Palma in 1859, and his proverbs by Morel-Fatio in the *Romania*, vol. xi. 188. (See Lul, Raimon.) Translations of parts, at least, of the Bible into Catalan were made at an early date, and there exist several romances of chivalry in the same dialect, one of which, *Tirant lo Blanch*, professedly translated from English into Portuguese, and from Portuguese into Valencian, by Juan Martorell, was published at Valencia in 1480. It has been reprinted lately in the *Biblioteca Catalana* mentioned below.

To what we have said of the general character of Catalan poetry the works of Ausias March (*circa* 1400–60) form a conspicuous exception. They were indeed, if not inspired, certainly suggested by the poems of Petrarch and the Provençals, but they are generally simple, unaffected, tender, and graceful, and not wanting in originality. (See March, Ausias.) The *Libre de les Dones* of Jayme Roig also possesses interest, if not high literary merit.

In the present generation much has been done by private individuals and by literary associations to revive the cultivation of the native tongue by the republication of old works and by original composition, and French and German scholars have essentially aided this movement. Buchon published in 1841 a translation of Muntaner, and in the same volume the origi-

nal text of d'Esclot; Lanz printed an edition of Muntaner in Catalan at Stuttgart in 1844; Bofarull, an edition of the same chronicler at Barcelona in 1860, and of the *Cronica de Don Pedro el Ceremonioso* at Barcelona in 1850. The beautiful *Biblioteca Catalana*, now in course of publication by Verdaguer at Barcelona, is devoted to the publication of old rare or inedited works, and deserves warm encouragement. Briz has printed (Barcelona, 1867) a *Libre dels Poetas*, or anthology of poems of the twelfth to the eighteenth centuries, an edition of Ausias March (Barcelona, 1864), and with Caudi and Salto a collection of *Cants Populars Catalans* in 5 vols. 8vo (Barcelona, 1866–77). Of modern original authors in this dialect we may cite Ros Carlos, *Rondalla de Rondalles* (Valencia, 1776); Balaguer, *Poesias Catalanas* (2 vols., Barcelona, 1814); *Los nous Trovadors* (a collection), by Bofarull (Barcelona, 1858–59, 2 vols.), and the *Proceedings* of the Catalan Academy, *Jochs Florals* (Barcelona, 1859–73, 15 vols. 8vo). Much interest has recently been shown in the collection and publication of Catalan folk-lore: for popular tales, see Fr. Maspons y Labros, *Lo Rondallayre* (Barcelona, 1871–75, 3 vols. 8vo); P. Bertran y Bros, *Rondallistica* (Barcelona, 1888, 8vo); for popular poetry, besides Briz, mentioned above, see J. Wolf, *Proben portugiesischer und catalanischer Volksromanzen* (Vienna, 1856); Milá y Fontanals, *Romancerillo catalan* (Barcelona, 1882); finally, for riddles and children's games, see Briz, *Endevinallas populars catalanas* (Barcelona, 1882); and Maspons y Labros, *Jochs de la infancia* (Barcelona, 1874). There are also two periodicals devoted to the same subject: *Folk-lore Catalá* and *Annari de la associació d'excursións catalana*, now in their ninth and eighth years respectively.

For more detailed information, see, besides general works on Spanish literature, Fuster, *Biblioteca Valenciana* (Valencia, 1827–30, 2 vols., folio); Torres Amat, *Memorias para ayudar á formar un Diccionario critico de los escritores Catalanes* (Barcelona, 1836, 1 vol. 8vo), and supplement by Corminas (Burgos, 1849, 1 vol. 8vo); Ballot, *Gramatica y Apologia de la Llengua Cathalana* (Barcelona, 1814, 12mo); Bofarull, *Estudios, Sistema Gramatical y Crestomatia de la Lengua Catalana* (Barcelona, 1864, 12mo); Cambouliù, *Essai sur l'Histoire de la Littérature Catalane* (Paris, 1858, 8vo); and especially Helfferich, *Raymund Lull und die Anfänge der Catalonischen Literatur* (Berlin, 1858, 8vo). The various French and German journals devoted to Romance literature may be consulted with advantage, and especially Körting's *Encyklopädie und Methodologie der romanischen Philologie* (Heilbronn, 1886, 3 vols. 8vo, vol. iii., p. 479), and Gröber's *Grundriss der romanischen Philologie* (Strassburg, 1886, 8vo, vol. i., p. 669). The latter work is to be in two vols. (See also ROMANCE LANGUAGES.) An account of modern Catalan language and literature, with copious bibliography, may conveniently be found in E. Vogel's *Neucatalanische Studien* (Paderborn, 1886), based on F. M. Tubino's *Historia del renacimiento literario contemporáneo en Cataluña, Baleares y Valencia* (Madrid, 1880, 8vo). Perhaps the best dictionary is that of Labernia, Catalan, Castilian, and Latin, and Castilian, Catalan, Latin (Barcelona, 1839, 4 vols. 8vo). Revised by THOMAS F. CRANE.

Catalau'nian Plain (Lat. *Campi Catalaunici*): the ancient name of the wide plain surrounding Châlons-sur-Marne, in France. On this plain the Roman general Aëtius and his ally, Theodoric the Visigoth, gained a great victory over Attila in 451 A. D.

Cat'alepsy [Med. Lat. *catalepsia*, from Gr. *κατάληψις*, deriv. of *καταλαβεῖν*, seize upon]: a condition which occurs in various diseases, and is characterized by a certain rigidity of the muscles, so that the patient retains any position in which he is placed. Formerly this was regarded as a special disease, but is now known to be a symptom of several. Most frequently the cause is *hysteria*; in other cases it may be grave mental disease, as *melancholia atonita*, or *katatonia*; in children, and more rarely in adults, it may occur in various general diseases; and lastly catalepsy is one of the phenomena obtainable in HYPNOTISM (*q. v.*). The most striking cases are those due to hysteria, and these may be accompanied by partial or complete loss of consciousness and by insensibility to pain or other sensations. The person may stand with the arms stretched out horizontally for an hour without apparent fatigue, the limb sinking very slowly at last. The condition may develop gradually, though more often after hysterical convulsions, and it may constantly recur, so that the patient is almost continuously cataleptic for weeks at a time. In such cases the body remains motionless, the mouth often open, the expression apathetic; the heart and respirations are normal in frequency and regularity, and generally the bodily functions may be unimpaired, the patient being fed by a tube passed into the stomach. The appearance of death in such cases is usually only superficial, and not deceptive, except to careless examination. Catalepsy without the trance-like loss of consciousness is more rare, though cases are recorded; and most rarely a single limb has been affected, the rest of the body remaining normal. The cataleptic state developed by hypnotism may be decided, and by "suggestion" attitudes may be assumed which are indicative of different occupations; but too close a scrutiny can not be accorded such cases to eliminate the possibility of fraud.

The definite cause of catalepsy is still mysterious, and its treatment depends upon the condition with which it is found associated, though fortunately, from the rarity of its occurrence, treatment is rarely required. In the severer cases associated with hysteria and insanity regular feeding by the stomach-tube must be practiced from the beginning.

WILLIAM PEPPER.

Catali'na: a port of entry of Newfoundland; on the north side of Trinity Bay; has an excellent harbor, though difficult to approach. It has a lighthouse and a fine Anglican church. Pop. 1,300.

Catalo'nia (Sp. *Cataluña*): an old province of Spain; bounded N. by France, E. by the Mediterranean, S. by Valencia, and W. by Aragon. Area, 12,483 sq. miles. Pop. (1887) 1,838,799. Capital, Barcelona. The Pyrenees extend along the northern border of this region, which is extremely mountainous. The highest summits are covered with perpetual snow. The soil of the valleys is fertile, and this is said to be the best-cultivated part of Spain. The orange, the olive, the grape, and cereal grains flourish here. The principal rivers are the Ebro and Llobregat. Among its minerals are copper, cobalt, lead, zinc, coal, sulphur, and marble. Catalonia surpasses every other province of Spain in the importance of its manufactures, the chief products of which are cotton, silk, and woolen fabrics, paper, firearms, cordage, and leather. Catalonia is divided into the provinces of Barcelona, Tarragona, Lerida, and Gerona. The Catalans speak a peculiar language, different from the Castilian, and nearly related to the Provençal. They surpass the other Spaniards in energy and industry. This region was in ancient times a Roman province called *Hispania Tarraconensis*. The Goths and Moors successively became masters of it. In 1137 it was united with Aragon by a marriage of the sovereigns, and in 1460 they both were united with Castile by the marriage of Ferdinand and Isabella. See CATALAN LANGUAGE.

Catal'pa [from the Indian of Carolina]: a genus of trees of the family *Bignoniaceæ*. The *Catalpa bignonioides* and *C. speciosa* (Western catalpa) are indigenous in the Southern and Central U. S., and are planted for ornamental and other purposes in the Northern States and in Europe. They have large cordate and pointed leaves, and showy flowers in open compound panicles. The fruit is a pod which is often a foot long, and usually remains on the tree all winter. The seeds are winged on each side, the wings cut into a fringe. The wood of the Western catalpa is durable, and is used for fence-posts, rails, etc. Revised by CHARLES E. BESSEY.

Catal'ysis [Gr. *κατάλυσις*, dissolution; *κατά-*, down + *λυειν*, loose]: action by contact. The conception came into prominence in chemistry early in the nineteenth century, and for a time what was called the theory of catalysis was accepted by many of the leading chemists. According to this theory certain substances have the power by their simple presence in mixtures, and without being changed themselves, to cause the other constituents of the mixtures to act upon one another. The theory is too elastic to be of service. I. R.

Catamaran' [Tamil, *kaṭṭamaram*, tied tree; *kaṭṭa*, tied + *maram*, wood]: a sort of raft used by the Hindus of the Coromandel coast; formed of three planks or pieces of wood lashed together. The middle piece is longer than the others. The catamaran, which is propelled by a paddle, is used by the people of Madras to maintain communication between the shore and ships where the surf is so violent that ordinary boats are unsafe. A catamaran carrying a sail is also used on the coast of Brazil. The name was also given to the fire-boats prepared by the British in 1804 to destroy the French vessels which Napoleon gathered for the invasion of England; used again to denote any craft with two hulls having their inner sides parallel, however it may be propelled.

Catamar'ca: a province or department of the Argentine Republic; bounded W. by the Andes and Rioja, S. and E. by Cordova, Santiago, and Tucuman, N. by Salta and Bolivia. The western part is mountainous or desert, but elsewhere the soil is fertile, producing grain, cotton, and cattle. Copper is mined in the province. Area, 31,500 sq. miles. Capital, Catamarca. Pop. (1895) 89,645.

Catamarca, San Fernando de: capital of the Argentine province of Catamarca; about 650 miles N. W. of Buenos Ayres (see map of South America, ref. 7–D). Pop. about 7,500.

Catame'nia, pl. [from Gr. *καταμήνια*, menses, monthly; deriv. from phrase *κατὰ μῆνα*, by the month]: monthly sanguineous uterine discharges. They commence in hot climates usually at the age of ten or eleven, and considerably later in colder regions. In a state of health each period commonly lasts from three to six days. The final cessation occurs, with some exceptions, at the age of forty-five or fifty.

Catamount: See Puma.

Catania, kăă-taa'nĕĕ-ăă: a province of Sicily, Italy; bounded E. by the Mediterranean, N. by Messina, W. by Caltanisetta, and S. by Noto. Area, 1,970 sq. miles. The surface is partly mountainous. Among its prominent features is Mt. Etna. Capital, Catania. Pop. (1890) 633,249.

Catania (anc. *Catana*): a city of Sicily; capital of the province of Catania; beautifully situated on the east coast at the foot of Mt. Etna; 31 miles N. N. W. of Syracuse; lat 37° 28′ N., lon. 15° 5′ E. (see map of Italy, ref. 10–G). It presents a noble appearance from the sea, and is internally handsome, being well built, with wide and straight streets, which are paved with lava. Some of the public buildings also are constructed of lava. It has been several times nearly ruined by earthquakes and eruptions of Mt. Etna, but it has risen again with greater beauty and splendor, and is now perhaps the finest city of Sicily. The most remarkable edifices are the cathedral, rebuilt after the great earthquake of 1693; the town-hall; the university, founded in 1445; and the grand Benedictine convent and Church of San Niccolò. Catania has about fifty churches, several hospitals, and a college of arts. In a fine square adjacent to the cathedral is a statue of an elephant formed of lava. The harbor, which was formerly good, has been partly choked by lava from Mt. Etna. This city has manufactures of silk and linen fabrics, and of articles and wares formed of amber and lava. The chief articles of export are grain, wine, silk, olives, manna, figs, soda, and snow from Mt. Etna. The ancient *Catana* was founded by the Phœnicians or Greeks, and was nearly as old as Rome. It was taken by the Athenian general Nicias about 413 B. C., and was an important city under the Romans, who adorned it with magnificent edifices. The remains of an aqueduct, a temple of Ceres, and a large amphitheater are still visible here. Catania was severely injured by earthquakes in 1693, 1783, and 1818. Pop. 98,335.

Catanzaro, kăă-tăăn-zaa'rō (formerly called **Calabria Ulteriore II.**): a province of Calabria, Southern Italy; bounded N. by the province of Cosenza, E. by the Gulf of Taranto, S. by the province of Reggio, and W. by the Mediterranean Sea. Area, 2,307 sq. miles. The soil is fertile and the climate healthy. The chief products are wool, cotton, linen, cheese, butter, hemp, oil, silk, wine, and lumber. Pop. (1890) 455,290. Chief town, Catanzaro.

Catanzaro: a city of Italy; in province of the same name; finely situated on a mountain near the Gulf of Squillace; 33 miles S. S. E. of Cosenza (see map of Italy, ref. 8–G). It has an old castle of the Norman period, a cathedral, a large college, and a royal academy of sciences. Many of its public buildings were destroyed by the earthquake of 1783. Here are manufactures of velvet and of silk and woolen fabrics. Pop. about 29,000.

Cataplasm: See Poultice.

Catapult [Lat. *catapulta*, from Gr. *καταπέλτης*, an engine for hurling missiles, connected with *κατα-πάλλειν*, hurl]: an engine of war used by the ancients for discharging arrows. We are not able, from any descriptions the ancients have left us, to form any exact idea of either the catapult or the ballista. It appears that in the catapult a rope, suddenly freed from great tension, gave impulse to an arrow placed in a groove. There were great catapults, fixed upon a scaffold with wheels, which were used in sieges, and small ones, carried in the hand, which were employed in the field. Originally ballistæ were employed to throw stones, and catapults to shoot darts; but the terms were often confounded by the later Roman writers.

Cataract: an opaque state of the crystalline lens of the eye, of its capsule, or both; called *cataract* because the ancients believed that a kind of opaque veil fell down within the eye, obscuring vision. Cataracts are thus lenticular, capsular, or lenticulo-capsular. Various other kinds are enumerated, such as hard cataract, in which the nucleus of the lens is large; soft cataract, in which the nucleus of the lens is small or wanting; and liquid cataract, in which there is a liquefaction of the cortical matter of the lens. Cataracts are also designated by their color as black, white, amber, etc. A cataract is either partial and stationary, or progressive and becomes complete, and is classified as senile, congenital or juvenile, secondary or complicated, and traumatic. The most common variety of cataract is the ordinary senile cataract, which is rare before the forty-fifth year. It begins in a gradual impairment of vision, and its growth from incipiency to full maturity may consume from one to three years or longer. If the cataract is uncomplicated, the patient can perceive light, and is able to recognize the flame of a candle and indicate the direction in which it is coming. The color of the pupil is dull, gray, or even white, according to the degree of maturity and the hue of the opacity. Often, however, the pupil is dark, and the absolute diagnosis depends upon the use of the ophthalmoscope. One or both eyes may be affected. Congenital cataract appears in the form of a complete or partial opacity of the lens, and is "soft," as all cataracts are which develop under the age of thirty-five. When it is complete, it is often of a bluish-white color. Cataracts of similar color, not congenital, sometimes develop in young people without known cause. The chief varieties of partial congenital cataract are the lamellar, central, and pyramidal cataract—names which describe the character of the opacity. Medical treatment for cataract is useless. Its removal by surgery is of frequent occurrence, and the methods of performing the operation are numerous. Hard cataracts are removed by one or other of the methods of extraction; soft cataracts by linear extraction, the needle operation, or the suction method. The function of the crystalline lens must be supplied by a kind of spectacle, called a cataract glass, and after a successful operation sight is to a great degree restored.

George E. de Schweinitz.

Cataracts, or Waterfalls [*cataract* is from Lat. *cataracta*, from Gr. *καταρράκτης*, deriv. of *καταρραγῆναι*; *κατα*, down + *ῥαγῆναι*, fall, rush; or *καταράκτης*, deriv. of *κατταράσσω*, fall headlong; *κατά* + *ἀράσσειν*, dash]: places of more or less sudden descent in the course of a stream or river, where the water leaps or rushes in its course. All such inequalities are gradually reduced to rapids, and finally destroyed by the action of the river in deepening its channel; hence falls indicate relative immaturity of river-life, or the occurrence of some disturbance in the regular course of river development by which a fall is introduced. Falls of the simplest type are those made in the course of normal valley cutting, as the Shoshone falls (190 feet) in the Shoshone or Snake river of Idaho, where a narrow gorge is cut down through a heavy series of horizontal lava-beds, and the river falls from one bed to another. The Great Falls of the Missouri in Montana plunge over beds of sandstone: in consequence of the geologically recent elevation of the region to a greater height above sea-level than before, the river is cutting a deep valley across the plains, but it has not yet cut back all the hard strata. The small cascades or waterfalls, so numerous in the Appalachian plateau, are of as simple origin, but they occur here only on the smaller streams, as the larger rivers have long ago worn back their falls up-stream to the branching head-waters. All these falls leap from higher to lower levels in valleys of their own making. Other falls leap into valleys made by other processes; thus the lofty falls of the Yosemite valley (Yosemite fall, 1,600 feet, and many of less height) plunge over cliffs in whose formation they have had no share; the Staubbach (900 feet) of Switzerland leaps over a cliff in which it has as yet hardly cut a notch, and is scattered to spray before reaching the bottom. Rjukanfos (900 feet) and other lofty falls of Norway are similar to these. Falls of still another class are those which are formed where rivers deepen their channels and discover the uneven foundation on which the strata of the region lie; thus the several cataracts or rapids of the Nile occur where the river has locally trenched through the weak desert sandstones in which its valley is eroded and found hard crystalline rocks beneath. The uneven distribution of glacial and

river drift has frequently diverted rivers from their former courses by a greater or less distance, and turned them over buried spurs or ledges, where falls are subsequently developed; thus the falls of the Rhine at Schaffhausen (60 feet), the rapids of the St. Lawrence, and all the water-powers of the Merrimack and other New England rivers have been produced. The greatest of such falls is NIAGARA (*q. v.*).

W. M. DAVIS.

Catarrh' [older spellings *cathar*, *catarr*, *cattar*, etc.; from Fr. *catarre*: Ital. *catarro*: Span. *catar* < Lat. *catarrhus*, = Gr. *κατάρρους*, a running down, discharge; *κατά*, down + *ῥεῖν*, flow]: a condition characterized by hyperæmia (or congestion) of the blood-vessels of any mucous surface, with great increase of the proper secretion of the part. Thus there may be catarrh of the nose, the throat, the air-passages, the bowels, the vagina, the bladder, or the urethra; but in popular language "catarrh" designates either a "cold" in general, a "cold in the head," or a chronic catarrh of the posterior nares (nostrils) and throat. Catarrhs in general arise from exposure to cold and wet, and to sudden atmospheric changes. They are most common in persons who are ill-fed, and who are not accustomed to out-of-door exercise, and in children. The latter are especially apt to suffer when they are of the habit called scrofulous, and the long-standing nasal catarrhs of children are generally of this nature. The variety of catarrh known as a "cold" is by no means always easy of cure. The popular belief that "a cold must have its run" has some foundation. Hot foot-baths, laxatives, sedatives, demulcents, mild stimulants, or diaphoretics may, however, prove useful in many cases. Judicious exercise, bathing, and life in the open air tend to overcome the morbid inclination to take cold from which some patients suffer. Chronic catarrh of the posterior nostrils is an obstinate disease, best treated by systematic exercise and attention to other hygienic conditions, and by the use of salt water as a nasal douche. See NOSTRILS AND THEIR DISEASES, and THROAT DISEASES.

Catarrhi'ni [from Gr. *κατά*, downward + *ῥίς*, gen. *ῥινός*, nose]: a collective name for the apes and monkeys of the Old World, on account of the narrowness of the nasal septum and the consequent downward direction of the nostrils: the character shared by man also, but not found in the New World monkeys, in which the septum is very broad.

Catasau'qua: borough of Lehigh co., Pa. (for location of county, see map of Pennsylvania, ref. 5–I); situated at junction of Cat. and Fog., N. J. Cent. and Leh. Val. R. Rs.; on Lehigh river; 3 miles N. of Allentown. Catasauqua has 10 churches, 14 schools, electric lights, water-works, machine-shops, rolling-mills, 5 blast-furnaces, 2 silk-mills, horseshoe works, and car-works. Pop. (1880) 3,065; (1890) 3,704; (1900) 3,963. EDITOR OF "DISPATCH."

Catastomidæ: same as CATOSTOMIDÆ (*q. v.*).

Catastrophe [Gr. *καταστροφή*, overturning, sudden turn, close; *κατά*, down + *στρέφειν*, turn]: the final event of a drama or romance, to which the other events are subsidiary; a disastrous revolution or event; a calamity; an unfortunate conclusion. The term is used by geologists to denote a violent convulsion or physical revolution, causing the elevation or subsidence of portions of the globe, and the destruction of large tribes or multitudes of animals.

Catawba: the name of an excellent wine of a rich muscadine flavor; produced in various parts of the U. S. It is made of the Catawba grape (*Vitis labrusca*), which originated probably near the Catawba river in North Carolina. This grape, which is highly esteemed for eating, is red or copper-colored. The first person who cultivated it extensively for wine was Nicholas Longworth, of Cincinnati, whose vineyards covered the southern slopes of the hills in the environs of that city. The Catawba grape flourishes in the Middle, Southern, and Western States. A large quantity of this wine is produced in the Ohio valley, the climate and soil of which are especially adapted to the culture of the grape. The best sparkling Catawba is considered nearly equal to champagne.

Catawba, or **Great Catawba**: a river which rises in McDowell co., N. C.; flows nearly eastward to Iredell County. It afterward runs southward into South Carolina, and forms the E. boundary of York and Chester Counties. Below Rocky Mount it is called the Wateree, which unites with the Congaree to form the Santee, their outlet to the Atlantic Ocean. The Little or South Catawba enters the Catawba on the W., a few miles above Charlotte, N. C. Its length from its source to Rocky Mount is 250 miles.

Catawba Indians: See SIOUAN INDIANS.

Catawissa: borough; Columbia co., Pa. (for location of county, see map of Pennsylvania, ref. 4–H); situated at the mouth of Catawissa creek; on the east bank of the north branch of the Susquehanna river, and on the Pa., Phil. and Read. and Del., Lack. and West. R. Rs.; 150 miles from Philadelphia. It has fine schools and churches of four denominations. The principal industrial establishments are fiber and paper mills, machine-shops, a foundry, shoe-factory, and a novelty manufactory. There is a good system of water-works. The original grant for Catawissa was from the proprietaries of Pennsylvania to the Shippen brothers Feb. 14, 1770. It was then known as "Catawassey or Lawpaughpeton's [an Indian chief] Town," and the grant covered 282¼ acres. In 1778 William Hughes acquired title to 92¼ acres of the tract, which he plotted and sold in town lots. The town was incorporated into a borough in Dec., 1892. Pop. (1880) 1,427; (1890) 1,809; (1900) 2,023.

EDITOR OF "NEWS ITEM."

Cat-bird (*Galeoscoptes carolinensis*): a song-bird common in the U. S.; of the family *Turdidæ*; related to the mocking-bird, which it resembles in its vocal powers. It derives its common name from a note or cry which it utters. It occurs in the Middle States as a summer bird of passage, and breeds in gardens or in the vicinity of dwelling-houses. The color of its upper plumage is dark gray or slate-color, the head is black, and there is a conspicuous reddish patch on the under-tail coverts. It is serviceable to man in devouring insects and worms. It sometimes imitates the song of other birds, and is remarkable for its boldness and vivacity.

Catchfly: a popular name for many species of *Silene*; a genus of pinkworts (*Caryophyllaceæ*). The name refers to the fact that insects are frequently caught in the viscid exudation from certain belts upon the stems.

CHARLES E. BESSEY.

Catean-Cambresis, or **Le Catean**, le-kăă'tō': a town of France; department of Nord; on the river Selle; 14 miles E. S. E. of Cambrai (see map of France, ref. 2–F). It is well built, and was formerly fortified. It has manufactures of shawls, merinoes, and calicoes. The important treaty of Cateau-Cambresis was concluded here between Henry II. of France and Philip II. of Spain, in 1559. Pop. (1896) 10,451.

Catechet'ical Schools: a name given to the ancient Christian schools of theology, of which the principal were those of Alexandria (160–400 A. D.) and Antioch (from 290 A. D. through the fifth century). The most noted teachers in the great school of Alexandria were Clement and Origen.

Catechism [from Lat. *catechis'mus*, as if from a Gr. **κατηχισμός*, cf. *κατήχησις*, instruction by word of mouth; *κατά*, down, thoroughly + *ἠχεῖν*, ring, sound]: an arrangement of questions and answers, generally designed to teach religious doctrine to the young. Catechetic instruction has long prevailed among the Jews, and in the early Christian Church the *catechumens* (or persons receiving instruction preparatory to baptism) constituted, according to several of the Fathers, a separate order in the membership of the Church. This order comprised both the children of believers and adults from heathen society who desired admission into the Church. What would now be called catechisms were used to some extent in those remote times. Catechisms were used in the Middle Ages by the Waldenses, and later by the Bohemian Brethren. It has been said that the catechisms of Luther (1518–29) were the first which received this name, but this point is not quite certain. The Roman Catholic Church had long used catechisms, though called by other names. Kero of St. Gall in the eighth century prepared one of the earliest in the German language. The principal catechisms of later times have been those of Luther (the Exposition of 1518, the Catechism of 1520, the Smaller and Larger Catechism of 1529), still extensively used in the Lutheran Church; Calvin's catechisms, the Smaller and Larger (1536–41); the Heidelberg Catechism (1563) (Reformed); that of Œcolampadius (1545); of Erasmus (1547); of Leo Judæ (1553); the Tridentine Catechism (1566), a standard in the Roman Catholic Church; the Anglican catechisms—the Larger (Latin, 1570), the Shorter or Middle Catechism, and the Smaller, which, with a few changes, is published in the Book of Common Prayer; the

British Presbyterian catechisms—the Shorter (1647) and Larger (1648), which, with the Westminster Confession (1646), are standard books with most Presbyterian churches in the U. S. and Great Britain. The Greek Church has the *Orthodox Confession of the Eastern Church* (1643), by Peter Mogilas, metropolitan of Kieff, the father of Russian theology; while its subdivision, the Russian Church, has a *Primer for Children* (1720) and a "Shorter" and "Longer Catechism" (1839). Besides these may be mentioned the three Wesleyan catechisms prepared by Richard Watson, and the three Methodist Episcopal Church catechisms (New York, 1852). The number of symbolical or authorized standard catechisms of the various churches is quite large, besides an immense number of private or unauthorized works of the kind. P. Schaff, *History of the Creeds of Christendom* (3 vols., New York, 1876), gives much information upon the general subject. Revised by S. M. Jackson.

Cat'echu: an extract which is obtained from the wood of *Acacia catechu*, according to the U. S. Pharmacopœia, or from the leaves and young shoots of *Uncaria gambir*, according to the British Pharmacopœia, which has entirely substituted the latter drug for true catechu. True catechu, such as is most commonly employed in the U. S., is derived chiefly from the East Indies, and comes in masses of various shapes, sometimes in balls or in flattened pieces, or in sausage-shape circular cakes with irregular edges. Its color is rusty brown and its hue may be light or dark. It is without odor, but has an astringent, bitter taste, which is also slightly sweet. Very frequently it contains a large amount of contaminating material, such as small pieces of wood and sand. It also contains an extractive which is called catechin. The source of true catechu is a tree, varying from 30 to 40 feet in height, which bears pale-yellow flowers arranged in dense cylinder-like spikes, about 3 inches in length. The wood of this tree is very heavy and durable, and contains a dark heart-wood which is reddish brown or blackish brown in color. This heart-wood, having been cut into chips, is boiled in water until the decoction thereby obtained is sufficiently strong, when it is strained and evaporated until the watery extract is of such a consistency that when poured into a mould it hardens into the irregular cakes we have described. Catechu is used in medicine for the purpose of producing an astringent effect in cases where there is relaxation of the mucous membranes, particularly of the stomach and intestines, and has been most largely used probably in the treatment of serous or watery diarrhœa, under which circumstances it is generally administered in the dose of one or two teaspoonfuls of the preparation, which is official in the U. S. Pharmacopœia under the translated name of compound tincture of catechu. The drug has also been used in the form of an infusion as an injection in the treatment of leucorrhœa, gleet, and other inflammations of the mucous membrane of the genito-urinary tract, and has been employed as a gargle and mouth-wash in the treatment of spongy gums, relaxation of the soft palate and uvula, and in chronic sore throat. The name is derived from Malay *cachu*.
H. A. Hare.

Catechumens: See Arcani Disciplina and Baptism.

Cat'egory [from Gr. *κατηγορία*, accusation, assertion; deriv. of *κατηγορεῖν*, accuse]: In philosophical terminology the categories are the ultimate classes in which all objects of knowledge can be systematically arranged. Philosophy and science, acknowledging the impossibility of knowing all things individually, reduce objects to classes: and when we gain knowledge of the class, we have a formal or general knowledge of its constituent objects. This attempt to render knowledge in some sense universal has been made in the philosophy of all ages, and has given rise to various systems of categories—literally, things that may be affirmed. Aristotle seems to have been the first of the Greeks to make anything like a complete classification of them. He makes them ten in number—viz., substance, quantity, quality, relation, place, time, position, possession, action, passivity. This system was unquestioningly received for a long time, but modern criticism has shown that there may be many predicates which could not be contained in any of these categories. Accordingly, Kant and others have attempted to make better classes. Kant makes twelve categories, in four classes of three species each—viz., singularity, plurality, and universality; reality, unreality, and indefiniteness; substance, dependence, and reaction; possibility, existence, and necessity. Various other arrangements have been proposed, but criticism has shown that thus far, perhaps, none is perfect. It is remarkable that the categories of the Hindu philosopher Kanâda are almost identical with those of Aristotle. Kanâda probably lived before the time of Aristotle. See Max Müller's paper on *Indian Logic*, appended to Archbishop Thomson's *Laws of Thought*.

Cate'na [Lat., chain > Fr. *chaîne*, whence Eng. *chain*]: in biblical literature a commentary made up of selections from various writers. The number of catenæ is very considerable, and some are of great antiquity. Perhaps the most celebrated is the *Catena Aurea* (i. e. Golden Chain) of Thomas Aquinas.

Cat'enary [from Lat. *catenā'rius*, pertaining to a chain (*cate'na*)]: the curve formed by a cord or flexible chain of uniform density and size when suspended or allowed to hang freely from two fixed points. This curve was first noticed by Galileo, but he imagined it to be the same as the parabola. Its true nature was first demonstrated by James Bernoulli. It has several remarkable properties, one of which is that its center of gravity is lower than that of any curve of equal perimeter and with the same fixed points for its extremities. It is interesting on account of the light it throws on the theory of arches, and by reason of its application to the construction of suspension bridges.

Caterina da Siena, Santa (*St. Catherine of Sienna*): an Italian saint and writer; b. in Siena, Mar. 25, 1347; she was the twenty-third child of the dyer, Giacomo Benincasa; early inclined to a mystical religious life, and showed herself to belong to the tradition which St. Francis of Assisi represented in the preceding century. She joined the Dominican nuns, and gave herself up to asceticism. As time went on, however, her horror at iniquities in Church and state led her to mingle in the most important affairs. She appeared at Avignon before the consistory (1376) to demand reform and the return of the pope to Rome. The next year she went to Florence as Gregory XI.'s ambassador to reconcile the Florentines to him. In 1378, at Pope Urban's request, she went to Rome to live. There she died Apr. 29, 1380. In 1461 she was canonized, and Apr. 30 was made her day. We have from her a collection of 373 letters, and a tractate later given the title *Dialoghi della Serafica Santa Caterina da Siena*, probably composed in 1378. We have further a series of twenty-six prayers. See her *Opere* (5 vols., Lucca and Siena, 1707–17); *Le Lettere* (ed. N. Tommaseo, 4 vols., Florence, 1860); K. Hase, *Katherine von Siena, ein Heiligenbild* (Leipzig, 1864); M. A. Mignaty, *Cathérine de Sienne, sa vie et sa rôle dans l'Italie du 14e siècle* (Paris, 1886); É. Gebhart, *L'Italie Mystique* (1890). A. R. Marsh.

Caterpillar: See Entomology.

Catesby, kayts'bi, Mark, F. R. S.: naturalist; b. in England in 1679. He visited the U. S. and the Bahamas in 1712–19 and 1722–26, during the war between the Carolinians and the Catawbas on the one side and the Tuscaroras on the other, and after his return to England published a *Natural History of Carolina, Florida, and the Bahama Islands*, with colored figures drawn and etched by himself; also *Hortus Britanno-Americanus*, and work on the fauna of the isle of Providence. D. in London, Dec. 23, 1749.

Catfish: any one of several species of *Siluridæ*, so called in allusion to the presence of long fleshy barbels about the mouth, suggesting the whiskers of a cat. All the catfishes are scaleless, and have stiff spines in the dorsal and pectoral fins. They are among the most conspicuous inhabitants of sluggish streams and ponds in the regions they inhabit. See Siluridæ and Wolf-fish. D. S. Jordan.

Catgut: a material employed for the strings of violins and other musical instruments, for the cords used by clockmakers, for bow-strings, fishing-lines, and for belt-stitching in mills, etc. It is generally prepared from the intestines of sheep, and sometimes from those of the horse and ass. It is prepared by an elaborate process, and preserved from putrefaction by treating it with a dilute solution of alkali. The best violin-strings are manufactured in Italy, and are called Roman strings. Catgut is much used in surgery for suturing wounds. Revised by H. A. Hare.

Ca'tha: a genus of plants of the family *Celastraceæ*. The *Catha edulis*, which the Arabs called *khât*, is a shrub; a native of Arabia; has narcotic and stimulating leaves, which are eaten by the Arabs. They also make a decoction of the leaves, which is used as a beverage.

Cath'ari [from Gr. *Καθαροί*, the pure (ones)]: a name applied at different times to various sects of Christians, such

as the Novatians of the third century, and to the Paulicians, who in Thrace were known as Bogomili, to the Albigenses, Patarenes, Waldenses, and others in the twelfth century. The name is analogous to "Puritans," and was apparently in some cases assumed, and in others ironically conferred in consequence of their professed aim at greater purity of life than was ordinarily attained. The Cathari proper were Dualists, and were perhaps of Slavonic, possibly of remote Gnostic, origin. They appeared in Italy in the eleventh century, and attained their greatest prosperity in Southern France, where they were confounded with the Albigenses, and were exterminated with them in the thirteenth century. The strict Cathari held no property, abstained from marriage, war, and the killing of animals, and rejected water-baptism. See S. R. Maitland, *Facts and Documents on the History of the Albigenses and Waldenses*, and Schmidt, *Histoire et Doctrine de la Secte des Cathares* (Paris, 1849).

Catharine Archipelago: See ALEUTIAN ISLANDS.

Catharine (Russ. *Ekaterina*) **I.**: Empress of Russia; b. of poor parents at Ringen, near Dorpat, in Livonia, Apr. 15, 1684; at first bore the name of Martha; brought up by a Lutheran pastor in Marienburg. Her first husband was a Swedish dragoon. She was taken a captive by the Russians in 1702; became the mistress of Prince Menschikoff; then of the Emperor Peter the Great, who married her in 1707, and avowed it 1711. Peter, having invaded Turkey in 1711, was reduced, it was once said, by want of provisions to a critical position, from which he was extricated by Catharine, who bribed the Turkish vizier, but the story lacks evidence. She was crowned as empress in 1712, and on the death of Peter in 1725 was acknowledged as empress; was sustained by Menschikoff; fell into dissolute practices. D. May 17, 1727. Her daughter Elizabeth became empress.

Catharine II.: Empress of Russia; b. at Stettin, May 2, 1729; daughter of the Prince of Anhalt-Zerbst. She was married in 1745 to Peter, a nephew and heir of Elizabeth, Empress of Russia. They soon quarreled and became estranged from each other. On the death of Elizabeth in 1761 he ascended the throne as Peter III. In July, 1762, he was assassinated by conspirators, of whom Catharine was probably an accomplice, and she assumed sovereign power, for which she was qualified by superior talents; but she was a woman of very dissolute character. She administered the government with energy and success, and increased both the extent and power of the empire. She co-operated with Austria and Prussia in the partition of Poland in 1772, and in the second partition of 1793. The Russians were victorious in a war against the Turks, which was ended by the treaty of Kainardji in 1774. Her principal paramour was POTEMKIN (*q. v.*). She was a liberal patron of scientific men. D. Nov. 17, 1796, and was succeeded by her son, Paul I. "Her capacity," says Lord Brougham, "was of an exalted order. Her judgment was clear and sure. The history of princes affords few examples of such force of character on a throne perverted to the working of so much mischief." (*Statesmen of the Time of George III.*) See Tooke, *History of Catherine II.* (1803); Castera, *Vie de Catherine II.* (1796); Tannenberg, *Leben Catherinens II.* (1797).

Catharine de' Medici, dĕ-med'i-chē [Fr. *Catherine de Médicis*]: Queen of France; b. in Florence in 1519. She was a daughter of the Duke of Urbino, who was a nephew of Pope Leo X. She was married in 1533 to a son of Francis I. of France, who ascended the throne as Henry II. in 1547. On the death of her son Francis II., in 1560, she became regent of France during the minority of Charles IX., who was her son. She was ambitious, crafty, perfidious, and made bad use of her power. Her intrigues promoted the civil or religious war by which France was for many years afflicted. She also appears to have been one of the instigators of the massacre of St. Bartholomew, Aug., 1572, though the exact extent of her participation is uncertain. D. at Blois, Jan. 5, 1589. See Eugenio Alberi, *Vita di Caterina de' Medici* (1834); La Ferrière's *Lettres de Catherine de Médicis* (Paris, 1880–85).

Catharine Howard: See HOWARD, CATHARINE.

Catharine of Aragon: Queen of England; daughter of Ferdinand and Isabella of Castile; b. Dec. 5, 1485. In 1501 she was married to Arthur, who was the eldest son of Henry VII. of England, and who died in 1502. She was married in 1509, under a papal dispensation, to Arthur's brother, Henry VIII., who was six years younger than herself. She gave birth in 1516 to a daughter, Mary, who alone survived of five of her children and became queen. The king, who had conceived a passion for Anne Boleyn, about 1527 expressed doubts of the legality of his marriage with Catharine, and applied to the pope for a divorce. The disagreement between the pope and Henry VIII. on this subject was one of the causes of the prevalence of Protestantism in England. Cranmer declared the marriage void in 1533; she went to live at Ampthill, in Bedfordshire, and then at Kimbolton Castle, Huntingdonshire, where she died Jan. 7, 1536. See CRANMER and HENRY VIII.

Catharine of Braganza: the queen of Charles II. of England; b. in 1638; daughter of John IV. of Portugal; brought in dower Tangiers and Bombay. She had been religiously bred, and the licentious customs of the English court she found strange. After the death of Charles (1685) she returned to Portugal in 1693, and was made regent by her brother Pedro in 1704. D. Dec. 31, 1705.

Catharine of Valois, văl wăă': queen of Henry V. of England; daughter of Charles VI. of France; b. Oct. 27, 1401. Her hand, together with the right of succession to the French throne, was given to Henry by the treaty of Troyes. After the death of the king, Catharine became the wife of Owen Tudor, a Welsh gentleman, and from them the Tudor dynasty was derived. D. Jan. 3, 1437.

Catharine Parr: sixth wife of Henry VIII. of England; b. in 1512. She was married to Edward Borough, and then to Lord Latimer; after his death became in 1543 the queen of Henry VIII. She was a woman of considerable learning and no little tact. After the death of the king she was married to Sir Thomas Seymour. D. Sept. 30, 1548.

Catharine, SAINT: a legendary character, said to have been an Alexandrian of noble descent; put to death in 307 on a wheel by Maximinus for confessing Christ at a public sacrificial feast. Her festival falls on Nov. 25. The legend further credits her with the conversion of many scholars who tried to win her back to paganism, and with a heavenly vision in which she was betrothed with a ring to Christ, a theme favorite to artists, who represented Christ as in infant form. Some think a basis of these legends is to be found in the story of HYPATIA (*q. v.*) of Alexandria.

Cathar'tes au'ra: same as TURKEY-BUZZARD (*q. v.*). See also CATHARTIDÆ.

Cathar'tics: drugs which possess the power of producing active movements of the bowels with copious fecal dejections. Some persons employ the term cathartic as equivalent to purgative, but a cathartic is a drug which has more powerful effects than the average purgative has. Jalap is a typical cathartic when given in ordinary dose, while castor oil or an ordinary amount of Epsom salts, or of sulphate of magnesia represents what might be called purgatives. Nearly all cathartics act upon the bowels in two ways: first, by stimulating or irritating its mucous membrane, and, second, by causing a reflex irritation of the nerves and nervous centers governing peristalsis, which are chiefly found in connection with the so-called splanchnic nerves. Catharties, as a rule, are to be employed only in cases where there is obstinate constipation, or in instances where it is considered necessary to cause a determination of blood from other parts to the abdominal cavity, or again when it is desired to remove dropsical swellings by producing large watery movements.

Cathar'tidæ [derived from Gr. καθαρτής, cleanser, i. e. by consumption of the unclean, in allusion to the scavenger habits of the group]: a family of *Accipitres* containing the condor, turkey-buzzard, and other vultures of the New World. They have the head and neck bare and sometimes carunculated, the wings long and ample, the inner toe small and on a level with the other toes, the nails blunt, the oil gland without a tuft, and the nostrils not separated by an imperforate bony septum. Other technical characters separate these birds widely from the vultures of the Old World, with which they were formerly associated, while these latter birds are now placed in the family *Falconidæ*, with the hawks and eagles. See CONDOR, KING VULTURE, and TURKEY-BUZZARD. F. A. LUCAS.

Cathar'tin is the supposed active principle in senna. It can be isolated as a yellowish-red uncrystallizable substance, which is deliquescent, and has a very bitter taste, a characteristic odor, and purging powers, causing nausea and griping. Three grains of cathartin are a full dose. It is not much used, and is perhaps not a definite compound. The same name is given to a purgative principle obtained from buckthorn berries.

Cathay′, or **Kathay′**: the name by which China was known to Europeans during the Middle Ages. In its Oriental form, *Khitai*, it is applied to China by all or nearly all the nations which know it from the direction of Inner Asia, including the Russians, the Persians, and the nations of Turkistan, yet it originally pertained to a people who were not Chinese. The Khitán or Khitát were a nation allied (it is supposed) to the modern Tungnses, whose chiefs, after making themselves supreme over all the tribes from the Sea of Korea to the Altai, in the early part of the tenth century overran the Chinese provinces N. of the Yellow river, and established their empire over them also, under the name of Liao or the *Iron* dynasty. This Khitán empire subsisted for two centuries, terminating in 1123, when it was in turn subverted by a new invasion from the N.

The Nyuché, or Chúrché, a tribe akin to the modern Manchus, displaced the Khitán, and reigned under the name of Kin or *Golden* dynasty. They about a century later (1214–34) were displaced by those more famous warriors, the Mongols of Chinghiz Khan. The conquest of the Kin empire was completed by Okkodai, the son of Chinghiz; but not till the third generation, and sixty years after the capture of Peking, was the Mongol conquest extended over Southern China, in the reign of Kublai. This southern empire, under its Chinese sovereigns holding their royal residence (*King-szé*) at the great city now called Hangchow, was known to the northern conquerors as *Mantzi*, a name often exchanged or confounded by Western Asiatics with *Máchín*—i. e. the Hindu *Mahá-Chín* (Great China).

The flood of Mongol conquest spread westward as well as eastward, leveling all political barriers, sweeping over Slavonic Europe, and threatening Christendom with annihilation. And when Western Europe had recovered from the alarm of this brief but terrible invasion (1240–42), Asia lay open as it never did before or has done since, and the accidents of war, commerce, and opportunity carried a number of persons in various ranks of life, and from almost every country in Europe, to its remotest regions. Missions also went to the Tartar courts from the pope and the princes of Europe, and among others John of Piano Carpini (1245–47), a native of Umbria, and William dé Rubruquis (1253), a Frenchman, both Franciscan monks of superior intelligence, who have left us narratives of high interest. And these brought to Western Europe the revived knowledge of a great and civilized nation occupying a country in the extreme East, on the shores of the ocean, which bore the name, then first heard in Europe, of Cathay. Rubruquis was acute enough to discern that these Cathayans must be the Seres of classic fame.

The first actual European visitors to Cathay of whom we know are the Polos (see Polo, Marco), regarding whom we need say nothing here. But just as they were reaching Venice (1295) after their absence of twenty-six years, the forerunner of a new band of travelers was entering China by the route of the Indian seas. This was John of Monte Corvino, another Franciscan, who was plunging into the ocean of paganism to preach the gospel. After years of uphill work, others joined him, and the Catholic mission flourished at Cambaluc, or Peking, under the patronage of the Great Khan himself. Friar John was made archbishop in Cambaluc with patriarchal authority, churches and houses of St. Francis were founded at Yangchow (on the Grand Canal), at the great ocean-port in Fuh-kien which the Westerns called Zayton and the Chinese called T'swanchow, and elsewhere. Among the monks whose duty carried them to Cathay during the interval between 1300 and 1328, several have left letters or narratives. We have letters from the archbishop himself (1305–06); a letter from Andrew, Bishop of Zayton (1326); and the narrative of Friar Odoric.

The narrative of Odoric is the only one that mentions Canton, known to him and the Westerns of that age by the name of Chín-kalán (i. e. Great China, a Persian rendering of the Indian Mahá-chín). He landed there on arriving from India, and describes it as a city as big as three Venices, standing on a great river, one day's voyage from the sea. Thence he traveled through Fuh-kien, visiting the cities of Zayton and Foochow, and then to Cansay or Kinsay (*King-szé*—i. e. Hangchow), the vastness of which in extent, population, and wealth made the same extraordinary impression upon him as upon Marco Polo and all the travelers who speak of it. Several of the stories told by Odoric that were probably regarded as fictions by his contemporaries are remarkably characteristic of China.

But the exchange had its emissaries at this time to Cathay as well as the Church. This commercial intercourse can not have begun till some years after 1300. For Monte Corvino, writing in 1305, says that he had not heard any news for twelve years. Yet even on his first entrance into China, Friar John had been accompanied by "Master Peter of Lucolongo, a faithful Christian man and a great merchant," who purchased a piece of ground for the mission-church opposite the palace gate at Peking. Twenty-one years later Bishop Andrew, of Zayton (1326), quotes the opinions of the Genoese merchants at that great mart touching a question of exchange value. Odoric, dictating his travels in 1330, refers for corroboration of the marvels of Kinsay or Cansay to the many persons at Venice who had themselves been witnesses of all that he asserted.

But the most distinct and notable evidence is to be found in the work of Francesco Balducci Pegolotti, written about 1340, the first two chapters of which are devoted to information for the merchant bound to Cathay. Particulars are given as to the investments and exchanges proper to the journey, and especially as to the paper money then forming the currency of China. The extent of dealings contemplated may be judged from the example, which the author assumes for illustration, of a merchant carrying goods to the value of some 25,000 gold florins (say $60,000). Little was to be taken to Cathay except silver in ingots, and the purchases contemplated there were silk and rich silk textures.

A striking feature of this early intercourse was the facilities of movement allowed to foreign visitors in the interior. But it was not of long duration. As the Mongol chiefs in Central and Western Asia one after another adopted Islam, the power of bigotry revived, and with it the old obstacles. Thus already in 1339 we find a merchant, William of Modena, along with certain friars, put to death for the faith at Almalik. About the middle of the century the house of Chinghiz in China began to totter, and its fall in 1368 closed all communication with the Western World. The last notices we possess are contained in a work (strange to say) on Bohemian history by John Marignolli, a Florentine monk who had been sent as envoy to the last of the Mongol emperors by Pope Benedict XII. He had gone by the usual land-route, and after spending about four years (1342–46) at Peking, returned by the sea-route to India, on his way visiting Ceylon, where he was wrecked. In 1370, the pope, probably in ignorance of the changes in the East, nominated one Friar William of Prato to be archbishop of Cambaluc, but we know not if he ever reached his see. He certainly can not have succeeded.

With the downfall of the Mongol dynasty in China, this curious phase of history came to a close. The new and native rulers reverted to the old policy, and kept all foreigners at arm's length, while Mohammedanism entirely recovered its grasp over Middle Asia, and the Nestorian Christianity, which had acquired considerable sway, as rapidly dwindled and expired. A dark mist descended on the further East, covering Mantzi and Cathay, with those cities of which the mediæval travelers had told such wonders, *Cambaluc* and *Kinsay*, *Zayton* and *Chín-kalán*. And when the veil rose, a century and a half later, before the Portuguese and Spanish navigators, those names were heard no more. In their stead men spoke of *Peking* and *Hangchow*, of *Chinchew* and *Canton*. Gradually new missionary priests went forth from Rome—Jesuits now. New converts were made, and new vicariats were constituted; but the old Franciscan churches, and the Nestorianism with which they had battled, had disappeared. In time, however, slight traces of the former existence of Christian churches came to the surface; and when Marco Polo's book was read by intelligent men, one and another began to suspect that his Cathay and the new China were identical.

But it was a very long time before this was thoroughly or generally understood. Cathay had been the aim of the first voyage of the Cabots in 1496, and it continued to be the object of many adventurous voyages, English and Dutch, to the N. W. and N. E. till far on in the sixteenth century. At least one memorable land-journey also was made by Englishmen, of which the investigation of trade with Cathay was a chief object—that in which Anthony Jenkinson and the two Johnsons reached Bokhara by way of Russia in 1558–59. The country of which they collected notices at that city was still known to them only as *Cathay*, and its great capital only as *Cambaluc*.

Cathay as a supposed separate entity may be considered to come to an end with the journey of Benedict Goës, a lay Jesuit, who had been sent through Central Asia in 1603 to determine whether the Cathay of old European

writers and of modern Mohammedans was or was not a distinct region from that China of which parallel marvels had now for some time been recounted. He died at Süchow, the frontier city of China, but not before he had ascertained that China and Cathay were one. See CHINA. H. YULE.

Cathcart', WILLIAM SHAW, Earl of: general and diplomatist; b. in Petersham, England, Sept. 17, 1755; educated at Eton and University of Glasgow; served in the Revolutionary war of the American colonies as an officer of dragoons, and as an aide to Sir Henry Clinton; commanded Tarleton's British Legion; wounded at Brandywine and Monmouth; returned from the siege of Charleston, 1780, to England; joined the Walcheren expedition, 1793, as brigadier-general; became a major-general in 1794; was sent on a mission to the court of Russia in 1805. He commanded the land forces which, with the aid of the fleet, captured Copenhagen in 1807. In 1813 he was sent as ambassador to St. Petersburg. He was raised to the rank of earl in 1814. D. near Glasgow, June 16, 1843.

Cathedral [from Med. Lat. *cathedra'lis*, pertaining to the bishop's chair, deriv. of *ca'thedra* = Gr. καθέδρα, seat; Lat. *cathe'dra* > Fr. *chaire*, whence Eng. *chair*]: the principal church of a diocese, containing the bishop's throne or *cathedra*. The cathedral is usually, though not invariably, the most imposing religious edifice in the diocese. Gothic architecture received its chief impetus and development in the designing of cathedrals and abbeys, and in the course of the Middle Ages evolved from the early Christian basilica the typical cathedral, with its nave, transepts, and choir, three-aisled or five-aisled; with or without exterior chapels; with its towers and spires, its lofty clerestory, and its ribbed vaulting of stone. The English cathedrals are noted for their extreme length, square easterly termination, rich vaulting, and, in some cases, their secondary transepts. Among them may be mentioned Durham, Peterborough, Lincoln, and Ely, begun in the Norman period (eleventh and twelfth centuries); Canterbury, Salisbury, and York, principally belonging to the thirteenth and fourteenth centuries; and Winchester, rebuilt in the fifteenth century. Among the French cathedrals, which differ from the English in being shorter, much loftier, and broader (having often four side aisles besides chapels), and in their apsidal easterly terminations encircled by chapels and called *chevets*, the most important are those of Notre Dame at Paris, begun under Philippe Auguste; Chartres, celebrated for its stained glass and its majestic simplicity; Rheims, Rouen, Bourges, Sens, Troyes, Beauvais, and Amiens, the last named being the largest of all, 133 feet high, and covering 70,000 sq. feet. In Germany the most magnificent is that at Cologne, completed in 1883, nearly 640 years after its commencement. It is 511 feet long, with two towers 500 feet high at the western end. In Italy the Duomo at Florence, begun by Arnolfo di Cambio (or di Lapo) in 1298, and completed by the erection of its colossal dome in 1444 by Brunelleschi, is, with one exception, the largest Gothic cathedral, covering 84,000 sq. feet, the cathedral of Milan alone exceeding it with its area of 107,000 feet.

The Renaissance produced the cathedral, or more properly the basilica, of St. Peter at Rome, the greatest of all churches, 602 feet long internally, and covering 240,000 sq. feet, and the Cathedral of St. Paul at London, Wren's masterpiece. Both are domed structures. St. Peter's is not, strictly speaking, the cathedral of Rome, this distinction belonging to the ancient basilica of St. John Lateran. In the U. S. the most important cathedrals are St. Patrick's (Roman Catholic) and the Protestant Episcopal Cathedral of St. John the Divine, both in New York. The corner-stone of the latter was laid Dec. 27, 1892.

A. D. F. HAMLIN.

Cathelineau, kăă'te-lĕĕ'nō', JACQUES: Vendean general; b. at Pin-en-Mauge, Jan. 5, 1759; a linen merchant; at the outbreak of the Vendean revolt in 1783 he put himself at the head of a small band of royalists, and soon became famous for his talents and success. After the victory at Saumur, June 13, 1793, he was made general-in-chief, but was mortally wounded in the attack on Nantes, June 29, and died July 11.

Catherine: See CATHARINE.

Catherine of Alexandria, SAINT: See CATHARINE.

Catherine of Sienna, SAINT: See CATERINA DA SIENA.

Catherine, SAINT (of Sweden): See BIRGITTA, SAINT.

Cath'eter [from Gr. καθετήρ, anything let down into, deriv. of καθ-ιέναι, let down]: a surgical instrument used for insertion into mucous canals, particularly the urinary passage or urethra. Catheters made of metal have been found among relics of primitive peoples, and have been in use among civilized nations for many centuries. The ordinary urinary catheter differs somewhat for the two sexes. That used for the male being 10 to 12 inches in length, and having a sharp arc or curve at the end; that for the female being from 4 to 6 inches in length, and having but a slight curve. The caliber varies considerably, but is usually from $\frac{1}{5}$th to $\frac{1}{3}$d inch in diameter. The catheters in ordinary use are made of silver or of rubber. The latter may be either entirely flexible or somewhat rigid, and their form may be determined by a stylet of wire which can be withdrawn after insertion of the instrument. Many varieties of catheters have been devised for use in special diseases. Œsophageal, Eustachian, aural, nasal, uterine, and rectal catheters of various forms are in use in the treatment or investigation of diseases.

Cathion: See KATHION.

Cathode: See KATHODE.

Catholic Apostolic Church: a body of Christians popularly known as the **Irvingites**; followers of the Rev. EDWARD IRVING (*q. v.*), who died in 1834. They are distinguished by their claim to the exercise of the spiritual gifts enumerated in 1 Cor. xii., such as prophecy, unknown tongues, and the miraculous healing of disease. They receive the Apostles', the Nicene, and the Athanasian creeds. They are further distinguished by their claim to possess the fourfold ministry of apostles, prophets, evangelists, and pastors, mentioned in Eph. iv., and have in addition deacons, under-deacons, and deaconesses. Each church is under the rule of a bishop (or angel, as he is termed). Their ritual is very full and impressive, combining many features of those of other branches of the Christian Church. The movement originated in London in 1830, and churches have been established throughout Christendom. They deny that they are a sect, and have taken the name of the Catholic Apostolic Church only because it is the common heritage of Christians generally. They lay great stress upon the immediate personal coming of Christ, but are not on this account to be confounded with the Second Adventists, notwithstanding that they have been disappointed in that Christ has not come as soon as they expected. Their churches are supported by tithes and offerings, the payment of which is a matter of conscience. See the Liturgy of this church and E. Miller, *History and Doctrine of Irvingism* (2 vols. London, 1878).

SAMUEL MACAULEY JACKSON.

Catholic Church [*catholic* is from Gr. καθολικός, universal, deriv. of phrase καθ'ὅλου, on the whole, as a whole]: is not found in ancient Greek, but is first used by Polybius (*Hist.* vi. 5. 3) in the sense of "general"; first used of the Church by Ignatius of Antioch (*Ad Smyrnæos*, chap. viii.). The phrase Catholic Church is equivalent to "universal church," and can not properly be limited to any particular sect or body. It was once employed to distinguish the Christian Church from the Jewish, the latter being restricted to a single nation, while the former was intended for the world. Afterward it served to mark the difference between the so-called orthodox Church and the sects which sprang from it, such as the Arians, Gnostics, etc. The name has been especially claimed by the Church of Rome. Protestant divines have been careful to deny its applicability, yet the term Catholic is still popularly used as synonymous with ROMAN CATHOLIC (*q. v.*).

Catholic Emancipation: in British history, the measure enacted Apr. 13, 1829, by which the political disabilities previously resting upon Roman Catholics were chiefly removed. These disabilities weighed most heavily upon the Roman Catholics of Ireland.

After the subjugation of Ireland in 1691 by the forces of William III., the whole people were disarmed; priests were banished the country; no Roman Catholic could act as guardian for any child; after 1704 a son turning Protestant could dispossess his father and take his estate; a Roman Catholic heir to landed property was to be set aside in favor of the next Protestant heir; no office, military or civil, could be held by a Roman Catholic; he could not vote or marry a Protestant wife; his son might force him to settle an allowance upon him (the son) at the discretion of a court of chancery; no Roman Catholic could practice law or teach school; no Protestant lawyer could marry a Roman Catholic wife; a

priest marrying a Roman Catholic and Protestant was to be hanged. Many of these measures became obsolete in practice, and more were repealed by the Irish Parliament of 1790; and at the union (1800) Mr. Pitt pledged himself to secure an act of emancipation, but through the opposition of George III. he failed. Subsequently, in consequence of the agitation of O'Connell and the Catholic Association, the subject was again taken up, was brought forward in Parliament by Mr. Peel, Home Secretary in the Wellington Ministry, Mar. 5, 1829, and a repeal of the severest penal restrictions was carried by large majorities in both Houses. The only disabilities left upon Roman Catholics were their exclusion from the regency, the chancellorship of England or Ireland, the viceroyship of Ireland, and from the offices and patronage of the Anglican Church, the universities, and the Church schools; the prohibition of episcopal titles, the public use of clerical insignia, the extension of monasticism, and the increase of the number of Jesuits. These latter prohibitions are, however, practically overlooked. See W. J. Amherst, *History of Catholic Emancipation* (2 vols., 1886).

Catholic Epistles: certain epistles of the New Testament addressed not to particular churches or individuals, but to the Church universal or to a large and indefinite circle of readers. Originally the Catholic Epistles comprised only the first Epistle of John and the first of Peter, but as early as the fourth century the term was applied also to the Epistle of James, of Jude, the second of Peter, and the second and third of John. These seven thus constitute the Catholic Epistles.

Cathol'icos: title of the patriarchs or chief ecclesiastics in the hierarchy of the Armenian Church; also of the prelates of the Christians of Georgia and Mingrelia.

Catholic University of America: an institution of learning located at Washington, D. C. In 1884 Miss Mary Caldwell offered the sum of $300,000 for the purpose of establishing a superior institution of ecclesiastical learning. Her proposition was accepted by the Roman Catholic bishops of the U. S. assembled the same year in plenary council at Baltimore, and it was further decided that this first donation should be made the nucleus of a university fund, and that around the divinity school, for which it was intended, should be grouped the other faculties of philosophy, medicine, and law.

In Nov., 1885, the university was incorporated under the laws of the District of Columbia, and in 1887 it was formally approved by Pope Leo XIII., who also granted it the power of conferring degrees. Nov. 13, 1889, the faculty of theology was opened, and is now fairly under way with a corps of ten professors. The endowment of chairs has been made possible by the liberal contributions of Miss Caldwell and her sister, the Misses Andrews, the Misses Drexel, Messrs. Eugene Kelly, M. P. O'Connor, and others. In addition to regular courses, weekly lectures on subjects of interest are given by competent scientists.

So far only post-graduate students, i. e. those who have made a four or five years' course of philosophy and theology, are matriculated. Each is free to choose his own line of work, both in the way of lectures and of practical exercises in the academies (seminaria). At the end of two years the degree of licentiate is conferred on those who have passed written and oral examinations successfully. For obtaining the doctorate in theology two years of additional study, either in the university or elsewhere, a printed dissertation, and public defense of theses are required. No honorary degrees are conferred.

Essentially the same regulations will apply to the other faculties. In 1891 Rev. James McMahon, of New York city, donated $400,000 toward the philosophical department. The McMahon Hall of Philosophy was erected, and courses in that department were opened in Oct., 1895.

The university is governed by a board of directors chosen from the episcopate, the clergy, and the laity. The office of chancellor, attached to the archiepiscopal see of Baltimore, is now held by his Eminence Cardinal Gibbons.

J. J. Keane.

Cat'iline (*Lucius Sergius Catilina*): Roman demagogue and conspirator; b. about 108 B. C. In his youth he was a partisan of Sulla in the civil war. He was elected prætor in 68 B. C., and afterward aspired to the office of consul. He was notorious for his crimes, and was ruined in fortune, but his talents and his audacity combined to render him a popular favorite of a large party, many of them insolvent debtors and desperate adventurers. Having been defeated in the election for consul, he formed a conspiracy against the state. It appears that he and his numerous accomplices proposed to massacre the senators and the friends of order, and to involve Rome in a general conflagration. The leaders of this plot met on Nov. 6, 63 B. C., and made arrangements for its speedy execution; but the secret was revealed by Fulvia, the mistress of one of the conspirators, who were baffled by the vigilance and energy of Cicero. On Nov. 8, Cicero uttered in the Senate his first oration against Catiline, who was present and attempted to reply, but his voice was drowned by cries of "Traitor!" and "Parricide!" Catiline left Rome in the next night, and went to the camp of Manlius, who was his accomplice and was at the head of an army in Etruria. Lentulus and other conspirators who remained in Rome were put to death in Dec., 63 B. C. The army of the senate encountered that of Catiline near Pistoria (now Pistoia) in 62 B. C. He stimulated the courage of his soldiers with an eloquent harangue, and a desperate battle ensued, in which Catiline was defeated and killed, with about 3,000 of his partisans. See Sallust, *Bellum Catilinarium*; Rose, *History of Catiline's Conspiracy* (1813); Cicero, *Orationes in Catilinam*.

Cat'kin, A'ment, or (Lat. form) **Amen'tum**: in botany, a form of inflorescence of which the willow, poplar, birch, and alder afford examples. It is a close spike of numerous small, unisexual flowers, destitute of calyx and corolla, and furnished with scale-like bracts. The plants which bear catkins form the order *Amentales*.

Cat'lettsburg, or **Cattletsburg**: village; capital of Boyd co., Ky. (for location of county, see map of Kentucky, ref. 2–K), on Ches. and Ohio R. R. and on the Ohio river, at the mouth of the Big Sandy, about 150 miles E. N. E. of Frankfort. It has a graded high school, a trade in lumber, various manufactures, electric street cars, electric lights, and waterworks. Pop. (1880) 1,225; (1890) 1,374; (1900) 3,081.

Editor of "Central Methodist."

Cat'lin, George: traveler and artist; b. in Wilkesbarre, Pa., in 1796. He passed eight years (1832–39) among the North American Indians, and published *Illustrations of the Manners, Customs, and Condition of the North American Indians*, with engravings (2 vols., 1841); *Last Rambles among the Indians* (1868), etc. He exhibited in Europe his Indian gallery and collection. D. in Jersey City, Dec. 23, 1872.

Catmint, or **Catnip** (*Nepeta cataria*): an herbaceous plant of the family *Labiatæ*, a native of Europe; a common weed in the U. S., but not indigenous there. It has cordate and crenate leaves, which are whitish, downy underneath, and emit a peculiar odor. Cats are extremely fond of this plant, which they eat with avidity and signs of excitement.

Ca'to, Dionysius: the supposititious name of the author or compiler of a small collection of moral precepts, each in two hexameter verses, entitled *Disticha de Moribus ad Filium*. The date of composition or compilation was perhaps the third century A. D. The name Cato probably arose from the reputed wisdom of the precepts; the name Dionysius is perhaps explained by the fact that in an ancient MS. mentioned by Scaliger (*vetustissimus codex Bosii*), but now lost, Priscian's translation of the *Periegesis* of Dionysius stood by the side of our work (see Haupt, *Opusc.* iii., 376). In the Middle Ages it was supposed that Cato Uticensis was the Cato intended, but this is impossible in fact. At any rate, the book was for many centuries one of the most read and cited of all Latin works. It was translated into many tongues, and led to the general exaltation of the name and fame of Cato which is to be noticed in the older authors of the modern world. See the edition by F. Hauthal (Berlin, 1869); also F. Zarncke, *Der deutsche Cato* (Sitz. Ber. der Wiener Akad. xxxvi., 211, 1852); J. Nehab, *Der altenglische Cato* (1879); M. O. Goldberg, *Der Englische Cato* (1883); Jonckbloet, *Die dietsche Catoen* (1845); A. Beets, *De Dist. Cat. in het middel-nederlandsch* (1885); A. Tobler, *Die altvenezianische Übersetzung der Sprüche der sog. dist. Cat.* (abh. der Berl. Akad. 1883); also Warton's *History of English Poetry*. A. R. Marsh.

Cato, Marcus Porcius (often called *Cato Censorius*, i. e. Cato the Censor): Roman statesman and patriot; b. of a plebeian family at Tusculum in 234 B. C. He was surnamed The Elder (Major), to distinguish him from his great-grandson, Cato Uticensis. As a young man he fought against Hannibal in the second Punic war, after the end of which he settled upon a small Sabine farm, adopted a simple and frugal mode of life, and became a model of austere and pristine Roman

virtue. Having removed to Rome, he gained distinction as an advocate in the courts of justice, and was elected prætor in 198 B. C. He was chosen consul in 195, and commanded an army in Spain, where he displayed superior military talents, and was so successful that he received a triumph on his return to Rome. In the year 184 he was elected censor, in which capacity he acted with uncommon rigor. He was a zealous asserter of old-fashioned principles, and opposed the growing tendency to luxury, and all innovations, good or bad. In 191 he acted as a military tribune in the war against Antiochus, and contributed his part to deliver Greece from the encroachments of the East and bring her into closer and more intimate relations with the West. Greece was at that time possessed of a much more developed and much more refined, but also much more artificial and much more corrupted, culture, and she could not fail in exercising a decisive influence on her conquerors. Cato saw it, and did his utmost to resist the invasion of Greek manners, tastes, ideas, and vices, but in vain. He was an implacable enemy of Carthage, and often repeated in the senate the phrase *Delenda est Carthago* (Carthage must be destroyed). He wrote, besides other works, a treatise on agriculture (*De Agri Cultura*), which is extant, and contains much curious information on the domestic habits of the Romans of his age. Of his *Origines*, a kind of history of Rome, and of his *Orations*, only fragments have come down to us. D. in 149 B. C. His *Life* was written by Cornelius Nepos and Plutarch, but some of the most intimate notes on his character and opinions are found in the works of Cicero and Livy, and are included in the *De Viris Illustribus* ascribed to Aurelius Victor. Best ed. of the *De Agri Cultura*, by H. Keil (Leipzig, 1884); of the *Fragments* by H. Jordan (Leipzig, 1860).

Revised by M. Warren.

Cato, Marcus Porcius, surnamed The Younger, or Uticensis, i. e. of Utica: Roman patriot and statesman; b. in 95 B. C.; a great-grandson of Cato Censorius. He studied and adopted the doctrines and discipline of the Stoic philosophers. In 72 B. C. he served in the campaign against Spartacus, but appears to have taken little satisfaction in warfare. Having been elected quæstor (treasurer), he effected reforms in the treasury department. He became tribune of the people in 63 B. C., and heartily co-operated with Cicero, who was then consul, in his efforts to defeat the treason of Catiline and his accomplices. He opposed the triumvirs, Cæsar, Pompey, and Crassus, after they had formed a coalition. In 54 B. C. he was chosen prætor, and used his power to prevent bribery in elections. He was an uncompromising opponent of corruption, and inflexible in his adherence to what he considered the right and the patriotic policy. As a candidate for the consulship he was defeated, because he declined to gain votes by bribery and other means which were customary, but not strictly lawful. In the civil war which began about 49 B. C. he adhered to the side of the senate and of Pompey, who had withdrawn from the triumvirate and become reconciled to the aristocracy. He was left in charge of Pompey's camp at Dyrrhachium during the battle of Pharsalia, and after that event escaped into Africa, where he was elected commander by the partisans of Pompey, but resigned the command to Metellus Scipio. The republican cause was ruined by the defeat of Scipio's army at Thapsus in April, 46 B. C., and Utica, which Cato had been defending, in the same year fell into the hands of the enemy. He refused to save his own life by flight, but to avoid capture by the enemy stabbed himself with his sword. Utica erected a statue to his memory, and Cæsar bewailed his death. Like his great-grandfather and the whole family to which he belonged, Cato was a man of sour temper, unconquerable pride, and despotic habits. But the roughness and uncouthness of his nature had been considerably softened by his adoption of Stoicism, and he was regarded as a model of pure and disinterested virtue. See Drumann, *Geschichte Roms*; Plutarch, *Life of Cato the Younger*.

Catop'trics [from Gr. *κατοπτρικός*, of a mirror; deriv. of *κάτοπτρον*, mirror]: that subdivision of geometrical optics which treats of the phenomena of light produced by the falling of a ray of light upon the surface of a body and its being reflected from it. See Reflection of Light.

Cator'ce: a mining town and district in the northern part of the state of San Luis Potosí, Mexico. The name means fourteen, and alludes to a band of fourteen robbers who were once the terror of the neighborhood. The silver mines are in the neighboring mountainous region, and for many years were among the richest in the republic. They are now partially exhausted. Much of the ore is reduced at the neighboring town of Cedral. It contains sulphur, and requires to be roasted. During the French invasion a mint was established at Catorce, which up to 1867 coined over $52,000,000. Former population of the town 20,000. At present it varies with the productiveness of the mines from 8,000 to 15,000. Herbert H. Smith.

Catostom'idæ [from *Catostomus*, the typical genus of the family; from Gr. *κατά*, down + *στόμα*, mouth]: a family of fresh-water fishes of the order *Eventognathi*; containing the suckers, carp-suckers, and buffalo-fishes of North America and Asia. The body is usually lengthened and nearly cylindrical, but in the carp-suckers is high and compressed; the scales are of rather large size, and smooth; the lateral line is generally present and decurved; the mouth is usually on the lower side of the head, and provided with fleshy lips; teeth are wanting in the jaws, but a row of numerous comb-like teeth is developed on a pair of sickle-shaped bones (the pharyngeal bones) located in the back of the mouth; the gill openings are restricted to the sides; branchiostegal rays three on each side; pectoral fins inserted low on the sides; ventral fins abdominal; the intestinal canal is very long; the stomach simple and destitute of pyloric cæca; the air-bladder is large, unprotected by an osseous capsule, and divided by transverse constrictions into two or three regions. The family is a very characteristic one, and is richly developed in the fresh waters of the North American continent, but a few species are also found in Northern Asia (Siberia, China, and Japan). About fifty species of the family have been described. They are among the most abundant fishes in the regions where they occur, and sometimes, in favorable localities, and when they are exempt from the attacks of enemies, they literally swarm, and cover the bottom of the waters with their compact masses. The mouths of the typical species are small and protractile, and well fitted for sucking in the aliment upon which they feed. Many of the species are quite apathetic, and remain basking in the sun or suspended almost motionless in the waters for a long period of time; and this habit is taken advantage of by boy-anglers, who attach a stiff loop to the end of a pole and drawing it over a fish toward the middle, suddenly jerk it from the water.

Revised by David S. Jordan.

Ca'tron, John: b. in Wythe co., Va., in 1778; was admitted to the bar in Tennessee in 1815; served under Gen. Jackson during one campaign; became state attorney for his circuit; removed to Nashville, Tenn., in 1818, and was prominent as a chancery lawyer; became judge of State Supreme Court in 1824; was chief justice 1830–36; in 1837 became a justice of U. S. Supreme Court. He opposed secession in 1860–61, and was driven from Tennessee, but returned in 1862. D. at Nashville, Tenn., May 30, 1865.

Cats, Jacob: Dutch poet; b. in Brouwershaven, Nov. 10, 1577; has had extraordinary popularity among the Dutch middle class, being known as "Father Cats." He was educated at Leyden, but received the doctor's degree at Orleans in France, and spent some time at Paris, perhaps more in pleasures than in studies. Then he settled at The Hague as an advocate, and obtained marked success. In 1622 a professorship at Leyden was offered him, but declined. About the same time, however, he became pensionary at Middelburg; in 1624, at Dordrecht. In 1636 he obtained the highest political preferment, becoming grand pensionary of Holland. This office he held till 1652. He was twice sent as ambassador to England. Nevertheless his political powers were anything but remarkable, and his successes seem to have been due in the main to his convenient colorlessness and his readiness to further the policy of the stadtholders. His last years were spent in retirement upon his estate, Zorgvliet, near Scheveningen. There he died Sept. 12, 1660.

Both as a man and as a poet Cats reflected to a remarkable degree the ideals of the Dutch *bourgeoisie*. As a man he was a curious combination of piety and thrift; as a poet he was unimaginative, prolix, didactic, though also often shrewd and even witty. His poetic purpose, as he expressed it himself, was to "draw from all kinds of things teaching that should make him better"; and elsewhere, "to furnish his countrymen simple and good reading, and so to prepare them for household and civic life and for a happy end." Having this in view, he cared little for poetic form and condensation, and his productivity was very great. Perhaps his most noted and at the same time characteristic work is *Het Houwelick* (*Marriage: that is, the whole course of the married state, divided into six heads, maid, sweetheart,*

bride, wife, mother, widow; contains also the corresponding duties of the husband, 1625). Other works are *Sinneen Minnebeelden* (1618); *Spieghel van den ouden en nieuwen tijd* (1632); *Trouringh* (1637); *Alle de Wercken, so oude als nieuwe* (1658). He has left a quaint rhymed biography in his *Tweeëntachtig-jarig leven* (first published in Leyden, 1732). The best edition of Cats's works is that of R. Feith (19 vols., Amsterdam, 1790–1800). Another is that of Van Vloten (2 vols., Zwolle, 1856–62). A. R. MARSH.

Cat's-eye: a very hard semi-transparent precious stone which when cut in a particular way presents a chatoyant appearance. The Oriental or true cat's-eye is found in Ceylon and Brazil, and is highly prized. It is a precious variety of CHRYSOBERYL (*q. v.*), in which the ray of light is due to the twinned structure in the crystal, or to included impurities. The line of light appears when the stone is cut *en cabochon*, traversely, or across the prism.

The quartz cat's-eye (of little value) consists of quartz containing asbestos, amianthus, or other fibers; and when the mass is cut *en cabochon*, across them the line of light appears. This variety is found in Ceylon and at Hof, in Bavaria.

The tiger-eye variety is the result of a natural alteration of crocidolite, a fibrous silicate of iron, by heated silicious water, which has removed part of the iron and coated each fiber with chalcedonic quartz. It is plentiful and inexpensive, and is found in the Orange river region, South Africa. GEORGE F. KUNZ.

Cats'kill: capital of Greene co., N. Y. (for location of county, see map of New York, ref. 6–J); on West Shore R. R., and on west bank of the Hudson river; at the mouth of Catskill creek; 34 miles below Albany, and 109 miles by rail N. of New York. There are 5 steamboat-lines connecting Catskill with New York city, Albany, and intermediate points. Here are a union public school with a high-school department, 2 hosiery mills, and 3 brick-yards, with total annual output about 16,000,000 bricks. Pop. (1880) 4,320; (1890) 4,920; (1900) 5,484. EDITOR OF "RECORDER."

Catskill Group: the uppermost division of the Devonian system of North America. The rocks of the group are situated on the eastern side of the Appalachian region, typically in Eastern New York, on the flanks of the Catskill Mountains, from which the name was derived, and extending south as far as Virginia. They are sandstones and shales, with predominance of the former which often are coarse and in places are conglomerates and of gray or red color. Palæontologically they are characterized by the occasional presence of fish-bones, scales, or teeth, and of plant remains, with the very rare appearance of certain lamellibranchs, which are believed to have been of brackish or fresh-water habitat. Stratigraphically they succeed the highest marine-fossil bearing strata of the Devonian, which generally in the more typical exposures are of Chemung age, but further E. are of Hamilton or even as early as Oriskany age, and are succeeded by the earliest formations of the carboniferous system, thus corresponding to the "old-red sandstones" of Great Britain, to which the early New York State geologists referred them. See GEOLOGY. H. S. WILLIAMS.

Catskill Mountains of New York: a group of the great Appalachian system; included mostly in Greene County. The highest summit, Slide Mountain, has an altitude of 4,205 feet. The summits of the mountains command extensive and beautiful prospects. The completion of several mountain railroads, which penetrate the very heart of this group, has opened up this section to the great tide of summer travel, and the Catskill Mountains have become a favorite resort. Many large and elegant mountain-houses have been erected on the eastern terraces. The scenery of this group is diversified by cascades, rocky precipices, small lakes, and deep ravines. The slopes and even the tops of the mountains, generally, are wooded.

Cat's-tail Grass: the *Phleum pratense*. See TIMOTHY.

Cat-tail, or **Cat's-tail** (*Typha latifolia*): an aquatic herbaceous plant of the family *Typhaceæ*; indigenous in the U. S. and Europe. It bears flowers in a long and very dense cylindrical spike terminating the stem. Its leaves have been employed with success in France as a material for paper-making.

Cat'taro: a seaport-town in Dalmatia, Austria; on the Gulf of Cattaro; about 37 miles S. E. of Ragusa (see map of Austria-Hungary, ref. 12–G). It is situated at the base of a steep limestone hill; is strongly fortified, and is surrounded with walls. It has a castle on a precipitous rock, a cathedral, and several churches. It was formerly the capital of a small republic of the same name. Pop. (1890) 5,432.

Cat'taro, Boc'ca di (i. e. Gulf of Cattaro): a tortuous inlet of the Adriatic; at the southern extremity of the coast of Dalmatia; is 30 miles long. It is protected from winds by high mountains on several sides, and forms the best harbor in the Adriatic. The entrance from the sea into this gulf is about 1½ miles wide.

Cat'tegat, or **Kattegat** (anc. *Codanus Sinus*): a part of the ocean which separates Denmark from Sweden and washes the eastern side of Jutland. It communicates with the Baltic by three channels—the Great Belt, the Little Belt, and the Sound. On the other side the Skager-Rack connects it with the German Ocean. It is about 150 miles long and 85 miles wide. Dangerous sand-banks occur in it.

Cat'termole, GEORGE: painter in water-colors of genre and historical subjects; b. at Dickleborough, Norfolk, Aug. 8, 1800; d. at Clapham Common, July 24, 1868. He studied architecture as well as painting, and was a well-known illustrator. A picture in oils painted by him, *A Terrible Secret*, was exhibited at the Royal Academy, London, in 1862. He received a first-class medal at the Paris Exposition of 1855. W. A. C.

Cattle [Norm. Fr. *catel* < Low Lat. *capta'le* < Lat. *capita'le*, capital, deriv. of adjec. *capita'lis*, belonging to the head (*caput*); *chattel* from centr. O. Fr. *chatel* is a doublet of *cattle*]: in Old English, property, goods, chattels; whence (because in ancient times a man's cattle were his principal goods) comes the modern use of the word as a collective term which in its widest sense includes all domestic animals, and in the usage of some writers includes also deer and other wild grazing animals. Among agriculturists, however, it is very generally limited to beasts of the species *Bos taurus*, the domestic ox, the neat cattle or black cattle of British writers. There are many varieties or breeds of cattle, some of which, as in Southern Asia, are distinguished by a large hump or mass of fat upon the shoulders. The original wild stock from which cattle are descended is not well known. The principal breeds in the U. S. are of British origin. The old native stock is of extremely mixed descent, but of late years much attention has been paid, with the best results, to the rearing of pure-blooded and grade stock. The best are the short-horn or Durham breed, which produces excellent beef-cattle, and is extensively reared in the U. S., chiefly for fattening purposes; the Herefords, for beef; the beautiful Devons, for working oxen; the Ayrshires, prized for milking qualities; the Jerseys or Alderneys, which yield extremely rich and excellent milk. The continent of Europe has many fine breeds which are little known in the U. S. The Texas cattle are descended chiefly from Spanish stock.

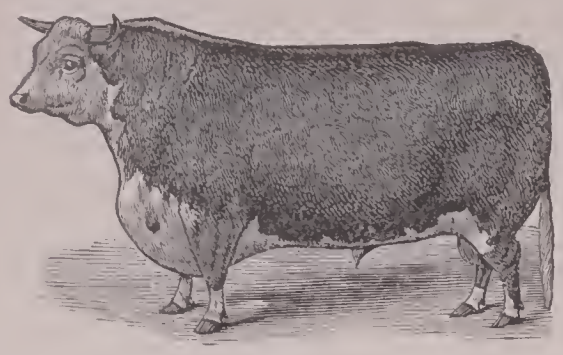
Great attention is paid in the U. S. to the improvement of cattle, and hence the best breeds of Great Britain especially, and to some extent of other parts of Europe, are largely introduced and mingled with the native stock. A brief description of some of the most noted is given below. The British cattle, by reason of long, careful, and scientific breeding, are undoubtedly the best in the world. Youatt, an eminent authority, classified the most remarkable breeds among them as the Long-horns, the Middle-horns, the Short-horns, and the Polled, or Hornless, cattle. Modern writers designate them as the English and the Scotch breeds, the former embracing the Devon, Sussex, Hereford, Long-horns, Short-horns, and Polled Norfolks; while the latter include the Ayrshires, the Polled Angus or Aberdeen, the Polled Galloways, and the West Highland or Kyloe breeds.

The Long-horns, an ancient and once famous breed of Lancashire and Westmoreland, England, are not bred in the U. S. A few are still bred in some English districts.

The Devons claim the first place among the *Middle-horns*. They are an old breed, of medium size, and so symmetrical as to appear small; their distinctive color is red. The head is small, the muzzle delicate; the horns are clear, smooth, and symmetrically curved upward. As working cattle they are not excelled for activity, docility, intelligence, and hardiness. The cow is gentle, feeds well on scanty pastures, and gives a moderate yield of rich milk. The flesh of this breed is excellent. It is probable that the first cattle imported into the U. S. were either pure or grade Devons.

The Sussex cattle resemble the Devons. They are red, and are larger and coarser than the Devons. They have been much improved in recent years.

The Hereford breed undoubtedly traces to the same source as the Devon and Sussex. The Herefords are of a medium or dark red color, with white faces and sometimes white on throat, back, and bellies. They are not excelled for grazing, and make beef of the best quality.



Hereford.

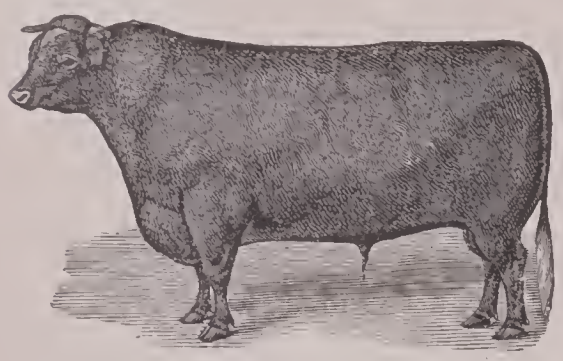
The Welsh cattle are smaller than the preceding, but are highly esteemed for practical uses. They vary somewhat in different localities, and different local names are applied to them.

The West Highland, or Kyloe, originally found in the Hebrides and the county of Argyle, seem to have retained most of their aboriginal character. They have remained unchanged, or improved only by selection, for many generations. They are a beef rather than a dairy breed. They are of varied colors—dun, red, black, brown—but never particolored.

Ayrshire cattle originated in Ayrshire, Scotland, and have for many years been considered as a leading dairy breed. The Ayrshire cows are of medium size, with wedge-shaped body, slim neck, a small head, and graceful upturned horns. In color they vary considerably, red and white spotted or mottled being the most common. Brown and white is a favorite combination with Ayrshire breeders. Ayrshire milk is better adapted to cheese-making than to butter.

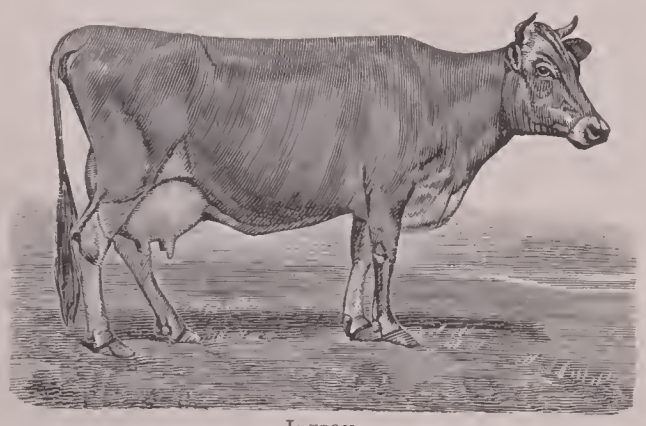
The Kerry cow of Ireland—sometimes called "the poor man's cow," from her moderate size, hardiness, good milking qualities, and docility—has a neatly formed head, upturned horns, lively and expressive eyes, and a body but little more than 3 feet high. Black is the common color.

Short-horns.—This justly celebrated breed has been prominent in the counties of Durham and York, England, since the latter part of the seventeenth century. They have been bred with great care and skill since 1780. See SHORT-HORNS.



Short-horn.

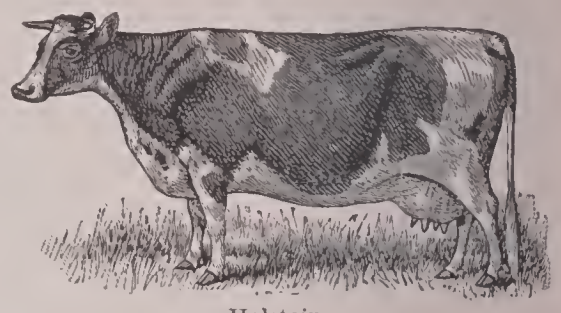
The Channel Island cattle from the islands of Jersey and Guernsey, in the British Channel, have long been noted for their superior value in the production of milk rich in butter properties. Many of them have been exported from Jersey, the largest island of the group, and in the U. S. they are generally known by the name of Jersey, though formerly they were often called



Jersey.

Alderney. The Jersey has a small deer-like head; muzzle fine and dark and encircled by a light color; horns small, crumpled, and of an amber color; chest inclined to be narrow; tail fine; udder full in form, well up behind, and running well forward; milk-veins prominent; escutcheon or milk-mirror high and broad, and full on thighs. They give a moderate amount of milk rich in butter fat of a deep yellow-color. Fawn is a common and favorite color. Fawn and white and gray are also quite common. The Jersey is not excelled as a family cow. Small, docile, and easily kept, she in a marked degree combines beauty with practical uses. The Guernseys are larger and hardier than the Jerseys, but have the same general characteristics.

Holstein-Friesian Cattle.—This famous breed takes its name from a region in the northern part of the German empire, but it is found in greatest perfection in the provinces of North Holland and West Friesland in the kingdom of the Netherlands. They are large, heavy animals with form indicating milking quality, muzzle black, colors black and white spotted or mottled in greater or less inequalities of proportion on the body. They are a hardy breed and large feeders. Holsteins are remarkable rather for the quantity of their milk product than for its richness, and have been thought better adapted to the manufacture of cheese than to that of butter. Recently, however, attention has been called to the large yield of butter from some of the best specimens of this breed. Many of these cattle have been exported to the U. S., where, like the Jerseys, they have reached a higher development than in their original habitats.



Holstein.

Polled or Hornless Cattle.—The most prominent are the Galloway and the Aberdeen or Angus, both Scotch breeds, and the Norfolk or Suffolk, an English breed deriving its name from Norfolk. The Aberdeens and the Galloways are black, the Norfolk red. The first have been housed and fed better than the second, and have become smoother, finer animals of most excellent feeding quality.

Revised by H. H. WING.

Cattle-plague: See RINDERPEST.

Cat'tleya: a genus of remarkably showy orchids; natives of tropical America, especially of Colombia, and numbering about twenty species, which have under cultivation given rise to numberless varieties. Many of the flowers are of great size, often 7 to 8 inches in diameter, and of rich and varied colors, and are much grown in greenhouses. The plants are epiphytic, and form thickened bulb-like enlargements upon their leaf-stalks (pseudo-bulbs), which serve as reservoirs of food material. Among the notable species are *C. gigas, C. guttata, C. intermedia, C. labiata, C. mossiæ, C. trianæ, C. warneri.* CHARLES E. BESSEY.

Cattol'ica: a town of Sicily; province of Girgenti; 14 miles N. W. of the city of Girgenti (see map of Italy, ref. 10–E). It is situated in the center of a very extensive sulphur-mining region. Pop. 7,000.

Cat'ty (deriv. of Malay *katī*): name given in commerce to a Chinese weight known also as "kin," or pound. The weight equivalent fixed at the Chinese custom-house is 1·3316 lb. avoir., or 0·60453 of a kilogramme.

Catul'lus, GAIUS VALERIUS: a Roman lyric poet of high reputation; b. at or near Verona about 87 B. C. He became in early life a resident of Rome, and enjoyed the society of Cicero and Cæsar. He was the first Roman who excelled in lyric poetry. He wrote, besides numerous lyrics and epigrams, an heroic or narrative poem entitled *The Nuptials of Peleus and Thetis*, which is his longest work; and a poem called *Attis*, in galliambics, which shows great power. One hundred and sixteen of his poems are extant. They are admired for the exquisite grace and beauty of their style, and for their intensity of feeling, but are in part grossly licentious. D. about 54 B. C. See R. Ellis, *A Commentary on Catullus* (2d ed. Oxford, 1889); text, with prolegomena, etc., 1878. M. W.

Cat'ulus, QUINTUS LUTATIUS: a Roman general and writer. He was chosen consul and a colleague of Gaius Marius in 102 B. C. Catulus and Marius commanded two armies,

which united and defeated the Cimbri near Vercelli in 101 B. C. The first was a partisan of Sulla in the civil war. Having been condemned to death by the Marian party, he killed himself in 87 B. C. His works are lost, except two epigrams.

Cauca, kow'kăa: a river of Colombia, South America; rises in the Andes; flows nearly northward through Popayan, Cauca, and Antioquía. After a course of 680 miles it enters the Magdalena in lat. 9° 25′ N. The valley of the Cauca is one of the most fertile and populous districts of South America.

Cauca: the largest department of Colombia, occupying the whole southern portion and a strip on the western side extending from Ecuador to the department of Panama, with a short coast on the Caribbean Sea; area, by official estimate, 257,424 sq. miles, but this includes a vast region claimed by Brazil and Ecuador. Pop. (1892) estimated at 700,000, including 200,000 wild Indians. Capital, Popayan. It is naturally divided into the mountainous western portion, about a tenth of the whole, but containing all the civilized population, and the great plains of the southeastern part. The first includes the valleys of the upper Cauca and Atrato, with the western Cordillera of the Andes between them, and a lower coast range. Southward, where the western Cordillera unites with the central and eastern branches, the whole country is mountainous, with several volcanic peaks and elevated basins similar to that of Quito. The higher valleys are cool and healthful. Lower down the valleys and coasts are hot and often sickly. Rains are abundant, and on the Pacific coast there is no well-marked dry season. Forest growths are extensive. The most important products are coffee, tobacco, cacao, cinchona, rubber, and hides. The gold and silver mines, especially of Chocó (the northern portion), are very rich, but are imperfectly worked. Southeastern Cauca is included in the great plain of the Amazon and Orinoco. It is one of the least-known regions of South America, covered in great part with forest, crossed by unexplored rivers, and peopled only by scattered tribes of wild Indians. HERBERT H. SMITH.

Cauca'sia: the Russian territory between the Black and Caspian Seas, on each side of the Caucasus Mountains. It consists of ten provinces, of which three (Kuban, Stavropol, and Terek) are in Europe and form Cis-Caucasia, or Northern Caucasia, while the seven others (Kutais, Tiflis, Elizabethpol, Baku, Erivan, Daghestan, and Kars) form Trans-Caucasia, or Caucasia in Asia. The area of Cis-Caucasia is 89,497 sq. miles; pop. (1897) 3,786,900; Trans-Caucasia, area, 91,346 sq. miles; pop. (1897) 5,936,653.

Cauca'sian (i. e. pertaining to Caucasus): an epithet somewhat loosely applied to the principal white races of mankind. The Circassians and Georgians dwelling at the foot of Mt. Caucasus have been taken as the type of the Caucasian race, and suggested the name. According to Blumenbach, the Caucasian race is the principal of the five divisions of the human family, and the original stock from which the other races have sprung. It also forms one of the three varieties of Cuvier. It comprises the most enlightened and powerful nations of the earth, including, besides the Aryan races (see ARYAN), the Hebrews, Phœnicians, and Arabs. But the inhabitants of the Caucasus, so long held to be types of the European variety, are now by some excluded from it altogether, and classed with the Mongols. The question of their relationship is a very obscure one. The basis upon which the theory of the Caucasian type was formed is thus stated by Latham: "Blumenbach had a solitary Georgian skull, and that skull was the finest in his collection, that of a Greek being the next. Hence it was taken as the type of the skull of the more organized divisions of our species. More than this, it gave its name to the type, and introduced the term Caucasian. Never has a single head done more harm to science than was done in the way of posthumous mischief by this well-shaped head of a female from Georgia." As commonly used, the term Caucasian is objectionable, as confounding under one name nations (as, for example, the Arabs and Germans) who have at best a very remote relationship; while it has often led to a still greater error—that of separating, on trivial and superficial grounds, nations who are unquestionably closely related, such as the dark-complexioned Hindus and the light-complexioned Teutons and Celts.

Cau'casus (Gr. *ὁ Καύκασος* or *ὁ Καύκασις*): a lofty mountain-range which extends between the Black Sea and the Caspian, and lies along the boundary between Europe and Asia. It is 690 miles long, and extends from the peninsula of Taman on the Black Sea, in an E. S. E. direction, to the peninsula of Apsheron on the Caspian. Connected with this central chain are several branches or transverse ridges on both sides. The culminating point of the Caucasus is Mt. Elburz, which is near the middle of the central chain, and has an altitude of about 18,570 feet. Its base is 7,660 feet above the sea-level. The next highest is Mt. Kasbek, 16,552 feet, E. of which is the Dariel Pass. This is said to be the only pass by which carriages can cross the Caucasus. The highest summits of this chain are formed of trachyte or porphyry, below which occur granite, syenite, etc. Limestone, slate, and other stratified rocks appear at the base and on the sides of these mountains. The limit of perpetual snow is here about 11,000 feet above the level of the sea. Some parts of the Caucasus are destitute of trees, but the secondary ranges near the Black Sea are covered with magnificent forests of oak, beech, ash, maple, and walnut. The cereal grains flourish 7,000 feet above the level of the sea, and the lower valleys produce rice, cotton, indigo, and the grape. The principal rivers that rise among these mountains are the Kuban, Kur, and Terek. The scenery of this region is said to be very beautiful and picturesque. Among its minerals are copper, iron, and lead. The inhabitants of the Caucasus comprise a variety of tribes, who speak different languages and are subject to Russia. Among these tribes are the Circassians, Georgians, and Lesghians. They are noted for their love of freedom; and to maintain their independence they waged a long war against the Russian invaders, which was terminated by the capture of their leader, Schamyl, in 1859. See CAUCASIAN.

Cauchy, kō'shee', AUGUSTIN LOUIS: mathematician; b. in Paris, Aug. 21, 1789. He gained a prize of the Institute in 1815 for his *Memoir on the Theory of Waves*. At Prague, where he resided as tutor to the Comte de Chambord, he published a *Memoir on the Dispersion of Light* (1837). He became a member of the Academy of Sciences and Professor of Mechanics in the Polytechnic School in 1816. He published, besides other works, *Lectures on the Differential Calculus* (1826), and succeeded Biot as professor of astronomy in 1848, but, refusing the oath of allegiance to Napoleon III., was retired under his empire. D. in Paris, May 23, 1857. See his *Life* (Paris, 1868) by Valson.

Caucus: a meeting of citizens for the selection of candidates to be supported at a pending election, or of legislators or others to confer and decide upon party measures or policy. The word originated in Boston during the popular discontent and agitation which culminated in the Revolutionary struggle—Boston, the cradle and focus of this agitation, being then a straggling maritime village, mainly supported by commerce and the seaboard fisheries, which gave importance to the arts subsidiary to navigation. The *calkers* of vessels were thus relatively numerous: they were robust, active citizens in the prime of life, and they were enlisted, heart and soul, in the patriot cause. Their work was done at the North End, where but few houses had yet been built, and their dwellings were mainly in that neighborhood. If they had a place of meeting as a craft, it would naturally be chosen for their political gatherings as well; and the Tories or loyalists, seeing these convened at the calkers' headquarters, would call them *calkers'* meetings, implying that none but low-bred mechanics and their like were hostile to the royal cause. *Caucus*—at first a corruption of *calkers*—thus became the received designation of a political meeting, especially if held with closed doors. The word first appears in the diary of John Adams, under date of Feb., 1763, as follows: "This day found that the *Caucus Club* meets at certain times in the garret of Tom Dawes, the adjutant of the Boston (militia) regiment." Adams adds that the town-officers and representatives were first chosen in this club before they were elected in town meeting. Gordon's *History of the Revolution* asserts that the caucus dates back at least to 1725, and that Samuel Adams's father and some twenty others devised and employed it to concentrate the power of the town in their own hands. He adds that Samuel Adams was first made representative of Boston through the instrumentality of the caucus, which thenceforth formed an important part of the machinery whereby the Revolution was incited and maintained.

That the majority of a legislative body should hold a caucus for the selection of the officers of that body can not be reasonably gainsaid, the minority being at perfect liberty to

do likewise; while any member of the majority, dissatisfied with its choice, may claim and exercise, if he will, the right to bolt. But when, about 1804, a caucus of the Republican (Jeffersonian) members of Congress was held expressly to recommend persons to be supported at the polls by Republicans living in districts represented by Federalists, thus giving to the people of those districts no voice in the selection of their candidates, the legitimacy of the assumption involved in such nominations was gravely questioned. Yet the candidates of the caucus continued to be chosen—with docility, if not with alacrity—until 1824, when the system broke down ignominiously upon William H. Crawford, of Georgia, being nominated for President, with Albert Gallatin, of Pennsylvania, for Vice-President. This ticket was badly defeated, the friends of John Quincy Adams, Gen. Andrew Jackson, and Henry Clay, forming two-thirds of those elected to either House, uniting in a public recommendation that the fiat of the caucus be disregarded—in fact, defied. Mr. Crawford received less than a fourth of the electoral votes, the vote standing—Jackson 99, Adams 84, Crawford 41, Clay 37. This sent the election to the House of Representatives, which elected Adams by a coalition of the supporters of Adams and Clay; the vote standing—for Adams, 13 States; Jackson, 7; Crawford, 4. This was the last caucus of members of Congress which assumed to nominate candidates for the people, and legislative caucuses with like purposes also have been discarded by all parties, though caucuses continue to be held for the choice of candidates to be supported by the body whose members make the nomination.

Presidential Conventions.—The first nominating national convention was held in 1832 by the Anti-Masons, who presented William Wirt, of Maryland, for President, with Nathaniel Ellmaker, of Pennsylvania, for Vice-President. In 1836 the Democrats held a like convention, which nominated Martin Van Buren, of New York, for President, with Richard M. Johnson, of Kentucky, for Vice-President. The Whigs held their first national convention at Harrisburg in Dec., 1839, and presented Gen. William Henry Harrison, of Ohio, for President, with John Tyler, of Virginia, for Vice-President. These were elected over Van Buren and Richard M. Johnson, the Democratic incumbents, who had triumphed four years previously. Each and every national party has since selected its candidates mainly by a delegated convention.

The local caucus for the selection of candidates for local offices, and especially for the selection of delegates to conventions that will nominate the more important State and national candidates, probably has been the chief field for fraud and oppression. The voters as a rule have taken little interest in such caucuses, but generally have left them to be managed by the local politicians, who, by simply notifying their followers to be present, have easily commanded a majority. Where, however, there has been the probability of a contest, shrewd managers have not hesitated to call a meeting to order by fast watches; to get to the appointed place with their followers before the appointed time, and then bar the door against their opponents; to call the meeting on short notice, or in an obscure place; and by other similarly unfair means they have tried to get the better of their opponents and to secure the regular delegation to the nominating convention. If their opponents sent a contesting delegation, the convention usually has seated the delegation favoring the wishes of the majority. See NOMINATING CONVENTIONS.

All members of the party are supposed to have the right to vote in caucus; and in rural districts and in the smaller cities the right has generally been freely granted. In the larger cities, however, especially in New York, it has been assumed by the party managers that a list of their voters is necessary in order to prevent fraud. The result has been that, practically, a society has been formed which limits its own membership, admitting only those whose names are presented by members, and who pledge themselves to follow the guidance of the central committee, and to support the candidates nominated by the society. By these means it has happened that not more than one-tenth of the members of either of the great parties could take part in the nomination of the regular candidates. See article *Caucus* in Lalor's *Cyclopædia of Political Science*: also article by A. C. Bernheim, *Party Organizations and their Nominations to Public Office in New York City*, in *Political Science Quarterly*, vol. iii., p. 99.

To avoid these evils some States have passed laws providing for *primary elections*, in which the members of each party are registered and vote by ballot under practically the same laws that obtain at a general election. The candidate receiving the highest number of ballots then becomes the regular candidate of his party. This system, however, only throws the informal caucus back one step, and it will still be held to select candidates for the primary elections. See PRIMARY ELECTIONS.

Perhaps no better method of purifying the caucus has been suggested than to insist upon all legal nominations being made by petition of a comparatively few voters, and to have the names of all candidates so nominated printed upon the election ballot without party designation. It is doubtless true, however, that no perfect mode of selecting candidates for the popular suffrage has yet been devised. See BALLOT REFORM.

Revised by JEREMIAH W. JENKS.

Cau'dine Forks (Lat. *Furculæ Caudinæ*): two narrow mountain-gorges or defiles near the town of Caudium, in ancient Samnium. They are celebrated in connection with a humiliating disaster which the Roman army suffered in 321 B. C. A large army commanded by the consuls Titus Veturius and Spurius Postumius were marching against the Samnites. According to Livy, this army, supposing the Samnites to be far distant, marched through one gorge or pass into a small valley inclosed by high mountains, and soon found that both of the passes were blocked up with trees and stones. The Romans were compelled by famine to surrender unconditionally to Caius Pontius, the Samnite general, who required them to pass under the yoke, and then permitted them to return to Rome. Caudium was on the Appian Way, 21 Roman miles E. of Capua. Niebuhr expresses an opinion that the Romans must have been defeated in battle before they were shut up between the two passes, and Cicero twice alludes to the battle and defeat of the Romans at Caudium. In one place he says, "Cum male pugnatum ad Caudium esset." (*De Officiis*, iii., 30.)

Caul: the thin membrane which sometimes covers the head of the child at birth. This is part of the general membranous sac enveloping the child in the womb, and its appearance over the child's head is due to unusual place of rupture of the sac. In ancient times it was considered a highly propitious circumstance to be born with a caul, and the person purchasing a caul thereby secured for himself various happy prospects. The caul was of particular value to advocates, who by its possession thought to obtain eloquence, and to seamen to secure them against drowning, and in consequence large sums were at times offered for the charm. This superstition has continued to the present day as far as seamen are concerned, and advertisements of cauls, so common in the newspapers of the last century, are still occasionally seen.

WILLIAM PEPPER.

Caulaincourt, kō'lăn'koor', ARMAND AUGUSTIN LOUIS, de: Duke of Vicenza; diplomatist of the first empire; b. at Caulaincourt, a village in the department of Somme, France, Dec. 9, 1772; d. in Paris, Feb. 19, 1827. He entered the army in 1787; was made a general in 1805; was sent in 1807 as ambassador to St. Petersburg. His position there was in the beginning rather difficult, as the Russian nobility believed him implicated in the capture of the Prince d' Enghien, and declined to hold any intercourse with him. The Emperor Alexander, however, who had great confidence in him, fully exonerated him. Unable to prevent the breach between Alexander and Napoleon, he resigned his position in 1811, but was in 1813 made Minister of Foreign Affairs, and as such was present at the Congress of Chatillon, 1814. It was due to his influence on Alexander that the island of Elba was granted to Napoleon. During the Hundred Days he was again Minister of Foreign Affairs. Under the Bourbons he lived in retirement.

Cauliflower [based upon the Latin form of Fr. *choufleuri* (flowered cabbage; cf. Germ. *Blumenkohl*), *cauliflora*, with adaptation to Eng. *flower*]: a plant of the mustard family and of the same species as the CABBAGE (*q. v.*). The edible portion is a head composed of the transformed flowers and flower-stems. The cauliflower is esteemed as one of the choicest vegetables of temperate climates. The head is cooked in various ways after the manner of preparing cabbage. The plant is cultivated in different methods in different parts of the U. S. In some regions it is grown as an early crop, in which case the seed is sown in hotbeds or cold-frames, and the crop is cultivated in essentially the same manner as early cabbages. In other places, as upon Long Island, N. Y., it is treated as a late or fall

crop. The cauliflower demands a rather moist soil and humid atmosphere, and it is therefore not adapted to much of the interior of America where the summers are very hot and dry. The seacoast regions, as the coast of New England, Long Island, and the Puget Sound region, are thought to be particularly adapted to the plant. The head is usually bleached, or rather protected from sun-scorching, by breaking the leaves over it when it is nearly grown. Cauliflower seed is mostly grown in Europe. The raising of it, however, has been undertaken with gratifying success in the neighborhood of Puget Sound, Washington. Broccoli is a large and late type of cauliflower. L. H. Bailey.

Caulo'nia: an ancient Greek city and seaport of Italy; in Bruttium, between Locri and the Gulf of Scyllacium. It was an important city about 500 B. C. According to Porphyry, Pythagoras sought refuge in Caulonia after his expulsion from Crotona. The people of Caulonia formed a league with those of Crotona and Sybaris. In 389 B. C. Dionysius the Elder invaded Magna Græcia with a large army, and besieged Caulonia, which he took. He then removed the inhabitants to Syracuse.

Caulopteris [Gr. καυλός, stem + πτερις, fern]: a generic name for certain fossil trunks of tree-ferns, chiefly Paleozoic, with roundish, separate, petiolar scars in quincuncial rows, each scar having a U-shaped or oval vascular bundle similar to that in the related living *Cyatheaceæ*.

Caupo'lican: an Araucanian Indian of Chili; b. about 1520, and elected *toqui* or chief of his tribe in 1553. He renewed the war on the Spaniards, forced them to abandon Arauco and Tucapel, and, aided by the advice of Lautaro (*q. v.*), defeated and killed the governor, Valdivia, who was hastening to the relief of Tucapel (Dec. 31, 1553). For several years the Araucanians carried on a successful war, until Imperial and Villa Rica were the only Spanish posts left in Southern Chili. In 1557 Caupolican was twice defeated by the governor, Hurtado de Mendoza, and was at length captured by the Spaniards and impaled alive at Cañete (1558).
Herbert H. Smith.

Caus, kō, or **Caulx**, Salomon, de: a French engineer; b. in Dieppe in 1576; a Protestant who lived much in Germany and England; considered by Arago to be the inventor of the steam-engine. He published in 1615 a work on motive-powers entitled *Les Raisons des Forces mouvantes*, etc., which gives a theorem on the expansion and condensation of steam. D. in Paris, June 6, 1626.

Cause: in law, an action, suit, or controversy in a court of justice: a case; a question tried before a judge. The term cause refers more particularly to the subject matter in dispute, while the terms action and suit refer more particularly to the legal procedure. Revised by F. Sturges Allen.

Cause: in Ontology (*q. v.*), any principle which in any way whatever embraces the Ground (*q. v.*) or Reason (*q. v.*) why anything diverse from itself exists. The principle correspondent with *this* principle is called Effect (*q. v.*), and the relation which exists between cause and effect is *causality*.

Causes have been divided into five classes (four by Aristotle): I. The *efficient* or operative cause. Its activity may be intransitive—that is, *immanent*—or transitive or transient—that is, *emanent*. The *efficient* cause is by pre-eminence *the* cause, and is usually meant if the word *cause* is not qualified. There may be *requisites* or *conditions*, even to the degree of *sine qua non*, and there may be *occasion*, but these ideas are not to be confounded, as they often are, with that of cause. Efficient causes are subdivided into primary and secondary; universal or general, and particular; principal and instrumental; univocal and equivocal; causes *per se* and *per accidens*; adequate and inadequate; free and necessary; physical and moral; proximate, remote, and ultimate; relative and absolute. There is in the train of causes a *subordination*, and this is material or formal. See Material Cause and Formal Cause.

The ontological principles deduced are: There is no effect without a cause; out of nothing nothing comes; nothing can be the efficient cause of itself; two things can not be the reciprocal cause of each other; the effect and the cause are *always* proportioned to each other; whatever is in the effect must in some sense be in the cause; the cause of the cause is also the cause of the effect; the same causes always produce the same effects; the cause must be present, either immediately or mediately, with that which it effects.

II. The Material; III. The Formal; IV. The Exemplary (Plato); and V. The Final Cause.

The names most distinguished in connection with the philosophical theories of cause are Heraclitus and Protagoras (denial of the notion), Plato (idea, matter, operative principle; immediately evident, free and physical: conditional and absolute), Aristotle (fourfold division; first cause of motion), Bruno (principle, internal; cause, external; first cause, final), Hobbes (potency and act), Descartes (assistance), De la Forge, Malebranche (occasional causes), Spinoza (adequate cause; cause of divine acts identical with cause of divine existence), Locke (appearance of changes), Leibnitz (pre-established harmony), Hume, Brown (observation of sequence, habit, not by, but *after*, natural instinct, apart from reason, blind belief), Kant (a fundamental, synthetical, *a priori* judgment, a postulate of pure reason, category of relation), Reid, Stewart (intuition), De Biran, Cousin (self-consciousness, personal causation), Fichte (positings of the Ego, self-originated subjective modification), Schelling, Hegel (spontaneity, all *being* has in it the internal impulse and power to *become*), Hamilton (the conditioned; mental impotence), Schopenhauer (the occasion for the phenomenon of Will). Among later points made, the most important is that each sphere of nature is controlled by a specific modification of the law of causality. All the views are reducible to two: the conception of cause is either *a priori* or *a posteriori*, and each of these is either original or derivative. In the application of the idea of cause arise the terms causal principle, causal judgment, causal nexus, causal connection, causal union, causal relation.

One of the most specious and widely accepted fallacies is that *cause precedes* effect. Cause and effect are absolute correlates, so that in point of *time* cause can not be *before* effect, but the two sides of the relation come into simultaneous being. Nor can cause, as such, exist without effect. As a term of relation, cause is as dependent on effect as effect on cause. The order of priority is therefore purely logical and mental. Nor is it true that a thing must be (*in time*) *before* it becomes a cause. It is only necessary that it shall be *when* it becomes a cause. Hence the thoughts of an eternal mind, the acts of an eternal being, may be eternal. In the world about us all that *becomes* cause *exists in deed* before it *becomes cause*, but the reason of this is that every source of cause, in our sphere, is also an effect, and must *be* as an effect before it can *act* as a cause. Nevertheless, it becomes cause strictly *simultaneously with* the effect, not *before* it. The true conception of cause therefore is demonstrably not that of sequence in time, as Hume contends, but the one we have given—to wit, that cause is that which contains the reason of the effect, and hence that the relation is a necessary one, and is as certain where we can not observe its result as where we can. Innumerable instances can be given of the invariable sequence, *in time*, of one thing which is not the effect of another.

That in virtue of which a causal agent can become cause, we call power. Some of the postulates which hold good as to cause and effect in the *inorganic* world are not demonstrably valid in the inorganic, and seem to fail entirely in the sphere of freedom and of intellect. So complete is the mind's recognition of the nature of cause that on a statement of any number of purely *hypothetical cases* it will at once decide which of the two terms is cause, which is effect, if the statement is such as to help the mind to see which of the terms must contain the reason of the other.
Revised by W. T. Harris.

Causes célèbres, kōz say'lebr': celebrated causes or trials, particularly certain French state trials of the seventeenth and eighteenth centuries, the reports of the decisions of which are contained in two collections, one by Gayot de Pitival and another by Des Essarts. In general, any trial which is especially interesting or remarkable in its incidents is called a *cause célèbre*, as the Tichborne Trial (*q. v.*).
F. Sturges Allen.

Caussin de Perceval, kō'săñ'de-pārs'vaăl', Armand Pierre: French Arabic scholar, 1795–1871; Professor of Modern Arabic in Paris. His most famous work is his *Essais sur l'histoire des Arabes avant l'Islamisme* (Paris, 1847–48), a monument of learning and good judgment. His father, Jean Jacques, was also a Semitist of merit. C. H. Toy.

Caustic [from Gr. καυστικός, capable of burning, deriv. of καίειν, burn]: a substance which exerts a disintegrating or destructive effect upon animal tissues. Caustics usually produce a sensation as of burning, whence the name. "Lunar caustic" is the silver nitrate, so called because *luna* (the moon) is the old alchemical name for silver.

Caustic lime, potash, soda, and magnesia are in effect like substances when pure, so called to distinguish them from their less active carbonates. Many other chemical reagents are used in surgery as causties, notably the nitric, chromic, and arsenious acids and bromine.

Caustic, in optics, is a term applied to curved lines formed by a series of points where (from the intersection of reflected or refracted rays) the heat and light are most intense. Reflected rays produce catacaustics—refracted rays, diacaustics. The study of caustic surfaces and curves is of the greatest importance in the construction of lenses and mirrors. For example, it has been found that the caustic by reflection from a paraboloid of revolution is reduced to a point when the incident rays are parallel to the axis of the paraboloid. For this reason parabolic reflectors have been introduced with great success into many optical instruments.

Cautery [from Gr. *καυτήριον*, branding-iron, deriv. of *καίειν*, burn]: in surgery, the application of a red-hot iron. White heat should rarely if ever be used, as it permits bleeding afterward. It is otherwise called "actual cautery," to distinguish it from "potential cautery," or the application of a chemical reagent as a caustic. "Cautery" is also the small iron instrument which is heated and applied in this operation. The actual cautery is useful in destroying certain morbid and gangrenous tissues, in staying hæmorrhages, and in relieving severe local pain. It has a valuable derivative effect in many cases, and when properly applied after thorough freezing of the part by ice and salt produces comparatively little pain. It is sometimes used to produce a slight, and sometimes a profound, local effect. The actual cautery is a favorite method of treatment in certain spinal affections. Galvano cautery is a platinum wire heated by a galvanic current to the required temperature. See Moxa.

Revised by William Pepper.

Cautin': a province of Chili; created in 1887 from a part of Araucania. It is on the river Cautin or Imperial, in lat. 39° S. Capital, Temuco. Area, 3,126 sq. miles. Pop. (1895) 78,221.

Cavaignac, kaă'vān'yaăk', Godefroy: a French Republican journalist: son of Jean Baptiste Cavaignac (1762–1829); figured in the revolution of 1830; b. in Paris in 1801. He was driven into exile in 1835, returned in 1841, and became one of the editors of *La Réforme*. He was one of the most popular leaders of the Liberal party. D. May 5, 1845.

Cavaignac, Louis Eugène: general and statesman; brother of the preceding; b. in Paris, Oct. 15, 1802. He served with distinction in Algeria, where he was sent in 1832; became a colonel in 1841, and governor of the province of Oran in 1847. In Mar., 1848, he was appointed governor-general of Algeria, and in the next month was invited by Lamartine to go to Paris and defend the Government against the mob. He reached that capital on May 17, and was then appointed Minister of War. He displayed much energy, skill, and presence of mind in his operations against the socialists and communists, who began a great insurrection in Paris on June 23, and were defeated in a battle which lasted three days. About June 28 he was chosen *chef du pouvoir exécutif*, or president of the republic, by the National Assembly. He was a moderate republican, and used his power with clemency. In the autumn of 1848 he was a candidate for the office of president, and received 1,448,302 votes, but was defeated by Louis Napoleon. He retired from power on Dec. 20, and took his seat in the National Assembly. He was excluded from political life by the *coup d'état* of Dec., 1851, and by his refusal to take the oath of allegiance to Napoleon III. D. near Tours, Oct. 28, 1857. See Henri Montfort, *Biographie du Général Cavaignac* (1848); Deschamps's *Life* (Paris, 1870).

Cavaignac, Jacques Marie Eugène Godefroy: French politician; son of the above; b. May 22, 1853; educated at the Lycées Charlemagne and Louis le Grand; served in the Franco-Prussian war; afterward studied in l'École Polytechnique and l'École des Ponts et Chaussées; elected to the Chamber of Deputies 1882; Under Secretary of State in the Brisson cabinet 1885; a prominent figure in the exciting scenes connected with the Panama revelations 1892–93; author of *L'État et les Tarifs des Chemins de Fer* (1883); *Formation de la Prusse contemporaine* (1891).

Cavaillon, kaa'vă'yōn' (anc. *Cabellio*): a town of France; department of Vaucluse; on the river Duranee; 16 miles S. E. of Avignon (see map of France, ref. 8–H). It has an old cathedral and remains of a Roman triumphal arch. Here are manufactures of silk twist and vermicelli. Pop. (1896) 9,405. *Cabellio* was a city of the ancient Cavares, and Pliny calls it an *oppidum Latinum*.

Cavalcanti, kaă-vaăl-kaan'tĕe, Guido: Italian poet; b. probably in Florence between 1250 and 1255; d. Aug. 28 or 29, 1300. His family, though apparently not originally noble, was one of the most eminent in Florence in the thirteenth century, and belonged first to the Guelph party, then to the Cerchi and to the Bianchi. The poet's father, Cavalcante Cavalcanti (died before 1280) fought in the battle of Monteaperti (1260), and took a prominent part in the affairs of his party. He is placed by Dante in the *Inferno* because of his Epicurean philosophy and his denial of the future life (*Inf.*, x. 52, *seq.*). The son, Guido, was one of the group of young men in Florence who, under the influence of Brunetto Latini and inspired by the Bolognese Guido Guinicelli, made the great advance in poetry to what Dante called *il dolce stil nuovo*. Dante himself, though somewhat younger, belonged to the group, and had a deep affection and admiration for Cavalcanti. He called him *queslo mio primo amico* (*Vita Nuova*, xxiv.), and elsewhere (*De Vulg. Elog.*, xiii.) named him with Lapo Gianni, Cino da Pistoia, and another (himself), as alone of the Tuscans excellent in the vulgar tongue. Furthermore, we have a poetic correspondence between Dante and Cavalcanti, full of tenderness and intimate solicitude on both sides (see especially Dante, Canzoniere, Sonetto I.). To Cavalcanti also, among others, was sent, according to Dante, the first sonnet of the *Vita Nuova*, written in the poet's nineteenth year, the first of his poetic efforts that have been saved to us. Cavalcanti replied with a sonnet of his own, so kindly and sympathetic that the friendship of the two at once began (*Vita Nuova*, iii.). After the death of Beatrice, Dante confided to his friend his plan of bringing together the poems written in honor of his dead love; and when this project was somewhat delayed by the perturbations of Dante's spirit and a certain reckless forgetfulness that came over him, he was chidden by Cavalcanti (Cavalcanti, Sonetto xxix.). This friendship certainly endured until the older poet's death, although at the very end, we are told by Dino Compagni (if only we could be sure of the authenticity of his much-discussed chronicle), Dante, as one of the priors of the city, had to participate in an act that must have been very grievous to Cavalcanti; for the latter had allowed himself to become engaged in the bitter feud between the Cerchi and the Donati, largely owing to his dislike of Corso Donati (see Dino Compagni, I.); and in June, 1300, after a violent outbreak of mutual hate, it became clear that the only hope of peace was to exile from Florence the heads of both these parties. The adherents of the Cerchi were sent to Sarzana, and with them Guido Cavalcanti. The exile was not a long one, for in August, on pretext of malaria at Sarzana, the Cerchi were recalled. But Cavalcanti had fallen really ill, and lived but a few days after his return.

As a poet, Guido Cavalcanti shows two somewhat distinct tendencies. He feels the philosophizing influence of Guido Guinicelli, which had transformed the chivalric and amorous ideals of Provence and France into doctrines of the spiritual life. He feels also, however, the charm of the simple and direct passion, the naïve loveliness, of the popular song of the Florentines. Hence his style is at once direct and intellectual. His influence upon Dante must have been great from this very fact.

Bibliography.—Pietro Ercole, *Guido Cavalcanti e le sue Rime* (Leghorn, 1885); Del Lungo, *Dino Campagni e la sua Cronaca* (Florence, 1879); A. Bartoli, *Storia della Letteratura italiana*, vol. iv. (Florence, 1881). A. R. Marsh.

Cavalcaselle, kaă-vaăl-kaă-sel'lăy, Giovanni Battista: Italian art historian; b. in Legnago, Jan. 22, 1820; embroiled in the revolution of 1848, he went with J. A. Crowe (*q. v.*) to London, and in collaboration they published *Early Flemish Painters* (3d ed. 1879); *History of Painting in Italy* (London, 1864–71); *Titian* (1876); *Raphael* (1883). He returned in 1858 to Rome and became inspector of the art department in the ministry of public instruction at Rome. D. in Rome, Nov., 1897.

Cavalier' [Fr., from Ital. *cavaliere* < Late Lat. *caballa'rius*, orig. one who has care of a horse, deriv. of vulg. Lat. *caba'llus*, horse. *Chevalier* is the proper Fr. representative of *caballa'rius*]: a horseman, a knight, an armed horseman, a gentleman (attendant on a lady), a gallant, a

soldier who fights on horseback. This name was given as a designation to a member of the party which fought on the king's side in the contest between Charles I. of England and the Parliament, their opponents being called Roundheads. It was at first a nickname and term of reproach, whence cavalier as an adjective came to be synonymous with rude or contemptuous, a meaning still perpetuated. But afterward it implied respect and was used as a title of honor. In the reign of Charles II. it remained in use until the extinction of the Cavalier Parliament in 1679.

Cavalier, John (1681 to 1740): often styled the "baker's boy of Anduze," because at one time apprenticed to that trade; the son of a Protestant peasant of the Cévennes, of the village of Ribaute near Anduze, Gard; in his early youth served as a shepherd lad or herdsman. When the Cevenol uprising in defense of the Protestant religious rights broke out in Languedoc in 1702, Cavalier, who had fled in 1701 for safety to Geneva, returned to share the lot of his persecuted brethren, and soon after was recognized as their military commander-in-chief.

His greatest engagement was that of Nages, Apr. 16, 1704. Upon this field, surprised through the physical prostration of his men, and surrounded by six or seven to his one, Cavalier extricated himself, defeated the finest soldiery in France and foiled the plans of their best commanders. Although he enjoyed the triumph of treating with Villars, Cavalier capitulated under stipulations for his own personal benefit, without insisting upon reliable guarantees in behalf of his religious brethren. There is no question but that Villars and Louis both deceived the Cevenol leader. He took part in the invasion of France in 1707, and finally entered the British service, in which he was elevated to the rank of major-general, and appointed governor of Jersey, which office he held when he died in Chelsea, England, May 17, 1740.

It is admitted that the effect of the Cevenol-Huguenot insurrection, in which Cavalier was the prominent figure, had a momentous effect on the fortunes of the war elsewhere, on the prospects of Louis XIV., and on the future of France. See Camisards.

Cavalli, kăă-vaăl'leĕ, Francesco: composer; b. near Venice, 1600; chapel-master of the Church of St. Mark from 1668 till his death; chiefly known as a dramatic composer, producing thirty-eight successful operas between 1637 and 1669; among them *La Didone* (1641); *Il Giasone* (1649); *Alessandro* (1651); and *L'Artemisia* (1656). D. 1676.

Cavalry [from Fr. *cavalerie*, from Ital. *cavalleria*, deriv. of *cavallo*, horse < Vulg. Lat. *caballus*]: that class of troops which serve mounted. It is recognized in modern warfare as one of the three great arms of service, and in earlier times, when war consisted more of predatory expeditions than of regular campaigns, it occupied the chief place. But even among the ancients it appears that this arm was not used to any extent in the earliest wars of which we have any record. The Egyptians, who were the first to organize a standing army, had no cavalry, its place being supplied by armed chariots. It is true that, on the monuments left by this people, pictures of mounted men are to be found, but there is every reason to suppose that these men were used only as messengers or couriers. Later, the Carthaginians in the organization of their armies gave a prominent place to the cavalry, which was made up of the most noble and distinguished citizens. Besides this body of picked troops, furnished by the city, Carthage employed vast numbers of Numidian horsemen, who rode not only bareback, as did all cavalry at first, but without bridles, guiding their horses in all their evolutions with the voice alone. It was to the great superiority of his cavalry that Hannibal, in his memorable campaigns against the Romans, was chiefly indebted for his success. His first five battles show the reliance he placed on this arm, and the efficiency with which he used it. At Cannæ his cavalry turned the issue of the day, and he owed his defeat at Zama to the superiority of Scipio's horse. In Asia an organized army was established among the Medes and Persians about 700 B. C., and in this the lancers, archers, and cavalry were placed in separate divisions. This force was rendered effective under Cyrus, and its main strength consisted in its cavalry. Leaving the East and turning to the West, we come to the military systems of Macedonia and Greece as the first organized, and upon which most others of antiquity were formed. In their armies both infantry and cavalry were used. The latter, as well as the former, was divided into heavy and light, and there was also another class which fought either mounted or on foot. In the heavy, which was composed of citizens, horse and rider were clad in mail. Their arms were long spears pointed at both ends. Mercenaries armed with javelins and arrows made up the light cavalry. These wore no mail, nor did their horses, which in all cases were ridden barebacked. The organization of the Greek cavalry approached that of modern times in many particulars. Their *ile*, corresponding to our troop, consisted of 64 men; the *hipparchy*, equivalent to our regiment, contained 512; while their largest formation, an *epitagma*, had 4,096, being about equal to a modern division of eight regiments. Philip and Alexander employed cavalry with great success, especially the latter, who was indebted to this arm for many of his most splendid victories. He won that of the Granicus with his cavalry, and in his two great battles with Darius, those of Issus and Arbela, his judicious use of his horse secured the victory, though he had in the latter not more than 8,000 to oppose 40,000 of the Persians. Among the Romans, even as early as the time of Romulus, each of the three tribes was required to furnish, besides its quota of infantry, 100 horse. In addition to this legionary cavalry there were 300 which constituted the body-guard of the king. In the formation of the legion it was customary to allow one mounted man to every ten of foot. Thus the numbers to make up the legion, as at first constituted, were 3,000 infantry and 300 cavalry. Servius Tullius increased these numbers to 4,000 infantry and 400 cavalry, and he raised his cavalry to 2,400 men. This force was made up, as with the Greeks, of the most noble citizens. The Roman cavalry was trained to fight on foot as well as mounted, and the light-armed infantry would sometimes spring up behind the horsemen, dismounting when the enemy was reached. Horses were furnished by the state. The cavalry was generally divided into ten parts; thus when 300 of this arm were attached to a legion, they were divided into ten *turmæ* or troops, and were formed in three, or sometimes six, ranks. Their defensive arms were helmet, cuirass, and shield; their offensive, a sword fit for striking only, a dagger, and a lance. Cæsar found that the Gauls used for their cavalry a very broad sword, suitable for cut and thrust. The order of battle among the Romans, though changed at different periods in many particulars, always preserved the system of keeping the flanks covered by cavalry. Sometimes a strong force of this arm was stationed in rear of the center, which was always held by a Roman legion; and on the repulse of the enemy the infantry opened to allow the cavalry to pass through in pursuit. On the march the head and rear of the column were protected by cavalry. In the feudal system the mail-clad knights, with their men-at-arms, made up the great body of cavalry and constituted the chief strength of all armies in the field. Their arms consisted of lance, battle-axe, and sword, the latter being generally straight and double-edged. Later, the Germans borrowed the curved sword from the Saracens, and they too invented the spur. In the earlier stages of the cavalry service, as has been mentioned, saddles were not used, but these were subsequently introduced, the first being a mere cushion, which has been developed into the almost countless styles of saddles now in use. During the wars of the Middle Ages the cavalry were used in heavy masses, which by their mere weight and superiority in arms could generally ride down the ill-armed and lighter infantry; but with the invention of gunpowder a new era in warfare commenced. The changes worked by this agent were very gradual, for it was used for many years only for heavy artillery. As soon, however, as it was applied to small-arms, the whole system of warfare underwent a radical change. Heavy defensive armor was discarded as useless; strategy and tactics overcame mere weight of numbers, and war became a science. To be enabled to perform the great movements dictated by strategy, and to employ properly the tactics requisite on a battle-field, it was necessary to have disciplined troops; and from this need grew up the standing armies of modern times. In all of these cavalry occupies a prominent position, as a glance at the various military systems of modern times will show. In Prussia the army grew out of the body-guard established by the elector Frederick I. This force was increased and disciplined under his successors, especially the great elector, and Frederick III. had a body of 36,000 admirable troops. But it was to Frederick the Great that the army owed its discipline, its organization, and its fame. Soon after his accession to the throne he issued his military regulations, and in

his efforts to perfect the efficiency of his army he paid special attention to his cavalry. To his reign belong two of the ablest and most brilliant cavalry leaders of history—Ziethen, who formed the Prussian hussars, and Seidlitz, who framed the cavalry tactics. So desirous was Frederick to bring this arm of the service to the highest perfection that he called to his aid the most distinguished Hungarian cavalry officers to drill and discipline his troops; and so efficient did they become that under the great leaders just named they gained some of his most important victories. Some of these battles give the happiest illustration of the efficiency of cavalry when properly used and ably handled. In that of Rossbach, Seidlitz threw his troopers against the French columns, broke them, and never allowed them to rally again. So brilliant were his services on this field that Frederick conferred on him the order of the Black Eagle—the highest mark of favor—and made him lieutenant-general. On the bloody field of Zorndorf it was reserved for the same gallant leader to save the day, for when the Prussian infantry gave way he charged the advancing Russians, broke both their cavalry and infantry, and sabered thousands of them. Ziethen, too, Frederick's other great leader of cavalry, contributed largely to the success of the Prussian army in Frederick's campaigns, especially on the field of Torgau, which was won by him.

The Prussian cavalry has well sustained the reputation it won during the wars of Frederick the Great, and it has been regarded as among the finest in the world. It is divided into cuirassier, dragoon, hussar, and Uhlan regiments. The first are armed with long straight swords; the others, with curved sabers, and all with carbines and lances. Each regiment is made up of 616 men—636 in those of the guards—and is composed of four squadrons.

The Austrian cavalry is made up of dragoons, hussars, and Uhlans. The regiments are composed of five squadrons with a total of 935 mounted officers and men, but there are some differences in arms and organization. In time of war one squadron is in dépôt to serve as a nucleus for recruiting and to train new men.

The Russian cavalry is made up of the cuirassiers, dragoons, lancers, and hussars of the guard, the regular regiments of dragoons, the localized regiment of Finland and that of Crimean Tartary. Besides these is her force of Cossacks.

The regular regiments are made up of 4 squadrons, each of 6 officers and 175 men, and are armed with the Berdan cavalry rifle with bayonet, and the saber. The lancers or Uhlans in the front rank are armed with the lance, those in the rear rank with carbine; all carry the saber. The 10 regiments of the guard, 2 localized, and 48 regular regiments make up a force of 57,464 men, and the 53 regiments of Cossacks, containing 11 squadrons of about 150 men each, and 275 sotnias, of about 135 men each, contain a total of 154,014 men, both on a war footing. In peace the Cossack troops are reduced, but the others are not.

Among the French the cavalry is divided into cuirassiers, dragoons, *chasseurs à cheval*, hussars, *chasseurs d'Afrique*, and the irregular African troops, spahis, etc. The regiments are made up of five squadrons, one of which is at the dépôt during war.

The dragoons, hussars, and chasseurs are armed with carbines, and the cuirassiers with revolvers in addition to their sabers, etc. In France, as well as in most other European nations, each squadron has a certain number of mounted pioneers trained in destroying bridges, etc., and carrying tools and materials for this kind of work.

The French cavalry seems to owe its origin to Charles VII., who about the middle of the fifteenth century took into his pay fifteen companies, as they were called, each of 500 men. In the reign of Louis XII. the cavalry appears to have been first organized in a separate body, with its own general officers and staff. Napoleon used his cavalry with terrific effect, and he called to its command some of his most distinguished lieutenants, though the ablest in this arm of the service was Murat. The battle of Marengo was converted from a defeat into a victory by the charge of Kellermann at the head of a small force of cavalry; and one of the most extraordinary exploits ever achieved by this arm was performed as Napoleon approached Madrid in 1808. Near the city, in the mountain-pass of Sorno-Sierra, were posted 20,000 men and 16 guns, which force checked the advance of the French. The emperor, after a personal reconnoissance, ordered a small body of Polish lancers to charge the formidable works, which they did with complete success. This is one of the most striking instances on record to show not only what can actually be accomplished by cavalry when properly directed, but the powerful moral effect produced by this arm when used with celerity and boldness.

The cavalry of Great Britain consists of life guards, which are cuirassier regiments, composed of eight troops of fifty to sixty men each—arms, straight sword; dragoon guards, same strength as life guards—arms, straight sword, pistols, and carbine; heavy and light cavalry—arms, saber, pistols, and carbine; and lancers—arms, saber, pistols, and lance. The British cavalry is the best in the world, having proved itself generally superior in the field.

The organization of the cavalry in the smaller states of Europe is very similar to that of the great powers already given, and we therefore do not deem it necessary to enter into details regarding it. In the East, too, especially among the Turks, an effort is being made to conform to European organization, armament, and drill. Ismail Pasha, Khedive of Egypt 1867–79, made rapid progress in this direction, and had for a number of years in his service several officers who served in the Confederate and Federal armies during the civil war in the U. S.

In the U. S. military system the organization of the cavalry is, with some slight modifications, the same general one which prevails in Europe. A regiment consists of twelve companies or troops of sixty-three men each; two troops form a squadron. All the cavalry in the U. S. should be classed as dragoons, their arms being saber, pistol, and carbine. During the civil war, when large masses of cavalry were brought together, they were formed into brigades, divisions, and corps, a brigade being composed of several—generally four or five—regiments; a division, of two or more brigades; and a corps of all the divisions serving with any army. When in active service it is usual to attach batteries of horse artillery to the cavalry, allowing generally one battery to each brigade. The cannoneers are all mounted for this service, and the guns used are usually light rifled pieces.

During the civil war the cavalry was used on both sides to picket all approaches, to cover all movements, to protect advances or retreats, and to make reconnoissances. The character of the ground on which the armies operated prevented as active participation in the great battles of the contest as is usual in European warfare, but the history of the war, when fully and impartially written, will show that on both sides this arm was not inferior in courage, discipline, soldiership, and achievements to any other.

During this war, however, the cavalry arm was not employed in the same manner or with the same effect as it has been in European armies in the great battles. In point of fact, as one of the "three arms," it was comparatively ineffective on the great battle-fields. Cavalry charges in actual battle were seldom made, except in cavalry combats, although on a few occasions they were employed against infantry. Most of the notions prevailing on the subject were found inapplicable to the actual conditions. Hence the use of cavalry was little more than to serve as mounted infantry; that is, for the purpose of conveying men rapidly from point to point, for the purpose of striking some sudden isolated blow or making what is called a *raid*. In most of the battles, however, the cavalry were dismounted and fought as infantry, often taking an important part. Two most notable instances of the kind occurred—one at the fight at Ream's Station, Aug. 25, 1864, where the dismounted Confederate cavalry carried a line of breastworks held by infantry; the other at Five Forks, where the Federal cavalry performed the same feat. During the civil war, 1861–65, there were many instances in which dismounted cavalry fought with the constancy and discipline of the best infantry, and despite the circumstances which prevented their use in heavy masses on the great battle-fields, many of the most gallant actions were performed by this arm of the service. The circumstances under which the war was fought, particularly the topographical features of the battle-fields, were such as to make it difficult to bring cavalry to bear in mass.

Revised by JAMES MERCUR.

Cav'an: a county of the province of Ulster, Ireland; area, 746 sq. miles; bounded by Fermanagh and Monaghan on the N. E., and Leitrim, Longford, Westmeath, and Meath on the W. and S. The surface is partly hilly and partly occupied by bogs. It is drained by the rivers Erne and Woodford. About three-fourths of the land is arable, but the soil is mostly poor, except near the rivers. Among

the rocks found here are clay-slate, gray-wacke, and carboniferous strata. It contains, coal, iron, copper, and lead. There are many mineral springs, and numerous highly picturesque lakes. There are some linen manufactures. The county returns two members to Parliament. The principal towns are Cavan, Cootehill, Belturbet, and Bailieborough. Capital, Cavan. Pop. (1881) 129,008; (1891) 111,679.

Cavanilles y Centi, kăă-văă-neel'yās-ĕe-thān'tĕe, Don Antonio: historian; b. in Coruña, Galicia, Spain, in 1805; became in 1841 a member of the Royal Academy of History, and soon after also a member of the Academy of Moral and Political Sciences. His *History of Spain* (5 vols., Madrid, 1860–64, not finished) is among the best historical works of Spanish literature. D. Jan. 2, 1864.

Cavatina [Ital.]: in music, a short operatic melody, simpler than the aria, without second and *da-capo* parts, a distinction, however, not uniformly observed by composers. A specimen is to be found in Meyerbeer's *Roberto il Diavolo*.

Cave, Cavern: an underground hollow space, more or less in communication with the surface. The largest caverns in the world are formed by the solvent action of subterranean waters on limestone rocks. The Mammoth Cave of Kentucky, Luray and other caverns of Virginia are the most noted in the U. S.; many others of less size are known. Percolating waters, carrying carbonic acid gas from the surface soils, may enter a cavern surcharged with limestone in solution; some of the limestone is then deposited owing to the acquisition of carbonic acid from the water. When the water flows on the walls or floor, it forms a calcareous incrustation. When dripping from the roof of a cave, it forms a pendant deposit called a stalactite, while a corresponding deposit, called a stalagmite, is built upward from the floor. These two forms may unite by convergent growth, building massive columns from floor to roof. Forms of great variety and beauty are thus produced, sometimes white, but generally yellowish, from a small amount of iron oxide. With the progressive wasting away of the land surface above, the roof of a cavern may be more or less completely removed, and the floor disclosed, while a remnant of the roof forms a rock arch through which a stream flows, as at the Natural Bridge of Virginia. Tubular caverns are found in lava flows, where the congealed surface of the flow stands as a roof while the liquid lava within has escaped. These are common on the Hawaiian islands. Caves of moderate depth are cut where strong sea waves beat on a bold rocky coast, eating away the weaker parts of the rock at water-level more rapidly than the cliff above retreats by weathering on its face. These always extend horizontally into the land mass, seldom for more than 50 feet. Fingal's Cave, Scotland (*q. v.*), is the most noted of this kind.

Plants do not grow in caverns, but a few species of fish, crayfish and crickets, nearly colorless and with undeveloped eyes, inhabit these dark regions; they are the degenerate descendants of similar species from the adjacent open country. Various caverns in Europe (Kirkdale, Kent, Brixham, and Dream caves in England, the Perigord caves in France, and Gailenreuth in Franconia, Germany, are among the most noted in this respect) have yielded numerous remains of extinct animals, such as the bear, hyæna, mammoth, horse, reindeer, rhinoceros, and others, their bones being found in the deposits that have been washed into the cave from above, or in the calcareous incrustation on the floor. Human remains have been found in such caves, associated with the bones of extinct animals. See Cave-dwellers.

W. M. Davis.

Cave, Alfred, D. D.: Congregationalist divine; b. in London, England, Aug. 29, 1847; graduated at London University 1872; became Professor of Hebrew and Philosophy at Hackney College, London, 1880, and principal and Professor of Theology 1881. He wrote *The Scriptural Doctrine of Sacrifice* (Edinburgh, 1877; 2d ed. 1890); *An Introduction to Theology, its Principles, its Branches, its Results, and its Literature* (1886); *The Inspiration of the Old Testament Inductively Considered* (1888).

Cave, Edward: printer; b. in Newton, Warwickshire, England, in 1691; founder of the *Gentleman's Magazine*, first issued in 1731. He was a friend and patron of Dr. Johnson. D. Jan. 10, 1754.

Cave, William: scholar; b. in Pickwell, Leicestershire, Dec. 30, 1637. He was educated at Cambridge; became vicar of Islington 1662; rector of All Hallows, London, 1679; canon of Windsor in 1684; and vicar of Isleworth in 1690. He published *Primitive Christianity* (London, 1672); a *History of Christ and the Apostles* (1676); *Lives of the Fathers of the Church in the Fourth Century* (1682); and *Historia Literaria* (1688–98, 2 parts), which were highly esteemed. D. in Windsor, Aug. 4, 1713.

Ca'veat [Lat. subjunc. pres. third sg., let him beware; deriv. of *cave're*]: in law, a formal caution or notice given to a court, judge, or ministerial officer to stay the performance of certain acts. It is used to prevent the enrollment of a decree in chancery; the issuing of a commission of lunacy; the admission of a will to probate; the grant of letters-testamentary to an executor; the issuing of letters-patent. A caveat in patent law is a written notice to the Patent Office of a person's claim to an alleged invention, to prevent the granting of letters-patent to another person while the caveat is in force, without notice to the caveator. The caveat papers must comprise, besides the petition, a specification and oath, and a drawing when the nature of the case permits, and must be limited to a single invention or improvement. Less particularity of description is required in a caveat than in an application for a patent, but it must set forth the object of the invention and its distinguishing characteristics with precision sufficient to enable the Patent Office to judge whether there is a probable interference in the case of a subsequent application for a similar invention. A caveat is filed in the confidential archives of the Patent Office, and preserved in secrecy, and is operative for a year. The caveator is entitled to notice of any application for an invention which would interfere with the invention as set forth in the caveat, and to the suspension of such application for three months after the notice. Within this time the caveator must file his own application, if he would avail himself of his caveat. A renewal of a caveat may be obtained by a written request and the payment of a second fee. Caveats may be filed by aliens who have resided in the U. S. for the year next preceding, and have made oath of their intention to become citizens. The U. S. patent laws, and laws relating to the registration of trade-marks and labels, and the rules of practice in the Patent Office may be obtained by application to the Commissioner of Patents.

Revised by F. Sturges Allen.

Ca'veat Emp'tor [Lat., let the purchaser beware]: an important rule in the law of sales of personal property. Its general meaning is that a purchaser must judge for himself of the quality of goods purchased. He will accordingly have no remedy against the seller if the goods turn out to be of an inferior character and of much less value than the price paid. The common law of England differs widely from the civil or Roman law, where the rule prevailed that a "sound price warrants a sound article." The rule (*caveat emptor*) must be confined to the *quality* of the goods. In the case of failure of the *title* to chattels sold by a person in possession, there is, according to the American decisions, an action against the seller, on the theory of an implied warranty. To the general doctrine of *caveat emptor* there are important qualifications. (1) The rule does not extend to cases of fraud. Where there is positive or active fraud, this is extremely clear. There is more doubt in the case where there is only concealment on the part of the seller. A distinction has here been taken between intrinsic and extrinsic defects. The latter would refer to cases where external circumstances affect the value of a chattel, as the outbreak of war or the conclusion of peace. The rule in such cases is that concealment is not a legal fraud, unless there is an active attempt to mislead. In the case of intrinsic defects there is great diversity of opinion. Some authors of repute hold that "the seller may allow the buyer to cheat himself *ad libitum*, but that he must use no effort to mislead." It is to be regretted that a view of the law should be taken so widely at variance with the dictates of common morality, and an effort should be made to find some satisfactory ground upon which they can be reconciled. It is believed that the seller is bound, *in law*, to disclose any facts within his knowledge of the nature referred to which can not be discerned by the exercise of ordinary observation and good judgment on the part of the buyer, and which materially affect the value of the chattel in ordinary estimation. To use a familiar illustration, if a seller knew that a horse which he exposed for sale in the ordinary manner had a secret defect not discernible by a careful purchaser, it would be a fraud on his part not to disclose it. Of course, this conclusion would not be arrived at

if he expressly stated that the sale was "with all faults," etc. (2) When a sale is made by a manufacturer for a special purpose, the better opinion is that the rule in question has no application. In other words, there is an implied warranty that the chattel is reasonably fit for the purpose for which it is bought. Some authorities of weight maintain that there is an implied warranty in all sales by manufacturers that there is no defect in the *process of manufacturing*, though they would not extend the doctrine to the materials used. (3) Wherever the reason on which the rule is founded fails, the rule itself gives way. The only rational ground of the doctrine of *caveat emptor* is that when a purchaser has an opportunity to examine goods he should act in the way in which a prudent man usually manages his affairs, and should notice such defects as he may be able to discover. Where there is no such opportunity for inspection, or where the seller takes the burden of selection upon himself, there is no room for the application of the rule. Accordingly, it does not apply to a true sale by sample; that is, where the bulk of the commodity is not present. In this case the seller impliedly warrants that the bulk of the commodity is equal to the sample. The purchaser must examine the sample for himself. If, however, that course is not open to him, the bulk of the commodity must be equal to the *apparent* qualities of the sample. Thus if an article like madder were sold by a sample contained in a sealed bottle, the bulk must equal the sample as it appears to the eye. The same general rule would apply to so-called executory contracts of sale, as where goods are sold at sea "to arrive" at a prescribed time. In the special case where the selection is made by the seller, the rule also fails. The distinction is put by one of the British judges in an apt form. He says: If the buyer says to the seller, "Sell me *a* gray horse to ride," there must be a horse supplied which the purchaser can ride. If, however, he had said, "Sell me *that* gray horse to ride," pointing to a particular animal, there would be no remedy, in the absence of fraud, if the horse were unfit to ride. In these cases another view might be taken. There is really no contract if the stipulated article is not supplied, the minds of the parties not having met. It seems very clear that if A proposes to sell B wheat by sample, and he furnishes on delivery wheat that does not correspond with the sample, there has been no agreement to buy the thing furnished, and it may accordingly be returned to A when its true character is discovered. (4) There is an exception to the rule in American law resting upon peculiar grounds, and it may be maintained though there be no fraud or other special circumstances. This is the sale of provisions for *domestic use*. There is an implied warranty that the goods are wholesome. The exception is not extended to sales by one dealer to another. It may be added that there is a corresponding rule (*caveat venditor*) applicable to the seller, who is bound in like manner to be on his guard in dealing with the purchaser, though this would also give way in cases of fraud. An instance is where the buyer, having learned that a war has ended, takes advantage of his superior knowledge to make purchases. Such a purchase would be legally valid, though if he misled the seller the fraud would vitiate the transaction. T. W. Dwight.

Cave-dwellers, or **Cave-men**: a term applied in European archæology to a population inhabiting certain portions of Western Europe in the palæolithic period of the stone age, and by extension to similar populations in other localities. In all ages men have sought shelter in natural caverns and in the protection afforded by overhanging cliffs, and have frequently artificially excavated such; but the cave-dwellers of the ancient period referred to appear to have selected such habitations for the seats of their densest population and most active industries. The remains of these industries, together with the refuse of their kitchens and workshops, usually became amalgamated with the cave mud, with the stalagmitic droppings from the ceiling, clay, pebbles, and charcoal, into a firm breccia, sometimes filling the original floor to a depth of 20 or 30 feet in successive layers. By carefully removing these layers and noting the contents of each, a correct opinion can be formed of their relative ages and the character of the civilization which the cave-dwellers of various ages enjoyed.

The caverns occupied by the cave-dwellers were not such as are chosen by wild beasts for their lairs. The latter are dark and narrow, while those selected as the abodes of men were more in the nature of rock-shelters, admitting light and air, and in convenient proximity to streams of water. The entrances are usually wide, the roof high, and the cavity not deep. Sometimes the walls were left in their natural state, but often they show signs of having been carved or dressed to render the cave more agreeable as a dwelling or more readily defensible against enemies.

The most characteristic caves of this period have been discovered in Southern Belgium, along the valley of the river Meuse, and in the valley of the Vezère, a branch of the Dordogne, in Southwestern France. About 1860 much attention was excited by the exploration of a cave near Aurignac, in Southern France, by M. Lartet, who was among the first to define clearly the traits of this ancient population. In England the cavern of Kent and others in Devonshire have yielded similar remains, and others on the Clyde and in Wales have been claimed by some to present the oldest specimens of man's handiwork yet discovered in Great Britain, referable even to a period before the glacial epoch. While all have not allowed this claim, there is no doubt that many English caves were inhabited in early palæolithic times. On the borders of Switzerland, the contents of a cave on Mont Salève, near Geneva, and the celebrated Kessler-hole in the canton of Schaffhausen, prove that the typical cave-dwellers extended that far to the east. To the south, near Mentone, at a locality called Baoussé-Roussé, remarkable caverns have been explored which were occupied by human beings at a most remote epoch; in Spain, near Santander on the northern coast and along the slope of the Sierra Nevada on the southern, evidences of like character have been exhumed.

The relative antiquity of the cave-dwellers has been ascertained by the close association of their relics with the remains of animals now extinct either altogether or in the locality. To the former class belong the cave bear, the saber-toothed tiger—a most formidable animal—the woolly rhinoceros, the Irish elk, some species of hyænas, and especially the hairy mammoth. Of animals which then lived in Southern Europe, but disappeared from there before the dawn of history, may be especially mentioned the reindeer and the musk ox, whose bones are found in large quantities in the caves, and the presence of which testifies to the prevalence at the time of a climate in Southern France almost as cold as that of Lapland to-day. Bones of a small species of horse are abundant, but it was evidently merely regarded as game, and was killed for food. No remains of dogs have been found, showing that at that early day this companion of man in so many climes had not yet been domesticated. The abundance of fish-bones indicates that the cave-dwellers depended on the water for a large part of their subsistence; while the relative scarcity of the remains of birds, as well as the character of the weapons found, point to the inference that they had little skill in securing flying animals. Nothing indicating the practice of agriculture or the domestication of animals has been discovered. In French archæology the general type of culture of the cave-dwellers is called the "Moustérien," from the cave of Le Moustier, a station which has been peculiarly rich in characteristic objects.

The cave-dwellers were acquainted with the use of fire, which was indeed necessary in their rigorous climate; but they had not acquired the art of pottery, nor that of polishing or boring stone. They were accustomed to cook their food, as the condition of the bones testifies. Their weapons and utensils were of bone, stone, horn, and doubtless wood, though the latter have perished. Countless arrow and lance heads of flint and other hard stones, knives, scrapers, and gouges of the same material, have been exhumed, many of them of symmetrical form and fine workmanship. The presence of bone needles and awls justifies the inference that they were used in sewing skins together for raiment, and therefore that the cave-dwellers went about clothed. Whistles or hunting-calls, made of the bone of the hind foot of the reindeer, were evidently employed in the pursuit of that animal. Small pebbles having a cavity on one side, and which are believed to have been used for paint-pots, indicate that they were given to decoration in colors. This is corroborated by the frequent discovery of ornaments made from ivory or by perforating the teeth of animals in order that they might be arranged on a string. Perforated marine and fresh-water shells, and flat pieces of ivory similarly bored, were doubtless esteemed as badges or gorgets. Remarkable artistic skill is indicated by the figures cut or scratched on many of the pieces of bones and horns exhumed in the caves. They represent, often with surprising

life and fidelity, the outlines of fishes, deer, horses, and human beings, and, what is more extraordinary, the hairy mammoth with its long mane, curved tusks, and pendant trunk. Some few small figures carved from bone or horn have been reported, showing that with their imperfect tools they sought to represent the forms of the animals around them.

The cave-dwellers were not cannibals. Among the many bones which remain as relics of their repasts none have been found of human beings. They appear to have had extremely dim religious impressions; few or no objects have been discovered which can be held to be idols or amulets. Nor do they appear to have had funeral rites; they neither buried nor burned the dead. In a few instances the bones of some of these ancient people have been preserved through accidents, as the sudden falling in of the roof of a cave. One such deposit occurs in the celebrated cave of Cro Magnon, in the south of France. This enables the modern anatomist to speak of their physical appearance. The skeletons of Cro Magnon belonged to a tall race, both men and women nearly 6 feet high, powerfully built, with long, narrow skulls, broad faces, and powerful jaws. The shin bones were flattened, as occurs in some of the lower races to-day. Similar investigations in the Belgian caves lead to the belief that they were occupied by a much smaller race, but with symmetrical bodies and well-shaped heads.

Literature.—W. Boyd Dawkins, *Cave Hunting* (London, 1874); De Mortillet, *Le Préhistorique Antiquité de l'Homme* (Paris); Nadaillac, *Manners and Monuments of Prehistoric Peoples* (New York, 1891). D. G. Brinton.

Cave-fish: See Amblyopsis.

Caven, William, D. D.: Presbyterian divine of the Dominion of Canada; b. in Kirkcolin, Wigtonshire, Scotland, Dec. 26, 1830; studied privately; received the degree of D. D. from Queen's University, Kingston, in 1875. He was pastor of St. Mary's and Downie 1852–65, and from 1865 Professor of Exegetical Theology and Biblical Criticism in Knox College, Toronto; in 1873 principal of the college; supported the successive acts of union by which the Presbyterian Church throughout the Dominion of Canada has become one.

Cav'endish: See Devonshire, Dukes of.

Cavendish, Frederick Charles, Lord: the second son of the seventh Duke of Devonshire; b. Nov. 20, 1836; graduated at Trinity College, Cambridge, 1858; sat in Parliament for the West Riding of Yorkshire 1865–82; private secretary to Lord Granville and Mr. Gladstone; held a lordship in the Treasury 1873–74; Financial Secretary of the Treasury 1880–82; Chief Secretary of Ireland 1882. On May 6, the day of his arrival in Dublin, he and his under secretary, Mr. Burke, were assassinated in Phœnix Park. The affair caused great excitement. Three of the conspirators turned state's evidence, and the other seventeen were punished, five of them being hanged.

Cavendish, Henry: chemist and physicist; b. in Nice, Italy, Oct. 10, 1731; d. in Clapham, London, Mar. 10, 1810; studied at Peterhouse, Cambridge, but took no degree. He was the possessor of a large fortune, and devoted himself to the natural sciences, particularly chemistry and physics. By his discovery of hydrogen in 1766 he contributed essentially to the overthrow of the phlogiston theory, which had long controlled the thoughts of chemists, and thus laid the foundation of pneumatic chemistry. He discovered that water is a compound of oxygen and hydrogen in certain proportions. The "Cavendish experiment" was a device of his for determining the earth's density. He was distinguished for the precision and accuracy of his processes, in spite of the rude appliances of his times. His *Electrical Researches* were edited and published by J. Clerk-Maxwell in 1879. He lived in extraordinary seclusion, as if dreading the face of man. See his *Life* by G. Wilson (London, 1846).

Cavendish, Sir Thomas: navigator; b. at Trimley St. Martin, Suffolk, England, about 1555; studied at Corpus Christi College, Cambridge, but left it without a degree; fitted out a ship and went to Virginia in 1585 with the expedition commanded by Sir Richard Grenville. After his return to England, Cavendish sailed from Plymouth July 21, 1586, with three small vessels, destroying, on the coasts of Chili, Peru, Mexico, and California, nineteen ships, including the Santa Anna, which belonged to the King of Spain and had an immensely valuable cargo. Cavendish returned to England by way of the Cape of Good Hope, having thus become the third circumnavigator of the globe. For this he was knighted by the queen. He afterward discovered the harbor of Port Desire, on the east coast of Patagonia, while attempting again to sail round the world. D. off Ascension island in 1592.

Cavendish, William: Duke of Newcastle; b. in 1592; son of Sir Charles Cavendish; educated at Cambridge; won honor and titles from James I. and Charles I., and in 1638 became governor to the latter's son, afterward Charles II. In the war with the Parliament he aided the king munificently and commanded the royal forces N. of the Trent, with regal prerogatives. He resided on the Continent during the commonwealth; became Duke of Newcastle in 1665. D. Dec. 25, 1676. He wrote a treatise on horsemanship and some poor comedies. See his *Life* by his second wife (n. ed. London, 1886).

Cavern: See Cave.

Cavery, kaw'ver-i, or **Cauvery** (anc. *Chaberis*): a river of India; in the Deccan; rises in the Ghats, about lat. 13° N. and lon. 76° E. It flows southeastward through Mysore, and after a course of about 470 miles enters the sea by many mouths. Its delta is mostly in the district of Tanjore. It is eminently available for irrigation and useful in agriculture.

Caviar, kăv'i-ăar, or **Caviare**, ka-veer': the prepared and salted roe of the sturgeon; made chiefly in Russia, the Caspian fishery alone sometimes yielding several hundred tons annually. There are six or seven species of sturgeon caught for their yield of caviare—species chiefly living in the Caspian and Black Seas and their tributary streams. The roe of the sterlet (*Acipenser ruthenus*) is the best, and its caviare is reserved for the imperial court. Caviare is proverbially disagreeable to the uneducated palate, though highly esteemed by the initiated. It is now manufactured quite extensively in the U. S.

Cavite, kăă-vĕĕ-tay': a fortified seaport-town of Luzon, one of the Philippine islands; on the Bay of Manila; 3 miles S. W. of the city of Manila (see map of East Indies, ref. 3–G). It was formerly the chief naval dépôt of the Spanish possessions in the East. It was captured by Commodore Dewey, May 3, 1898. Pop. about 6,500.

Ca'vo, Andres: Mexican Jesuit and historian; b. in Guadalajara, 1739; a missionary among the Indians until the expulsion of his order from Mexico in 1768. He wrote a history of the conquest and Spanish dominion, first published by Bustamente, with the title *Los tres siglos de Méjico durante el gobierno español* (Mexico, 1836). Cavo probably died at Rome some time after 1794. H. H. S.

Cavour, kăă-voor', Camillo Benso, Count di: statesman; b. in Turin, Italy, Aug. 10, 1810; of an aristocratic Piedmontese family; son of the Marchese Michele di Cavour and his wife Adelaide Syllon d'Allamar, an accomplished Swiss lady. Camillo, a younger son, was destined for the army. In the military academy at Turin he showed such proficiency in mathematical studies that he was made an engineer officer at the age of sixteen, and given responsible commands. Military life was repugnant to his tastes, and he entertained radical opinions which he did not hesitate to utter, and thereby displeased the king, Charles Albert. He therefore left the army in 1831, and turned his attention to agriculture, taking part also in the reform agitations of the time. He pursued a zealous inquiry into social and industrial questions, visiting England and France for that purpose. He was one of the founders of the Associazione Agraria, an energetic reform society, and started the liberal journal *Il Risorgimento* in 1847. When in 1848 the liberal party came into power and a constitutional frame of government was accorded to Sardinia, Cavour stood at the head of the moderate republican press, and, elected to the Chamber, he took an important part in the debates, supporting the moderate ministry of D'Azeglio and opposing the violent demands of the Left, whereby he lost in great measure his popularity. In 1850 he was appointed minister of commerce, in 1851 of finance, and in 1852 he became premier, accomplishing a fusion of the Right Center with the Left Center under Ratazzi. From that time forth he conducted the policy of Italy, bringing about finally its political consolidation amid stormy internal commotions and foreign complications. He promoted free trade and religious toleration, and opposed the encroachments of the papal power. His idea was "A free Church in a free state." Full freedom should be secured for the Church in all spiritual

affairs, and for the state in all civil affairs. The radicals, who proposed to confiscate all the estates of the Church, he opposed as decidedly as the Ultramontanists, who hoped to make the state a mere tool in the hands of the Church. The grand aim of his diplomacy was to promote the union of the Italian peoples and the liberation of Italy from foreign domination, and his first moves in that direction were the formation of an alliance with France and Great Britain and the participation in the Crimean war. When the audacious scheme proved successful, an Austrian diplomatist said, with good reason, that it was a pistol-shot fired in the face of Austria. At the congress of Paris in 1856 he succeeded in bringing the Italian question on the *tapis*, and provoked the hostility of Austria. In 1858 he made a secret treaty with Napoleon III. involving a plan to drive Austria from Italy, and the Franco-Sardinian war followed the next year. The Austrians were defeated, and obtained peace by ceding Lombardy, which was annexed to the Sardinian states. Cavour resigned office in July, 1859, because he disapproved the provision of the treaty of Villafranca, which allowed Austria to retain Venetia, but he resumed the position of prime minister in Jan., 1860. In consequence of the victories of Garibaldi and the general uprising of Italian patriots in 1859 and 1860, nearly all Italy was liberated and united. Cavour was prime minister of the new kingdom of Italy when he died on June 6, 1861. He was never married. He left the reputation of being one of the greatest statesmen of modern times. See *Reminiscences of the Life of Cavour*, translated from the French by Edward Romilly (1863); Edward Dicey, *Cavour, a Memoir*; Bianchi, *La Politique de Cavour* (Paris, 1885); and the biographies by Massari (Turin, 1873) and Mazade (Eng. trans. London, 1877).

Ca'vy [from the native Guiana name *cabiai*]: the name of various South American tailless rodent mammals, closely related to the porcupine family, and by most naturalists referred to the family *Caviidæ*. There are four molar teeth in each jaw, and in the genus *Cavia* these are compound; there are four toes on each of the fore feet, and three on the hind feet, the feet not being webbed. The females have only two teats. One species, *Cavia cobaya*, has long been domesticated as a pet and plaything of children. It is called usually the "Guinea pig," although it is neither a pig nor a native of Guinea. Other related species are very numerous in parts of South America. See GUINEA PIG.

Cawnpur', or **Cawnpore**: a town of Hindustan; on the right bank of the Ganges, which is here nearly a mile wide; about 96 miles S. W. of Lucknow; lat. 26° 29′ N., lon. 80° 25′ E. (see map of N. India, ref. 6–F). It is an important British military station, having cantonments which accommodate about 7,000 men. Connected with the cantonments are several hundred bungalows for the officers, which are fitted up luxuriously and have large gardens. During the mutiny in 1857, Nana Sahib massacred here a number of British captives, including 125 women and children. A handsome monument to their memory has been erected over the well into which their bodies were thrown. Pop. (1881) 119,603; (1891) 182,310.

Caxamarca: See CAJAMARCA.

Caxamarquilla: See YUNCAN ANTIQUITIES.

Caxias, kăă-shee'ăăs: a city of the state of Maranhão, Brazil; on the east side of the Itapecurú river: about 250 miles S. of the city of Maranhão; population about 10,000. Steamboats ascend the river to this point, and it is the commercial center of a large agricultural and grazing district. Caxias grew from the old Indian village and Jesuit mission of Aldeas Altas. It was made a city in 1836. In 1839 it was taken and sacked by the *Balaios* rebels. H. H. S.

Caxias, kăă-shē'-as, DUKE OF: See LIMA E SILVA, LUIZ ALVES.

Cax'ton, WILLIAM: merchant; b. in Kent, England, about 1422; was the first to introduce printing into England. In 1464 he was employed to negotiate a treaty of commerce between Edward IV. of England and the Duke of Burgundy. He translated from the French a *History of Troy*, which he printed in Bruges in 1474. This is said to be the first book ever printed in the English language, as his *Dictes and Sayings of the Philosophers* is the first book, so far as known, published in England, 1477. After he had resided for some time at the court of the Duchess of Burgundy, he returned to England and established a printing-office in Westminster in 1476, where he printed several other books. D. about 1492. Most of his books were of his own translation, were in folio, and may be called "black-letter" books. See his *Life* by Blades (1861–63), also his *Biography and Typography of Caxton* (2d ed. London, 1882).

Cayambe, kī-ăăm'băў, or **Cayambe-Urcu'**: a mountain in Ecuador; a peak of the Colombian Andes; is directly under the equator, and about 45 miles N. E. of Quito. It has a beautiful conical form, and an altitude of 19,386 feet. It is covered with perpetual snow, and forms one of the most remarkable landmarks on the globe.

Cayenne, kā-yen', or kī-en': a seaport-town of South America; capital of French Guiana; on the Atlantic, and on an island of same name; at the mouth of the Cayenne river; lat. 4° 56′ N., lon. 52° 13′ W. (see map of South America, ref. 2–F). It has a shallow harbor, and is defended by a fort and batteries. Considerable quantities of coffee, sugar, cotton, indigo, and cacao are exported from this place. The imports are French wines, spirits, liqueurs, and vinegar, silk and cotton stuffs, tobacco, hardware, glass, earthenware, and clothing, preserved meat, fish, vegetables, maize, flour, hay, etc. For many years the import trade has been steadily increasing and the export trade is steadily decreasing. Cayenne island is about 30 miles in circumference, and is separated by a narrow channel from the mainland. Cayenne is a penal colony to which criminal offenders are transported. Yellow fever and other fevers often attack the residents, probably originating from the vast swamps which surround it on two sides. Pop. (1886) 12,524.

Cayenne Pepper: See PEPPER, RED.

Cayes, kay: a seaport-town of Hayti; on its southern coast; 92 miles W. S. W. of Port-au-Prince (see map of West Indies, ref. 6–F). Pop. 3,000.

Cay'ley, ARTHUR: mathematician; b. at Richmond, Surrey, England, Aug. 16, 1821; graduated at Trinity College, Cambridge, 1842; became a barrister and conveyancer, but at an early age devoted himself to mathematics, which subject he enriched by a series of memoirs continued without cessation from 1841 until his death in London, Jan. 26, 1895. In 1861 he was appointed Sadlerian Professor of Pure Mathematics in the University of Cambridge. In 1882 he lectured in Johns Hopkins University, Baltimore. SIMON NEWCOMB.

Cayman, kay'man: the name applied in many parts of South America to any of the alligator family, or even to the crocodiles. In a scientific sense it is restricted to certain species of the genus *Caiman*, inhabiting Central and South America. They are distinguished from other crocodilians, other than the jacares, by an armor of bony plates on the under side of the body, and from the jacares by having the bony part of the eyelids smooth, and by the absence of a bony ridge between the orbits. See CROCODILE.

F. A. LUCAS.

Caymans, The: three small islands in the Caribbean Sea; belong to Great Britain; 130 miles N. W. of Jamaica (see map of West Indies, ref. 5–C). Chief product, turtles. Area, 225 sq. miles. Pop. 2,400. They are politically attached to Jamaica.

Cayu'ga: a post-town of Ontario, Canada; capital of Haldimand County; on railroad and Grand river, which is navigable; 14 miles from its entrance into Lake Erie, and 25 miles S. of Hamilton (see map of Ontario, ref. 5–D). It has a heavy trade in grain and plaster. Pop. about 1,000.

Cayuga Indians: See IROQUOIAN INDIANS.

Cayuga Lake: a beautiful lake of New York; on the boundary between Cayuga and Seneca Counties; is about 38 miles long. Its width varies from 1 to 3 miles, and its greatest depth is supposed to be above 500 feet. The surface is 387 feet above the level of the sea. Its banks are formed of Silurian and Devonian rocks. Whitefish and many other species of fish are caught in it. Steamboats ply daily between Cayuga Bridge and Ithaca, which is at the head of the lake. The outlet of this lake flows into Seneca river, a tributary to Lake Ontario.

Cayuse Indians: See WAHLATPUAN INDIANS.

Cazal, MANUEL AYRES, de: Portuguese historian; b. in 1754. He took orders, and for many years was prior of the town of Crato, in Goyaz, Brazil. He spent his leisure in studying the history and geography of the country, and published the results with the title *Corographia Brasilica, ou relação historica-geographica do reino do Brazil* (Rio de Janeiro, 1817; 2d ed. 1845), a work of great value. Cazal returned to Portugal in 1821, and died soon after.

HERBERT H. SMITH.

Cazalès, kăă'zăă'lĕs', Edmond, de: b. at Grenade-sur-Garonne, in the department of Haute-Garonne, Aug. 31, 1804; d. at Rennes, Jan. 28, 1876. He studied law and received some appointment at the tribunal of Provins. But his interest was entirely occupied by the religious questions of the time—the possibility of effecting a reconciliation between the Roman Catholic Church and the French Revolution. In 1829 he gave up the legal career; in 1843 took holy orders; in 1845 was appointed director of the Ecclesiastical Seminary of Montauban; in 1848 took a prominent part in political affairs, and again in 1871–72. Besides a great number of articles in various periodicals and some devotional books, he published *Étude historique et critique sur l'Allemagne contemporaine* (Paris, 1853) and *Nos maux et leurs remèdes* (Paris, 1874), which latter book attracted much attention.

Cazalla de la Sierra, kăă-thaal'yăă-dā-lăă-sĕĕ-er'răă: a town of Spain; province of Seville; 39 miles N. N. E. of the city of Seville (see map of Spain, ref. 19–D). It is on a declivity of the Sierra Morena, and in a district which abounds in silver, copper, iron, and marble. It has manufactures of linen, machinery, etc. Here are several ruined villas and Roman and Arabic antiquities. Pop. 8,322.

Cazem'be, or **Kasembe**: properly the hereditary name of an African chief whose territories lie E. of and adjoining Lake Moero, and N. of Lake Bemba, or Bangweolo; in lat. 7° to 10° S. The dynasty was formerly very powerful, but has steadily declined, until the name Cazembe is now limited to a native town near the southern end of Lake Moero, in about lat. 9° S., long. 29° E.

Cazeno'via: village (founded in 1793): Madison co., N. Y. (for location of county, see map of New York, ref. 5–G); on E. C. and N. and West Shore (Chenango Branch) R. Rs., and on a lake 4½ miles long; 18 miles S. E. of Syracuse. It has churches of five denominations, and a graded school; and is the seat of Cazenovia Seminary. There are here a few manufactories, but the village is supported chiefly by agriculture. Numbers of summer visitors are attracted to the village by its beautiful situation. Pop. (1800) 1,918; (1890) 1,987; (1900) 1,819. Editor of "Republican."

Cazin, kăă'zăń', Jean Charles: contemporary artist of the French school; b. in Samer, Pas-de-Calais, about 1840; pupil of Le Cocq de Boisbaudran; first-class medal, Salon, 1882; officer Legion of Honor 1889. Though he is most properly classed as a landscape-painter, Cazin has also a decorative side in his painting, and frequently introduces figures, sometimes even making them the subjects of his pictures, but never treating them as the chief element, and never concentrating the interest in them at the expense of their surroundings. His *Judith* (1883), *Ishmael* (1880), *The Flight into Egypt* (1877), *Tobit* (1880), and other pictures contain figures, but they possess only equal importance with the landscape. His figures and his landscape are treated as units in an harmonious ensemble, each color-note holding its proper place, and each modification of "value," or strength in light and shade, maintaining the needful force. His pictures are tender and beautiful in color. He has a studio in Paris and another at his country home at Bourron, near Fontainebleau. William A. Coffin.

Cazotte, kăă'zot', Jacques: French poet; b. in Dijon, 1720; educated by the Jesuits; author of the *Roman d'Olivier* (Paris, 1762); *Le Diable Amoureux* (Paris, 1772), etc. His style resembled that of Voltaire. Executed as a Royalist, Sept. 25, 1792.

Ccápac Yupánqui, or **Cápac Yupánqui**: fifth sovereign of the Inca line of Peru; reigned in the second quarter of the fourteenth century. Under him the tribes immediately west of Cuzco were subdued and conquests were carried southward to the Vilcañota Mountains, on the edge of the Titicaca basin. H. H. S.

Ceano'thus america'nus, New Jersey Tea, or **Redroot**: a shrubby plant of the family *Celastraceæ*; a native of the U. S. It is about 2 feet high, and has ovate, serrate leaves, which were used as a substitute for tea during the Revolutionary war. It has small white flowers in clusters, which are crowded in dense panicles. The beautiful native shrubs called in California wild lilac belong to this genus.

Ceará: city. See Fortaleza.

Ceará: a northeastern state of Brazil; bounded N. by the Atlantic, E. by Rio Grande do Norte and Parahiba, S. by Pernambuco, and W. by Piauhy; area, 40,240 sq. miles. Pop. officially estimated (1888) at 952,625, which is probably above the truth. Capital, Fortaleza. The interior forms part of the Brazilian plateau, from 2,000 to 3,000 feet high, but with numerous valleys. It is abruptly cut down to a strip of low land, 15 to 50 miles wide, along the coast. The so-called mountains of Ibiapaba, Baturité, etc., are simply the edges of the plateau. The rivers are small, and most of them disappear in the dry season. The land is either open or covered with scrubby *cerrado* growth; the only true forest is along the edge of the plateau. The heaviest rains are from January to April. From May to October the state is absolutely rainless, and vegetation dries up except in the valleys and near the plateau escarpments. Over large districts water can be obtained only by digging in the river-beds. The soil is fertile, but owing to the lack of water little of it can be used for agriculture. It affords excellent pasturage, and grazing is the principal industry, the cattle being kept on the high lands during the rains and driven to the river-bottoms in the dry season. Ceará is subject to periodical droughts, when the rains are suspended for one, two, and sometimes three or four years. These cause great loss and suffering. In the great drought of 1877–80 half the population died of famine and pestilence, the herds were nearly destroyed, and the interior was practically deserted. Attempts have been made to avoid these evils by forming great reservoirs and irrigation systems. The whites, who constitute the better class of Ceará, are intelligent and enterprising. The peasantry are a peculiar race of mixed white, Indian, and Negro blood, very ignorant and dirty, but excellent herdsmen and capable of great endurance. The whole coast is surf-washed and without harbors. Vessels anchor in roadsteads, and passengers and freight are transported through the surf on sailing rafts called *jangadas*. The exports are hides, Ceará rubber, sugar, and coffee.

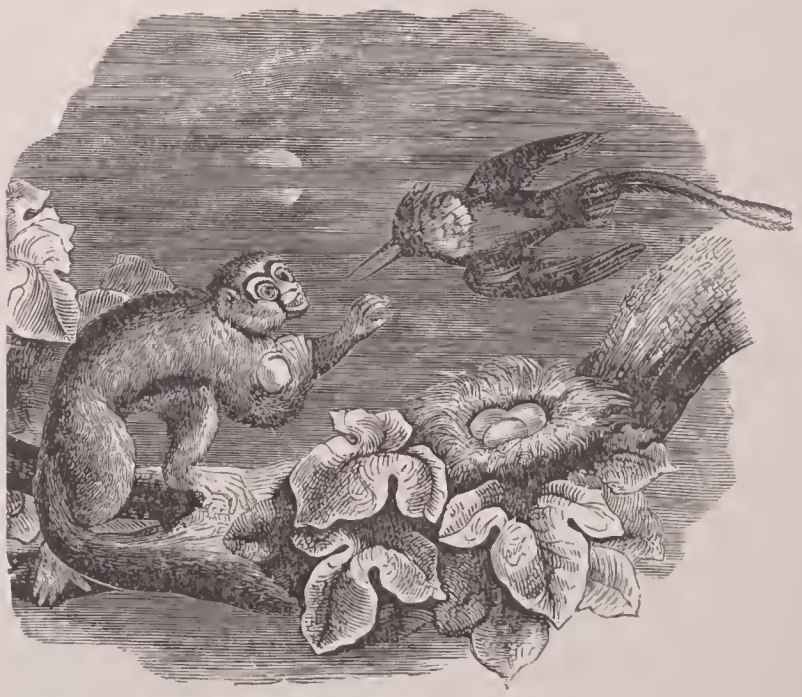
Ceará was the first Brazilian province to free her slaves, mainly by private subscription in 1883 and 1884.

See Pompeo, *Ensaio Estatistico da Provincia do Ceará* (1863); T. A. A. (Alencar Araripe), *Historia da Provincia do Ceará* (Recife, 1867); Koster's and Gardner's travels; Rodolpho Theophilo, *Historia da Secca do Ceará* (Fortaleza, 1883); Theberge, *Esboço historico sobre a provincia do Ceará* (Fortaleza, 1870). Herbert H. Smith.

Ceballos, Pedro de: See Zeballos.

Ce'bes of Thebes: a disciple of Socrates who figures in the *Phædo* of Plato. The *Picture of Cebes* (Πίναξ Κέβητος), an allegorical description of life, was for centuries exceedingly popular. As the Peripatetics are mentioned in c. 13, the author of this performance can not be the Socratic Cebes, if he is a Cebes at all, and the work belongs in all probability to the first or second century after Christ. Ed. by Drosihn (1871); by Kraus (1882); Parsons (Boston, 1887).

Ceb'idæ [deriv. of Gr. κῆβος, monkey]: a family of American monkeys, characterized by the want of an external



Cebus, or Sajou monkey.

bony auditory meatus, widely separated nostrils, and thirty-six teeth (molars, $\frac{3}{3}$; pre-molars, $\frac{3}{3}$). They represent in trop-

ical America the monkeys of the Old World. They feed chiefly on fruits, but also on eggs, insects, worms, and mollusks. The family includes most of the South American monkeys. The typical genus is *Cebus*.

Cebú: See ZEBÚ.

Cecidomyia, ses-i-dō-mī'i-a [from Gr. *κηκίς*, *-ίδος*, gall-apple, + *μυία*, fly]: a genus of two-winged insects (*Diptera*) or true flies, the members of which are sometimes called gall-gnats. They are minute flies with downy wings, long antennæ with whorls of hairs on each joint, and slender legs. Over sixty species from Europe have been described, and there are probably as many in the U. S. On account of their small size they readily escape notice, but on account of the damage they do some forms are serious pests. The eggs are laid on various kinds of plants, and the larvæ, sucking the juices, produce injuries. In some cases the result is the formation of enlargements or galls; in others the vitality of the plant is sapped, and in certain grains the crop is seriously injured. The most injurious forms are the clover-midges, one of which prevents the formation of seed, the barley-midge, the wheat-midge, and the so-called HESSIAN-FLY (*q. v.*). J. S. K.

Cecil, ses'il, or sis'il, RICHARD: an evangelical clergyman of the Church of England; b. in London, Nov. 8, 1748. In early life he was skeptical and profligate, but, converted, he resolved to enter the ministry; studied at Oxford, graduated B. A. 1777; held country livings; became minister of St. John's chapel, Holborn, London, 1780. D. in Belle Vue, Hampstead, Aug. 15, 1810. His works were published (London, 1811) in 4 vols. 8vo. The fourth volume, containing his *Remains*, is considered the most valuable. There is also an American edition (New York, 1845) in 3 vols. 8vo. *Original Thoughts in Holy Scripture* appeared London, 1848. See his memoir by his widow (London).

Cecil: See BURLEIGH.

Cecil, Lord ROBERT: See SALISBURY, MARQUISES OF.

Cecil'ia, SAINT: a Roman virgin who is supposed to have suffered martyrdom under Marcus Aurelius. The legend runs that her pagan parents betrothed her to young Valerian, she being secretly a Christian. He and his brother soon suffered martyrdom together. Refusing the imperial sacrifice she was thrown into a boiling caldron, but emerged apparently unscathed. Thrice the terror-stricken executioner struck to behead her, and then fled. Three days after the girl died and was buried in the catacomb of Callistus. In 821 Pope Paschal placed her bones in the new Church of St. Cecilia in Rome. She is regarded as the patroness of musicians and the inventor of the organ. Numerous musical societies in Europe and elsewhere have been named after her. Raphael (canvas in Bologna), Domenichino (in the Louvre), Rubens (in Berlin), and other great artists painted pictures of her, and Dryden wrote a celebrated *Ode for St. Cecilia's Day*. Her festival is Nov. 22, and in Rome is celebrated with fine music. She must not be confounded with St. Cecilia of Africa, who is said to have been starved to death under Diocletian, and whose calendar day is Feb. 11.

Cecilius: See CÆCILIUS.

Cecro'pia: a genus of forty or more species of soft-wooded diœcious trees of the Nettle family (*Urticaceæ*), natives of tropical America. They contain a milky juice which contains caoutchouc, and bear large, alternate, long-petioled peltate and lobed leaves. The flowers, which are apetalous and inconspicuous, are followed by compound, edible fruits resembling a raspberry, which in some species they are said to resemble in flavor. The best-known species is *C. peltata* of the West Indies, an evergreen tree 40 feet in height with leaves a foot in diameter, green above and white below. It is called smoke-wood, or more commonly trumpet-wood, musical instruments being made from its hollow branches. It is somewhat grown in conservatories as an ornamental, broad-leaved evergreen. In its native country its tough bark is used for cordage. C. E. B.

Cecropia Moth: a lepidopterous insect of the family *Bombycidæ*; nearly related to the silkworm. The systematic arrangement of this family is unsettled, but of the numerous names proposed for this insect perhaps *Platysamia cecropia* is the best. This is the largest North American moth yet known. When expanded it often measures 6½ inches across. It is of a dusky gray color, variegated with white, black, and various neutral tints. It appears in the U. S. in June, and is a most striking and beautiful object. Its larva is over 3 inches long, of a light-green color, with red and yellow warts armed with bristles. The cocoon is of a very strong silk, which is abundant in quantity, but can not be reeled. It has, however, been carded and spun into an excellent thread, and but for the delicate character of the larvæ, which are hard to raise, it would become an important article of commerce. The *Telea polyphemus*, an American relative of this moth, has attracted much attention from the excellence of its silk and the hardiness of its young. The ailanthus silkworm of China also closely resembles the larva of the cecropia moth. From the fact that the common silkworm has become subject to several destructive diseases, the scientific world is much interested in the effort to find another silkworm which shall be hardy and productive of useful cocoons.

Ce'crops, or **Kekrops** (in Gr. *κέκροψ*): a semi-fabulous hero of the Pelasgian race; called the first king and legislator of Attica. According to tradition, he instituted marriage and instructed the Athenians in agriculture, navigation, religion, etc. The people of Attica were sometimes called Cecropidæ.

Cedar [deriv. of Lat. *cedrus*, Gr. *κέδρος*]: the common name of several species of evergreen trees of the family *Coniferæ*, which afford durable and valuable timber. The name red cedar is given to the *Juniperus virginiana*, a native of the U. S., which is prized for its durable, compact, and odorous wood, and is used by cabinet-makers. It grows mostly in dry and sterile soils. In the Western States it attains the height of 70 feet or more, but in the Eastern States it is a small tree. The American white cedar (*Chamæcyparis sphæroidea*), an evergreen tree, abounds in the swamps of the Eastern U. S., and grows from 30 to 90 feet high. The timber of this tree will remain for a long time under water without decaying, and is an excellent material for posts of fences and for shingles. Various other coniferous trees are called cedars in the U. S. The name white cedar is given in the U. S. to the wood of *Chamæcyparis sphæroidea* and *Thuya occidentalis*—the latter throughout the Northern States. The cedar of Lebanon is the true and original cedar. It is not, like the American cedars, related to the cypress, but to the pine and larch, the foliage resembling that of the latter, but evergreen as in the former. The cones are similar to those of the larch, but are larger and very broad. *Cedrus*, the cedar genus, consists of three species, which are by some supposed to be geographical varieties of one—viz., *Cedrus libani*, confined to Lebanon, the Caucasus, etc.; *C. atlantica*, of the Atlas Mountains; and *C. deodara*, the deodar of the Himalayas. The character of the light reddish, fragrant, and durable timber is the same in all these. They thrive in England, and even in Scotland, but not in any part of the Atlantic U. S. They grow well on the U. S. Pacific coast. Of the celebrated cedars on Mt. Lebanon eleven groves still remain. The famous B'Sherreh grove is ¾ of a mile in circumference, and contains about 400 trees, young and old. Perhaps a dozen of these are very old; the largest, 63 feet in girth, is thought by some to have attained the age of 2,000 years. The name of cedar also is applied to the wood of a few trees which are not related to the *Coniferæ*, the color and odor being somewhat similar. Spanish cedar, of which cigar-boxes are made, and which is used for wardrobes and sometimes for lead-pencils (as a substitute for red cedar), is the wood of *Cedrela odorata*, a West Indian tree of the mahogany family.

Cedar-bird, or **Cherry-bird** (*Ampelis cedrorum*): a species of wax-wing (*Ampelidæ*); abundant in America; a graceful little bird, of a soft-brown color, not musical, feeding upon insects and fruits.

Cedar Creek: a creek which gives its name to one of the most brilliant actions of the civil war in the U. S. It rises in Shenandoah co., Va., and flows into the North Fork of the Shenandoah river, about 4 miles below Strasburg. On Oct. 19, 1864, Sheridan's army was encamped along this creek, the Eighth Corps forming its left about ¾ of a mile from the North Fork, the Nineteenth Corps, Sixth Corps, and the cavalry continuing the line to the right. Sheridan was temporarily absent from his army, having been called to Washington for consultation, and Gen. Wright was left in command. Reconnoissances upon both flanks on the 18th discovered no signs of an early movement on the part of the enemy, and no immediate attack was expected. At daybreak (about five o'clock) the Confederates, who by a night march had placed themselves upon the left and rear of the Union line, attacked the left wing in flank and rear, com-

pletely surprised and routed the Eighth Corps, and, following up the attack, forced back the Nineteenth Corps in some confusion.

Gen. Wright, with the Sixth Corps, part of the Nineteenth, and a force of cavalry, succeeded at about 9 A. M. in making a stand just N. of Middletown, which temporarily checked the Confederates and compelled them to reform their lines. This was accomplished very slowly, owing to the men being engaged in plundering the captured camps of the Eighth and Nineteenth Corps. Wright, selecting a more favorable position about a mile farther to the rear, caused his troops to fall back and occupy it, placing the mass of his cavalry on his left, the Confederates following up and taking a position in its front preparatory to an attack.

Sheridan, who, at Winchester, had heard of the fight, arrived upon the field and took command, placing additional troops upon the line and preparing to meet the Confederate attack, which was made with but little spirit and was easily repulsed. Sheridan's ride from Winchester, his enthusiastic reception by his army, which caused the retreating troops to face about and march to the front, and the new life infused into his troops when he rode along their front, all combined to form one of the most dramatic scenes of the war.

The repulse of Early's last attack took place at about 1 P. M. At about 4 P. M., Sheridan, having made the necessary arrangements, made a vigorous attack upon the Confederates, breaking first their left wing and successively their whole front, following up his advantage so sharply that the Confederates were forced back in great confusion entirely off the field, and driven back to Fisher's Hill by nightfall, losing in their retreat all the guns and camp equipage previously captured, about 24 guns of their own, 56 ambulances, and a large number of flags. The losses on the Union side were about 6,000 in killed, wounded, and prisoners. The Confederates admitted a loss of about 3,100 men. This was the last important battle in the Shenandoah valley. See SHERIDAN. JAMES MERCUR.

Cedar Falls: a city of Black Hawk co., Ia., on Cedar river, and B., C. R. and N., Ch. and Gt. West., and Ill. Cent. R. Rs. (see map of Iowa, ref. 4–I). It has good schools, and a State normal school. There are here a very large wood-pump factory, oat-meal mill, 2 flouring-mills, 2 feed-mills, paper-mill, planing-mill, foundry, etc. Pop. (1880) 3,020; (1890) 3,459; (1900) 5,319.

Cedar Keys: on railroad: a seaport of Levy co., Fla. (for location of county, see map of Florida, ref. 4–H); on the Gulf of Mexico and on Way Key; a small island; 154 miles S. W. from Fernandina. Its harbor is formed by a group of keys, or small islands, which give name to the town. It has a lighthouse on Seahorse Key; lat. 29° 05′ 49″ N., lon. 83° 04′ 46″ W. It shows a revolving light 75 feet above the sea. Cedar Keys has several cedar sawmills, an ice-factory, a large pine-lumber mill, etc., and is remarkable for extreme healthfulness and equable climate. There is an extensive trade in lumber, cedar pencil-wood, fish, and oysters. Pop. of the group (1880) 1,458; (1890) 1,869; town (1900) 739.
EDITOR OF "GULF VIEW."

Cedar Mountain, Va.: about 2 miles W. of Mitchell's Station, Culpeper County; on the Orange, Alexandria and Manassas R. R.; was the scene of a desperate and sanguinary conflict on Aug. 9, 1862, between the forces of Gens. Banks and Jackson, in which the Federal forces were outnumbered and defeated with a loss of nearly 2,400—killed, wounded, and missing—and a large quantity of war material; the Confederate loss was about 1,300.

Cedar Mountains: of South Africa; in Cape Colony; extend nearly parallel with the Atlantic. The highest summits rise about 6,590 feet above the level of the sea. They are partly covered with forests of cedar.

Cedar Rapids: a city and railroad center of Linn co., Ia. (for location of county, see map of Iowa, ref. 5–J); on Cedar river; 219 miles W. of Chicago, 310 miles N. of St. Louis, Mo., and 265 miles S. of St. Paul. It is the headquarters of the Iowa R. R. Land Company, and other land and coal companies, and of the Bur., Cedar Rapids and Nor. R. R. and all its branches. The railroad machine-shops employ about 1,000 men. The city has a valuable water-power, large oatmeal and flouring-mills, steam-bakeries, foundries, planing-mills, manufactories of furniture, confectionery, pumps, windmills, oil and lint, beer, woolens, knit-goods, agricultural tools, wagons, carriages, door-latches, etc. Pork-packing is very extensively carried on. The wholesale trade is important. The city is lighted with gas and electric light, has electric street railroad, and is supplied with water by the Holly system. Pop. (1880) 10,104; (1890) 18,020; (1900) 25,656.
EDITOR OF "REPUBLICAN."

Cedar (or **Red Cedar**) **River**: a stream of Iowa; rises in the southern part of Minnesota; flows nearly southeastward through Mitchell, Floyd, Bremer, Black Hawk, Benton, Linn, and Cedar Counties of Iowa; then turning to the S. W., it enters the Iowa river. Total length estimated at 350 miles.

Cedar Springs: village (in Nelson and Solon townships); Kent co., Mich. (for location of county, see map of Michigan, ref. 7–H); on Gr. Rap. and Ind. and Tol., Sag. and Musk. R. Rs., and on Cedar Creek; 21 miles N. of Grand Rapids; has churches of four denominations, fine large public school, large planing-mill, saw-mill, shingle-mill, stave-factory, stock-farm, and water-works. The village was first platted in 1860, and was incorporated in 1871. Pop. (1880) 1,141; (1890) 1,035; (1900) 950.
EDITOR OF "CLIPPER."

Cedartown: capital of Polk co., Ga. (for location of county, see map of Georgia, ref. 2–F); on Chattanooga Div. of Cent. R. R. of Georgia and East and West R. R. of Alabama; about 60 miles W. N. W. of Atlanta. Cedartown has 7 churches (4 white and 3 colored) and public schools for white and colored children. Its principal industrial establishments are iron mines, furnaces, foundries, machine-shops, lumber-yards, and fruit-farms. Pop. (1880) 843; (1890) 1,625; (1900) 2,823, the increase being largely due to extension of the corporate limits.
EDITORS OF "STANDARD."

Cefalu, chay-fä-loo′ (anc. *Cephalœdium*): a town of Sicily; in the province of Palermo; situated on the Mediterranean; 40 miles E. S. E. of Palermo (see map of Italy, ref. 9–F). Here is a fine cathedral of Norman architecture. The town is situated at the foot of a mountain or high rock, on which are the ruins of an ancient Phœnician structure and of a Saracenic castle. It has marble-quarries and sardine-fisheries. Pop. 14,774.

Cehegin, thā-ā-*k*heen′: a town of Spain: province of Murcia; 35 miles W. N. W. of the city of Murcia (see map of Spain, ref. 18–H). It has manufactures of cloth, paper, soap, and pottery, and a trade in wine and fruits. It is partly built of marble quarried in the vicinity. Pop. 9,760.

Ceiling [indirectly connected with Lat. *cælum* > Fr. *ciel*, Ital. *cielo*, sky; later, canopy, vault, roof]: the covering or upper surface of a room. Ancient ceilings, whether of wood or stone, usually consisted of horizontal beams or lintels, supporting flat slabs richly painted. Two sets of intersecting beams, forming panels or *lacunæ*, often were used; and this style of ceiling was extensively imitated and elaborated in the Renaissance. The Romans were the first to make general use of arched or vaulted ceilings, especially in their temples and *thermæ*; these were usually of brick or concrete, heavily stuccoed, and the stucco wrought into rich panels or painted; they were of three kinds—barrel vaults, groined vaults, and domes. While the East elaborated the domical ceiling, the West, throughout the Middle Ages, was perfecting the groined vault with ribs. Modern ceilings are usually flat, finished in wood or in plaster. Those divided into deep panels are called *coffered*; those in which a curved surface intervenes between the flat portion and the wall are called *coved* ceilings.
A. D. F. HAMLIN.

Cel'andine: the *Chelidonium majus* of the Poppy family (*Papaveraceæ*); a biennial or perennial herb native of the temperate portions of the Old World, but now more or less cultivated everywhere. It is the sole representative of the genus, which is related to the California poppy (*Eschscholtzia*), from which it differs in its nodding flower-buds, two-lobed stigmas, and orange juice. It attains a height of 2 or 3 feet, and is a smooth, branching, leafy and soft-herbaceous plant, with small, yellow, umbellate flowers, which blossom all summer. In the Old World this plant has borne the name of "swallow-wort," because it blossoms when the swallows arrive in the spring. It has long been used in medicine, the whole plant being dried, and then constituting the drug "chelidonium." It is an acrid purgative, and is also diuretic and expectorant.
C. E. B.

Celano Lake: See FUCINO.

Celastraceæ: See SPINDLE-TREE FAMILY.

Celaya, sā-laa′yaä: a city of Queretaro, Mexico: on the Rio Grande de St. Iago; 150 miles N. W. of the city of Mexico

(see map of Mexico, ref. 7–G). It has a large trade, and manufactures of cotton, wool, and saddlery. Pop. (1889) 24,670.

Cel'ebes (native, *Negri-Orang-Bugis*): a large island of the Malay Archipelago; about 75 miles E. of Borneo, from which it is separated by Macassar Strait (see map of East Indies, ref. 7–G). It extends from lat. 1° 50′ N. to 5° 30′ S., and is mostly included between lon. 119° and 125° E. It has a very irregular form, being divided by deep bays into four peninsulas, one of which (called Menado) is about 400 miles long and very narrow. These peninsulas are formed by chains of mountains radiating from the central part of the island, and in the N. there are lofty volcanoes, recently active, and still giving rise to earthquakes. The highest summit (Bonthain) rises 9,994 feet above the level of the sea. Though the area of Celebes is only 71,150 sq. miles, it has a coast-line of nearly 2,500 miles. The peninsula of Menado is bounded N. by the Sea of Celebes, S. by the Bay of Tomini. The two southern peninsulas are separated by the large Bay of Boni. The fauna comprises some animals peculiar to the island, as the tailless baboon, the babiroussa, the cuscus, the sapi-utan or wild cow, several species of starlings, and magpies. The vegetation is luxuriant, and the island is partly covered with forests of oak, teak, palm, cedar, and upas trees, and partly by vast grassy champaigns which are used in common by the natives. The nutmeg, the clove, and the bamboo also flourish here. Among the minerals are gold, copper, tin, and iron. Coffee, rice, sugar, indigo, and manioc are cultivated. The most cultivated district of the island is Minahassa, its coffee culture being in government control. Chief town, MACASSAR (*q. v.*). The pretty town of Menado is the seat of a Dutch residence. Celebes is partly occupied by a race called Bugis, who are strong and well built, revengeful in character, and fond of the chase. The tribe of Wadjus are an intelligent race who pursue commerce; the Arafuras inhabit the central regions, and are the aborigines of this archipelago. This island was visited by the Portuguese in 1512. The Dutch expelled the Portuguese in 1660, and planted there colonies, which they still possess. Pop. of Celebes (1890) 762,284. See Lahure, *L'île de Célèbes* (Paris, 1879).

Revised by M. W. HARRINGTON.

Cel'ery [properly *selery* or *sellery*, as in Early Modern English; from Lat. *selinon*; Gr. σέλινον, a kind of parsley]: a plant of the parsley family (*Umbelliferæ*), which is widely cultivated in temperate climates for its leaf-stalks, which are bleached by various means. One form, the *celeriac* or *turnip-rooted celery*, is grown for the swollen subterranean part. Celery is native to damp places in the Old World, ranging from Sweden to the Caucasus, and even to the higher parts of India. Its technical name, *Apium graveolens*, records the heavy scent of the foliage. The acrid principles of the plant are greatly mollified by cultivation and bleaching, and the tissues also become more tender and brittle. A variety of celery called *celeriac* is raised in Europe for its root.

The cultivation of celery in the U. S. has increased rapidly in recent years. In 1890 there were 15,381 acres devoted to the crop in the truck-gardens of that country, besides a large area in smaller gardens. The increase in celery cultivation is largely due to recent improvements in methods of growing the crop. Formerly it was grown in drills from 6 inches to a foot deep, a method which was thought to be necessary to insure the proper bleaching of the leaf-stalks. It is now grown in level culture, the bleaching being performed by heaping earth against the plants or by the use of boards, paper, or other material: or the plants may be set so thickly as to bleach themselves, as in the so-called "new celery culture." In many celery-growing localities banking with earth is giving place to bleaching by means of boards. Boards about a foot wide are used, one being placed on edge against either side of the row. The lower and moister lands are ordinarily devoted to celery culture, although the plant grows well upon rich and friable upland. Alluvial deposits along rivers, as at Kalamazoo, Mich., and reclaimed bogs and marshes usually make good celery lands. Celery is nearly always started in hotbeds or cold-frames, or the late crop may be started in seedbeds in the open. The plants are set in the field when about 6 inches high, in rows from 3 to 4 feet apart and a foot or less apart in the row. The crop often follows some other early crop, as beets or early cabbages. Bleaching is delayed until the plants are well grown, the late crops not being "handled" until late in fall. The late varieties can be stored in pits until spring, and most varieties will keep until the holidays. Nearly fifty varieties are known in the U. S. Revised by L. H. BAILEY.

Céleste, sā'lest', MADAME: a dancer; b. in Paris, Aug. 6, 1814; became in childhood a pupil at the Conservatoire in that city. When fifteen years old she removed to the U. S., and soon after married a Mr. Elliot. After her husband's death she went to England, where she met with great professional success. Subsequently she passed several years in the U. S. (1834–37 and 1865–68), where she was received with great enthusiasm. Most of her life was spent in England, where she was successful as an actress and a theatrical manager. D. in Paris, Feb. 20, 1882.

Cel'estine, or **Cœlestine** [from the Lat. *cœlum*, the sky, in allusion to its color]: a mineral which is essentially sulphate of strontia, with occasional mixture of sulphate of baryta and carbonate of lime in small proportions. Its color is often a beautiful indigo blue. It resembles heavy spar, but is not quite equal to it in specific gravity. Fine specimens of crystallized celestine are found in Sicily. It is useful as a source of strontia. The finest crystals of celestine are found on Strontian island, Lake Erie.

Cel'estine (or **Cœlesti'nus**) **I.**, SAINT: a native of Rome; became pope in 422 A. D.; promoted the meeting of a council which deposed Nestorius; d. in Rome, July 26, 432, and was succeeded by Sixtus III.—CELESTINE II., Pope: originally GUIDO DI CASTELLO; b. in Tiferno, Tuscany; succeeded Innocent II. in 1143; d. in Rome, Mar. 8, 1144.—CELESTINE III. (GIACINTO ORSINI): elected pope in 1191 as the successor of Clement III.; promoted the first crusade; excommunicated Leopold, Duke of Austria, for detaining Richard Cœur de Lion in prison; d. in Rome, Jan. 8, 1198, aged about ninety-two years.—CELESTINE IV. (GOFFREDO CASTIGLIONE): succeeded Pope Gregory IX. Oct. 25, 1241; d. Nov. 10 of the same year.—CELESTINE V., St. (PIETRO DA MURRONE or MORONE), Pope: b. in Isernia, Italy, 1215; was elected July 5, 1294, as the successor of Nicholas IV. Before that event he had founded an order of hermits called CELESTINES (*q. v.*). He abdicated the office after a disastrous reign, of his own volition, but with universal approval, Dec. 13, 1294; returned to the monastic life; was succeeded by Boniface VIII., who confined him in the Castle Fumone, near Anagni, and there he died May 19, 1296. Dante put him at the entrance to hell because of his abdication. He was canonized in 1313.

Celestines: an order of hermits or monks founded in 1254 by Pietro da Murrone, who became Pope Celestine V. (1294). This order spread rapidly in France, Italy, and Germany between 1264 and 1400, but it is now nearly extinct. They were at first called Hermits of St. Damian or of Morone, and after 1294 Celestines. Their costume is white, with black hood and scapulary. These monks followed the rule of St. Benedict, and preferred a contemplative life.

Celibacy [deriv. of Lat. *cælebs*, unmarried]: the condition of a person never married; applied often to the voluntary life of abstinence from marriage assumed by religious devotees and the clergy of some churches, such as the Roman Catholic. Practiced in ancient Rome in the case of the vestal virgins, in Judæa by the Essenes, and in the East by the priests of Bûddhism, it possibly took its origin among them in the belief that the material body is the source of evil and the prison of the soul. Among Christians it was the natural outcome of the ascetic teachings and spirit of the Gospel, as well as of the example of Christ himself. It showed itself at once with the new doctrine as a higher form of life, and spread with it all over the world. Virginity was held in peculiar honor in the early Church, the priesthood especially being urged to celibacy by the example of Christ, and by the motives suggested 1 Cor. vii. 32, 33. But it is certain from the inscriptions found in the catacombs, from passages in the canon law, and from the positive testimony of history, that celibacy was not enforced from the beginning, even among the higher clergy. Commencing as a counsel and as a custom, it gradually developed into a law, which was much more strictly enforced in the Western or Latin than in the Oriental Churches. Thus the Council of Tours (566) suspended from their functions for one year all secular priests and deacons with wives; whereas in 692 the third Council of Constantinople allowed sacred orders to be given to those who had been married but once; and in parts of the Greek Church their marriage is compulsory, though bishops and patriarchs are celibates. In the West, decretals were from time to time issued against the marriage of the clergy, lead-

ing to many struggles within the Church. These struggles culminated in the eleventh century, and the point was finally settled by the vigor and determination of Gregory VII. in 1074, positively forbidding the marriage of the clergy. The Council of Trent (1563) confirmed (sess. xxiv., can. 9) the discipline in practice for several centuries. There is, however, an exception made in favor of priests and deacons of the Eastern rites, who are allowed to retain their wives if married before ordination. See *History of Sacerdotal Celibacy*, by Henry C. Lea (1867); Roskovány, etc.

Revised by John J. Keane.

Celi'na: village, capital of Mercer co., O. (for location of county, see map of Ohio, ref. 4–C); is in Jefferson township; on L. E. and Louisville R. R.; 105 miles W. N. W. of Columbus, and 30 miles S. W. of Lima; is at the northwestern corner of the Great Reservoir. It has several manufactures. Pop. (1880) 1,346; (1890) 2,702; (1900) 2,815.

Cell [from Lat. *cella*, a small apartment]: in biology, the structural unit of plants and animals. Most plants and animals of the lowest divisions, the protophytes and protozoa, consist of a single cell, while the bodies of higher animals and plants are made up of masses of cells and the products of these cells. The cell is also the physiological unit. The life of an organism is the sum of the activities of all its individual cells. In the single-celled animals all the physiological activities are carried on by a single cell, while in the multicellular animals different groups of cells, the *tissues*, are specialized to perform more perfectly some one of these processes, and by this "physiological division of labor" a better organization is effected with more perfect results. The recognition of the great importance that the cell holds has brought to it the most careful study in recent years. This study is at the present time very active, and is rapidly adding to our knowledge of its structure and properties. At present a typical cell is considered to be a portion of living matter usually of from $\frac{1}{300}$ to $\frac{1}{1000}$ of an inch in diameter, the actual sizes extending through a much greater range, surrounded by a wall of its own formation, the *cell-wall*, the contents consisting of a central part, the *nucleus*, imbedded in a surrounding mass, the *protoplasm*. The protoplasm consists of at least two substances, a network of somewhat firm material which will stain with certain reagents called by some authors *spongioplasm*, containing in its meshes a more liquid material, the *hyaloplasm*. Imbedded in this latter there may be particles of various other substances, such as oil globules, food granules, or pigment grains. The protoplasm may show spontaneous movement called "amœboid movements," and always makes use of oxygen with the production of carbonic acid. In the single-celled organisms the protoplasm possesses general physiological properties, such as secretion, respiration, digestion, motion, and sensitiveness to stimuli.

In the higher animals, in which different kinds of cells are grouped together as tissues, the protoplasm of the cells of each group possesses in a more particular degree some one of these properties, or specializations under them; for example, the cells of the salivary glands that of secreting saliva, or the muscle cells that of motion.

While the *nucleus* has not yet been demonstrated in all cells, it is thought by the majority of investigators to be essential to the activity of the cell. Two substances are recognized in the nucleus, one staining with reagents, the *chromoplasm* or nucleoplasm, and the other not so staining, the nuclear matrix, also called achromatin. The most obvious function of the nucleus is that of governing the reproduction of the cell. The cell multiplies by division of the whole into two cells. The process begins at the nucleus, which is at this time very active. The nucleus may divide without showing any other changes, *direct division*, or the division may be preceded by a complicated series of changes and movements of the chromoplasm, *indirect division* or *karyokinesis*. At the end of the process of nuclear division the protoplasm of the cell becomes divided, each mass surrounding the new nucleus, the result being two cells. These typical methods have many variations in detail. Different authors have claimed in addition other functions for the nucleus, such as the control of the nutrition and growth of the protoplasm. The forms of cells vary greatly according to their particular function and position.

In plants the majority of the tissues are generally composed wholly of cells whose walls are in contact. In the higher animals this condition exists in some as in the epithelial and secreting tissues, while in others the cells have formed a large amount of material deposited between them, called *intercellular substance*, which may take the form of fibers, as in connective tissue, or an elastic padding, as in cartilage, or of a rigid solid, as in bone.

For the details of how, with the cell as origin (as the ovum in both animals and plants) and remaining always the active unit, the whole of the tissues of plants and animals are built up, the reader must be referred to special works in structural botany, animal histology, and embryology.

O. P. Jenkins.

Cell (plant): See Histology, Vegetable.

Cell, of an electric battery: See Battery, Voltaic or Galvanic.

Celle, tsel'le, or **Zelle**: a town of Hanover, Germany; on a sandy plain on the river Aller; at the head of navigation; and on the Hanover and Brunswick Railway, 28 miles N. E. of Hanover (see map of German Empire, ref. 3–E). Here is a noted Government breeding stud. The town has an old castle, a gymnasium, and a library of 60,000 volumes; also manufactures of wax candles, printer's ink, thread and yarn, pianofortes, tobacco, matches, etc. The place was from the fourteenth century the seat of a branch of the Brunswick-Lüneberg family. Here Sweden in 1679 acceded to the treaty of Nimeguen. Pop. (1890) 18,901.

Cellier, Alfred: musician; b. at Hackney, England, Dec. 1, 1844, of a French father and an English mother. From 1855 to 1860 he was a chorister of the Chapel Royal, St. James, under the Rev. Thomas Helmore. In 1862 was organist of All Saints', Blackheath; in 1864 director of the Ulster Hall concerts, Belfast; in 1868 organist of St. Alban's, London; 1871–75 conductor of the Prince's theater, Manchester: 1877–79 conductor of the Opera Comique, London. His compositions include a cantata to Gray's *Elegy*, some songs and pieces for orchestra and pianoforte, and a number of operas and operettas, prominent among which are *The Tower of London* (1875); *Nell Gwynne* (1876); *Bella Donna* (1878), all produced at Manchester; *The Masque of Pandora* (Boston, 1881); *The Sultan of Mocha*; *Dorothy* (1886); and *The Mountebanks*, libretto by Gilbert, which was produced in London, Jan. 4, 1892, just a week after the composer's death, which occurred on Dec. 28, 1891.

D. E. Hervey.

Cellini, chel-lee'nĕe, Benvenuto: Italian artist; b. in Florence in 1500. He was a skillful engraver, gold-worker, and sculptor; was in Rome in 1527 when it was attacked by the army of Constable Bourbon, and according to his own statement he killed that commander on that occasion. He was a man of passionate and quarrelsome temper, and much inclined to egotism. Among his patrons were Pope Clement VII., Francis I. of France, and Cosimo de' Medici. He worked in Rome, Paris, and Florence, produced, besides other works, the bronze of *Perseus with the Head of Medusa*, now in the Loggia dei Lanzi, Florence. His interesting autobiography, marked by its naïve disclosures, was translated into German by Goethe and into English by Roscoe (1822) and J. A. Symonds (1887). Cf. the artistic works upon him by Eugene Plon (Paris, 1882–84, 2 vols.). D. in Florence, Feb. 25, 1571.

Cellular Tissue, more properly **Areolar Tissue**: in animals the soft, elastic, filamentous substance which underlies the skin and the serous and mucous membranes, and which fills the spaces between muscles and between their fibers, and indeed surrounds almost all important organs, such as nerves, glands, blood-vessels, etc., throughout the body. It normally contains a small quantity of serous fluid, which in certain diseased conditions becomes increased, constituting anasarca or widespread dropsy.

Cellular tissue in botany is simply non-vascular substance (parenchyma) composed entirely of untransformed cells.

Cellulitis: See Phlegmasia.

Celluloid [Lat. *cel'lula*, dimin. of *cella*, cell + suffix *-oid*, having appearance of]: the trade-name for a plastic material composed of guncotton and camphor. The guncotton, or nitro-cellulose, is made by treating tissue-paper with a mixture of nitric and sulphuric acids. The product is mixed with camphor and various pigments to produce the desired color, and the materials are thoroughly incorporated by means of heated rolls. It is subsequently submitted to great pressure. It is afterward molded into form by means of heated dies, under pressure. Celluloid is applicable to the greatest variety of purposes, such as imitation ivory for billiard-balls, handles for hair-brushes, mirrors, umbrellas,

etc.; piano-keys, etc.; imitation coral for jewelry, imitation tortoise-shell for combs, and for rims for eye-glasses, etc.; imitation amber for beads and mouthpieces for pipes; imitation porcelain for dolls' heads, for mounting artificial teeth, in place of hard rubber, for imitation collars, cuffs, and shirt-fronts, which are waterproof. It is very hard and elastic, and takes a high finish. Liquoid is a similar material. See ZYLONITE.

Cellulose [Late Lat. *cellulo'sus*, full of *cellulæ*, little cells, dimin. of *cella*] $n(C_6H_{10}O_5)$: the substance which forms the mass of the cell-membranes of plants. Cellulose forms the framework or skeleton of all plants; next to water it is the most abundant substance in the vegetable kingdom. During the early stages of the development of the plant the cell-walls consist entirely of cellulose, but as the plant grows the walls become intergrown with resins, coloring-matters, and other substances. Some tissues consist almost entirely of cellulose, as the pith of the Chinese rice-paper plant (*Aralia papyrifera*) and the vegetable ivory. Cotton, linen, hemp, and unsized paper consist of almost pure cellulose.

The following percentages of cellulose are found in some of the most common vegetable matters in the air-dry state:

	Per cent.		Per cent.
Potato tubers	1·1	Timothy hay	23·0
Wheat kernels	3·0	Red clover hay	34·0
Maize kernels	5·5	Oat straw	40·0
Oat kernels	10·3	Wheat straw	48·0
Buckwheat kernels	15·0	Rye straw	54·0

Cellulose is said to exist in the animal kingdom in the mantle of Mollusca (*Tunicata*) and the integuments of insects and *Crustacea*. It is more probable, however, that these tissues consist of the nitrogenized body CHITIN (*q. v.*). Virchow (*Comptes Rendus*, xxxvi., 492, 860) found cellulose in degenerated human spleen and in the brain. De Luca (*Comptes Rendus*, lii., 102, lvii., 43) found cellulose in the skin of the silkworm and of the serpent.

Preparation.—Owing to the insolubility of cellulose in water, alcohol, ether, dilute alkalies, and dilute acids, it is generally prepared by subjecting vegetable tissues to the successive action of these agents, by which all foreign substances—sugar, starch, gum, resins, oils, fats, etc.—are removed. It may then be bleached by the action of chlorine water. Thus prepared, it retains more or less perfectly the structure from which it was obtained. Skeleton leaves, which are made up into the beautiful "phantom bouquets," consist of nearly pure cellulose. They are prepared either (1) by boiling the leaves in a dilute solution of caustic soda till the epidermis and parenchyma separate readily, removing them to a vessel of cold water, and carefully rubbing them with the fingers, and then bleaching by immersion in a solution of hypochlorite of lime, to which a little acid has been added; or (2) by adding to a pint of nitric acid, of a specific gravity of 1·1, an ounce of potassium chlorate in fine powder, and suspending the leaves in the mixture for from ten to twenty days. They are then thoroughly washed and dried between sheets of blotting-paper. In the conversion of rags, straw, wood, etc., into paper the cellulose is rendered nearly pure by treatment with caustic soda, hypochlorite of lime, and sulphuric acid. Swedish filter-paper is almost chemically pure cellulose. Common paper receives an addition of a considerable proportion of kaolin (china clay), and is sized on the surface. (See PAPER.) In bleaching the textile fibers—cotton, flax, and hemp—the process has for its object the purification of the fibrous cellulose by the removal of resinous and coloring-matters. See BLEACHING.

Composition.—Cellulose usually contains about 10 per cent. of moisture, which may be removed by drying. It then contains, in 100 parts, carbon 44·44, hydrogen 6·17, oxygen 49·39. Its composition is represented by the formula $n(C_6H_{10}O_5)$. This is also the composition of starch, a body possessing totally different properties. Sugar and gum are nearly allied to cellulose in composition. All these bodies are called *carbohydrates* (*q. v.*), because they consist of carbon in combination with hydrogen and oxygen in the proportions in which they exist in water, H_2O.

Properties.—When pure, cellulose is fibrous or spongy, white, and translucent, and often silky. Under the microscope the fibrous varieties appear like spun glass. It is tough and elastic. Its specific gravity is 1·5. When pure it is unalterable in the air, but when associated with albuminous and other easily alterable bodies, it gradually decomposes (decays) in moist air, undergoing a slow combustion, and changing to a yellow or brown friable substance called touchwood, and then finally to humus. (See FERMENTATION and PRESERVATION OF TIMBER.) Cellulose is insoluble in water, alcohol, ether, and oils—both volatile and fixed. It is not sensibly affected by boiling in water unless it has been derived from a very soft or imperfectly developed portion of a plant, when it becomes pulpy; and in the case of cellulose from Iceland moss, which is easily disintegrated and finally converted into soluble dextrine. Mulder observed that on boiling Swedish filter-paper with water under pressure at 400° F. a little glucose was produced. Another property is that of swelling when wet; hence cellulose from cocoanut fiber is now used in the construction of war-ships, being packed in a coffer-dam at the water-line, extending all around the ship, where it serves to close any aperture before much water enters.

Solution of Cellulose.—An ammoniacal solution of oxide of copper was discovered by Schweitzer to dissolve cellulose without changing its character. The solvent is prepared by dissolving cupric hydroxide in ammonia, or partially immersing copper turnings in ammonia. The cellulose is precipitated from the solution in amorphous flakes by boiling, diluting, or the addition of acids in excess. By dipping paper or cotton or linen fabrics in the copper ammonia solution, and then passing them between rolls, they are rendered waterproof. Several layers of such sheets or cloths pressed together form an artificial wood of great strength. A plastic mass can be prepared of this material suitable for the manufacture of water-pipes, gas-pipes, hats, clothing, boats, etc.

Action of Acids, etc.—Cold dilute acids and alkalies have little action on cellulose. Long boiling with dilute hydrochloric or sulphuric acid converts cellulose into glucose. In concentrated hydrochloric and sulphuric acids it dissolves, exhibiting different products according to the temperature and the duration of the treatment: (1) disaggregated, dissolved cellulose, precipitated by dilution; (2) an amyloid body; (3) dextrin, which differs from starch dextrin in having little action on polarized light. Strong boiling hydrochloric acid converts it into a fine powder, without change of composition. Boiled for a short time with dilute sulphuric acid, it is converted into a pulpy mass, still exhibiting the composition of cellulose, and not sensibly soluble in water. By dipping unsized paper for a few seconds into a mixture of 2 volumes of sulphuric acid and 1 volume of water, and then thoroughly washing with water and dilute ammonia, it is converted into "parchment-paper," a substance of the appearance and properties of animal parchment. Neumann proposed to make cotton and linen fabrics stronger, more compact, and waterproof by subjecting them to the above treatment and pressing between rolls. Parchment-paper is an excellent material for the septa used in dialysis. (See ENDOSMOSIS.) If cellulose is ground with concentrated sulphuric acid, without allowing the mixture to become heated, it forms a pasty mass, and this when largely diluted deposits an amorphous body which is blued by iodine, and is hence called *amyloid*. Longer digestion with sulphuric acid converts cellulose into dextrin, and, on diluting with water and boiling, into glucose. Strong nitric acid, or a mixture of nitric and sulphuric acids, or of niter and sulphuric acid, converts cellulose into nitro-substitution products, such as GUNCOTTON (*q. v.*). Moist chlorine gas and warm solutions of hypochlorites rapidly cause the oxidation of cellulose. For this reason care must be observed in bleaching paper-stock and fabrics by chlorine. See BLEACHING and ANTICHLORE.

Cellulose in its more compact forms is not rendered blue by iodine until it has been disintegrated by sulphuric acid or caustic alkalies. Some lichens and algæ—Iceland moss, for example—give the blue color after being boiled with water. Heated in close vessels, cellulose in all its forms undergoes destructive distillation, yielding charcoal, which remains behind, and combustible gases, tar, and a mixture of water, acetic acid, and methylic alcohol, all of which distill over. See ACETIC ACID, CHARCOAL, and TAR.

Digestibility of Cellulose.—Although wood and straw are not easily digestible by most animals, the cellulose of young and succulent stems, leaves, and fruits is digested to a large extent; and therefore cellulose, which forms a large proportion of the food of herbivorous animals, contributes directly to their nutrition. *Fungin*, from fungi, and *medullin*, from the pith of various trees, are mere modifications of cellulose. *Hordein*, from barley, is a mixture of cellulose with starch and a nitrogenized body.

Revised by IRA REMSEN.

Cel'sius, Anders: mathematician; b. in Upsala, Sweden, Nov. 27, 1701; nephew of Olof Celsius, Professor of Theology at Upsala and author of *Hierobotanicon*. His father was Professor of Mathematics at Upsala, and at the same university Anders became Professor of Astronomy in 1730—a position which he left in 1732 in order to pursue the study of astronomy where he could have the advantages of an observatory and instruments. He remained some time at Nuremberg with Doppelmayer, in which city he published *Observationes luminis borealis*. He then visited Rome, determining with greater exactitude the meridian drawn by Bianchini and Maraldi. Here he made observations upon the intensity of light, and established the true size of the ancient Roman lineal measures. In 1734 he went to Paris, and with Maupertuis went to Lapland to determine the measure of a degree of latitude. He afterward returned to Upsala, wrote *De observationibus pro figura telluris determinanda in Gallia* (1738), and worked out a theory regarding Jupiter's satellites. At his instance the observatory at Upsala was constructed. A centigrade division of the thermometer called the Celsius scale, which divides the difference of temperature between freezing and boiling water into 100 equal parts, was proposed by him. It differs from the centigrade scale in that it places zero at the boiling-point and reads downward, while the centigrade scale begins at the freezing-point and reads upward. D. in Upsala, Apr. 25, 1744.

Cel'sus, Aulus Cornelius: an eminent Latin medical writer who is supposed to have lived at Rome in the reign of Tiberius. The events of his life are mostly unknown, except that he wrote works on various subjects, including philosophy and rhetoric. These are all lost except his excellent work on medicine, *De Medicina*, in eight books, the style of which is remarkably elegant and pure. He adopted most of the medical doctrines of Hippocrates. The first English translation of his works appeared in 1756. Best edition by C. Daremberg (Leipzig, 1859).

Celsus: the oldest literary opponent of Christianity; of uncertain date and origin; the author of *The True Discourse*, to which Origen replied, giving copious extracts, and thus preserving our only knowledge of the treatise. It is divided into four parts, preceded by an introduction in which the general character of Christianity and its divisive character are touched upon. Part i. is an historical refutation of Christianity from the standpoint of Judaism, a Jew being the alleged speaker, apparently from literary considerations, for Celsus was far from being a Jew. In this part Celsus concerns himself with the life and work of Jesus. Part ii. is a general refutation from the standpoint of philosophy. Part iii. opposes certain special doctrines of Christianity from the standpoint of the history of philosophy. Part iv. is an attempt to convert the Christians to the worship of the heathen divinities. The extracts of the treatise will be found translated in connection with Origen's refutation in vol. iv. of the American edition of *The Ante-Nicene Fathers*, pp. 395–669 (New York), and as put together in German by Theodor Keim, *Celsus' Wahres Wort* (Zurich, 1873), which is the authoritative edition. Keim dates the treatise A. D. 178.

Samuel Macauley Jackson.

Celt [from Late Lat. *celtis*, a stone chisel]: the name given by archæologists of Europe to certain instruments of stone or bronze which were used by prehistoric peoples. Similar stone tools are found in the U. S., but are not often called "celts." They are generally of a kind of chisel-shape, but vary greatly in this respect, some being extremely rude and simple; others, especially the bronze ones, are sometimes ornamented with some taste with cut lines. In length they vary from 2 inches to 2 feet. They often had handles, and seem to have served for axes and domestic utensils, as well as for weapons of war and the chase.

Celtibe'ri, or **Celtibe'rians**: an ancient and powerful people who inhabited the northern or northeastern part of Spain. They are supposed to have been a mixture of indigenous Iberians with Celtic people who came from Gaul. Their country was called *Celtiberia* (Gr. Κελτιβηρία). They were a warlike nation, and were subdued by Hannibal with great difficulty. In the second Punic war they fought for the Carthaginians. They made a brave and long resistance to the Romans, who conquered them about 143–133 B. C., and they renewed the war under Sertorius. Among their chief towns were Segobriga and Numantia. Celtiberia proper comprised the southwestern part of Aragon, Cuença, Soria, and the greater part of Burgos, but the name was sometimes applied by the Romans to a larger region.

Celtic Church: See England, Church of.

Celtic Languages: These languages are steadily declining, two only of their branches having living representatives to-day—(1) the Irish or Gaelic (*Goidelic*), divided into the Irish in Ireland, the Gaelic in Scotland and the western islands, and the Manx of the Isle of Man; (2) the Britannic, divided into the Welsh (Cymric) in Wales and the Bretonic (Armoric) in the French Basse-Bretagne, which was settled in the fifth and sixth centuries A. D. by immigrants from England. To this branch belonged also the Cornish of Cornwall, which became extinct in the eighteenth century, and was closely allied with the Bretonic. It is also proposed to call this second group Brythonic, from a native name for Welsh. The Celtic-speaking population of the world, i. e. the number of those *able* to speak Celtic, was estimated in 1880 at about 3½ millions. The most of these, however, spoke a second language, the English or the French. Since that time the Celtic has certainly declined still further. The only one of its languages that now possesses actual vitality is the Welsh.

In antiquity the race and tongue of the Celts (Gr. Κελτοί and Γαλάται, Lat. *Galli* and *Celtæ*) held sway over a much more extensive territory, spreading itself over a large portion of the European mainland. Its center of distribution seems to have been the western part of Central Europe, Northern France, the central Rhine, and the upper Danube. As early, however, as the sixth century B. C. it had occupied the western part of the Iberian peninsula. About 400 B. C. nearly the whole of upper Italy (*Gallia cisalpina*) was occupied by Celtic tribes, which soon after made their appearance also in Southern France. They pushed their way at the same time also toward the E., into what is now Austria, and into Illyria, and followed the course of the Danube as far as the Dobrudscha. One body of them founded in Asia Minor the principality of Galatia. At what period the Celts first entered the British isles we do not know, but the various branches of speech represented there show that several different migrations occurred.

The downfall of the Celtic power and the consequent decline of the Celtic language on the mainland was occasioned by the twofold pressure from north and south; on the north the Germans, who as early as Cæsar's time bordered the Rhine, were pushing their way forward, and from the south the Romans were subjugating one after another of the Celtic lands. The latest authentic evidence of the existence of the Celtic tongue in Gaul dates from about 400 A. D. In the British isles also the Celtic has been steadily displaced by the English, and yearly is losing ground.

The linguistic remains of continental Celtic are extremely scanty, consisting of about thirty inscriptions from the two Gauls, mostly in Greek or Roman writing, and a large number of proper names in the ancient writers and in Latin inscriptions. These have been collected in Holder's *Alt-celtischer Sprachschatz* (from 1891). They suffice to show it is essentially the same language as the island-Celtic, though it is impossible to determine therefrom the entire structure of the language. The Irish-Gaelic and the Britannic branch we know more fully, both through the surviving dialects and from the literature, which extends back into the Middle Ages. (See under the different languages.) Concerning a third Celtic branch on the British isles, the Pict, we have only the most meager information; it had become extinct before the year 1000.

After the discovery of the Indo-European family of speech, Prichard (1831) and Pictet (1837) were the first to assert on the basis of etymologies that the Celtic belonged to it also. Definite proof was furnished by Bopp (1838) on the basis of the grammatical structure. It has ever since been accepted as fully established that the Celts are to be regarded as brothers of the Italians, Greeks, and Germans, the Slavs and Lithuanians, the Hindus, Iranians, and Armenians. The solid foundations of Celtic philology were laid by J. C. Zeuss in his *Grammatica Celtica* (1853; 2d ed. by Ebel, 1871). This work treats of the grammar of all the Celtic languages studied from their earliest documents. Since this the history of the different languages, pre-eminently of the Irish and Bretonic, has been the subject of diligent investigation.

Characteristic of the Celtic family is (1) the loss of Indo-Eur. *p*- (initial); Ir. *athir*: Lat. *pater*, father: (2) the change of *ē* to *ī*; Gall. *catu-rīx*, battle-chief: Ir. *rī*: Lat. *rēx*; (3) the masc. genitive in *-i*, Gall. *Dannotali* (nomin. *-talos*). The passives and deponents with *-r*, Ir. *sechidir*: Lat. *sequitur*, he follows, unite with other things to show that among the

Indo-Europeans the Italic tribes (the Latins, Umbrians, Samnites, etc.) held the closest relation to the Celts. The languages of the island Celts lack an infinitive proper, and have preserved but one of the original participles.

Among the Celts, the Britons and the Gauls have generally been regarded as closely related, and some considerations favor this view; thus Gall. and Brit. *p* for Ir. *c* (< i. e. *q*), e. g. Gall. *Tetru-corii*, Welsh *pedwar*, four, but Ir. *cethir* (: Lat. *quattuor*). In other points, however, the Britannic unites with the Irish, so that it seems to occupy a mean position between the two. Whether the Celts of the Iberian peninsula were closely related to the Irish is uncertain, as too little remains of their language. The island-Celtic (neo-Celtic) languages of MSS., since the eighth century, hold a relation to Old Celtic and Gallic similar to that of French to Latin—almost all the final syllables have disappeared. The Irish branch is, however, more primitive in type than the Britannic, the former retaining the noun inflection, while the latter from the earliest period uses but one form for the singular and one for the plural. The Old Irish vocabulary is also purer than the Britannic, as the latter under the Roman sway adopted many Latin words; cf. Loth, *Les mots latins dans les langues brittoniques* (1892). Both branches are remarkable for the variation of the initial element of words; thus Irish *bard*, bard, according to the word immediately preceding it, is also pronounced as *ward* and *mard*; Welsh *penn*, head, also *benn*, *fenn*, and *mhenn*. In other respects the two branches are strongly differentiated, but the subdivisions of both are closely connected among themselves. Welsh and Bretonic too were earlier, but little differentiated. In the course of the centuries, however, they have followed distinct courses, the former adopting much English, the latter much French material. A journal especially devoted to Celtic philology is the *Revue Celtique* (since 1870), in which a discussion of the more recent literature will be found. R. Thurneysen.

(Translated by Benj. Ide Wheeler.)

Celtic Literature: See Gaelic Literature and Kymric Literature.

Celts, or **Kelts** [Lat. *Celtæ*, Gr. Κελτοί, Κελται (Strabo), a name, like most names of peoples, of doubtful origin]: one of the great divisions of the Indo-European family of mankind, itself divided on the basis of language into three groups: the Gaelic, Britannic, and Gallic. The Gaelic division of languages comprises the Irish, the Scotch-Gaelic and the Manx (of the Isle of Man). The Irish and the Scotch Gaelic have been differentiated only since the eighth or ninth century. The Britannic comprises the Cymric or Welsh, the Cornish (extinct since early in the nineteenth century), and the Bretonic (Armoric) of Brittany. The Gallic, or the language of ancient Gaul, is known only from a few inscriptions and coins, and Celtic names quoted by Latin and Greek writers. (See Celtic Languages.) But the Celtic blood is much more widely diffused than those relics of their language would seem to indicate. Almost all France (Gallia) was inhabited by Celts. The Belgæ are thought to have been partially Cymric, as the ancient Britons undoubtedly were. The name *Celtiberi* indicates that in Spain the Celtic was probably long ago mixed with the Basque or Iberian blood. Northern Italy was long so entirely Celtic as to be called Cisalpine Gaul. The Celts under Brennus invaded Greece. In Asia Minor they settled and gave name to Galatia. In Germany the Boii gave name to Bohemia and Bavaria. In Great Britain the Cymri long had sway in Cornwall, Cumberland, and Strathclyde. It is probable that the present Cymric element of Northwestern France, though generally traced to immigration from England, is partly of direct Gaulish descent. Many of the Latin and Germanic races have a strong infusion of Celtic blood.

The ancient Celtic religion was a rude polytheism, the mythology and doctrines of which are now for the most part unknown. The priestly caste of Druids were lawgivers, poets, and prophets as well. Human sacrifices were common. The common people were grossly superstitious and ignorant. Weakened by the workings of their rude social system of clans and septs, oppressed by the exactions of their priesthood, and harassed by the constant inroads of Rome and the Germanic tribes, the Celts, after the dawn of history, are almost constantly seen to be the losing race. But they yielded nothing except to force, and among all the races none was ever more distinguished for valor. Among their other characteristics may be mentioned profound religious feeling and acute sensibilities.

The Celtic literature is of very ancient origin, all the old Celts having a literary class called "bards," sometimes of noble and sometimes of sacerdotal rank. The ancient Irish wrote in a rude alphabet called the Ogham. The people of Gaul have left comparatively few inscriptions, and these are often much Latinized. The chief existing Celtic literature consists of the hymns, martyrologies, annals, and laws of Ireland (see Gaelic Language and Ireland); the Welsh poems and laws, and many historical and theological works, mostly of a somewhat later date than the Irish, with the *Mabinogion*, a collection of tales. There are also extant a few Cornish religious dramas. The Manx literature is not extensive, and is quite recent. The number of people speaking the Irish, Manx, and Gaelic languages is rapidly diminishing, while the number of persons of Celtic blood seems to be increasing. The English language is fast displacing the others in Ireland, Scotland, and the Isle of Man. In Wales, however, the use of the Cymric language is probably much more extensive now than for many centuries past. Intense national feeling and systematic, persistent, and widely sustained effort have caused the old language to maintain its ground. See Celtic Languages, Irish Language, Irish Literature, Welsh Language, Welsh Literature, Manx, Cornish, Gaelic, and Bretonic.

Revised by Benj. Ide Wheeler.

Cem'bra Pine, or **Swiss Stone Pine**: the *Pinus cembra*; a noble and stately forest tree of Asia and Europe; cultivated to some extent in parks and arboretums in the U. S. It is prized for its seeds, which, though hard to extract from the cone, are very agreeable, and are used for dessert, and with those of *Pinus pinea* (the stone pine of Southern Europe and Barbary) are sold under the name of pine-nuts. The Cembra pine yields also a thin fragrant turpentine, called Riga balsam, Carpathian balsam, or balsam of Lebanon. It is caught in bottles as it flows from the wounded twigs, and is used in medicine.

Cement [from Lat. *cæmentum*, for *cædimen'tum* (cf. *prū'dens* < **providens*, *aetas* < **ae'vitas*, *auceps* < **aviceps*); deriv. of *cæ'dere*, hew, lit., chipped stone, broken stone, applied to broken stone used in setting mortar, so, finally, mortar]: any fluid, semi-fluid, or plastic substance capable of uniting solid bodies together when interposed between the surfaces, and afterward solidifying. There are many kinds of cement, animal, vegetable, or mineral, used separately or in combination with each other.

Glue is a cement of animal origin in common use. It is a hard, brittle, brownish gelatine, obtained by boiling to a soft jelly the skins, hoofs, etc., of animals. When heated gently with water it becomes viscid, and is employed for uniting solid bodies, mostly wood. In drying it becomes very tough and hard, but is easily softened again by water. Marine glue is formed by dissolving 1 lb. of india-rubber in 5 gal. of coal-naphtha, and adding to this solution an equal weight of shellac. The mixture is then placed over a gentle fire, and thoroughly incorporated by stirring. This glue is insoluble in water, and is very tenacious and adhesive. A cement for iron pipe, etc., is made as follows: Mix together in a mortar 2 oz. of muriate of ammonia in powder, 1 oz. of flowers of sulphur, and 16 oz. of cast-iron filings, and keep the mixture dry for use. When the cement is to be used, take 1 part of this mixture, 20 parts of clear iron borings or filings, pound them together in a mortar, mix them with water to a proper consistency, and apply the compound between the joints. A good cement for resisting moisture is made by mixing 8 parts of melted glue, of the consistency used by joiners, with 4 parts of linseed-oil, boiled into varnish with litharge. This cement hardens in 45 to 50 hours, and renders the joints of wooden cisterns and casks air and water tight. A good cement for coating the outside of buildings consists of linseed-oil, rendered dry by boiling with litharge, and mixed with porcelain clay or well-dried pipeclay in fine powder, to give the consistency of stiff mortar. Oil of turpentine added in small quantity to thin the cement aids its adhesion to stone, brick, or wood. A cement designed to improve the composition of artificial stone, stucco, etc., is made by dissolving 1 lb. of gum shellac in 3 to 4 oz. of concentrated alkali in aqueous solution. This mixture is then diluted with water, and used for mixing up the materials—hydraulic cement, lime, and sand—of which the artificial stone or stucco is made. The water required to mix 1 cubic foot of the materials should contain 1 to 2 oz. of gum shellac. Shellac dissolved in a concentrated solu-

tion of borax gives a good cement for uniting broken stone. Singer's cement for joints between brass and glass is made by melting together 5 lb. of rosin, 1 lb. of beeswax, 1 lb. of red ocher, and 2 tablespoonfuls of gypsum. Ure recommends for cementing voltaic plates into wooden troughs, and for similar uses, a cement made of 6 lb. of rosin, 1 lb. of red ocher, ½ lb. of gypsum, and ¼ lb. of linseed-oil; the ocher and gypsum to be calcined beforehand, and added to the other ingredients while in fusion. French plumbers employ for the joints of glazed pottery pipes, used for distributing water, a cold cement made of quicklime, cheese, milk, and the white of eggs, or a hot cement made by melting rosin, beeswax, and lime together. There are a great variety of cements composed of vegetable, mineral, and animal substances mixed, which it is not deemed necessary to mention.

There is a class of cements of which plaster-of-Paris or gypsum is the basis, the hardening of which is due to the union of the plaster with water, and not to the formation of silicates, as in the hydraulic cements hereinafter described. Plaster-of-Paris, however, never attains sufficient hardness and tenacity to be used with water alone. It may be advantageously combined with alum. Keene's cement is made by mixing powdered gypsum with an aqueous solution of alum, then heating the mixture until the water of combination is driven off. It is then finely ground in a suitable mill, and slaked with a solution of 1 part of alum to 12 or 13 parts of water by weight. Martin's cement differs from Keene's in adding to the original mixture a portion of carbonate of soda or of potassa. It is burnt with a higher degree of heat. In Parian cement borax is used instead of the carbonate of soda or of potassa.

Cement—Common Lime, Hydraulic Lime, and Hydraulic Cement.—Considered as materials for use in the builder's art, the products derived from the calcination of pure and impure limestones are classified into common or fat lime, hydraulic lime, and hydraulic cement. Common lime is sometimes called air lime, because a paste or mortar made from it requires exposure to the air to enable it to "set," or harden. The hydraulic limes and cements are also called water limes and water cements, from their property of hardening under water.

Common Lime.—The limestones which furnish the common lime of commerce are seldom if ever pure, but usually contain, besides the carbonate of lime, from 3 per cent. to 10 per cent. of impurities, such as silica, alumina, magnesia, oxide of iron, oxide of manganese, and traces of the alkalies. Lime, common lime, quicklime, or caustic lime (synonymous terms), is a protoxide of calcium, and is produced when marble or any other variety of pure or nearly pure carbonate of lime is calcined with a heat of sufficient intensity and duration to expel the carbonic acid. It has a specific gravity of 2·3, is amorphous, highly caustic, has a great avidity for water, and when brought into contact with it will rapidly absorb nearly a quarter of its weight of that substance, accompanied and followed by a great elevation of temperature, the evolution of hot and slightly caustic vapor, the bursting of the lime into pieces, and finally its reduction to a powder, of which the volume is from two and a half to three and a half times that of the original lime. In this condition the lime is said to be slaked, and is ready for use in making mortar. The purer the limestone the larger is its *growth* or increase of volume in slaking. The paste of common lime is unctuous and impalpable to the sight and touch; hence these limes are sometimes called *fat* or *rich* limes, as distinguished from others known as *poor* or *meager* limes. These latter usually contain more or less silica in the form of sand, and a greater proportion of other impurities than the fat limes, and in slaking exhibit a more moderate elevation of temperature, evolve less hot vapor, are seldom reduced to an impalpable, homogeneous powder, yield thin paste, and are characterized by less *growth* of volume. They are less valuable for mortar than the fat limes, but have an extensive application as a fertilizer. When used for building purposes they should, if practicable, be reduced to powder by grinding, in order to remove all danger of subsequent slaking.

Common lime, when mixed into a paste with water, or when slaked with sufficient water to produce a paste, may be kept for an indefinite time in that condition without deterioration, if protected from contact with the air so that it will not dry up. It is customary to keep the lime-paste in casks, or in wide, shallow boxes in which it was slaked, or heaped up on the ground, covered over with the sand to be subsequently incorporated with it in making mortar. It is convenient, for some purposes, to keep the slaked lime on hand in a state of powder, which may be done in casks under cover, or in bulk, in a room set apart for that purpose. Most common limes contain impurities which prevent a thorough, uniform, and prompt slaking of the entire mass, and hence the necessity of slaking some days before the lime is to be used, to avoid all danger to the masonry by subsequent enlargement of volume and change of condition.

A paste or mortar of common lime will not harden under water, or in continuously damp places excluded from contact with the air. It will slowly harden in the air, from the surface toward the interior, by desiccation and the gradual absorption of carbonic acid gas, by which a subcarbonate with an excess of hydrated base is formed, or $CaO.CO_2 + CaO.HO$.

The pastes of fat lime shrink, in hardening, to such a degree that they can not be employed as mortar without a large dose of sand. In other situations they have a very extensive application, possessing as they do a great advantage in economy over the hydraulic limes and cements, on account of the large augmentation of their volume in slaking, their extensive distribution over the surface of the globe, and the simplicity attending their manufacture. For masonry constructions of importance, and particularly upon our public works, a mortar or a concrete containing common lime only as the cementing medium is seldom used at the present day. Hydraulic lime or hydraulic cement is usually added, to a greater or less extent, in order to hasten the induration and secure greater ultimate strength and hardness.

The Hydraulic Property.—A lime is said to possess *hydraulic* properties when, after being calcined, reduced to powder, and made into a paste with water, it will harden or set under water, or in damp places excluded from contact with the atmospheric air. If the calcined stone can be slaked to powder in the presence of water, it is customary to call it *hydraulic lime.* The *cements* possess the hydraulic property to a greater degree than the hydraulic limes, and are reduced to powder by grinding. In both initial and ultimate strength and hardness, the hydraulic mixtures are greatly superior to those of common lime, even when the latter are employed under the most advantageous circumstances, but their maximum strength is not reached under a period of several years. The best cements, when mixed to a paste without sand, attain during the first month, or month and a half, fully one-half their greatest ultimate strength and hardness. After the first two years, the increase in strength and hardness proceeds very slowly, and at the end of three years the monthly increment requires the use of delicate instruments for its measurement. This principle of slow and gradually diminishing induration is characteristic of all hydraulic mortars, whether derived from the cements or the hydraulic limes, either natural or artificial. The most *active* hydraulic limes or cements, or those which set the most quickly, are not necessarily those which attain the greatest ultimate strength and hardness. The latter are characterized as possessing the greatest hydraulic *energy.*

The *argillaceous hydraulic limes* of commerce are generally derived from limestones containing from 10 to 20 per cent. of clay, homogeneously mixed with carbonate of lime as the principal ingredient. Traces of the alkalies, and a small percentage of the oxides of iron and carbonate of magnesia, are also present in most cases. The clay ingredient usually contains from 1½ to 2 of silica to 1 of alumina. During the burning, which is conducted at a heat just sufficient to expel the carbonic acid, all the silica and alumina is neutralized by entering into combination with a portion of the lime, forming both the silicate of lime and the aluminate of lime, leaving in the burnt product an excess of quick or caustic lime, which induces slaking, and becomes hydrate of lime when brought into contact with water. As this lime is burnt at a low heat, the double silicate of lime and alumina, which is formed only at a high heat, is not produced. The silicate of lime is first formed, and the alumina, reacting upon the quicklime as an acid, produces aluminate of lime. When slaked by sprinkling, the quicklime alone is hydrated.

Argillaceous hydraulic lime is therefore composed of—

Anhydrous silicate of lime	$SiO_3.3CaO$, or	Silica	23
		Lime	43
Anhydrous aluminate of lime	$Al_2O_3.3CaO$, or	Alumina	17
		Lime	22
And hydrate of lime	$CaO.HO$, or	Lime	34
		Water	11

When argillaceous hydraulic lime is mixed into a paste with water or made into mortar, the anhydrous silicate and aluminate of lime form hydro-silicates and hydro-aluminates of lime by combining with six equivalents of water, and subsequently undergo a species of crystallization technically called *setting*. This setting will ensue under water, and constitutes the hydraulic property.

If, in the general case, more than 20 per cent. of clay be present in a homogeneous limestone, a larger proportion of the lime will combine with silica or alumina during the burning, leaving insufficient quicklime present to induce slaking; and such stone may be expected to furnish a hydraulic cement. Some heterogeneous limestones, however, containing as high as 30 to 35 per cent. of clay, will slake more or less thoroughly after burning, for the reason that the ingredients are not in sufficiently close contact to combine in the kiln in the formation of the hydraulic elements. In such cases the burnt product contains an excess of lime, of silica, and of alumina, and, after slaking as much as possible, there still remains a lumpy residue.

Limes containing 10 per cent. of clay are *moderately hydraulic*. If made into a paste and immersed in water in small cakes, they will harden so as to resist crushing between the thumb and finger in from twelve to fifteen days. The *eminently hydraulic limes*, derived from homogeneous stones containing from 18 to 20 per cent. of clay, will harden under water in from twelve to twenty hours. If the stone contains more clay than this, and still yields hydraulic lime by slaking, the excess of clay does not combine with lime, and therefore confers no additional hydraulic energy. On the contrary, it impairs the strength and value of the lime for building purposes.

In consequence of their peculiar properties, the hydraulic limes can not be kept on hand in a state of paste, like common lime. They are preserved in casks or sacks in the condition of powder, and in using them for mortar or concrete, especially those that are eminently hydraulic, it is not well to mix more than one day's supply in advance. The lime and the sand may be mixed together dry, and kept on hand a long time in that condition if protected from the weather, but the water should not be added until a few hours before the material is to be used, whether for mortar or concrete.

The method usually pursued in manufacturing hydraulic limes is as follows: The stone, after being quarried and broken up into pieces not exceeding generally 12 or 15 lb. in weight, is burnt in any suitable kiln at a heat just sufficient to expel the carbonic acid, and then, after being drawn from the kiln and while still warm, is sprinkled with from 15 to 20 per cent. of its own weight of water. The slaking soon begins, and the stone falls to pieces, some of it in fine powder, and the rest in unslaked lumps of various sizes. The mass is then thrown together in large heaps, where it remains undisturbed for six or eight days, in order that the slaking may be completed by the steam evolved. It is then screened through fine wire-cloth to get rid of the unslaked lumps, packed in sacks or barrels, and sent to market.

It is not known that any deposits of argillaceous limestones capable of furnishing good hydraulic lime exist in the U. S. It is manufactured in several localities in France, notably at Seilley, about 70 miles from Paris. The Seilley lime is exported to the U. S. in small quantities for use in making artificial stone. When fresh it weighs about 50 lb. to the struck U. S. bushel, loosely measured. If made into a stiff paste, it will set in the air in ten or twelve hours, and will resist crushing between the thumb and finger in from twenty to twenty-four hours. It is not active enough for laying masonry under water, but will harden under water after the initial set has taken place in the open air.

The *siliceous hydraulic limes* are generally derived from siliceous limestones containing from 12 to 18 per cent. of silica, less than 90 per cent. of carbonate of lime, with a small proportion of alumina and oxide of iron. The process followed in their manufacture is similar, in all essential respects, to that described for producing argillaceous hydraulic lime. They owe their hydraulic property, when mixed to a paste with water, to the crystallizing energy of the anhydrous silicate of lime, formed during the calcination: $SiO_3.3CaO = \begin{cases} \text{Silica, } 23. \\ \text{Lime, } 23. \end{cases}$ The best type of siliceous hydraulic lime is derived from the quarries at Teil on the river Rhône, department of Ardèche, France. It is known as hydraulic lime of Teil. The raw stone contains from 11 to 15 per cent. of silica, from 1 to 2 per cent. of alumina, from 80 to 84 per cent. of carbonate of lime, and a trace of oxide of iron. When newly made this lime weighs about 56 lb. to the struck U. S. bushel, loosely measured, but if exposed to the air it absorbs moisture so that its weight is considerably augmented. In initial hydraulic energy the Teil lime does not materially differ from the lime of Seilley, but in ultimate strength and hardness it is believed to be superior to it. Analyses of the Teil hydraulic lime after burning, by Prof. Rivot, gave the following composition:

Lime	78·29	.....	73·60	
Silica	18·20	.....	17·20	
Alumina	1·80	21·70....	1·70	20·50
Quartz sand	1·70	.....	1·60	
Oxide of iron	traces	.....	traces.	
Water and carbonic acid	....	.....	5·00	
	99·99		99·10	

The elements of hydraulic energy in this lime may be stated to be 60 per cent. of the whole immediately after calcination, as indicated below, neglecting a small quantity of alumina and oxide of iron:

Silicate of lime	66	Silica	23	$SiO_3.3CaO$.
		Combined lime	43	
Free lime	34		34	CaO.
	100		100	

Heavy, Slow-setting Argillaceous Cement (*Portland Cement*).—When a homogeneous, argillaceous limestone contains so large a proportion of clay, usually exceeding 20 per cent., that it will not slake after calcination, it may be expected to furnish some grade of hydraulic cement. The stone from which the celebrated Portland cement is derived contains from 20 to 22 per cent. of clay and 78 to 80 per cent. of carbonate of lime. The clay itself is composed of 1½ to 2 parts of silica to 1 of alumina. When calcined at a high, long-continued heat, all or nearly all the silica and alumina of the clay combines with a portion of the lime, producing both silicate of lime, represented by the formula $SiO_3.3CaO \begin{cases} \text{Silica, } 23, \\ \text{Lime, } 43, \end{cases}$ and double silicate of lime and alumina, as expressed by the formula

$$SiO_3(Al_2O_3 + CaO)_3 \begin{cases} \text{Silica,} & 15, \\ \text{Alumina,} & 51, \\ \text{Lime,} & 28. \end{cases}$$

The burnt product does not contain any uncombined, and therefore inert, silica and alumina to adulterate the cement and impair its hydraulic properties; while the quantity of uncombined lime is not sufficient to cause the mass to slake to powder in the presence of water. After calcination the cement is therefore reduced to powder by grinding between ordinary millstones.

Good Portland cement, when made into paste and formed into small cakes, will set under water in from two to four hours, so as to resist crushing between the thumb and finger. When stone suitable for Portland cement is calcined at a low heat, barely sufficient to expel the carbonic acid, the silicate of lime (as above) and the aluminate of lime ($Al_2O_3.3CaO$) are formed, and a light quick-setting cement is usually the result, greatly inferior to Portland cement in weight as well as in ultimate strength and hardness.

The superior quality of Portland cement appears to depend in a great measure upon the presence of the double silicate of lime and alumina, which is formed only at a high heat. The weight of Portland cement, as well as its hydraulic energy and its ultimate strength and hardness, is increased by augmenting the intensity and duration of the heat employed in burning, within the limit of vitrification. The initial hydraulic activity, however, is diminished by high burning, so that the best Portland cements are slowest in setting. A cement weighing 100 lb. to the struck U. S. bushel may be burnt to weigh 125 lb. to the bushel, and its strength will be nearly doubled thereby.

Artificial Portland Cement.—Fully nineteen-twentieths of all the Portland cement used in Europe is artificial. It is made by thoroughly mixing together, in suitable proportions, clay and finely pulverized carbonate of lime (either chalk, marl, or compact limestone), burning the mixture in kilns at a high heat, and then grinding the burnt product to fine powder between ordinary millstones. There are two methods of manufacture, both well adapted to the char-

acter of the materials employed, and known respectively as the "wet proeess" and the "dry proeess."

Portland Cement by the Wet Process.—The works in the vicinity of London, England, employ the wet proeess. The carbonate of lime is furnished by both the white and gray chalks of the neighborhood. The clay procured from the shores of the Medway and Thames, and from the adjoining marshes and inlets, eontains about 2 parts of silica to 1 of all the other ingredients, eomprising alumina, oxide of iron, soda, carbonatc of lime, etc.

First. The clay and chalk are mixed together with a large quantity of water in a eireular wash-mill or basin, provided with heavy harrows attached to the horizontal arms of a revolving vertieal shaft. By this means the ehalk is thoroughly pulverized and ineorporated with the elay in a semi-fluid state. The proportions are about 1 of elay to 3 of chalk, by weight. Seeond. When a thorough mixture of the ingredients is thus effeeted, the liquid mass, resembling whitewash in appearanee, is conducted into large reservoirs, called *backs*, where it is left to settle. When the heavier material, or raw eement, has settled to the bottom, and the surplus water has become clear on top, the latter is drained off. By subsequent evaporation the drying proeess is continued until the raw eement has attained the requisite stiffness. During the time the mixture remains in the backs samples of it are taken from time to time and made into eement by burning in sample kilns, in order to test the accuracy of the proportions. If any error in this respeet is discovered, it is eorrected by conveying from the wash-mills additional material containing an excess of either elay or chalk, as the ease may require. Sometimes the needed eorreetion is secured by mixing together the contents of two or more backs. Third. When, by evaporation, the raw cement mixture has attained the consisteney of butter, or rather of stiff clay, it is taken out of the baeks by shovelfuls, and in that form and condition is removed to rooms artificially heated, or spread out around the tops of the kilns, and further dried. Fourth. After being dried, although it is not neeessary to expel all the moisture, the cement is burnt in suitable kilns with nearly a white heat, just below the point of incipient vitrification. The kilns may be intermittent or perpetual, the latter being most eeonomical in eurrent expenses, though somewhat more costly in original outlay for construetion. When properly burnt, the pieees of eement, called *clinker*, are of a greenish-brown eolor, contorted and much shrunken from the effect of the heat. Fifth. The cement clinker is then finely ground between ordinary millstones, packed in barrels, eaeh containing 400 lb. net, and sent to market.

Portland Cement by the Dry Process.—By the dry proeess any of the eompaet limestones, as well as the ehalks and marls, may be used in making Portland eement. First. The raw materials—the earbonate of lime and the elay—are kiln-dried at 212° F., in order to expel the moisture and prevent caking in the kiln, and otherwise faeilitate grinding and sifting. Seeond. After drying, the clay and the earbonate of lime are mixed together in suitable proportions, and redueed to a fine powder. In most localities the proportion will vary from 20 to 23 per eent. of elay and 80 to 77 per eent. of the carbonate. One kind of machine will not suffice for grinding the raw material eeonomieally. In Germany, whenee most of the artifieial Portland cement made by the dry proeess is derived, three maehines are used, viz.: (1) A stone-breaking maehine of the kind usually employed in breaking stone for roadways or for eoncrete. Through this the dried and mixed materials are passed, issuing therefrom in pieces varying from the size of a pea to that of a hen's egg. (2) A further reduetion is effeeted by a vertical mill or edge-runner. (3) The material is then finely ground between horizontal millstones. Third. The powdered material is then tempered to a rather stiff paste in a briek-making maehine, and made into bricks of a suitable size for burning. During this mixing the material is kept warm by coils of steam-pipe or otherwise, and the water used for tempering is rendered strongly alkaline by adding 3 to 6 per cent. of calcined soda, and an equal amount of newly burnt slaked lime. Fourth. The bricks are dried by artificial means, and are then burnt at a high heat and ground to a fine powder, as in the wet proeess. The same number of mills is necessary for grinding the cement as for pulverizing the raw materials. The clinker is first put through a stone-breaking machine, then into a vertical mill or edge-runner, and lastly is ground to an impalpable powder in a horizontal mill.

American Portland Cement.—The manufaeture of Portland cement in the U. S. began in 1875, and it is now produced at Coplay, Pa., Egypt, Pa., Jordan, N. Y., and other places. In 1886 the U. S. imported 650,000 and manufactured 150,000 barrels of Portland eement. The growth of this industry is due to the discovery of argillaeeous limestone possessing the requisite properties. The stone is broken into small pieces by a crusher, and then into an impalpable powder by a finer crusher. This powder is tested, and, if necessary, marl or clay is added in proper proportions. The whole mass again is passed between millstones to more thoroughly ineorporate the different parts, after which it is taken to a pug-mill where water is added in suffieient quantity to produce a stiff paste, and this is taken in barrows to a drying-floor and spread out over the floor to a depth of about 4 inehes, when a workman lays a scaled strip upon it, and with a large spade-like blade fastened in a handle at right angles with the eenter, cuts the mass into brieks; another workman with a shovel follows and overturns or up-ends them, giving them an opportunity to dry out. After drying, boys pile them up for further kilning. These brieks are now put into another furnace or kiln, alternately with layers of coke, and fired for three days. The result is a clinker and refuse, and the elinker is again crushed and ground in another set of millstones, after which it is bolted through a mesh of 2,500 parts to the square ineh. The eement is now taken to a storehouse, and barreled or put up in sacks for shipment.

Light, Quick-setting, Argillaceous Cements.—When an argillaceous limestone, eontaining more than 23 per cent. of elay homogeneously mixed through the mass, is burnt with the great intensity and duration of heat neeessary to produee Portland eement, it generally fuses into a speeies of slag or glass, in eonsequence of the large amount of silica present, and beeomes nearly destitute of hydraulic energy. But if the caleination be kept below the point of vitrification, it may be expected to yield a quiek-setting hydraulic cement, weighing about 70 lb. to the struek bushel, loosely measured. In the burning, a portion, and in some eases all, of the lime enters into combination with a portion of the siliea and alumina of the clay, produeing silicate and aluminate of lime, leaving generally an excess of uncombined elay, but more espeeially of siliea, whieh, being inert, adulterates the cement, injuring its hydraulie energy, and eonsequently impairing its strength. Cements of this elass, if mixed into a paste and immersed in water, will set so as to lose their plastie condition in ten or fifteen minutes, but are far inferior in ultimate strength and hardness to Portland cement of average quality. Some of these contain as high as 10 or 15 per eent. of the oxides of iron, the proportion of elay in such eases being generally below 23 per eent.

The eement of Vassy, Grenoble, Camp Rond, and Corbigny, in Franee, and the English and French Roman eements made from nodules of septaria, belong to this elass. No deposits of this type of argillaceous limestones have been diseovered in the U. S.

This grade of eement may also be produeed artificially, by burning at a low heat a mixture of lime and clay, and was manufaetured largely in England and Franee by this method before the superior and peculiar qualities of the Portland eement were diseovered.

Argillo-magnesian Cements.—All the natural hydraulic cements of the U. S. are made from argillo-magnesian limestones—that is, limestones of whieh the prineipal ingredients are earbonate of lime, earbonate of magnesia ($MgO.CO_2$), and clay. The Rosendale eements, from the valley of Roundout creek, in Ulster co., N. Y., and those found at Shepherdstown, Va., Cumberland, Md., Louisville, Ky., and at different points on the line of the Erie Canal, and at Sandusky, O., Utiea, Ill., and other loealities in the West, belong to this elass. The process followed in their manufaeture is essentially the same for all. The stone is quarried, and then broken up into pieces of irregular size, seldom exceeding 12 or 15 lb. in weight, and burnt in an ordinary kiln (either intermittent or perpetual), with either wood or coal as fuel. Where coal is used the perpetual method of burning is usually followed, the kiln being filled, in starting, with alternate layers of eoal and stone, and then fired with wood at the bottom. As the burning proeeeds, the charge settles down, the burnt stone is drawn at the bottom of the kiln, and alternate layers of eoal and stone are added at the top. The burnt cement is then erushed up into small fragments by suitable machinery, ground between ordinary millstones, packed in barrels of 300 lb. each, and sent to market.

In burning the argillo-magnesian cement both the lime and the magnesia combine with the silica and alumina of the clay. The result is the formation of the silicate and aluminate of lime and magnesia—compounds which become hydrates when water is added, and are capable of undergoing the species of crystallization or hardening under water called *setting*. The argillo-magnesian cements can not be burnt with that intensity and duration of heat necessary in making Portland cement without fusing into slag, destitute of hydraulic energy. Those manufactured in the U. S. are all quick-setting, and their weight does not ordinarily exceed 70 lb. to the struck bushel, loosely measured. The Rosendale cement is regarded as the most valuable of them all, but even this will never attain, under the most favorable circumstances, more than one-third the ultimate strength and hardness of the best Portland cement.

The elements of hydraulic energy in limes and cements are composed as follows, the proportions being given by weight:

Silicate of lime, $SiO_3.3CaO$	Silica	23
	Lime	43
Aluminate of lime, $Al_2O_3.3CaO$	Alumina	17
	Lime	28
Silicate of alumina, $2SiO_3.Al_2O_3$	Silica	30
	Alumina	17
Double silicate of lime and alumina, $SiO_3.(Al_2O_3+CaO)_3$	Silica	15
	Alumina	51
	Lime	28
Silicate of magnesia, $SiO_3.3MgO$	Silica	23
	Magnesia	30

Magnesian Cement.—Pure carbonate of magnesia, called magnesite, when burnt in a heat of moderate intensity, about cherry-red, ground to a fine powder, and made into a paste with water, possesses considerable hydraulic energy. This calcined magnesite has been patented under the name of Union cement. Its characteristic property, however, upon which it depends for its peculiar value, is not developed when mixed with water alone, for in that case the induration or setting is due to the crystallization of the hydrated magnesia or oxide of magnesium. But if the burnt and pulverized magnesite, or Union cement, be mixed up with the chloride of magnesium—for which the bittern water of seaside salt-works has been found to be a cheap and suitable substitute—a chemical combination takes place between the oxide and the chloride of magnesium, and oxychloride of magnesium is formed. This is a very remarkable hydraulic cement, being greatly superior to any other known cement in strength and hardness, not excepting even Portland cement.

Dolomite, or the double carbonate of lime and magnesia, when burnt at a low heat, reduced to powder, and made into mortar, also exhibits hydraulic properties. But if the heat be carried sufficiently high—say about 400° C.—to reduce the carbonate of lime also, thus forming caustic or quicklime, the addition of water causes slaking, and the hydraulic energy is destroyed or impaired by the presence of the hydrate of lime.

Any magnesian limestone containing as high as 60 per cent. of carbonate of magnesia may be presumed to be capable of yielding hydraulic cement of greater or less value, if properly underburnt, no matter whether clay be present or not. If clay exists as one of the principal ingredients, there are formed in the kiln silicate and aluminate of magnesia, as well as silicate and aluminate of lime. All of these compounds become hydrated when brought in contact with water, and are then in condition to undergo that species of crystallization called setting.

Mortar.—Mortar is a mixture of the paste of lime or cement with sand. The paste may be made before adding the sand, or the materials may be incorporated dry, and afterward tempered to a plastic condition with water. In common mortar the cementing substance is common lime. Hydraulic mortar may be made by mixing a paste of hydraulic lime or cement with sand, or by adding hydraulic materials to common mortar.

Common Mortar.—As a paste of common lime hardens or *sets* very slowly, even in the open air, unless it be subdivided into small particles or thin films, it is important that the volume of lime-paste in common mortar should be but slightly in excess of what is sufficient to coat all the grains of sand and fill the voids between them. If this limit be exceeded the strength of the mortar will be impaired. With most sands the proper proportion will be from $2\frac{5}{10}$ to 3 volumes of sand to 1 volume of lime-paste. Generally, if either less or more sand than is herein indicated be used, the mortar will be injured; in the former case from excess of lime-paste, and in the latter from porosity.

Hydraulic Cement Mortar.—A paste of good hydraulic cement hardens simultaneously and uniformly throughout the mass, and its strength is impaired by any addition of sand. For ordinary use, however, it is customary to add as much sand as possible without making the mortar porous: 1 barrel of cement, as packed for market, to 3 barrels of sand is the proportion usually followed. The usual practice is to mix the cement and sand together dry, and afterward temper to a plastic condition with water.

TENSILE OR COHESIVE STRENGTH OF MORTAR PER SQUARE INCH, IN POUNDS.

COMPOSITION OF THE MORTAR.	One month old.	Two years old.
Portland cement mixed to a paste without sand	300 to 400	500 to 600
Good Portland cement, 1 vol.	50 to 80	200 to 230
Sand, 3 "		
Rosendale cement mixed to a paste without sand	80 to 100	180 to 220
Rosendale cement, 1 vol.	15 to 20	75 to 85
Sand, 3 "		
Portland cement paste, $\frac{1}{2}$ vol.	.....	95 to 110
Fat lime paste, $\frac{1}{2}$ "		
Sand, 3 "		
Rosendale cement paste, $\frac{1}{2}$ vol.	.....	45 to 60
Fat lime paste, $\frac{1}{2}$ "		
Sand, 3 "		
Teil hydraulic lime dry, 3 vol.	25 to 35	120 to 160
Sand, 5 "		
Good common mortar		
Common lime-paste, 1 vol.	.....	40 to 60
Sand, 3 "		

CRUSHING STRENGTH OF CEMENTS AND MORTARS, FROM TRIALS UPON CUBES AND PARALLELOPIPEDONS OF VARIOUS SIZES, IN POUNDS PER SQUARE INCH OF TOP SURFACE.

COMPOSITION OF THE MORTAR.	Six months old.	Two years old.
Portland cement without sand	4,500 to 5,300	5,000 to 6,000
Dry Portland cement, 1 vol.	1,500 to 2,200	2,000 to 2,600
Sand, 3 "		
Mixed to a stiff mortar		
Dry Portland cement, 1 vol.	1,200 to 1,600	1,600 to 2,000
Sand, 5 "		
Mixed as above		
Rosendale cement, without sand	1,500 to 1,800	1,800 to 2,000
Dry Rosendale cement, 1 vol.	450 to 600	550 to 700
Sand, 3 "		
Mixed to a stiff mortar		
Good hydraulic lime, like Teil, 3 vol.	450 to 590	550 to 600
Sand, 5 "		
Common lime-paste, 1 vol.	.....	400 to 500
Sand, 3 "		
Poor common lime-mortar	.....	200 to 250

Cement and Lime Mortar.—When it is desirable, from any cause, to lessen the cost of cement mortar, the best way is to add a portion of common lime to the cement, rather than to increase the quantity of sand, as this last method produces a porous mortar. The volume of the cementing paste, whether of pure cement or a mixture of cement and lime, should be slightly in excess of what is theoretically necessary to coat all the grains of sand and completely fill the voids. A mortar of cement and sand loses about four-tenths of its strength if one-half of the cement paste is replaced by an equal volume of common lime-paste, but is then quite suitable for ordinary work.

Tests for Hydraulic Cements.—The methods of testing hydraulic cements recommended by a committee of the American Society of Civil Engineers in 1885 are now widely used, and may be regarded as standards. They have had the effect of greatly improving the quality of many varieties of cements sold in the market. These tests are three in number; first, for fineness; second, for cracking or checking; and third, for tensile strength. The following is an outline of the methods of making them:

The strength of a cement depends greatly upon the fineness to which it is ground, especially when mixed with a large dose of sand. It is therefore recommended that the tests be made with cement that has passed through a No. 100 sieve (10,000 meshes to the square inch), made of No. 40 wire, Stubbs's wire gauge. The results thus obtained will indicate the grade which the cement can attain, under the condition that it is finely ground, but it does not show whether or not a given cement offered for sale shall be accepted and used. But the finer the cement, if otherwise

good, the larger dose of sand it will take, and the greater is its value.

The tests for checking or cracking are conducted by making two cakes of neat cement 2 or 3 inches in diameter, about $\frac{1}{2}$ inch thick, with thin edges, and noting the time in minutes that these cakes, when mixed with water to the consistency of a stiff plastic mortar, take to set hard enough to support a wire $\frac{1}{12}$ inch diameter loaded with $\frac{1}{4}$ lb., and $\frac{1}{24}$ inch loaded with 1 lb. One of these cakes, when hard enough, should be put in water and examined from day to day to see if it becomes contorted, or if cracks show themselves at the edges, such contortions or cracks indicating that the cement is unfit for use at that time. The remaining cake should be kept in the air and its color observed, which for a good cement should be uniform throughout, yellowish blotches indicating a poor quality; the Portland cements being of a bluish gray, and the natural cements being light or dark, according to the character of the rock of which they are made. The color of the cements when left in the air indicates the quality much better than when they are put in water.

The tensile tests are to be made on briquettes having an area of 1 sq. inch at the smallest cross section. These are made in molds, kept in air for a designated time, and then put under water until used in the testing-machine. For a quick test the briquettes may be kept in air one hour, or until set, and be broken twenty-four hours after being made, and in such case only neat cement would be used. But for tests of seven days or upward the briquettes may be kept one day in air before being put under water, and a mixture of 1 part cement to 1 part of sand, for natural cements, and 3 parts of sand for Portland cements, be used in addition to trials of the neat cement. The quantities used in the mixture should be determined by weight. To secure the best comparative results the crushed quartz used in the manufacture of sandpaper was recommended by the committee, the degree of fineness to be such that it will all pass through a No. 20 sieve and be caught on a No. 30 sieve. The sand and cement should be mixed dry, and all the water be added at once. The mixing should be rapid and thorough, and the mortar, which should be stiff and plastic, should be firmly pressed into the molds with the trowel, without ramming, and struck off level: the molds in each instance, while being charged and manipulated, to be laid directly on glass, slate, or some other non-absorbent material. The molding must be completed before incipient setting begins. As soon as the briquettes are hard enough to bear it, they should be taken from the molds and be kept covered with a damp cloth until they are immersed. For the sake of uniformity, the briquettes, both of neat cement and those containing sand, should be immersed in water at the end of twenty-four hours, except in the case of one-day tests. The briquettes should be put into the testing-machine and be broken immediately after being taken out of the water, and the temperature of the testing-room should be kept between 60° and 70° F. The stress may be applied at a uniform rate of about 400 lb. per minute, starting each time at 0. With a weak mixture one-half the speed is recommended.

Similar standard methods of testing hydraulic cements and mortars have been formulated by associations of architects and engineers in European countries. The Pennsylvania Railroad Company specifies regarding tensile strength that neat Portland cement one day old shall exceed 102 lb. per square inch, and as follows concerning longer tests:

AGE OF CEMENT.	Neat.	1 sand to 1 cement.	2 sand to 1 cement.
One week	303	160	126 lb.
One month	412	225	163 lb.
Six months	468	347	279 lb.

The New York Aqueduct Commission requires neat Portland cement one day old to exceed 110 lb. per sq. inch, seven days old to exceed 300 lb. per sq. inch, and twenty-eight days old to exceed 400 lb. per sq. inch, and that the fineness should be such that 20 per cent. would be retained on a sieve of 10,000 meshes per sq. inch.

AUTHORITIES.—See Gillmore's *Treatise on Limes, Hydraulic Cements, and Mortars* (1863); Reid's *Portland Cements* (1885); and Baker's *Treatise on Masonry Construction* (1890). See also the articles CONCRETE, LIME, MASONRY, POZZUOLANA, and STONE.

Revised by MANSFIELD MERRIMAN.

Cementation of Steel: See FURNACE.

Cemetery [also *cœmitery, cimitery*, from Lat. *cœmite'rium* or *cimite'rium*, acc. to Late Gr. pronunciation of κοιμητήριον, resting-place, deriv. of κοιμᾶν, lull to sleep]: The ancient Germans interred their dead in consecrated groves; the Egyptians interred them in vast catacombs or pyramids; the Hebrews usually selected for this purpose ornamental gardens, fertile valleys, or grottoes, and they still designate them, with a sad emphasis, as the "house of the living"; the Greeks discouraged interments within their cities, consigned their dead to shaded groves, and called them "places of repose." The Romans erected monuments to the dead on the sides of their spacious roads, in the midst of trees and ornamental walks, placing therein the ashes of their great citizens. The Appian Way was crowded with columns and obelisks in memory of their heroes, and at every turn the short and touching inscription met the eye—*Siste, viator* (Pause, traveler). It is probable that the modern idea of a cemetery was derived from the Turks, for Constantinople is almost environed with cypress groves filled with sepulchral stones.

The term *cemetery* was applied by the early Christians to their usual places of interment, which were extra-mural, but after some centuries the desire to lie under the religious sanction of the Church led to the transferral of burial-places to consecrated grounds and crypts of sacred edifices. "God's acre" was usually the churchyard, and these places rapidly became populous with the dead. One of the earliest of modern cemeteries is that of Père la Chaise, in Paris, laid out in 1804, and at that time beyond the walls. It was named for the confessor of Louis XIV., and contained 200 acres. The earliest in the U. S. is Mt. Auburn, near Boston, where, at the instigation of Dr. Jacob Bigelow, a park of 625 acres was opened for burial uses in 1831. Soon after, Laurel Hill was established on the Schuylkill river above Philadelphia. Greenwood followed in 1838, and was long a place of sepulture for New York, although it lay on the S. of Brooklyn, L. I., where it commanded a view of the sea. In 1843 Chadwick, in a parliamentary report, arraigned the unhealthfulness of interments in churches and cities, and from that time the substitution for them of extra-mural burial-grounds has gone on with rapidity until every considerable town in Great Britain and America is provided with them. In France every city and town is required to provide burial-grounds beyond its barriers, on rising ground if possible, and to keep them in ornamental cultivation. In Paris the practice prevails of burying forty or fifty corpses at a time in the *fosses communes*; the poor gratuitously and others at a small charge. When the *fosse* is filled its surface is leveled, left undisturbed for five years, then covered with 4 feet of earth, when interments begin again. Pit-burials are usual in Naples, and in other cities of continental Europe. In 1874 Paris was provided with a cemetery of 1,200 acres on the plain of Méry-sur-Oise, 16 miles N. of the city, reached by a special railway line. Near Liverpool the St. James's Cemetery utilizes an old quarry, which is entered by a tunnel. On the face of the escarpment roads are cut leading to the openings of a sort of catacombs excavated in the rock.

The dominant motive to the establishment of the modern cemetery was a consideration of public health, but that was speedily seen to be compatible with beautiful grounds and the gratification of the reverent respect civilized men feel for their dead. It was a fortunate thing that the first examples were governed by cultivated men; they inaugurated a taste for fine planting that culminated in a general demand for ornamental grounds.

A rich vegetation exercises a powerful influence in preventing the escape of deleterious miasmata, though this is not to be feared where graves are single and of a depth of 7 or 8 feet, as they always should be. Trees should neither cover a large space with their branches, nor give so much shade as to prevent the growth of grasses. All the arbor-vitæ family, the junipers, yews, hollies, a few species of oaks, magnolias, and in general the trees of middle size suitable to the climate meet these requirements.

How to lay out a cemetery is an important topic. It should conform to the character of the ground and be made as cheerful as possible. The so-called landscape plan has no inclosures, the lots are marked by a sunken post at each corner, there is but one monument in the center, and the interments surround this on all sides; the advantages claimed are a park-like appearance and more open space,

with more facility for neat keeping. Bricked vaults of greater or less size under ground are not uncommon, and a more general desire for those above the surface is observable. The latter should never be allowed unless provision is made effectually to seal the crypts in which bodies are deposited. Granite is much used as a curbing; this suffices for the inclosure, and marks the possession of each family, and is the most enduring; the best burnt bricks for underground structures are also lasting; marble or other veneering gives out, and should be avoided, as the introduction of water in the interstices, which in freezing opens them with great force.

The best material for monuments is granite, either the expensive Aberdeen or the American. Italian marbles are not adapted to a cold climate; they inevitably split and crumble, while the American will do the same if not laid in the position of its natural bed.

Cenci, chen'chĕe, Beatrice: a Roman lady: b. Feb. 12, 1577. Her father, Francesco, the son of a cardinal who left him vast wealth, was very depraved and extravagant, and treated his children with cruelty. Finally, Francesco was found dead under suspicious circumstances; Beatrice, her brother, and her stepmother were accused of his murder, and for that crime were executed at Rome Sept. 11, 1599. Her story is the subject of one of Shelley's tragedies (1819) and of a novel by Guerrazzi (1854). The long current story, with its well-nigh incredible details of ferocity and depravity, is derived from the *Annales* of Muratori, and has been familiarized in these romantic forms. But there is no proof that Beatrice was beautiful, nor that her father committed incest with her, as her defender asserted in her behalf at the trial; while the picture by Guido Reni in the Palace Barberini in Rome can hardly be hers, surely not if by Reni, because he did not paint in Rome until nine years after Beatrice's execution. For these facts, see A. Bertolotti, *Francesco Cenci e la sua Famiglia* (Florence, 1877; 2d ed. 1879).

Cenis, Mont: See Mont Cenis.

Cenozo'ic, or **Cainozoic Era** [Gr. *καινός*, recent + *ζῷον*, animal]: the latest of the greater divisions of geologic time, including the Tertiary and Quaternary of earlier classifications, and co-ordinate with Mesozoic, Palæozoic, and Proterozoic. In this era are included the Eocene, Neocene, and Pleistocene periods. See Paleontology.

Censer [O. Fr. *censier*, short form for *encensier* (cf. Eng. *encenser*), as if from Lat. **incensarium*, deriv. of *incensum*, incense, deriv. of *incen'dere*, kindle]: a vase or other vessel used for burning perfumes and incense in temples and churches. Censers were used by the ancient Hebrews and Greeks, and are now employed in the Roman Catholic Church at mass, vespers, and other services; also in some services of ritualistic Protestant Episcopal churches. The censer now in use is suspended by chains which are held in the hand, and is tossed or swung in the air. It is frequently called the Thurible (*q. v.*).

Censor [Lat. *censor*, to *cense're*, rate, value, estimate, pass judgment]: the title of two magistrates in ancient Rome, who were appointed to take the census—i. e. to make an enumeration of the citizens and a valuation of their property—also to inspect and regulate their manners and moral conduct. In the early ages of the republic these duties were performed by the consuls, and no special magistrates were elected for the purpose until 443 B. C. The censors were originally chosen for a term of five years (which was soon reduced to eighteen months), and only patricians were eligible to the office. In 339 B. C. a law was enacted that one of the censors must be a plebeian, and in 131 both the censors elected were plebeian. The censorship (in Lat. *censura*) was regarded as the highest dignity in the republic except the office of dictator. The power of the censors was in a great measure undefined and irresponsible, especially in the regulation of morals (*regimen morum*). They had power to expel a senator from the senate for a misdemeanor, and to punish with marks of ignominy those whose conduct did not accord with their own ideas of rectitude. They could degrade persons from a higher to a lower rank, and fill vacancies in the senate. Among their duties was the administration of the finances of the state and the erection of new public buildings. As a general rule, the only persons eligible to the office were those who previously had been consuls. No person could be elected censor for a second term.

Censorship of Books: term applied to interference by a government with the freedom of the press, exercised formerly over books alone, but since the rise of journalism extended to periodicals also. The censorship of books did not come into operation until the invention of printing (except that heretical books were prohibited by the Church). It soon became common to all European countries, Great Britain included. The censorship of books was established by act of Parliament in 1662, and renewed from time to time; but its renewal was refused in 1693. In 1766 it was abolished in Sweden; in 1770 in Denmark; in 1791 in France, where it was restored in 1805, again abolished in 1814, and after having again been in turn restored and abolished, was finally suppressed in 1827, but has since been from time to time, to some extent, revived. In Germany and Austria freedom of the press was promised in article 18 of the Federal Act (1815), but not established until 1848. In Germany, however, censorship exists at the present day, in Russia it is very rigorous, and in some other countries the police authorities have a supervision of books and periodicals. In the republics of North and South America a censorship of books has never been known.

The Church of Rome has long claimed the right of censorship over books. Some of the early provincial councils prohibited the reading of suspicious or heretical works, but the first catalogue of the kind now known was issued in 494 A. D., in the time of Pope Gelasius. The authoritative lists of that Church have a continuous history from the time of the Council of Trent, and are known as the two collections, *Index Librorum Prohibitorum*, which forbids the reading of the book named at all, and the *Index Expurgatorius*, which requires the elimination of certain paragraphs before the book named can be read by the faithful. See Index Librorum Prohibitorum.

Census [Lat., registration of Roman citizens according to birth, age, family, and property; the census-list; the sum total of property disclosed]: an official account of population or wealth. For a discussion of the origin and progress of statistical inquiry in general, see Statistics.

I. The Census of Antiquity has but little bearing upon the modern census. There are allusions in historical records, of greater or less validity, to censuses taken in early ages in China and Japan. The book of Exodus (xiii. 11–13; xxii. 29; xxx. 12–16) contains ordinances prescribing donations for religious purposes, which, based as they were upon the numbers of men and of beasts among the Hebrew tribes, required for their due observance an occasional enumeration. In Ex. xxxviii. 26; Num. i. 2, 3; xxvi. 63–65; 2 Sam. xxiv. 1–9; 1 Chron. xxi. 1–7, 14; xxvii. 23, 24 are found accounts of several of these enumerations, the most notable being that of King David, which is stated to have been followed by a pestilence that destroyed 70,000 men. It is not safe to conjecture whether this succession of the plague to the census became the cause of the widespread aversion to enumeration of inhabitants found later among Christian and Mohammedan nations, or whether superstition, pre-existing in the minds of the Hebrew people, caused the pestilence, when it occurred, to be considered the direct and proper result of the enumeration which had immediately preceded it. The censuses which are referred to in the New Testament did not originate with the people of Judæa, but were initiated and conducted under Roman authority. By the Solonian laws an official determination of the individual wealth of all citizens, and their classification according to four grades in this respect, was made a part of the constitution of Athens. This classification, based upon wealth, had both a fiscal and a political purpose, the higher classes not only paying taxes at a greater rate upon their property, but possessing larger political privileges.

In Rome, whence we derive the word, the census was at once a political, a military, and a fiscal agency. Its institution is attributed to Servius Tullius (555 B. C.). The first object sought was the classification of citizens according to the quantity of land owned by each. There were five classes of freeholders upon this basis, the non-freeholders (*proletarii*) paying no taxes, having no vote, and being excluded from military service. The enumeration and consequent registration were accompanied by religious ceremonial and sacrifices for the purifying of the people (*lustration*). As the census was taken quinquennially the word *lustrum* came to signify a term of five years. The census was conducted first by the kings, afterward by the consuls, until, in 443 B. C., two officers, whose powers were of the highest in the state, were chosen at first solely from the patricians, to be called censors, by whom this duty was to be discharged. The ex-

tension of the powers of the censors to the supervision and correction of morals and social relations, and even to the purging of the senate of unworthy members, carried the Roman censorship far outside the limits assigned to the census of any modern nation. In addition to this periodical enumeration, births, deaths, divorces, and possibly, also, marriages, were required to be registered at Rome upon their occurrence. Notwithstanding the successive enlargements of the citizenship geographically, the census of citizens continued to be taken in Rome only, and by the censors alone; consequently, the roll of citizens became more and more inadequate to the facts. As the republican spirit declined the census became irregular in occurrence. When Octavius, in his sixth consulship, numbered the Roman people, there had been no census for forty-two years. The next two censuses took place at intervals respectively of twenty and twenty-one years. While thus the Roman census proper lost accuracy and validity with the lapse of time, owing largely, it is probable, to the exemption of citizens from the land-tax, with a view to which, in great measure, it had been originally instituted, a species of official enumeration sprang up with reference to the provincials wherever the land-tax was extended, which more nearly approached than the census had ever done to the modern forms of statistical inquiry. The accounts relating to the provincials were not dignified by the name of *census*, but bore that of *professio*; they were not taken in Rome, but in the region to which they related; they were not conducted by the censor, but by the proconsul; they were sanctified by no religious ceremonies or sacrifices; they were not even coincident, of necessity, with the census of citizens. They contained, however, a greatly superior amount of information, extending not only to the number of freemen and slaves, of women and children, of cattle of every description, of houses and holdings, but to the acreage of every farm, to the amount under tillage, in pasture, or in wood, and even to the number of vines and of olive and other fruit trees. "It was," says Mr. Merivale, "from the precise information contained in these official registers that Augustus, toward the close of his reign, drew up the complete survey of the Roman empire, which he placed in the hands of the vestal virgins, to be delivered to the senate and his successor after his death. To this table of statistics he gave the name of *Breviarium* or *Rationarium*. It was the ledger of his household; but his household comprehended half the human race."

II. The Modern Census.—With the dissolution of the Roman empire the census as a statistical agency disappears from history. During the Middle Ages the word was at times used, but in application almost exclusively to the record of landed property or the assessment of taxes. Charlemagne in 780 A. D. undertook an economic survey of his vast dominions, appointing commissioners whose duty it was to report upon the condition of the people, the soil, and the products of the several provinces. The *Domesday Book* of England, compiled by command of William the Conqueror in 1081, contains the quantity of land within each county of the kingdom, the name of each Norman or Saxon proprietor of land, and the number of slaves and of cattle belonging to each. Several other statistical works, of an uncertain value, appeared in the long interval between the last Roman census and the seventeenth century of the Christian era.

Sweden.—To Sweden is attributed the honor of first establishing a systematic plan for recording important facts concerning population. By an ecclesiastical law of 1686, still in force, the clergy were required to keep a register of births, marriages, and deaths, with many accompanying particulars; a record of all removals out of or into each parish; a list of inhabitants by homes and by families; and an account of all extraordinary accidents occurring during the year. In 1746, in consequence of a memorial presented to the diet by the Academy of Sciences of Stockholm, schedules of questions concerning the movement and the condition of population were distributed among the parishes, with instructions that returns should be made embracing the previous twenty-five years, which was done in 1749. These returns were, however, at first deemed confidential, and the disclosure of the number of inhabitants was forbidden under heavy penalties. It was not until 1762 that permission was given to publish extracts from the official returns. Out of the facts thus obtained Dr. Richard Price constructed those life-tables which formed the basis of his great work on reversionary payments, and of which he wrote: "I can not hesitate to pronounce that they exceed in correctness every-thing of this kind which has been hitherto offered to the public, and that nothing is wanting to make our knowledge in this instance complete but similar observations in other kingdoms." From 1749 to 1751 the Swedish reports of population were made annually; from 1754 to 1772, triennially; from 1775 to the present time the census has been taken in that country once in five years. In towns the schedules are filled up by the heads of families and collected by the police; in the rural districts the census is still taken by the pastors as a part of their regular duties.

Great Britain.—In the British isles vital statistics had their origin in the record of deaths made while the plague was raging in London in 1592. The practice fell into disuse, but in 1603 a weekly account was ordered to be kept of all burials and christenings in the city, which was regularly done thereafter. The writings of Sir William Petty, between 1661 and 1686, first attract attention to these records as a mine of valuable information. This eminent writer on political arithmetic made use of the bills of mortality in London and Dublin to compute the population of those cities at various dates, the rate of the multiplication of mankind, and also as the subject of certain "natural and political observations," with reference to government, religion, trade, growth, air, disease, etc. Sir William Petty had sought to reach the facts of the living population by computation based on the bills of mortality. In 1743, no progress whatever having been made in Great Britain toward the development of statistical science, Dr. Webster undertook, and in 1755 completed, through his own labors, an approximate account of the population of Scotland. Inspired, doubtless, by this example, Sir John Sinclair began in 1791 the herculean task of obtaining returns relating to population, agriculture, trade, and industry from all the clergymen of the Established Church of the kingdom; his schedule of interrogatories comprised 160 items. Persevering against untold discouragements, this remarkable man succeeded so far as to secure 900 voluntary contributions to his census, and in 1798 published his results in a work of twenty-one volumes, which remains a monument of industry, zeal, and assidnity. Both his example and his direct appeals aided in securing the attention of Parliament to the need of a systematic periodic collection of statistics, and on Dec. 21, 1800, was passed the act providing for a general official enumeration of the population of England, Wales, and Scotland in the following spring, and every tenth year thereafter.

The first census was taken through the overseers of the poor on Mar. 10, 1801, in both England and Wales, a later date being adopted in Scotland owing to the inclemency of the weather. The single census schedule required the following information: The number of houses, inhabited and uninhabited; the number of families; the number of inmates, distinguished as male or female; occupations according to three divisions—viz., agriculture, trade, manufactures, or handicraft; all other avocations; the number of baptisms and burials each tenth year 1700 to 1800, and the number of marriages from 1754 to 1801. In the census of 1811 the same schedule was used, except that only the occupation of the head of the family was entered. In 1821 a most important addition was made—viz., the classification of ages. In 1836 a change was made in the laws of the kingdom, which, though not effected in the interests of the census, has yet caused a marked improvement in every enumeration since that date. This was the establishment of a system of registration uniform throughout England and Wales, which were for this purpose divided into districts and sub-districts, with permanent paid officials, all under the control of the registrar-general. Through this agency marriages, births, and deaths are recorded at the time of occurrence, with severe penalties, promptly enforced, in case of omission. To this staff of trained officials, having a permanent tenure, was committed the work of taking the decennial census, the overseers of the poor being thereafter relieved of that charge. The British census of 1851, like the U. S. census of the previous year (to be hereafter spoken of), marked a great advance in statistical science.

The growing interest throughout Europe in sanitary and sociological inquiry had increased the demand for positive information regarding the numbers and condition of population, and the magnificent work of M. Quetelet, the Belgian statistician, had given intelligent direction to that demand. Accordingly, great efforts were put forth to render the sixth census of England, Wales, and Scotland, in 1851, superior in results to preceding enumerations. The special

law enacted for the purpose provided that the census should be taken on one and the same day—Mar. 31—in the three countries; 30,610 enumerators were appointed, with the authority of the registrar-general, by the 2,190 district registrars of England and Wales. Only as much territory was assigned to each enumerator as could be canvassed by one person. There being no uniform system of registration in Scotland, the thirty-two sheriffs of that country were authorized to appoint 1,010 temporary registrars—generally parochial schoolmasters—and 8,130 enumerators; the Government appointed 257 enumerators for the smaller islands. Some days before the census-day the enumerators delivered to every occupier of a house or tenement a "householder's schedule," containing inquiries as to the name, the head of family, condition, sex, age, occupation, and birthplace of every person in Great Britain, and also as to the number of blind, deaf, and dumb. For the use of the lower classes of Wales schedules were printed in Welsh. The schedule was to be filled up with reference to the night of Mar. 30–31 No one present on that night was to be omitted, except workingmen and others performing night labor away from their habitations. Travelers were enumerated at the hotels and houses at which they arrived on the following morning. Simultaneously with the household schedules the enumerators distributed in the proper quarters forms for collecting information respecting places of worship, scholastic establishments, and miscellaneous institutions. The schedules were taken up by the enumerators on Mar. 31. The collectors filled up those parts which persons had neglected or were unable to fill. They also were required to note all the unoccupied houses and buildings in course of construction. The floating population—that is, such persons as spent the night named in barges or boats on canals or small streams, in barns, sheds, tents, and the like—the enumerators were required to estimate according to the best information they could obtain. Special notice was to be taken of all extraordinary assemblages of people anywhere at the time of the census. The enumerators were allowed one week for the transcription of their schedules and the completion of summaries and estimates called for. The revision of the returns by the district registrars had to be completed in a fortnight. The returns were subjected to another revision by the superintendent-registrars before they were transmitted to the census office. The custom-house officers took the census of sea-going vessels in port. Persons belonging to the navy and commercial marine were also separately enumerated by the proper authorities. The Government furnished the statistics of the army, half-pay officers, and pensioners, the civil service, the civilians and Europeans in the East India Company's service, and British subjects living in foreign parts, as far as they could be ascertained through consular and diplomatic organs.

The British census of 1851 was the most successful statistical operation, as regards both quickness and accuracy of execution, performed up to that time in any country. The census of England and Wales was taken in 1861, in 1871, and in 1881 as of date Apr. 3. In the last year named 34,711 persons were employed in distributing, collecting, and copying the householders' schedules. To these must be added 2,175 registrars and 630 superintendent-registrars, making altogether 37,516 directly engaged in the local collection of the required particulars.

The Census Act of 1890 introduced some new features: providing that inquiry be made concerning the language spoken by persons enumerated in the principality of Wales; adding columns to the householder's schedule, to enable persons to be returned either as employers, as employed, or as neither employers nor employed; also the number of rooms occupied by a person in possession of less than five rooms. The whole country was divided into about 40,000 enumeration districts. The householders' schedules were distributed during the week ending Saturday, Apr. 4, and were collected on Monday, Apr. 6, with the required information respecting "every living person who abode in every house on the night of the census day" (Sunday, Apr. 5). The census act required the publication of the preliminary census report within five months from Apr. 5.

The establishment of a permanent system of registration in Scotland in 1855 has given to the subsequent censuses taken in that country (1861, 1871, 1881, 1891) similar advantages to those derived by the English census from the Registration Act of 1836. The history of the census in Ireland begins in 1811, coincidently with the second British census. The attempt resulted in a decided failure. The census of 1821 was of doubtful accuracy; the census of 1831 had subsequently to be corrected according to new data. The censuses of 1841 and of 1851, taken by the members of the constabulary force, attained great perfection, the reports of the latter year, in seven immense volumes, constituting a monument in the history of public statistics. The famine of 1846–47 gave to the results of this census a peculiar and painful interest.

France.—In France the census did not find a place in the government until after the Revolution. Vauban, indeed, the great engineer of Louis XIV. in his project for equalizing taxation, addressed to the king in 1707, strongly urged the necessity of an enumeration of the population, wealth, and industry of France. "There is," he said, "no battalion in the kingdom, however insignificant it may be, that is not subject to at least a dozen reviews and inspections during the year. Of how much greater importance is it to enumerate and review the condition of the great body of the nation from which the king draws all his glory and his riches!" Whether from repugnance to the idea of a census, or from the offense given by a project of just and equal taxation in the days of the old *régime*, the work of Vauban was by royal decree ordered to be seized and publicly burned—an indignity closely followed by the death of the illustrious author. During the reign of Louis XV. some useful statistics were collected by the minister of commerce. In 1784 the gifted Neckar, a minister of Louis XVI., published his treatise on the finances of the kingdom, the views and proposals of which were based on the fullest and most authentic information regarding the state of the several parts of the kingdom which could be obtained without special agencies of enumeration. Before the close of that century a law was passed requiring prefects of departments to prepare from the civil registers exact annual abstracts of births, marriages, and deaths; this law, with some modifications, is still in force. A general census was taken in 1801, and again in 1806. The next succeeding enumeration was in 1821, since which time the census has been regularly taken once in five years.

Belgium, the country to which the science of statistics owes so much, has carried to a high point the art of enumeration. Immediately upon the achievement of Belgian independence a special statistical service was created—viz., in 1831. In 1841 a central commission was established, with which M. Quetelet was from the first connected. In 1843 provincial statistical commissions were instituted throughout the kingdom. In 1856 a new law was enacted regulating the mode of taking the census and keeping the civil register. It provided that a general census should be taken every ten years throughout the kingdom, and that the population returns should form the basis of representation. The census was to be taken in such a manner as to give the actual as well as the legal population. The prescribed inquiries included name, sex, age by year and month, birthplace, civil status, occupation or condition, habitual domicile, and town and country population. Both the distribution and the collection of schedules were to be made in one day. Temporary census bureaus were established, one for each province, which were to receive the returns of the agents after they had been revised by the communal juries—bodies appointed for each community, and consisting of officials and private citizens. The statistics of schools and public institutions were taken by means of special schedules. The military authorities were charged with the army census. The refusal to give information was punishable by fine and imprisonment. The central statistical commission receives the results of the successive censuses, yearly abstracts from the civil registers, and the results of special occasional inquiry, and prepares the same for publication.

Prussia obtains population reports through a central bureau established in 1805. The labors of the bureau are directed to—1, general statistics; 2, births, marriages, and deaths; 3, schools and churches; 4, medical statistics; 5, statistics of mechanical trades and manufactures. From 1805 to 1820 these inquiries were made annually, but since the latter date the information relative to the first, third, and fourth subjects has been collected but once in three years. When the customs union of 1834 was established, triennial censuses of population were authorized, and have been taken regularly since. At first the inquiries related to the *numbers* of the actual population, according to the sex, age, birthplace, religion, immigration, and emigration. In 1840 the enumeration was required to be made *by name*, which resulted immediately in a large increase in the population re-

turns. In 1846 the number of families was determined, and in 1849 the distribution of the population by habitations. In 1858 the persons of the two sexes between seventeen and forty-five years of age were returned in five classes. In 1861 the unmarried and widowed were specially classified. With the census of the same year an inquiry was added in reference to the language spoken and the social condition and occupations of the population. The Prussian census is taken every five years (1885, 1890) by civil officers, in the month of December, on one day, by means of printed schedules. In addition to the statistics of population, many statistics are obtained showing the nature, extent, and distribution of real property, wages and salaries, insurance, aid and co-operative societies, and the numerical strength of the Catholic and Protestant churches.

Austria.—During the last half of the eighteenth century and the first half of the nineteenth no censuses were taken in Austria except those connected with military conscription. Separate systems of enumeration prevailed in the different provinces, and the materials for a general knowledge of the whole population of the empire were very meager. In 1828 a central bureau of statistics was created. A uniform enumeration was made throughout the empire for the first time in 1851, but its results were so imperfect that in 1855 a commission of high administrative officers was appointed for the preparation of a new census law, which received the imperial sanction in 1857. The military needs of the state were no longer the main motive for a census, but statistics of population, wealth, and industry were to be obtained as a basis for the safe conduct of public affairs. A census based on the actual population was to be taken once in six years, exclusively by the civil authorities. Printed schedules were to be filled up by the heads of families, owners of tenement-houses, and those in charge of convents, schools, and public institutions. Those that intentionally failed to furnish the desired information were to be punished by fine and imprisonment. The schedules called for information under the following heads: Composition of families, including servants; age; sex; names and titles; civil status; social condition; religion; occupation; marriages, births, and deaths; the number of cities, towns, hamlets, villages, dwellings, and renters. The number of Austrian subjects living in foreign parts was to be obtained through the imperial legations. The census of the naval and military population was to be separately taken by the proper authorities. The census is now taken every ten years (1880, 1890).

Russia.—Partial censuses were taken by the Russian Government in 1700, 1704, 1705, and 1710. In 1718 Peter the Great required all landed proprietors to make a declaration of the number of serfs belonging to each. The same year he organized a special commission to visit the separate provinces of his empire for the purpose of making a general census. No enumeration of females was made in these early censuses, which were taken solely for the purposes of revenue and military conscription. A decree of 1772 directed that a census should be taken once in twenty years, but this interval of time was not regularly observed. In 1802 a central bureau of statistics was organized, reorganized in 1852 under the name of the statistical commission. The commission has taken censuses in 1812, 1815, 1834, 1850, 1860, 1870, 1880, 1886, and 1897. The census is taken by means of printed schedules distributed by the local authorities. The work of consolidating and publishing devolves upon the statistical commission.

Norway.—A decennial census was instituted here in 1815, and has continued up to the present time, comprising inquiries as to age, sex, civil status, number of families and habitations, useful domestic animals, and the territorial area of each district. A bureau of statistics superintends all forms of public statistics except those pertaining to the administration of justice, public education, and financial administration. Inquiries are made once in five years in regard to the condition of industry. Annual exhibits are made of births, marriages, and deaths, of commerce and navigation, of the administration of justice, and of the population suffering from physical and mental disabilities.

Spain paid but little attention to public statistics after her census of 1798 until 1856, when a central statistical commission was organized, under whose supervision a general census was taken in 1857, and since then once in three years. The census is taken in one night by Government officials charged with the collection, verification, and consolidation of the returns. A final revision is made by the statistical commission.

Switzerland.—The original constitution of the Swiss federation required a census once in twenty years. Most of the inquiries were conducted by the several cantonal governments. The returns were not uniform, and were generally inaccurate. In 1860 a law of the Federal assembly prescribed a decennial census for the whole federation, and instituted a federal bureau of statistics under the direction of the interior department. The first census under the new law was in 1860. The inquiries included sex, age, civil condition, origin, birthplace, domicile, religion, language, physical disabilities, immigration, the distribution of real property, the number of families, and the number of habitations and other buildings. The cantonal statistics collected by the local governments are consolidated and published by the central bureau. Until a few years ago the different cantons followed different methods in the collection of vital and mortuary statistics, but at the instance of the bureau they have now adopted a uniform plan. In 1866 the central bureau initiated the census of live stock, and later collected very full statistics of railways, savings-banks, and fire-insurance companies.

Italy.—Soon after the founding of the modern kingdom of Italy in 1859 and 1860, a bureau of statistics was created with ample powers. The first general census, which was to afford the basis of representation in the national parliament, was taken Dec. 31, 1861, under a law prescribing general enumerations once in ten years. The census is taken in one day by means of previously distributed schedules. Since 1861 the central bureau has been charged with additional inquiries relative to mutual-aid societies, savings-banks, public charities, industrial corporations, libraries, and institutions of education.

Greece.—The census in modern Greece dates from her last struggle for independence. The first general enumeration of the people was made in 1836. From that date censuses were taken annually until 1845, since when they have been taken at irregular intervals—viz., 1848, 1853, 1856, 1861, 1879, 1889, 1896.

III. The Census of the United States is, in its latest development, unique, differing widely from the European type, the reason for which will hereafter appear.

During the colonial period the British Board of Trade attempted several partial enumerations for administrative uses; but the results were often flagrantly inaccurate, especially in the Southern colonies. In the census of New York, attempted by Gov. Hunter in 1712, the superstition already alluded to* entered seriously to affect the completeness of the returns. This feeling was so strong as to deter the governor of New Jersey, a few years later, from attempting the census of that colony. So defective were the colonial censuses in general that Mr. Bancroft, for the purposes of his *History*, constructed in preference a table of population projected backward to 1750 from the first U. S. census—that, namely, taken in 1790. Several efforts were made during the Revolutionary war and during the continuance of the government of the Confederation, but without success, to secure an enumeration of the population of the several States, with a view to apportioning requisitions for men and supplies. In these schemes, various estimates and computations were made use of, all subsequently ascertained to have been in a considerable degree erroneous.

By the Constitution of 1787 a decennial census was made a constituent part of the political system of the U. S. M. Moreau de Jonnès has attributed great credit to the U. S. on this account, declaring that they present a phenomenon unprecedented in history—"that of a people who instituted the statistics of their country on the very day when they founded their government, and who regulated, by the same instrument, the census of inhabitants, their political rights, and the destinies of the nation." The fact is, however, that this provision of the Constitution was not in the least degree of a philosophical origin. It was a necessity of the federal representative character of the government then established, in which both representation and direct taxation were required to be apportioned according to population. The first census law was passed Mar. 1, 1790, and the first census was taken under it as of date Aug. 1 of that year. Nine months was the period allowed for the completion of the enumeration. The work was to be conducted by the mar-

* When a proposition to institute a census was before the British Parliament in 1753, the member for Newcastle-upon-Tyne stated that "the people looked upon the proposal as ominous, and feared lest some public misfortune or an epidemical distemper should follow the numbering."

shals of the several judicial districts, who were authorized to appoint as many assistants as should be required, each of whom should have an assigned district, to be personally enumerated by him. Lists of inhabitants were to be set up at two places of resort within each district for public inspection. All persons sixteen years of age and upward were required, under penalties, to give all needed information to the census-takers. The inquiries were six in number for each family: (1) name of the head of the family; (2) number of free white males sixteen years and upward; (3) number of free white males under sixteen years; (4) number of free white females; (5) number of all other free persons; (6) number of slaves.

The results of the first enumeration caused much disappointment, owing to overstrained expectations based on the extravagant estimates that had prevailed, as is usual in the absence of authentic information; and Mr. Jefferson, then Secretary of State, in sending copies of the census report to the ministers of the U. S. in foreign lands, carefully explained that the enumeration was largely defective. The results of subsequent censuses, however, established the substantial accuracy of the count made in 1790.

In 1800 two learned societies memorialized Congress on the subject. The American Philosophical Society, Thomas Jefferson president, represented that the decennial census offered an occasion of great value for ascertaining sundry facts highly important to society, and not otherwise to be obtained. It therefore prayed that the next census might be so taken as to present a more detailed view of the inhabitants of the U. S. under several different aspects, such as the effect of soil and climate on human life; the increase of population by birth and immigration; and the conditions and vocations of the people. To gain the first of these ends, the society suggested that the population should be much more minutely analyzed with respect to age. To gain the second, it was proposed that a table should be used presenting in separate columns the respective numbers of native citizens, citizens of foreign birth, and aliens. To reach the third end, it was proposed that the number of free male inhabitants of all ages engaged in different professions and pursuits should be ascertained, such as merchants, agriculturists, handicraftsmen, mariners, etc. The other memorial, to a similar effect, came from the Connecticut Academy of Arts and Sciences, Timothy Dwight president. Both memorials were presented to the Senate Jan. 10, 1800, and were referred to the committee already charged with drafting a census bill. By the law of 1800 the schedule was somewhat extended. It registered the name of the head of each family; the number of free white males under ten years of age; of free white males of ten and under sixteen; of free white males of sixteen and under twenty-six; of free white males of twenty-six and under forty-five; of free white males of forty-five and upward. The last five inquiries were duplicated in reference to females. All other persons, except Indians not taxed and slaves, were also enumerated, but without distinction of age. The general direction of the census was placed in the Department of State, where it remained until 1850.

In 1810 the population schedule of 1800 was retained without modification, but by a supplementary act (May 1) the scope of the enumeration was extended to embrace an account of all the manufacturing establishments. The construction of the schedule was left to the Secretary of the Treasury. The results of this new statistical effort proved to be of little value.

The census of 1820 presented no new features of marked importance. The population schedule discriminated between foreigners naturalized and not naturalized, while slaves and free colored persons were classified with respect to age. A new manufacturers' schedule was introduced, which was an improvement upon that of 1810. It comprehended fewer details, but was more discriminating in inquiries and more scientific in arrangement. This part of the work, however, was so imperfectly done by the census-takers that the results obtained possessed little value.

In the census of 1830 no attempt was made to obtain industrial statistics of any sort. The schedule made a more minute classification of population. The number of the deaf and dumb and blind in the three classes of white, free colored, and slave population was ascertained as far as practicable in conducting a new experiment.

In 1840 still other statistics of population were collected—the number of insane and idiotic people, the number of persons engaged in the great industries, such as agriculture, manufactures, and commerce; likewise the number of Revolutionary pensioners. Several columns were added to the schedule for educational statistics—the number of scholars in schools, together with the number of white persons over twenty years of age who could not read and write. The attempt to obtain statistics of industry was renewed, and an extended though badly arranged list of questions was incorporated. As there was no penalty for refusing to answer these questions, in some localities the people refused to answer them, on the ground that they were illegal and inquisitorial. The industrial statistics obtained, however, were the most valuable yet procured.

As the time for taking the seventh census drew near, the subject began to attract an unusual degree of attention. A census board, consisting of the Secretary of State, the Attorney-General, and the Postmaster-General was created by an act approved Mar. 3, 1849. This board was charged with the duty of preparing forms, schedules, etc., for taking the next census, but was instructed not to incorporate into the schedules more than 100 questions of all kinds. At the next session of Congress the Senate raised a special committee on the census, and imposed upon it a similar task. The law, as passed, greatly extended the sphere of the census. The act, approved May 23, 1850, is entitled "A general act providing for the census of 1850, and for every subsequent census." It created a census office in the newly created Department of the Interior. The six schedules incorporated in the law bore the following names by number: 1, "Free inhabitants"; 2, "Slave inhabitants"; 3, "Persons who died during the year ending June 1"; 4, "Productions of agriculture"; 5, "Products of industry"; 6, "Social statistics." Several important new features were incorporated in the first schedule, viz., the name, age, sex, and color of each person, together with the place of birth.

The third or mortality schedule contained a class of inquiries wholly new in the census. The fourth, fifth, and sixth schedules related to subjects that had received some attention in previous censuses, but without adequate provision for the collection of the statistics required. The census of 1850 was a great improvement on all its predecessors. The addition of general statistics of manufactures and of agriculture was a gain of the highest importance. Others of the new features of the act of 1850 never became practically valuable.

The census of 1860 was taken on the same plan as that of 1850, with but few modifications.

Before the census of 1870 was taken an attempt was made to procure a new law which should provide new machinery and remodel the old schedules. An elaborate bill, drawn largely by the late President Garfield, passed the House of Representatives, but failed to receive the sanction of the Senate. The census of 1870 was taken under the law of 1850. Some important additions to the inquiries were made by authority of the Secretary of the Interior. In consequence of the abolition of slavery the old schedule relating to statistics of slaves was dropped. To meet the requirements of the fourteenth amendment to the Constitution two columns were added to the population schedule—the first to obtain the number of male citizens of the U. S. in each State of twenty-one years and upward; the second to obtain the number of such citizens whose right to vote is denied or abridged on other grounds than rebellion or crime. The results of this special inquiry were of little value. Many changes were made by the census office in the forms of the inquiries, by which they were rendered more definite and more easily understood. Besides the inquiries concerning "place of birth," two columns were added requiring a statement of the parentage of each person. This has provided a way for ascertaining the number of citizens born of foreign parents. An inquiry was also added concerning the public debt of towns, cities, counties, and States. A striking feature was added in the publication of results by the construction of engraved maps, illustrating the various classes of statistics.

In preparation for the tenth census (1880), Congress passed an act (Mar. 3, 1879), supplemented by the act of Apr. 20, 1880, under which that census was taken, and under which, unless new legislation shall be had, "a census will hereafter be taken every ten years."

By the act of 1879 the census system of the U. S. was greatly changed, both as to the agencies of enumeration and as to the subjects of inquiry. The most important of these will be now indicated.

1. *Agencies of Enumeration.*—(*a*) By the act of 1879 the

superintendent of census becomes an officer appointed by the President and confirmed by the Senate, instead of merely a "superintending clerk," appointed by the Secretary of the Interior. (*b*) No other important change is necessarily wrought by the new law in the organization of the census bureau as an office for revising, digesting, compiling, and publishing the results of the enumeration. (*c*) Instead of the marshals of the several judicial districts (sixty-four in 1870), officers especially appointed for the purpose, termed "supervisors of census," are intrusted with the charge of the enumeration. The appointment of such officers, not to exceed 150 in all nor fewer than one for any State or Territory, is authorized. The full number authorized were appointed in 1880, the numbers in the several States varying from one to eleven (New York). The creation of a special body of officers for the purpose, presumably appointed with reference to their qualifications for the work, and directly responsible to the department charged with the general direction of the census, in the place of intrusting this duty, as under the act of 1850, to officers previously appointed for altogether different duties, responsible to a department which has nothing to do with the census and already fully burdened with regular official duties, in connection with the U. S. courts—duties which are not of a nature to be avoided or postponed—constitutes a great advance toward a proper enumeration. (*d*) Instead of the appointment by marshals of assistant marshals to perform the actual work of enumeration, without any control thereof by the central office, as under the act of 1850, the appointment of the actual canvassers—called by the new law "enumerators"—is by the act of 1879 made subject to the veto of the census office. (*e*) The population of districts to be assigned to any enumerator is reduced from an estimated maximum of 20,000, as by the law of 1850, to a maximum of 4,000, according to the results of the next preceding enumeration. The subdivision of supervisors' districts and the arrangement of enumerators' districts are also made liable to the veto of the census office. The result of these provisions in 1880 was to increase the actual number of enumerators from about 6,400 in 1870 to 31,265. By this means not only is the earlier completion of the work made practicable, but a higher degree of local knowledge and personal acquaintance is secured—elements of the highest importance, as affording security against defective and erroneous returns of population. (*f*) While the enumeration continues to be taken as of the same date (June 1) as by the act of 1850, the time allowed for the completion of the work is reduced from five months to one month, while in cities of over 10,000 inhabitants (according to the next preceding census) the enumeration is required to be completed within two weeks. (*g*) The rules regulating the compensation of enumerators are greatly changed in the direction of allowing a closer correspondence of pay to work than was possible under the inflexible rule laid down in the act of 1850. (*h*) Instead of committing to each enumerator the collection of the manufacturing and social statistics of his own district, the superintendent of census may in his discretion "withdraw the schedules for manufacturing and social statistics from the enumerators of the several subdivisions, and may charge the collection of these statistics upon experts and special agents, to be employed without respect to locality." Under this provision special agents were appointed at the census of 1880 to collect the manufacturing statistics of 279 cities and large towns. Special agents were also appointed to collect the statistics of certain industries for the U. S. at large, such as iron and steel, woolen, silk, and cotton goods, glass, coke, interchangeable machinery, etc., and of all the mining industries. Special agents were also appointed to collect the statistics of the deaf and dumb, blind, insane and idiotic, of criminals, and of paupers, never before properly enumerated, although embraced in the act of 1850; also to collect the statistics of the factory system, the social statistics of cities, the statistics of schools, colleges, museums, and churches, of public indebtedness, of valuation and taxation of property, etc. (*i*) The superintendent of census is authorized in his discretion to employ "prior schedules," so called—that is, schedules to be left with heads of families in advance of the enumeration, and to be taken up on or after the legal date of the census. No use was made of this provision, however, at the tenth census.

2. Regarding the points of inquiry by the act of 1879 in comparison with the act of 1850, it may be said that several entirely new subjects of enumeration were introduced by the later law, such as railroads, telegraphs, fire, life, and marine insurance, etc.; while the amount of detail required respecting the traditional subjects of enumeration is vastly increased in the agricultural schedule.

An act providing for taking the eleventh census (1890) was approved Mar. 1, 1889, and was, with some slight amendments, a re-enactment of the law of 1879. No change was made in the general plan for enumeration. The salary of the superintendent was raised from $5,000 to $6,000. A new official, entitled the "disbursing clerk," was provided for, and also ten "chiefs of divisions." The number of supervisors' districts was increased from 150 to 175, and, as in 1880, the full number of supervisors authorized was obtained. The number of enumerators appointed in the eleventh census was 47,975. Five important changes in the scope of the investigation were introduced by the law of 1889. (*a*) A special schedule of inquiry was introduced for the purpose of obtaining the names of all surviving persons who had served in the army, navy, or marine corps in the U. S. during the civil war (1861–65), as also the names of all surviving widows of such soldiers, sailors, or marines. (*b*) A special inquiry was added in the population schedule by which Negroes might be classified, as "full-blooded Negroes," "mulattoes," "quadroons," and "octoroons." (*c*) Provision was made for the collection of statistics relating to the recorded indebtedness of private corporations and individuals, and for this inquiry Congress made a special appropriation in addition to the regular census appropriation. (*d*) By the law of 1879 Indians paying taxes were the only ones subject to enumeration, but the law of 1889 provided for a complete census of all living Indians, which should record both the Indian and English name of every Indian in tribal relations, and contain full data as to age and occupation, and for classifying Indians as "those paying taxes" and "those free from taxation." (*e*) The law further made provision for the collection of statistics of the population, industries, and resources of the district of Alaska.

The scope of the law was also extended by an amendment approved Aug. 14, 1890, which required that unincorporated express companies as well as incorporated express companies should respond to schedules presented—an amendment which was necessary in order to secure any information respecting the express business, since with one exception all express companies in the U. S. are joint-stock associations. The census of 1890 paid special attention to the collection of data pertaining to the nativity of parents, to the relative fecundity of native and foreign born mothers, and to the expectation of life of children born of native and foreign parents. Certain questions respecting naturalization and the ability of persons enumerated to read and speak the English language were also introduced. The eleventh census for the first time made use of "prior" schedules in facilitating the work of enumeration, and of electricity as an agency for tabulation. The result of the employment of the electric tabulator is regarded with great interest by statisticians, for, if successful and trustworthy, it renders possible statistical compilations which have heretofore been regarded as too complicated and laborious to be undertaken by the ordinary methods.

The census bureau as originally organized was divided into twenty-three divisions, as follows: Appointments; Disbursements and Accounts; Geography; Population; Vital Statistics; Church Statistics; Educational Statistics; Pauperism and Crime; National and State Finances; Farms, Homes, and Mortgages; Agriculture; Manufactures; Mines and Mining; Fish and Fisheries; Transportation; Insurance; Printing and Stationery; Statistics of Special Classes; Supervisors' Correspondence; Alaska; Statistics of Indians; Social Statistics of Cities; Revision and Results. The number of divisions was on Apr. 1, 1892, reduced to nine, embracing the divisions of Population; Manufactures; Agriculture; Farms; Homes and Mortgages; Vital Statistics; Social Statistics; Wealth, Debt and Taxation; Printing and Stationery, and Revision and Results.

It was said that the census of the U. S., in its present state of development, is unique, differing widely from the European type; the justification of this statement has been given above. The European census is a mere count of inhabitants, individually and by families, with certain personal particulars as to age, sex, color, conjugal condition, occupation, place of birth, etc. Whatever statistical information beyond this government requires is obtained either by registration, by boards or commissioners, or by other agencies wholly independent of the census proper. The

U. S. census since 1850 has been, in the phrase of the act of 1879, "a census of population, wealth, and industry." The amount of statistical detail collected in the U. S. decennial enumeration is greater than that obtained in any other country through the same agency, and is vastly greater than the sum of the statistical details collected in any other country through all agencies combined. The reason for thus imposing upon the census inquiries which in European countries are made, if made at all, through other agencies, has been found mainly in the indisposition of Congress to raise the question whether, under the Constitution, the U. S. Government can institute or conduct purely statistical investigations affecting private persons, and enforced by penalties in the event of refusal to give information, except in connection with the decennial enumeration expressly authorized and required by the Constitution. Were this consideration set aside, there can be little question that the statistical work of the country could be better done by agencies very differently organized.

The publications of the successive censuses of the U. S. have been as follows:

1790.—*Return of the Whole Number of Persons within the Several Districts of the United States, etc.* (8vo, 52 pp., 1792).

1800.—*Return of the Whole Number of Persons, etc.* (folio, 78 pp, 1801).

1810.—(1) *Aggregate Amount of each Description of Persons, etc.* (oblong folio, without date); (2) *A Series of Tables Showing the Several Branches of American Manufactures, etc.* (4to, 170 pp.).

1820.—(1) *Census for 1820, etc.* (folio, 164 pp., 1821); (2) *Digest of Accounts of Manufacturing Establishments, etc.* (folio, 100 pp., 1823).

1830.—*Fifth Census of Enumeration of the Inhabitants of the United States* (folio, 163 pp., 1832). This work was so badly compiled and printed that Congress directed a republication. Even the latter is honeycombed with errors.

1840.—(1) *Compendium of the Enumeration, etc.* (folio, 378 pp., 1841); (2) *Sixth Census or Enumeration of the Inhabitants of the United States* (folio, 470 pp., 1841); (3) *Statistics of the United States, etc.* (folio, 410 pp., 1841); (4) *Census of Pensioners of Revolutionary and Military Service, with Names, Ages, and Places of Residence, etc.* (4to, 196 pp.).

1850.—(1) *The Seventh Census of the United States* (4to, 1022 pp., 1853); (2) *Statistical View of the United States* (8vo, 400 pp., 1854); (3) *Mortality Statistics, etc.* (8vo, 304 pp., 1855); (4) *Digest of the Statistics of Manufactures* (8vo, 143 pp., 1859).

1860.—(1) *Preliminary Report of the Eighth Census* (8vo, 294 pp., 1862); (2) *Population* (4to, 811 pp., 1864); (3) *Agricutture* (4to, 464 pp., 1864); (4) *Manufactures* (4to, 963 pp., 1865), (5) *Mortality and Miscellaneous Statistics* (4to, 650 pp., 1866).

1870.—(1) *Population and Social Statistics* (4to, 854 pp., 1872); (2) *Vital Statistics* (4to, 700 pp., 1872); (3) *Industry and Wealth* (4to, 843 pp., 1872); (4) *Compendium* (8vo, 949 pp., 1872).

1880.—Omitting the *Census Bulletins*, which were a marked feature of the census of 1880, the final volumes published are the following: Vol. i. *Population* (4to, 961 pp., 1883); vol. ii. *Manufactures* (4to, 1198 pp., 1883); vol. iii. *Products of Agriculture* (4to, 1149 pp., 1883); vol. iv. *Agencies of Transportation* (4to, 869 pp., 1883); vol. v. *Cotton Product*, part i. (4to, 924 pp., 1884); vol. vi. *Cotton Product*, part ii. (4to, 848 pp., 1884); vol. vii. *Valuation, Taxation, and Public Indebtedness* (4to, 909 pp., 1884); vol. viii. *Newspaper and Periodical Press* (446 pp.), *Alaska, its Population, Industries, and Products* (189 pp.), *Seal Islands of Alaska* (188 pp.), *Ship-building Industry* (276 pp.) (4to, 1884); vol. ix. *Forests of North America* (4to, 612 pp., with extra volume for map, 1884); vol. x. *Petroleum and its Products* (318 pp.), *Manufactures of Coke* (114 pp.), *Building-stone* (393 pp. exclusive of plates) (4to, 1884); vol. xi. *Mortality and Vital Statistics*, part i. (4to, 763 pp., 1885); vol. xii. *Mortality and Vital Statistics*, part ii. (4to, 803 pp., 1885); vol. xiii. *Precious Metals* (4to, 541 pp., 1885); vol. xiv. *United States Mining Laws* (4to, 705 pp., 1885); vol. xv. *Mining Industry*, exclusive of precious metals (4to, 1022 pp., 1886); vol xvi. *Power and Machinery Emptoyed in Manufactures*, part i. (4to, 874 pp., 1885); vol. xvii. *Power and Machinery Emptoyed in Manufactures*, part ii (4to, 788 pp., 1885); vol. xviii. *Social Statistics of Cities*, part i. (4to, 915 pp., 1886); vol. xix. *Social Statistics of Cities*, part ii. (4to. 843 pp., 1887); vol. xx. *Statistics of Wages in the Manufacturing Industry* (567 pp.), *Average Retail Prices of Necessaries of Life* (117 pp.), *Strikes and Lockouts* (28 pp.) (4to, 1886); vol. xxi. *Defective, Dependent, and Delinquent Classes* (4to, 581 pp., 1888); vol. xxii. *Power and Machinery Employed in Manufactures* (11 pp.), *Machine Tools and Woodwork Machinery* (294 pp.), *Steam-pump and Pumping-engines* (64 pp.), *Wool and Silk Machinery* (27 pp.), *Manufacture of Engines and Boilers* (66 pp.), *Marine Engines and Steam-vessels* (106 pp.), *Ice Industry in the United States* (41 pp.) (4to, 1888). In addition to the above, two octavo volumes entitled *A Compendium of the Tenth Census* were published, containing 1771 pages.

1890.—The complete report of the eleventh census comprises thirty-nine volumes, published as follows: *Compendium*, part i. *Population* (1892); part ii. *Vital and Social Statistics, Educational and Church Statistics, Wealth, Debt, and Taxation, Mineral Industries, Insurance, Foreign-born Population, Manufactures* (1894); part iii. *Population, Agriculture, Manufactures, Fisheries, Transportation, Wealth, Debt, and Taxation, Real Estate Mortgages, Farms and Homes, Proprietorship and Indebtedness, Indians* (1897); *Abstract* (2d ed. 1896); *Vital Statistics of the District of Columbia* (1893); *Report on Education* (1893); *Report on Manufacturing Industries* (2 vols., 1894); *Report on Transportation Business* (1893); *Vital Statistics of New York and Brooklyn* (1894); *Report on Agricutture by Irrigation* (1894); *Vital Statistics, Boston and Philadelphia* (1895); *Report of the Social Statistics of Cities* (1895); *Report on the Mineral Industries in the United States* (1892); *Report on Wealth, Debt, and Taxation* (2 vols., 1892–95); *Report on Indians Taxed and Indians not Taxed* (1894); *Report on Statistics of Churches* (1894); *Report on Population of United States* (2 parts, 1895–97); *Report on Insurance Business* (2 parts, 1894–95); *Report on Transportation Business* (2 parts, 1894–95); *Report on Manufacturing Industries* (3 parts, 1895); *Report on Vital and Social Statistics* (4 parts, 1894–96); *Report on Crime, Pauperism, and Benevolence* (2 parts, 1895–96); *Report on Insane, Feeble-minded, Deaf and Dumb, and Blind* (1895); *Statistics of Agricutture, Agricutture by Irrigation, Statistics of Fisheries* (1895); *Report on Real Estate Mortgages* (1895); *Report on Farms and Homes* (1896); *Statistical Atlas* (1898).

The Twelfth Census.—The law authorizing the taking of the twelfth census was passed by Congress Mar. 3, 1899, and President McKinley appointed William R. Merriam director. The enumeration began June 1, 1900. It is the first census in which the counting of returns is to be done by mechanical means. Congress stipulates that the four principal reports—on population, mortality, agriculture, and manufactures—must be ready for publication on July 1, 1902. The members of the field force, nearly 40,000 in number, forwarded their data to headquarters in Washington, where it is compiled and prepared for publication by a staff of 3,000 clerks. Each of the 76,000,000 cards used, on which are punched the statistics concerning each person, are numbered to correspond with the numbers opposite the names in the schedules. They contain 228 symbols, each of which is an abbreviation representing some fact within the range of the census enumeration. They are punched by means of a machine similar to a typewriter as a clerk reads from the schedule the required information to the operator at the keyboard. In this way 700 cards can be disposed of in one day by one clerk. From the punching machine the record cards go to the electric tabulating machine, which collects all the information they convey and puts it into systematized form. One machine does the labor of 20 clerks under the old system. From here the record slips pass to a force of 1,000 clerks, who make up the tables and prepare copy for the printers.

IV. State Censuses.—In many of the States of the Union a census is required at some time within the interval between each two national censuses. These provisions are very various, but there is even greater range in the manner in which the provisions are executed.

By the twenty-second section of the act of Mar. 3, 1879, it was provided that any State or Territory taking a census during the median year (1885, 1895, etc.) between two national censuses should receive, on the deposit of the returns and reports of such census with the Secretary of the Interior, from the Secretary of the Treasury a sum equal to fifty per centum of the amount that was paid to the supervisors and actual enumerators within such State or Territory at the U. S. census next preceding, increased by one-

half the percentage of gain in population in such State or Territory between the two censuses next preceding: "*Provided*, that the blank schedules used for the purposes of the enumeration herein provided for shall be similar, in all respects of form and size of heading and ruling, to those used in the census of the U. S." Whether this effort to promote State censuses intermediate between the national censuses will have any more effect than the provisions for State censuses now found in the constitution or on the statute-books of many States remains to be seen. See map of CENTER OF POPULATION, in article UNITED STATES.

FRANCIS A. WALKER. Revised by H. C. ADAMS.

Cent [*cent.* in the phrase *per cent.* represents Ital. *cento* (in *per cento*) or Fr. *cent* (in *pour cent*) < Lat. *centum*, hundred; *per centum* is merely a mistaken Latinization of the Ital. In the sense of a hundredth of a dollar cent was first used in the U. S. late in the eighteenth century, probably as clip-form of Fr. *centime* or Ital. *centesimo*]: a coin of the U. S. of the legal value of the one-hundredth part of a dollar, or nearly one halfpenny sterling. It is now coined of an alloy of copper, tin, and zinc, and is legal tender for the payment of sums not exceeding twenty-five cents. The Dutch cent is the one-hundredth of a guilder, and its value is about one-third of that of the American cent. The French cent (*centime*) is one-hundredth of a franc.

Cen'taurs [from Gr. *κένταυροι*; Lat. *centau'ri*]: fabulous animals which the ancient Greek poets imagined to be half men and half horses, the head and anterior part being human. They were supposed to be the offspring of Ixion and a cloud, and to have lived in Thessaly. The battle of the centaurs with the Lapithæ was celebrated in Greek mythology, and was a favorite subject of ancient art.

Centau'rus (the Centaur): a constellation of the southern hemisphere; contains two stars of the first magnitude designated respectively as α Centauri and β Centauri, which do not rise in latitudes of the U. S.

Centenéra, MARTIN DEL BARCO: Spanish ecclesiastic and poet; b. at Logrosán, 1535; went to the Rio de la Plata in 1572; was archdeacon of Paraguay, and traveled extensively in the Platine provinces and Peru. After his return in 1576 he resided in Portugal, where he published his poem, *La Argentina* (Lisbon, 1602). It is a versified chronicle of the Spanish conquests, and is esteemed only for its historical value. D. at Lisbon, 1604. H. H. S.

Centennial Exhibition, or **Exposition**: See INTERNATIONAL EXHIBITION and PHILADELPHIA.

Cente'no, DIEGO: Spanish soldier; b. at Ciudad Rodrigo, 1504; went to America; passed to Peru with Pedro de Alvarado in 1534, and soon became known as one of the most skillful leaders there. He fought against the elder Almagro at Las Salinas (Apr. 26, 1538), and against the younger Almagro at Chapas (Sept. 16, 1542), and was rewarded with rich grants in Charcas. At first he supported the revolt of Gonzalo Pizarro, but subsequently declared for the king. Carvajal, who was sent against him, defeated him several times, and he was forced to hide in a cave near Arequipa (1546). On the arrival of Gasca he emerged and collected an army for him in Charcas, but was again defeated by Pizarro and Carvajal at Huarina, near Lake Titicaca (Oct. 26, 1547). He escaped, and was present at the final rout of Pizarro, near Cuzco (Apr. 8, 1548). He died suddenly, with suspicion of poison, at La Plata, in Upper Peru, in 1549.

HERBERT H. SMITH.

Center, or **Centre**: originally a "point"; hence the point of a compass which remains fixed while the other is moved round to describe a circle. The center of a circle is a point within it equally distant from every part of the circumference. The center of a sphere is a point equally distant from every point of the surface. In war, the term *center* is applied to the main body of an army located between the two wings. In French politics the *Center* is used to designate a party of moderate royalists or conservatives who support a policy intermediate between that of the *Droit*, "right," and that of the *Gauche*, "left"; in German politics it is applied to the representatives of the Roman Catholics.

Centering: a temporary framework built for the purpose of constructing a stone arch or vault. For the arches of common windows or door the centering is made of boards with their upper surfaces cut to the required curve. In building arched bridges the centering is a trussed framework of timber, or of timber and iron combined. The centering is not removed until the mortar of the masonry is well set, and especial care is necessary that it be removed without subjecting the structure to shocks. Arched iron bridges are also usually built upon a timber centering.

Center of Gravity: the point in a body which is always in the line of the resultant of the weights of all the particles composing that body, no matter in what position the body be placed. Each particle of a body held above the surface of the earth is acted upon by gravitation, and we may look upon the gravitation of each particle as being one of a system of parallel forces, and the gravitation of the whole as a resultant of those forces. Whatever be the direction of these forces with respect to the mass, the resultant will always pass through a fixed point within the mass, which point is the center of gravity for the body. Every mass which is supported above the earth must have its center of gravity so placed that a line drawn from it perpendicularly downward will fall within the base; otherwise the body will fall. The center of gravity of many bodies may be found by geometrical rules, but with the supposition that the bodies are of homogeneous or uniform specific gravity—a condition which is not often found exactly fulfilled in practice.

Center of Magnitude: that point of a geometric figure which would be its center of gravity were it a mass of uniform density throughout.

Center of Oscillation: See PENDULUM.

Center of Percussion: See PENDULUM.

Centerville: See CENTREVILLE.

Centerville: city; capital of Appanoose co., Ia. (for location of county, see map of Iowa, ref. 7–H); on Ch., Rk. I. and Pac. and K. and K. and Iowa Cent. R. Rs.; 125 miles W. S. W. of Muscatine. The city is a coal-mining center for Southern Iowa and Northern Missouri, and is in the heart of the blue-grass region of Iowa. It has various manufacturing industries. The surrounding country is a well-watered agricultural region, with plenty of stone and timber. Pop. (1880) 2,475; (1890) 3,668; (1900) 5,256.

EDITOR OF "APPANOOSE IOWEGIAN."

Centigrade Thermometer [*centigrade* is viâ Fr. from Lat. *centum*, hundred + *gradus*, step; i. e. having a hundred steps]: a thermometer having its scale between the freezing and the boiling point of water divided into 100 equal parts, or degrees (hence the name); the freezing-point being taken as zero, and the boiling-point as 100°. The reversed scale (with zero at the boiling-point and reading downward) was invented about the year 1741 by Prof. Anders Celsius, of Upsala, in Sweden, and through a failure to note this difference the centigrade thermometer is often called Celsius's thermometer. Its use was for many years mostly limited to Sweden and Russia, but it is now the scale generally used in France; and its excellences so commend it that it will probably come into almost universal use. In Germany it is rapidly superseding the scale of Réaumur, while in England, Holland, and the U. S., where Fahrenheit's scale is more generally known, the centigrade is used in chemical and other scientific operations, and thermometers are often marked with both scales, one on each side of the mercurial column. The advantages of the centigrade scale are that its zero and its hundredth degree can always be redetermined with ease, and, above all, that its divisions are in harmony with the decimal system of measurement. The objection to the centigrade, that its degree is too large, is obviated by dividing the degree into decimals, which are marked on the scale, thus greatly increasing its precision. One degree centigrade is equal to 1·8 Fahrenheit, or, conversely, 1° Fahrenheit nearly equals ·55 of a degree centigrade. See THERMOMETER.

Centipede [Fr., from Lat. *centi'peda*, the hundred-footed; *centum*, hundred + *pes*, *pedis*, foot]: a popular name for various insects of the order *Myriapoda*, but properly given to those of the sub-order *Chilopoda*, and especially to the family *Scolopendridæ*. They have long slender bodies, and twenty-one to twenty-three pairs of feet. Some tropical species are nearly a foot long. The bite of many species is poisonous, and even dangerous. *Scolopendra castaniceps* is the largest U. S. species, and is found in the Southern States. See MYRIAPODA.

Centlivre, sent-liv'er, SUSANNA (*Freeman*): English actress and playwright; b. probably in Ireland about 1680. Her third husband (1706) was Joseph Centlivre, Queen Anne's head-cook. She wrote about twenty comedies, in-

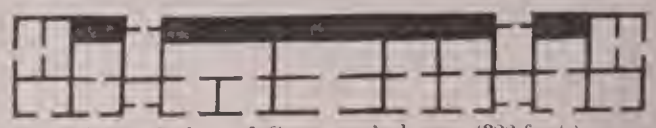
cluding *The Busybody* (1709); *The Wonder* (1713); and *A Bold Stroke for a Wife* (1718). Her works were reprinted with a biography in 1872. D. Dec. 1, 1727. H. A. Beers.

Central America: See America.

Central American Antiquities: The architectural remains which exist in such numbers in Central America may be divided into three groups, differing in character, location, and construction. Much the most important of the three was that found within the area occupied by the Maya linguistic stock, and undoubtedly the work of the ancestors of that people. Fewer in number, but presenting some unique examples of stone work, were the remains left by certain Aztec or Nahuatl colonists, who at an early period settled in various parts of Central America. Finally, in Costa Rica there are numerous relics attesting a comparatively high civilization left by a tribe or by tribes belonging to stocks different from either of those above mentioned. We shall examine each of these in turn.

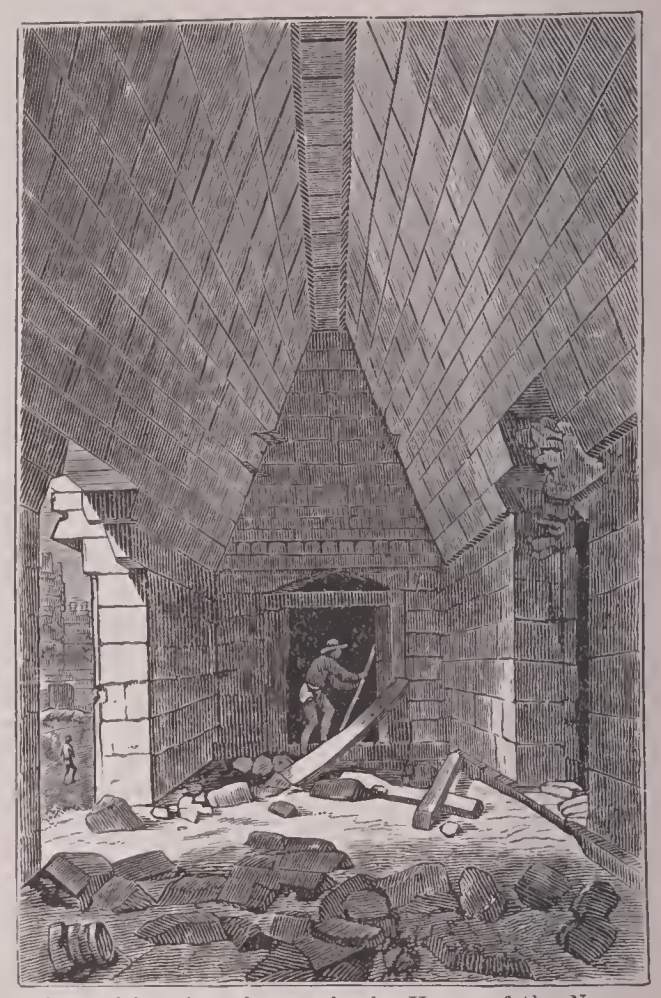
Maya Antiquities.—Although all the remains found within the area of the Maya stock of tribes present certain general similarities, they offer special traits which suggest their division into two sub-groups; the one including those within the area of the Mexican states of Chiapas and Yucatan, the other in the republics of Guatemala and Honduras. The principal sites in the former of these sub-groups are—Palenque, situated on the small river Otolum, a branch of the Usumacinta, in Chiapas, containing five remarkable structures; Comacaleo, N. W. of Palenque, near the coast; Mayapan, the ancient native capital of Yucatan, S. E. of Merida; Uxmal, S. W. of Mayapan, presenting some of the vastest monuments of American architecture; Kabah, Nochacab, Chunhuhu, Mani, and many others, nearly forty in all, within a radius of 50 miles from the capital, Mayapan. Further E. are Izamal and the singular agglomeration of buildings called Chichen-Itza; on the eastern coast the city of Tuloom, fortified with strong walls and surmounted with square towers; and on the island of Cozumel numerous edifices of smaller proportions, visible from the sea. In the south of the peninsula are the well-preserved structures of Tikal, not far from Lake Peten, and on the Usumacinta river a large mass of ruins, which has been named Lorillard City.

In the architectural remains discovered in these localities certain resemblances are found which show them to have been the work of the same people, and which separate them from similar relics of native civilization seen elsewhere. It is evident on the other hand, from their state of preservation, that they are of widely diverse ages. Palenque was undoubtedly an abandoned city when Cortes conquered Mexico, as he passed almost within sight of it and never heard of its existence. Even at that time there were massive ruined cities in Yucatan, covered with a forest of seemingly primeval growth. Such a one was Tiho, on the site of which Mérida now stands, and whose materials served to build the present city. Others again were in process of construction when the Spaniards arrived. The usual material of the buildings is the limestone which underlies the surface soil in most parts of the country. The blocks were shaped by stone tools and laid in a mortar of admirable temper, which has become exceedingly hard. The plumb-line and square were unknown, the masons guiding themselves by the eye and by the use of long, straight reeds. The general plan of all these edifices was that of a walled building, erected on the summit of an artificial mound or pyramid. The structure of the pyramid varied. Sometimes it was merely a heap of rubble and earth, kept in place by an external layer of



Ground-plan of Governor's house (322 feet.).

stone; elsewhere the foundation walls of the superstructure extend down through the pyramid to the original soil, the mound being constructed around them. The base is generally rectangular, though rarely accurately so, and the sides are occasionally terraced into one, two, or three platforms. The area of the ground plans and the height vary

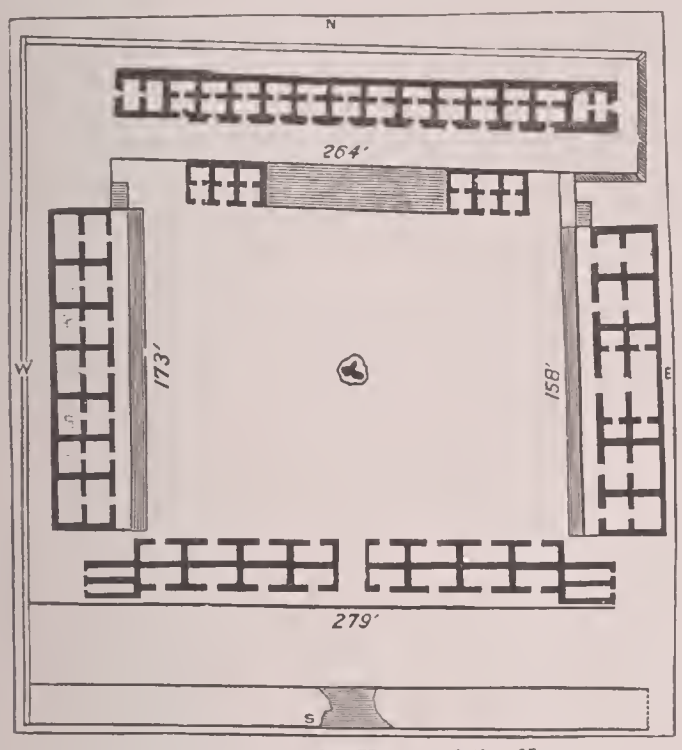


Part of interior of room in the House of the Nuns.

greatly. What is called the palace at Palenque has a base area of 260 by 310 feet, with a height of 40 feet; the Governor's house ("Casa del Gobernador") at Uxmal has an irregular base about 600 feet on each side. From these, which are among the maximum dimensions, the base area descends to that of small pyramids supporting single rooms, as in the island of Cozumel. An exception to the usual plan of utilizing the pyramid is seen in the ruins of Kabah and Zayi. Here, instead of being the support for the foundation of the superstructure, it serves as a central nucleus around which the house, with receding stories, one above the other, is constructed. The first story is built upon the ground, its rear wall being the face of the pyramid; the second story is built in the same way on the platform of the first terrace of the mound; and so on to the top. This reminds one somewhat of the structure of some of the pueblos of New Mexico. In such an instance we

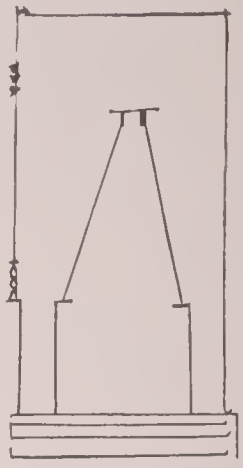
The Governor's house at Uxmal.

may suppose that we have an example of domestic or residential architecture; but this was certainly not the purpose of most of the examples of this group of Maya remains. The pyramids usually have steep sides; the steps are narrow and often 2 feet in the rise, with narrow treads. The buildings which surmount them have entirely inadequate accommodations for residence; and finally we are clearly told by the first explorers that the native houses were of light wood, leaves, brush, mats, and similar perishable materials. There is no doubt but that the destination of most of these structures was for religious or ceremonial purposes, and not as dwellings. They are divided into small and dark rooms, rarely communicating. In that known as the "House of the Nuns" at Uxmal there are eighty-eight of these small rooms looking on an interior stone-paved court. But such examples are not frequent. The decorations of many of the buildings are extremely elaborate, both exter-



Ground-plan of the House of the Nuns.

nally and internally, and evidently largely symbolic. The faces of the walls are elaborately carved in designs extending across the whole elevation, sometimes in fixed patterns, as intricate meanders and *grecques*, often to represent more or less conventionally the figures of animals. Of these the serpent seems to have been the favorite, but other animals and the human figure are also frequent. The assertion of some writers that the elephant is among the species thus depicted is incorrect, a recurved ornament on the angles of the structures having been mistaken for the trunk of the animal. Officials in ceremonial costumes are sometimes represented performing religious rites, surrounded by inscriptions in low relief in the peculiar hieroglyphic character of the Mayas, known as the "calculiform." The most celebrated example of this is seen in the altar slabs from Palenque, where several figures are depicted in the act of making offerings to a central object shaped like the Latin cross. The Latin, the Greek, and the Egyptian cross, or *tau*, were evidently sacred symbols to this ancient people, bearing some religious meanings derived from their own cult. This fact has no further significance, as these and other such simple figures were connected with the religious symbolism of many primitive peoples. The interior of the buildings was usually covered with hard stucco, sometimes itself molded by hand into ornamental elements, and more frequently serving as a ground for color work. In this manner, especially in Chichen-Itza, scenes from life are depicted with bold, free-hand drawings, and in strong crude coloring on the interior surfaces of the walls. The doors were rectangular, with lintels of stone or of wood. That some of the latter still remain in place is evidence that the buildings in which they are can not claim any vast antiquity. The roofs were sometimes of stones, laid the one overlapping the other, or of wooden beams plastered with cement inside and out. The latter have not withstood the attacks of time, but descriptions of them have been left by early travelers. The use of pillars as supports was not generally understood, although various examples are met with. On the other hand, the arch as an architectural element had received a higher development in the Maya countries than elsewhere in America. Its early form is seen at Palenque. Here it is simply formed by two walls which approach each other, the stones on each side being laid to project toward the center. At the top a single flat stone is laid across the aperture to close the approaching walls. In the buildings of Uxmal and elsewhere in Yucatan the edges of the overlapping stones are neatly polished off and the surface covered with stucco, so that the technical plan is concealed; while at Comacalco the Palenque method is maintained. At Palenque also we find examples of a more complicated arch, somewhat resembling that known as the Moorish, though properly called the trefoil arch. Nevertheless even this appears to depart from the true definition of this element, as it terminates in an architrave, and not in a keystone.



Cross-section through one apartment, showing early form of arch.

The other sub-group into which we have divided the Maya antiquities includes the area of Guatemala and the adjacent territory of Honduras. The most celebrated sites are Utatlan, the capital of the ancient Quiches, in Western Guatemala; Iximche, the capital of the Cakchiquels, neighbors of the Quiches on the east, both of them powerful nations at the time of the conquest and with well-developed civilization; and the enigmatical ruins of Copan, on the banks of a river of the same name in Honduras, but only some 10 or 12 miles from the Guatemala line. Like Palenque, Copan had been abandoned by its inhabitants long before the conquest, and when first heard of was a mass of ruins. Some writers maintain that it can lay claim to being the oldest city in America. It presents an elevated rectangular area about 900 by 1,600 feet, surrounded by solid stone walls and inclosing a number of structures, especially one principal group designated as the "temple." This is of massive blocks of cut stone, with walls 25 feet in thickness. The ground plan measures 624 by 809 feet. The adjacent soil is covered with sculptured obelisks, pillars, and idols, with finely dressed stones, and with blocks ornamented with skillfully carved figures of the characteristic Maya hieroglyphs, which, could they be deciphered, would doubtless reveal the story of this strange and solitary city. Both Utatlan and Iximche were occupied by their builders and owners when the country was conquered by Alvarado in 1524, and we have slight descriptions of them by the historians of his expedition. At present, however, they are nothing more than mounds of *débris*, the cut stones of which they were constructed having been carried off by the European settlers to serve as building material. Several pyramids remain at Utatlan; one, called the "Fortress," is about 120 feet high, its summit surrounded by a stone wall plastered with stucco. Another pyramid, supposed to have been a temple site, is ascended by a staircase of nineteen steps, each 8 inches broad and 19 inches high. The foundation wall of what is called the "palace" shows it to have been a building with dimensions of about 1,100 by 2,200 feet. Iximche was not inferior in its ancient splendor, but now scarcely more than its solidly paved and cemented streets and the foundations of its large communal residences can be seen.

The second and third groups of Central American antiquities may be briefly treated. The Nahuas at an early date moved southward from Central Mexico, some colonies remaining in Guatemala under the names Pipiles and Alaguilacs, and others moving on to Nicaragua, where they settled between the lake of that name and the Pacific, and on the island in the lake called Ometepec. They brought with them their long-acquired skill in dressing stone and in erecting tumuli, and such are found in these localities which they occupied. The most celebrated of such relics are the sculptures of Cozumel-hualpa in Guatemala, extraordinary carvings in bas-relief, evidently funereal in character, specimens of which have been taken to various museums in North America and Europe. The sculptures from Ometepec have also deservedly attracted the attention of the students of American antiquities. There can be no doubt of the Nahuatl origin of these ancient specimens of art.

In Costa Rica the traveler finds many mounds of large size, proving to be funeral monuments, from which have

been taken thousands of small images in gold known as "Chiriqui ornaments." They appear to have been the work of one of the tribes dwelling near the Gulf of Chiriqui at the time of the conquest. A few structures in stone have been reported from Costa Rica, but there is some doubt whether they can be attributed to native art of a date anteceding the advent and influence of the Europeans.

AUTHORITIES.—*Travels in Yucatan*, by John L. Stephens; *Travels in Central America, Chiapas, and Yucatan*, by the same; A. S. Maudsley in *Proc. Royal Geog. Society* (1888); D. Charnay, *The Ancient Cities of the New World*; H. H. Bancroft, *The Native Races of the Pacific Coast.*

D. G. BRINTON.

Central City: city; capital of Gilpin co., Col. (for location of county, see map of Colorado, ref. 2–D); is situated among the Rocky Mountains, on Union Pac. R. R.; 40 miles W. by N. from Denver. It derives its prosperity from its gold mines, and has quartz-mills, manufactures of mining machinery, a fine school building, and churches of four denominations. The city was founded in 1859, and is the oldest gold-mining camp in the State. Pop. (1880) 2,626; (1890) 2,480; (1900) 3,114.

EDITOR OF "GILPIN COUNTY OBSERVER."

Central City: railroad junction: on Platte river; capital of Merrick co., Neb. (for location of county, see map of Nebraska, ref. 7–J); has Nebraska Central College. Pop. (1880) 648; (1890) 1,368; (1900) 1,571.

Central Falls: city (incorporated 1895); formerly part of town of Lincoln, Providence co., R. I. (for location, see map of Rhode Island, ref. 7–N); on Worcester Division of N. Y., N. H. and H. R. R., and on Blackstone river; about 6 miles N. of Providence; has 7 churches, 7 public schools, public library, 3 parks, cotton and woolen mills, thread-mills, hair-cloth manufactory, copper-refinery, foundries, and machine-shops. Pop. (1900) 18,169.

EDITOR OF "RECORD-VISITOR."

Central Forces: in mechanics, those forces which radiate from a point or center. A body impelled by a constantly acting force toward a fixed center will move up to that point with a constantly increasing velocity; but if it have an initial motion in a direction toward some point other than the center, the constantly acting central force will deflect it from its original path, but will not draw it to the center of force. The resultant path will be a curve. The straight line from the moving body to its center of force is called a "radius vector," and it is found, mathematically, that the radius vector of a body moving in a curve under the influence of a central force will pass over equal areas in equal times, whatever the rate of motion. It is found, also, that the velocity of such a body is at all times inversely proportional to the perpendicular from the fixed point on the tangent to the curve at the point considered. Therefore, if the motion be uniform, the path of motion is a circle. If the path be an ellipse, and the center of force be the center of the curve, the central force is directly proportional to the distance; but if the center of force be at a focus of the ellipse (or of a hyperbolic or parabolic path), the force acts with an energy inversely proportional to the square of the distance.

Centra'lia: a city and railroad junction; Marion co., Ill. (for location of county, see map of Illinois, ref. 9–E); 252 miles S. of Chicago. It has machine-shops of the Illinois Central R. R. Company, two coal mines, iron and steel works, an iron-foundry, and various other manufactories. There are in Centralia several parks, a public library, a high school, and graded schools. It is a center of trade for the famous fruit-belt of Southern Illinois. Pop. (1880) 3,621; (1890) 4,763; (1900) 6,721. EDITOR OF "DEMOCRAT."

Centralia: city; Lewis co., Wash. (for location of county, see map of Washington, ref. 5–C); on Northern Pac. R. R.; 94 miles N. of Portland, Ore. Its industries are agriculture, coal-mining, and lumbering. Pop. (1890) 2,026; (1900) 1,600.

Centralia: city; Wood co., Wis. (for location of county, see map of Wisconsin, ref. 5–D); on Ch., Mil. and St. Paul and other R. Rs., and on Wisconsin river. It has abundant water-power and many important manufactures. Pop. (1880) 806; (1890) 1,435; annexed to Grand Rapids since 1890.

Centralia: town; Boone co., Mo. (for location of county, see map of Missouri, ref. 4–G); on Wabash and Chicago and Alton R. Rs.; 124 miles N. W. of St. Louis. It is in an agricultural and grazing region. Pop. (1880) 703; (1890) 1,275; (1900) 1,722.

Central Provinces of India: one of the great administrative divisions of British India; situated between lat. 18° and 24° N., and between lon. 77° and 83° E. Area, 86,501 sq. miles. They were formed into a chief commissionership in 1861, and they are divided into 4 commissionerships and 18 districts. The line of railway connecting Bombay with Calcutta passes through these provinces, and has completely altered the condition of the country, which up to the time when it was formed into a chief commissionership was almost unknown. The traffic that passes through the capital, Jabalpur, is larger than that of any other city in India, except Bombay. The revenue of the provinces in 1880 amounted to £1,293,130. Pop. (1901) 9,845,318.

Centrarch'idæ [from *Centrarchus*, the name of a genus, from Gr. *κέντρον*, spine + *ἀρχός*, anus]: a family of fishes of the order *Acanthopteri*, peculiar to North America. They constitute a very characteristic type in at least the Eastern and Mississippi regions. The body is oblong and compressed, and divided into nearly equal and corresponding halves by a longitudinal axis coincident with the commencement of the lateral line and the middle of the caudal fin; the scales are well developed, and generally ctenoid; the lateral line is continuous; the head is compressed, and covered with scales on the opercula and cheeks; the eyes are lateral. The species are quite numerous (about fifty having been described), and generally among the most common fishes of the waters which they frequent. They are all carnivorous, and mostly quite bold and gamy fishes. In the breeding season they generally select a spot, which they clear of weeds and obnoxious substances, for depositing their eggs; these the male and female guard with zealous care, rushing boldly forward to drive away any intruder not too large for their powers. It is to this family that the black bass, as well as rock-bass, sunfish, crappie, etc., belong. Several distinct types of structure are exemplified by the species. See SUNFISH.

THEODORE GILL. Revised by DAVID S. JORDAN.

Centre College (Danville, Ky.): chartered as a State institution in 1819. Under the long presidency of Dr. J. C. Young (1830–57) the college rose to great eminence among Western schools. It retained both its numbers and its reputation until the civil war, when the number of students was reduced from 200 to less than 50. At the close of the war the synod of Kentucky was rent asunder, and the smaller body, and with it Centre College, adhered to the General Assembly. The libraries of the college contain about 20,000 volumes. Facilities for instruction in the sciences are good and increasing. The endowment yielding an income amounts to about $175,000; the buildings and grounds are estimated at $85,000 additional. Instructors (1900) 30; students, 350.

Centreville: See CENTERVILLE.

Centreville: town; capital of Queen Anne co., Md. (for location of county, see map of Maryland, ref. 2–G); on Phil., Wil. and Balt. R. R.; 30 miles E. by N. from Annapolis; is situated in a large peach-growing region. Steamboats connect it with Baltimore. It has an academy for boys and one for girls, an agricultural-implement factory, and a foundry. Pop. (1880) 1,196; (1890) 1,309; (1900) 1,231.

Centrip'etal and **Centrif'ugal**: terms used in botany, and applied to two modes of inflorescence. When the terminal flower-bud is the first to expand, the inflorescence is said to be centrifugal. When the expansion begins with the bud which is nearest the base of the floral axis (or nearest the circumference in a cyme or corymb), and proceeds toward the terminal or central bud, the inflorescence is centripetal.

Centripetal and **Centrifugal Forces** [*centripetal* is from Lat. *centrum*, center + *pe'tere*, seek (Newton used the Mod. Lat. *centri'petus* and *centri'fugus*); *centrifugal* is from Lat. *centrum*, center + *fu'gere*, flee]: If we suppose a body to move in a circle with a uniform velocity, it is shown by the laws of motion that it must be acted upon continually by a uniform force directed toward the center; which force expends itself each instant in deflecting the moving body from the straight line in which it would normally move, this line being a tangent of the circle in which motion takes place. The force with which the body is impelled toward the center is called *centripetal*; the equal and opposite reaction of the body against this impulsion is the *centrifugal* force. Both together are the *central* forces. Each is equal to the mass of the body multiplied by the square of the velocity, and divided by the radius of the circle round which the body moves.

Centumalus: the name of a plebeian family of the *Gens Fulvia*.—One member, Maximus Centumalus, was legate to the dictator M. Valerius Corvus in the Etruscan war, 301 B. C., and consul in 298 with L. Cornelius Scipio, when he gained a brilliant victory over the Samnites near Bovianum.—Another, Cn. Fulvius Centumalus, was consul in 229, and triumphed in the following year, having dispersed the troops of the Illyrian queen, Teuta, and shut her up in the fortress of Rhizon. This was the first triumph over Illyrians occurring in the history of Rome.—His son, Cn. Fulvius Centumalus, was consul in 211 together with P. Sulpicius Galba. His command was prolonged beyond the term of his consulship, but in 210 he was defeated by Hannibal near the town of Herdonsa in Apulia. He himself and eleven tribunes perished in the battle.

Centum'viri: among the Romans judges appointed, three out of each tribe, to decide common causes. The extent, however, of their power is uncertain.

Centuries of Magdeburg: the first Church history by the Protestants, the preparation of which occupied many eminent scholars for a long period. The plan of an extended work, which should reveal the deviations of the Roman Church from the practices of the early Christians, was first conceived by Matthew Flacius of Magdeburg in 1552. The labor begun by him was carried forward by Johann Wigand, Matthew Judex, Basil Faber, Andreas Corvinus, and Thomas Holzhuter, and the means therefor were provided by the evangelical princes and great men. The work appeared in Basel in 13 folio volumes, each volume covering a century (1559–74), but the headquarters of the enterprise was Magdeburg, whence the name. A second edition, edited by Ludwig Lucius, appeared in Basel, 1624 (6 vols. fol.); a new edition of the first five centuries, edited by L. J. Baumgarten and J. S. Semler, at Nuremburg (1757–65, 6 vols.); while a German translation of the first four centuries, by the original authors, appeared at Jena (1560–65, 2 vols.). The materials are arranged under sixteen different heads—doctrine, government, heresies, ceremonies, missions, councils, etc. The arrangement is mechanical, and the style (the book is written in Latin) is cumbersome and affected. But the amount of criticism brought to bear on the subject is considerable. The *centuriatores*, as the authors were called, never brought it down in printed form beyond the year 1300; but Wigand prepared the parts for the fourteenth, fifteenth, and sixteenth centuries, and the MS. is now preserved in the Wolfenbüttel library. The work has been severely criticized by Protestants as partisan, in the interests of strict Lutheranism. But as a pioneer work it deserves great honor. It stirred up a vigorous Roman Catholic opposition, the result of which was great gain to the study of Church history. It was in refutation of the *Centuries* that Baronius wrote the *Annales Ecclesiastici* (Rome, 1588–1607, 12 vols.).

Revised by Samuel Macauley Jackson.

Century [from Lat. *centu'ria*, a division consisting originally of a hundred (*centum*)]: a company of 100 men in the Roman army; also a civil division of the Roman people formed for the purpose of voting. According to this division, which was founded on property, the people voted in the *comitia centuriata*. (See Comitia.) Servius Tullius divided the citizens of Rome into 193 centuries. In modern times the term is used mostly to denote a period of 100 years.

Century Plant: See Agave.

Cepe'da, Diego: Spanish lawyer and judge; b. in Tordesillas, Valladolid, about 1495. He was *oidor* or administrator of the Canary islands, and in 1543 was one of the judges of the royal audience which was sent to Peru with the viceroy Blasco Nuñez Vela. He led the judges in their opposition to Vela's measures and his imprisonment. Subsequently he became the adviser and tool of Gonzalo Pizarro, fought on his side at the battle of Anaquito (Jan. 18, 1546), counseled Pizarro not to accept Gasca's offers of amnesty, but finally deserted him on the field of Sacsahuana (Apr. 8, 1548). Gasca sent him to be tried in Spain, and he died in prison at Valladolid, probably by his own hand.

Herbert H. Smith.

Cephalas'pis [from Gr. κεφαλή, head + ἀσπίς, shield]: a genus of fossil fishes armed with rhomboidal ganoid plates of enameled bony structure. Several species are found in the Upper Silurian and in the Devonian rocks. They had large heterocercal tails, and appear to have been rapidly moving, predaceous fishes. The name is derived from the large plate which covered the head.

Cephalization [derived from Gr. κεφαλή, head]: a term introduced by Prof. James D. Dana to denote simply the degree of head domination in the structure of the body. The following are some of the ways or methods in which it is manifested:

1. With *superior* cephalization—that is, as species rise in grade or rank—more and more of the anterior part of the body or of its members render service to the head; with *inferior*, less and less. In many cases, part of the organs that serve as feet in the lower tribes serve as jaws in the higher, or, in other words, are transferred from the locomotive to the cephalic series, and thus the structure indicates higher cephalization.

2. With *superior* cephalization the structure of the head or of the anterior portion of the body becomes more and more compacted, perfected, and condensed or abbreviated; with *inferior*, the same portion becomes more and more lax in its parts or loosely put together, and imperfect in the parts or members themselves, and at the same time the whole is more and more elongated and spaced out or enlarged.

3. With *superior* cephalization the posterior portion of the body becomes more and more compacted, or firmly put together and abbreviated; that is, as concentration goes on *anteriorly* there is abbreviation *posteriorly*. Even the tail shows grade; for great length or size or functional importance is actually a mark of inferior grade, other things being equal.

4. With *superior* cephalization there is an upward rise in the head extremity of the nervous system; and this reaches its limit in man, in which it becomes *erect*. With *inferior*, there is the reverse condition, and the limit is seen in the *horizontal* fish.

5. With *inferior* cephalization there is not only a less and less concentrated or compacted and perfected state of the whole structure before and behind, but in its lower stages the degradation of the structure extends to an absence of essential parts, as teeth, members, senses; and often also to a gross enlargement of the body beyond the size which the system of life within can properly wield, and in this case the body is stupid and sluggish.

Revised by David S. Jordan.

Cephalo'nia (anc. *Cephallenia*; in Gr. Κεφαλληνία): the largest of the Ionian islands; one of the nomarchies of the kingdom of Greece; in the Mediterranean, near the west coast of Greece. It is about lat. 38° N. and lon. 20° 30′ E. The greatest length is 32 miles, and the area 302 sq. miles. The surface is mountainous, the climate is pleasant, and the soil is mostly thin. The highest summit rises about 5,000 feet above the level of the sea. The chief articles of export are currants and olive oil. The principal towns are Argostoli and Lixuri. There are many ancient ruins upon the island. This island was called *Samos* by Homer. Pop. (1879) 80,543; (1896) 83,363. See Ionian Islands.

Cephalop'oda [from Gr. κεφαλή, head + πούς, ποδός, foot]: the highest class of the *Mollusca*, including cuttlefishes, squids, octopods, sepias, *Nautilus*, and *Argonauta* (paper-nautilus). The class is characterized by having a distinct head and by possessing a circle of arms surrounding the mouth. The arms are regarded as homologous to the fore part of the "foot" of other mollusks. The arms are provided with suckers, the efficiency of which is in most cases greatly increased by numerous fine hooks arranged around their margins.

The body is covered with a mantle, which is in the shape of a bag or cone, from the open mouth of which project the head and arms. This covering contains much muscular tissue. It is attached to the rest of the body along the dorsal line. The water can pass freely into the mouth cavity around the collar; but when the mantle contracts, by a peculiar arrangement it may fit so closely to the neck that the water can not return by the same way, but is forcibly expelled through a tube called the siphon, connecting with the mantle cavity. By this means the animal may be projected backward through the water, sometimes with great rapidity. By means of these movements the water is also driven over the gills which project into the mantle chamber, and thus respiration is accomplished. In some forms, as in the squids, the mantle may be raised into folds, which constitute the so-called fins which aid in directing the movements through the water.

The nervous system is highly developed and greatly centralized. The eyes are very large and conspicuous, and in

many forms are remarkably like those of vertebrates, although differing from them in very important particulars, both in structure and manner of development. The ears, two in number, consist each of a single sac imbedded in the head, containing a watery liquid in which is a single otolith.

A cartilaginous skeleton is present which surrounds certain of the nerve centers, supports the eyes and ears, and serves for the attachment of muscles. The mouth possesses two jaws very much resembling the beak of a parrot.

In some forms an external shell is developed, e. g. in the nautilus; in others a shell more or less rudimentary is imbedded in the mantle, and is known as the "pen" in the squid and "cuttlebone" in the cuttlefish; while still others, e. g. octopi, are devoid of both.

There is present in most forms an ink-sac, which opens by a duct within the anus. It contains a black fluid which the animal discharges into the water, thereby rendering it so cloudy that it may escape when attacked by enemies. The contents of the ink-sac of certain forms is the india ink or sepia of commerce.

The cephalopods are marine and carnivorous in their habits. They are placed in two orders. The first, *Tetrabranchiata*, are those which have four gills, a chambered shell, and a siphon not closed into a tube. They also possess numerous tentacles surrounding the mouth. The only living forms are of the genus *Nautilus*, found in the Pacific and Indian Oceans. Members of this order were very numerous throughout geological times, from the Lower Silurian upward. Their shells are characteristic of certain geological formations. The most common are those of the genera *Orthoceras*, *Baculites*, *Goniatites*, *Ceratites*, and *Ammonites*.

The second order, *Dibranchiata*, are those which have two gills in the mantle-chamber, bear eight or ten arms with suckers, and have the siphon formed into a tube. In one group, the *Decacera*, or *Decapoda*, there are ten arms, two differing materially from the others. This group includes the cuttlefishes, the squids, spirula, and the fossil Belemnites. The other group, *Octopoda*, includes the various forms commonly known as octopi, or devil-fish.

DAVID S. JORDAN.

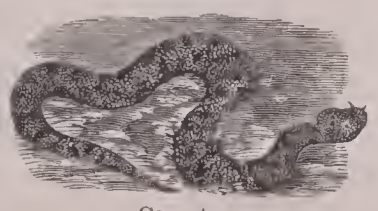
Cephren: See KEPHREN.

Ceram', or **Zeram'**: an island of the Malay Archipelago; the largest of the Moluccas except one. It is between Buru and Papua, about 3° S. of the equator (see map of East Indies, ref. 8–I). Its length E. and W. is nearly 200 miles, and its area about 6,950 sq. miles. Pop. 200,000. It is partly occupied by mountains, the highest point of which, Nusa Keli, rises about 11,000 feet above the level of the sea. The vegetation here is luxuriant, and the highlands are mostly covered with forests. The clove and nutmeg grow wild in Ceram, which also produces the sago-palm in abundance. The lowlands are peopled by Malays, who are bold sailors. The mountains are inhabited by fierce Alfuros. The Dutch claim the sovereignty of this island.

Ceramics: See KERAMICS.

Cerami'cus [Gr. Κεραμεικός, deriv. of κέραμος, earthenware]: name of a region at Athens, partly without and partly within the walls, and connected by the Dipylum gate. Inner Ceramicus extended over the Agora, or market-place. Here popular assemblies and the senate met for business, and the district was adorned with porticoes, the Prytaneum, the Theseum, and other public buildings. Outer Ceramicus was a suburb, where funeral eulogies were made over those who had died in battle and where their ashes were inurned. Here the Athenians erected inscribed statuary to celebrate their heroes.

Ceras'tes [Gr. κεράστης, horned, horned animal, deriv. of κέρας, horn]: a genus of venomous serpents, the horned vipers, of Northern Africa and India, having a flattened head, two rows of plates under the tail, and keeled but not spinous scales. The nostril is small and semi-lunar. Its name is derived from the horned scale which grows upon the eyelids of the male. Several deadly species of *Clotho* of West and South Africa have somewhat similar horns, and are by some included in this cognate genus.



Cerastes.

Ce'rates [from Lat. *cera'tum*, wax-plaster, deriv. of *cera*, wax; cf. Lat. *cero'tum*, wax = Gr. κηρωτόν]: unctuous preparations consisting of oil or lard, which have their consistency increased by the addition of wax, resin, or spermaceti, in order to prevent too great a diffusion of the ointment when it is applied to the skin. Cerates are employed to soothe irritation of the skin, or to bring in contact with it some powerful medicinal substance, such as cantharides.

Cerati'tes [from Gr. κέρας, κέρατος, horn]: a genus of the fossil cephalopods, of the family *Ceratitidæ*: characteristic of the Triassic and Permian rocks. The shell is coiled in a vertical plane, and is distinguished by having the lobes of the sutures serrated, while the intervening curves toward the aperture are simple.

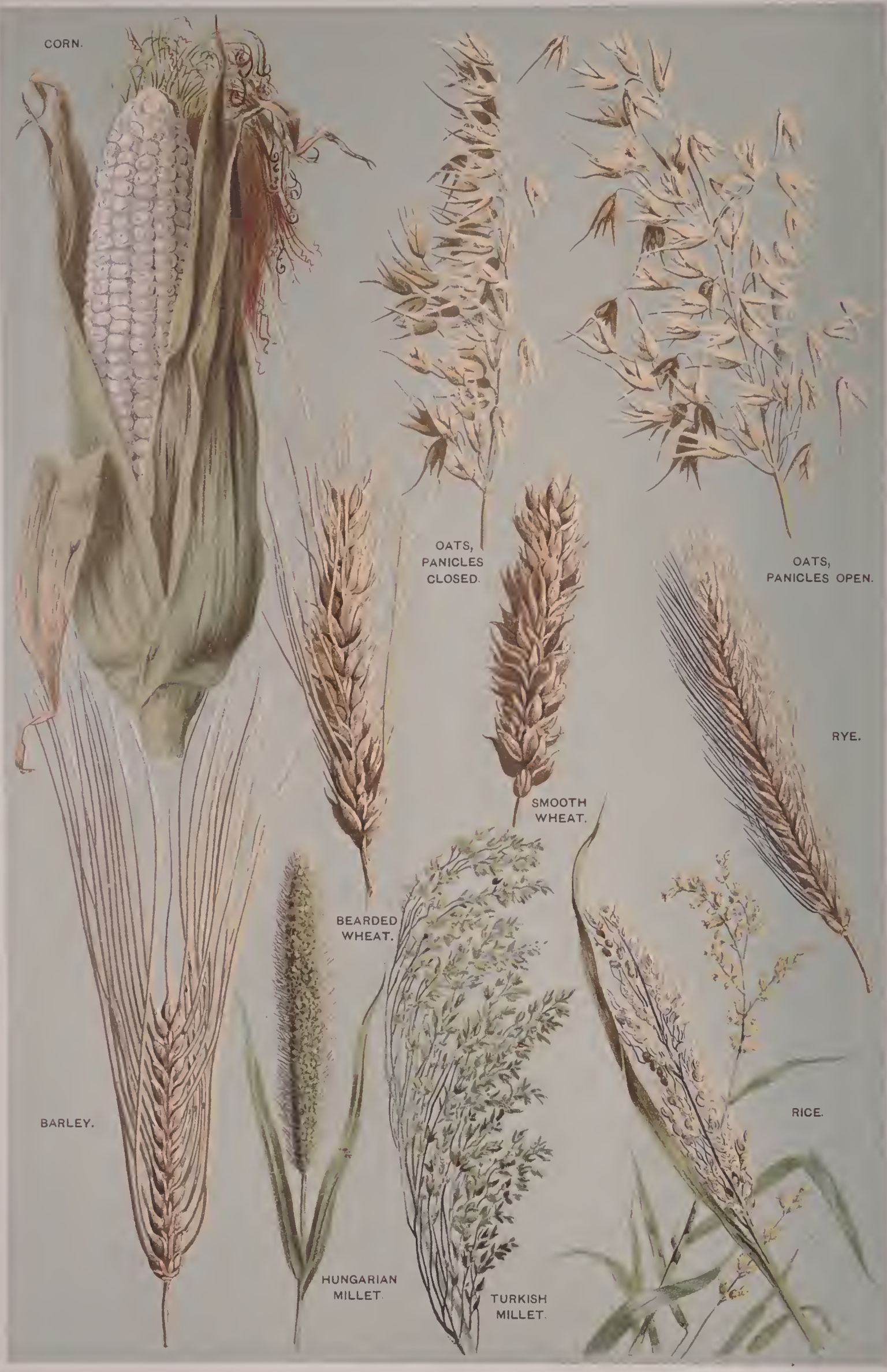
Ceratodon'tidæ [from Gr. κέρας, -ατος, horn + ὀδούς, ὀδόντος, tooth]: a family of fishes of the order *Sirenoidei*, supposed, until recently, to be extinct, but lately discovered to be represented by living species in certain Australian rivers. The discovery of these living forms is one of the most important, if not actually the most important, of modern additions to ichthyology. The body is elongated, and of nearly equal height from the head to the post-ventral region, but thence tapers backward toward the tail; the scales are large, oblong, and are regularly imbricated; they have the surfaces sculptured with several concentric lines of growth, and the margins are rounded, entire, and membranaceous. The anatomical peculiarities are numerous, but can not be here signalized. Previous to the discovery of the most noteworthy characters of the living *Ceratodontidæ*, it had been supposed that the representatives of the family were characteristic of the Secondary epoch, and that they had not survived beyond the Triassic period. It was with great astonishment, therefore, that the discovery of living species in the fresh waters of Australia was hailed. The living forms have even been generally regarded as actually congeneric with the Triassic species; but this seems to be questionable, and the differences between the dental laminæ of the living and extinct species are sufficiently great to warrant generic differentiation independent of any hypothetical considerations. For the living forms the name *Neoceratodus*, proposed by Castelnau, may be retained. The only *certainly* known living species (*N. fosteri*) was first discovered in 1870 by Mr. Girard Kreft, curator of the Australian Museum at Sydney, in a river of Queensland, but has since been found in other streams. The fish is said to frequently leave the water and go on the land at night. It feeds chiefly, if not entirely, on vegetable matter, such as the leaves, etc., of various plants. It attains a length sometimes of about 6 feet. The extinct species of the family flourished chiefly during the deposition of the Jurassic and Triassic formations in Europe and America, and were among the most abundant and characteristic of the fishes of those epochs. Until the discovery of the living forms they were supposed to have been shark-like animals; thus the finding of the Australian species has not only greatly extended the range in time of an ancient type, but has enabled us to recognize the affinities of the later, and, in connection with them, of a long series of other extinct forms.

THEODORE GILL.

Ceratonia: See CAROB.

Cer'berus (in Gr. Κέρβερος): the triple-headed dog which, as the ancient Greeks imagined, guarded the portal of the infernal regions. He was represented as having a mane and tail composed of serpents; the poets gave him as many heads as they wished. He resisted only those who attempted to come out of Hades. Orpheus charmed him with his lyre, and Hercules is said to have overpowered him and dragged him out. The name Cerberus was given by Hevelius to a northern constellation.

Cerca'ria [from Gr. κέρκος, tail]: the larval form of various trematode worms (*Distoma*, *Bilharzia*, etc.). The adult worm of *Distoma hepaticum*, the liver-fluke, a parasite in the liver of many mammals, deposits thousands of eggs in the liver, which find their way through the bile duct into the intestines, and from these pass out, and are finally washed by rains into pools, where they develop into free swimming embryos, which in a short time find their way into the tissues of a snail, *Limnea truncatula*. These embryos further develop into a form called *Redia*. The *rediæ* give rise to the *cercaria*, the typical larvæ of the worm. The *cercaria* finally escape from the snails when the latter make excursions on land. They become encysted on the



CEREAL GRAINS.

grass, and are swallowed with the food of cattle or sheep. They develop in the intestines of the host, and pass to the liver, where they live till they deposit eggs, and the cycle again begins. The liver-fluke is found in many animals, including man. It is injurious, and may be fatal to its hosts. See TREMATODA. D. S. JORDAN.

Cer'cis canaden'sis, Redbud, or Judas-tree: a small tree of the family *Leguminosæ*; a native of the U. S.; cultivated as an ornamental tree. It has cordate, pointed leaves, and red-purple flowers in umbel-like clusters. It flowers early in the spring, before its leaves are opened. See JUDAS-TREE.

Cercoce'bus [from Gr. *κέρκος*, tail + *κῆβος*, monkey]: a genus of long-tailed African monkeys, collectively called

Cercocebus fuliginosus.

"mangabeys" by Buffon. They are remarkable for their ludicrous antics, their almost constant grotesque grinning, and their general good temper. The sooty monkey (*Cercocebus fuliginosus*) is the best known.

Cercopithe'cus [from Gr. *κέρκος*, tail + *πίθηκος*, ape]: a genus of small, long-tailed African monkeys, the type of

Cercopithecus cynosurus.

the family *Cercopithecidæ*. The species are very numerous. They have mostly long hair, and long and large tails, which they carry over the back. They are collectively called guenons by some authors. One of the best known is the malbrouck (*Cercopithecus cynosurus*), or dog-tailed monkey.

Ce'real [from Lat. *cerea'lis*, pertaining to *Ceres*, the goddess of agriculture; cf. *cerea'lia*, the festival of *Ce'res*, the grains]: Bread or grain was once called *cerealia munera* (cereal gifts, or gifts of Ceres). In modern language, cereal as an adjective means pertaining to edible grain or breadstuffs, as wheat, rye, maize, and barley; as a noun it denotes those articles of food.

Cerea'lia, or Cereal Plants: the plants which produce edible grains, and are cultivated for seeds, which are used as breadstuffs. They belong to the order *Graminæ* (true grasses), although buckwheat, a member of the knot-weed family, is sometimes classed with cereals, but differs widely in structure and characters. Having been cultivated from a very remote antiquity and modified by cultivation, their original forms and native countries can not be ascertained. Difficulty is found in arranging the numerous varieties in their proper species. The most important cereal grasses are wheat (*Triticum*), barley (*Hordeum*), maize (*Zea*), rye (*Secale*), rice (*Oryza*), and oats (*Avena*). Rice is the chief food of a greater number of the human family than any other grain, but wheat is generally admitted to be superior as a material for bread to all the other cereals. Maize will thrive in regions which are too warm for wheat. The cereal grains are extensively used in the manufacture of fermented and distilled liquors. Revised by L. H. BAILEY.

Cerebel'lum [Lat., dimin. of *ce'rebrum*, brain; used in class. Lat. only in sense of small brain, but used by mediæval translators of Aristotle and Galen to render Gr. *παρεγκεφαλίς*, hinder brain, hence its modern use]: the little brain, or the lobe back of and above the medulla oblongata. See BRAIN.

Cerebro-spinal Fluid: a serous liquid, of alkaline reaction, containing a small percentage of saline and animal matters. It fills the subarachnoid space, between the arachnoid membrane and pia-mater, both within the skull and the vertebral canal. It prevents injury from concussions and shocks, and perhaps prevents undue pressure upon the brain by withdrawing itself into the spinal canal at times when the brain contains more blood than usual. In certain diseases it is secreted in great excess.

Cerebro-spinal Meningitis: See MENINGITIS.

Cereop'sis: a genus of Australian geese, of which there is but one known species, *C. novæ hollandiæ*, remarkable for its very short and thickened bill. Unlike other geese, it seldom seeks the water. It is large and easily domesticated, but is quarrelsome, and when tamed is so fierce that it has not been generally bred.

Ce'res: the Roman name of the goddess of agriculture, whom the Greeks called Demeter, and to whom men were supposed to be indebted for the gift of breadstuffs. She was said to be the daughter of Cronos (Saturn) by Rhea, and the mother of Proserpine, known also as Cora in the Eleusynian legends. Like the other children of Cronos, she was devoured by her father; but he gave her forth again after taking the emetic which Metis had given him. By her brother Zeus she became the mother of Persephone (Proserpine). The most remarkable part of the myth of Ceres was the abduction of her daughter by Pluto, and the long search which Ceres made for her. Persephone, while gathering flowers in Nysia, Asia, was carried to the lower world by Pluto (the Latin legend puts the rape at Enna, Sicily); the mother searched long for her, and on discovering her abode left Olympus in anger to dwell among men, diffusing blessings of civilization and plenty where she abode. Zeus eventually released the daughter, and she and her mother went again to dwell on Olympus, and the earth renewed her fertility. But Persephone, having eaten part of a pomegranate in Hades, was decreed to dwell there for a third part of each year. These are legends denoting the cycle of vegetable growth. Though the details of the story vary considerably, nevertheless, as a whole, it not only suggests the main idea embodied in Demeter, but also directs our attention to Eleusis, the principal seat of her worship, on which were based the ELEUSYNIAN MYSTERIES (*q. v.*). The Greeks revered Demeter as the source of the practical arts which had their origin in agriculture. Her chief festivals were the Eleusinia and the Thesmophoria. Her cult came to Rome through Sicily; her great Latin festival was the Cerealia; her temple at Rome was made the archives of the state. See PROSERPINE.

Ceres: an asteroid discovered by Piazzi at Palermo in Jan., 1801. It was the first asteroid ever discovered. Its apparent size is nearly equal to that of a star of the seventh magnitude.

Ce'reus [from Lat. *ce'reus*, waxen, deriv. of *ce'ra*, wax; in allusion to the columnar or taper-like form of one species]: a genus of plants of the family *Cactaceæ*. It comprises about 200 species, some of which have beautiful flowers. The *Cereus speciosissimus*, a native of Mexico, is cultivated in greenhouses. Its flowers are large and of a fine scarlet

color, and its fruit, when well ripened, is delicious. The night-blooming cereus (*Cereus grandiflorus*), a native of South America, bears large, beautiful, and fragrant flowers, which expand and fade in a few hours. It has been used in medicine as an antispasmodic.

Cerignola, chā-rēēn-yō'lăă: an episcopal town of Italy; in the province of Foggia; 24 miles S. E. of Foggia (see map of Italy, ref. 6–G). It has a college and several convents; also manufactures of linen. The Spaniards gained here a decided victory over the French in 1503, and the French commander, the Duke of Nemours, was killed in that action. Pop. 25,400.

Cer'igo (anc. *Cythera*; in Gr. Κύθηρα): one of the Ionian islands; now constituting, with the neighboring small islands, an eparchy of the nomarchy of Argolis and Corinth, in the kingdom of Greece; is in the Mediterranean, and is separated by a narrow strait from the Morea (see map of Greece, ref. 18–K). Area, 110 sq. miles. The surface is mountainous and rocky. The soil is not rich, but produces some wheat, olives, grapes, etc. Here are two remarkable stalactitic caverns. The ancient *Cythera* was sacred to Venus, and said to be her favorite residence. Capital, Capsali. Pop. 13,250.

Cerin'thus: the founder of one of the earliest heretical sects in the Christian Church; according to Irenæus, a contemporary of the Apostle John; flourished, according to Eusebius, under the reign of Trajan, 98–117. He was a converted Jew, born and educated in Egypt, but afterward removed to Asia Minor, where he propagated his ideas. His system is decidedly Gnostic. He taught that the world was not made by the supreme God, but by a certain power which was separate and distinct from God, though an emanation from him. He also taught that Jesus was not born of a Virgin, but was the natural offspring of Joseph and Mary; that after his baptism the Christ came down into him in the form of a dove, and that toward the end the Christ again flew away from Jesus. The Gospel of John was once said to have special reference to Cerinthus, but the error never had any foundation.

Ce'rium [so named by Hisinger and Berzelius, who isolated it in 1803, after the recently (1801) discovered asteroid Ceres]: a rare metal which is obtained from cerite. Chem. symbol Ce; atomic weight 92. It is not employed in the arts and manufactures, but its oxalate is a valuable antiemetic medicine in certain cases. Combined with oxygen, it forms two oxides. It is difficult to procure it in a separate or metallic state.

Cernuschi, Enrico: economist; b. in Milan, Italy, 1821; fought as a revolutionist 1848–49; in 1850 engaged in banking at Paris. On account of the hostility of the communists he left France 1871–73, traveling in Egypt, China, and Japan; visited England in 1876 and the U. S. in 1877. He was an advocate of bimetallism; author of *Mécanique de l'Échange* (1865); *Illusions des Sociétés co-opératives* (1866); *Discours* (1871); *Silver Vindicated* (1876); *Le Bimétallisme à quinze et demi* (1881); *Anatomie de la Monnaie* (1886); and numerous other works. D. at Mentone, May 11, 1896.

Cerreto Sannita, chăr-rā'tō-săăn-nee'tăă: a town of Italy; in the province of Benevento; on a slope of the Apennines; 22 miles N. E. of Capua (see map of Italy, ref. 6–F). It has a cathedral with fine paintings, a collegiate church, and manufactures of coarse woolen cloth. Pop. 5,450.

Cer'ro de Pas'co: a city of Peru; capital of the department of Junin and of the province and district of its name; situated in a bleak mountain valley, 14,280 feet above the sea (see map of South America, ref. 5–B). Pop. in 1889 about 14,000. It is built on very irregular ground, the streets are narrow and crooked, and the houses have no architectural pretensions. Owing to the great elevation the climate is very severe; hail and snow are common in August and September, and from October to April there are violent rainstorms. The population varies greatly with the season and with the yield of the silver mines which gave rise to the town. These extend over a large tract of mountain land, and are among the richest in the world; there are said to be over 2,000 veins, and many hundred mines have been opened. The silver was discovered in 1630 by a Quichua shepherd, and the yield since that time has been nearly $500,000,000. During the nineteenth century it decreased greatly, not because the deposits were exhausted, but from lack of labor and proper mining appliances. The Cerro de Pasco mines are still the principal source of the Peruvian silver-supply, the annual output being about 1,750,000 oz. In 1891 118 mines were worked. In 1889 the mines were ceded for a long term to the "Peruvian Corporation," represented by Michael Grace. The Oroya R. R. is to be continued to Cerro de Pasco, which at present (1893) has a short local railroad.

See A. D. Hodges, *Notes on the Topography and Geology of the Cerro de Pasco*, in *Trans. Amer. Inst. of Mining Engineers* (1888); Paz Soldan, *Diccionario geografico-estadistico del Peru* (1877). Herbert H. Smith.

Cer'ro Gor'do: a celebrated battle-field and mountain-pass in Mexico, through which the National road from Vera Cruz to the city of Mexico passes. Here Gen. Scott defeated a greatly superior force of Mexicans under Santa Anna, Apr. 18, 1847. Following up his success at Vera Cruz, Scott's army had arrived at Plan del Rio, a small plain 50 miles from Vera Cruz, when intelligence reached him that the pass of Cerro Gordo had been fortified by Santa Anna. The level ground terminates at Plan del Rio, from which the road ascends in a long circuit among lofty hills, whose commanding points had been fortified by the enemy. His right rested on a precipice overhanging an impassable ravine, his intrenchments extending to the road, on which was placed a battery. On the other side the lofty and difficult height of Cerro Gordo commanded the approaches in all directions. Half a mile to the rear of this height the Mexican army, numbering upward of 13,000, with five pieces of artillery, was encamped. Resolving to attempt to turn the enemy's left and attack in rear while threatening his front, Scott caused daily reconnoissances to be made in the hope of finding a route by which to reach the Jalapa road and cut off the retreat of the Mexicans. A road was made through difficult slopes and over chasms, and was only abandoned when a further prosecution of the work would have brought on an action. Scott now determined to gain the Jalapa road by assaulting and carrying the height of Cerro Gordo, and on the night of Apr. 17 issued his plan of battle, which was successfully executed. Twiggs was re-enforced during the night by Shields's brigade, consisting of one New York and two Illinois regiments. In selecting their ground for bivouacking and an opposing height for a battery, a sharp combat took place, but the height was occupied and a battery of three 24-pounders placed thereon. During the night an 8-inch howitzer was with great difficulty and labor placed opposite the enemy's right battery.

Early on the 18th the general attack commenced. Pillow's brigade twice assaulted the enemy's line of batteries on the left; but, though unsuccessful, they served to distract their opponents; Twiggs's division, storming the strong and vital point of Cerro Gordo, pierced the center, gained command of all the intrenchments, and cut them off from support; Riley's brigade of infantry pushed on against the main body of the enemy, and, the guns of their own fort being turned on them, they fled in confusion; Shields's brigade bravely assaulted the left, carried the rear battery of five guns on the Jalapa road, and rendered important aid in completing the rout of the enemy. At an early part of the engagement Gen. Shields received a severe but not fatal wound, being shot through the lungs. The moment the fate of the day was decided the reserve forces were pushed on toward Jalapa in advance of the pursuing columns of Twiggs's division and Shields's brigade (the latter now under Col. E. D. Baker), and Gen. Patterson was sent to take command. The rout was complete; 3,000 prisoners were taken, 4,000 or 5,000 stand of arms, and 43 pieces of artillery. Gen. Scott's loss in the two days was 431, of whom 63 were killed. The immediate result of this important battle was the occupation of Jalapa the next day.

Cerro Gordo de Potosi': a famous mountain of Bolivia; immediately S. W. of Potosi. It contains rich silver mines. Altitude, 16,150 feet. See Potosi.

Cerro Largo: a northeastern department of Uruguay; between the Rio Negro and the Lagoa Merim, and separated from Brazil by the river Jaguarão. Area, 5,753 sq. miles. Pop. (1890) 25,041. Capital, Melo. It consists of rolling or hilly grass lands, well suited for stock-raising, which is the principal industry. There are considerable establishments for salting and drying meat. H. H. S.

Cer'ros or **Ced'ros Island**: a large island belonging to Mexico; off the west coast of Lower California; lat. 28° 5′ to 28° 35′ N.; forming the western inclosure of the great bay of S. Sebastian Viscaino (see map of Mexico, ref. 3–A). Area, 120 sq. miles. The island is very mountainous; the southern part barren; the northern more fertile and covered with

cedars and pines. Goats and rabbits abound, and there are a few deer. It is said to be rich in minerals. The climate is very dry, but it is subject to cloudbursts.

Certaldo, chär-tăăl′dō: a town of Italy; province of Florence: picturesquely situated on the Elsa; 15 miles S. W. of Florence (see map of Italy, ref. 4–D). It was the birthplace of Boccaccio, whose house is still preserved. Pop. of commune 8,000.

Certificate [from Med. Lat. *certifica′tum*, deriv. of *certifica′re*, certify; *certus*, certain + *fa′cere*, make]: in law, a legally authenticated written statement made by a court, judge, officer, or other duly authorized person, giving notice of the existence of certain facts; as the certificate in which a judge states whether the title to real property came in question at a trial; a vessel's certificate of registry or certificate of clearance, etc. Revised by F. Sturges Allen.

Certiora′ri [Lat., to be informed, certified; the expression occurs in the opening of the writ to which it gives the name]: a writ issued from a supreme court to an inferior court or a special body having judicial powers, such as commissioners, magistrates, assessors of taxes, etc., acting in a summary manner or in a method different from the common law, commanding the latter to return the records of a matter depending before it to the superior court. Its object is to bring the entire record of the inferior tribunal before the superior court to enable the latter to determine whether the former had jurisdiction, or had failed to proceed according to the essential requirements of the law. It is applicable to either civil or criminal cases. When used as a means of review of an actual decision or determination made by the inferior tribunal, its office is to correct errors made in point of law, rather than to reconsider the subject on matters of fact. Thus if a board of assessors of taxes should decide that a bank could be taxed under State authority upon that portion of its property which is invested in the bonds of the U. S. Government, it would decide a point of law which might, by means of a writ of *certiorari*, be submitted to the various State courts, and finally to the Supreme Court of the U. S. This writ may also be resorted to for the purpose of supplying any defects in the return of its proceedings by the inferior tribunal to the superior court. It may be considered in this aspect as auxiliary to the main purpose of removing the record itself. In the U. S. the issuance of the writ is generally provided for by statutes. But if the statutes make no provision for it, and no other mode of review is provided from the decisions of an inferior jurisdiction, a superior court exercising general original common-law jurisdiction has inherent authority to revise the proceedings by *certiorari*, unless it is expressly forbidden to do so. The writ issues only to inferior courts and officers exercising judicial functions, and when the act to be reviewed is judicial in its nature and not ministerial or legislative.
Revised by Henry Wade Rogers.

Certo′sa di Pavi′a, La: a celebrated Carthusian monastery; 5 miles N. of Pavía, Italy; province of Pavía; in the Gothic style; founded in 1396 by Giovanni Galeazzo Visconti, the first Duke of Milan. It is no longer a monastery but a Government property. Here is a magnificent church 235 feet long, adorned with fine paintings, sculptures, and mosaics.

Cer′umen [Mod. Lat., deriv. of *cera*, wax]: the ear wax. It is a yellowish, oily secretion of certain small glands lying in the skin of the external meatus of the ear. These glands are analogous to the sebaceous glands of the skin, and their secretion is similar to the sebum. It serves to attach and cause the removal of foreign bodies which enter the auditory meatus, and also to make the skin pliable and soft.

Ce′rusite, or **Cerussite**: native carbonate of lead; occurs in fibrous, compact, and earthy masses, and in numerous crystalline forms which may be referred to a right rhombic prism. When pure, it consists of 16·42 per cent. of carbonic acid and 83·58 of oxide of lead, or 77 per cent. of metallic lead. When perfectly pure, it is colorless and transparent, with an adamantine luster, which is resinous on fractured surfaces. Next to galena, cerusite is the most common ore of lead.

Cervantes Saavedra, Miguel, de: the most celebrated Spanish author; b. at Alcalá de Henares in Oct., 1547 (baptized Oct. 9). Very little is known of his youth. In 1568 we find him at Madrid, and in the following year he was taken to Rome by the papal legate Giulio Acquaviva, a friend of letters. In 1571 he took part in the naval battle of Lepanto, in which he lost the use of his left arm, and on his return home in 1575 he was captured by Algerine pirates. Ransomed in 1580, he returned to Spain and here served in the campaign against Portugal and the Azores. In 1583 he retired from the service in Portugal. In the next year he published the pastoral romance *Galatea*. This work he is said to have written to win the hand of D. Catalina de Palacios Salazar y Vozmediano, whom he married Dec. 12, 1584. In the years 1585–92 Cervantes wrote for the stage. Of the twenty or more plays which he is reported as having produced only *Numancia*, *El trato de Argel*, and a number of *entremeses*, published in 1615, have come down to us. During the imprisonment to which for some unknown cause he was subjected from 1599 to 1601, Cervantes composed the principal work of his life, the social romance *Don Quijote* (*q. v.*), the first part of which was printed in 1605, the second in 1616. This work made its author famous not only in Spain but in the whole of Europe. After the publication of the first part of his *Don Quijote*, Cervantes wrote, under the title of *Novelas Ejemplares* (published 1613), a series of novels of adventure, in imitation of the Italian novel of this kind. The best of these tales are *La Gitanita*, *La Ilustre Fregona*, and *El Casamiento Engañoso*. His last work was another pastoral romance, entitled *Los Trabajos de Pérsiles y Sigismunda*. Cervantes died Apr. 23, 1616 (Gregorian calendar). The best Spanish biography of Cervantes is still Navarrete's *Vida de Miguel Cervantes Saavedra* (Madrid, 1819); a late English work is by James Fitzmauriee-Kelly (London, 1892). Henry R. Lang.

Cervera y Topete, Don Pasquale, de: rear-admiral of Spanish navy; b. Feb. 18, 1839; graduated at the naval academy of San Fernando; was commissioned to foreign service in 1859. In 1898 in the war between the U. S. and Spain he commanded a squadron in the Atlantic. In an engagement off Santiago de Cuba, July 3, 1898, all his ships were destroyed and Cervera himself was taken prisoner, by a U. S. fleet under the command of Rear-Admiral Sampson.

Cer′vidæ [Mod. Lat., deriv. of Lat. *cervus*, deer]: a family of mammals of the order *Ungulata* and sub-order *Artiodactyla*, containing the deer and related types. The genera of the family are grouped as follows: (1) *Moschus*; (2) *Hydropotes*; (3) *Cervulus*; (4) *Pudu*, *Furcifer*, *Coassus*, *Blastocerus*, *Cariacus*, and *Capreolus*; (5) *Hyelaphus*, *Rucervus*, *Rusa*, *Cervus*, *Elaphurus*, and *Dama*; (6) *Rangifer*; and (7) *Alces*. See Deer.

Cervin, Mont, mōn′săr′văn′ (in Germ. *Matterhorn*): a peak of the Pennine Alps, between the canton of Valais, in Switzerland, and Piedmont, in Italy; 12 miles W. N. W. of Monte Rosa. It rises 14,705 feet above sea-level. Within 3,000 feet of the top it is exceedingly steep, resembling an obelisk of rock. The summit was first reached by the artist Whymper with three companions and three guides, on July 14, 1865, when several of the party were killed.

Cesalpino, chăy-săăl-pee′nō, often Anglicized as **Cæsal′pin**, Andrea: physiologist and botanist; b. in Arezzo, Tuscany, in 1519. He was Professor of Medicine and Botany at Pisa, and physician to Pope Clement VIII. He wrote *Ars Medica* (1601), and an important work *On Plants* (De Plantis, 1583), in which he propounded an improved system of botany. He was the first who proposed a natural system of classification on philosophical principles. D. in Rome, Feb. 23, 1603.

Cesari, chay′zăă-rĕe, Giuseppe: painter; sometimes called Il Cavaliere d'Arpino and Giuseppino (Fr. *Le Joséphin*); b. at Arpino or Rome, Italy, about 1568; pupil of Motta and Orsi. He worked mostly in Rome; was patronized by several popes, and was very successful and popular. He was the chief of the conventional school, opposed by the naturalists, the Caracci, the Caravaggio, and their scholars. His works display much skill in execution, but are deficient in simplicity. The best of them are historical scenes in the Capitol. D. in Rome, July 3, 1640.

Cesarot′ti, Melchiore: poet; b. in Padua, Italy, May 15, 1730; educated at the university of his native city, and early became professor there of rhetoric, and in 1768 of Greek and Hebrew. When Italy was invaded by the French he advocated their cause and was made Knight of the Iron Crown by Napoleon I. He made metrical translations of the *Iliad* (entitled *La Morte di Ettore*) and of Macpherson's *Ossian* (1763). Cesarotti wrote *On the Philosophy of Language* and *On the Philosophy of Taste*, etc. D. Nov. 3, 1808. His works were published in 42 vols. 8vo. (1800–13).

Cesena, chăy-zay′năă (Lat. *Cæsena*): a town of Italy; in province of Forlì; on the railway between Bologna and Ancona; 15 miles by rail E. of Forlì (see map of Italy, ref. 4–E). It is situated on the slope of a hill which is close to the river Savio. It has a cathedral: a Capuchin church, in which is a fine painting by Guercino; a library founded in 1452; and several convents. It has sulphur mines in the vicinity. Pop. 39,500.

Cesnola, ches′nō′lăă′, Luigi Palma, di: archæologist; b. near Turin, Italy, July 29, 1832; received his education at the Royal Military Academy; was in the war for Italian independence, and in the Crimean war; removed to the U. S. in 1860; volunteered in the military service of the U. S.; was made colonel of the Fourth Regiment of the New York Cavalry, and served with distinction. After the war he received the brevet of brigadier-general, and was appointed U. S. consul to Cyprus. During his residence in this island Di Cesnola made excavations resulting in remarkable discoveries of statuary, pottery, jewelry, and other objects of art, which were purchased for the Metropolitan Museum of Art in New York, and constitute the Cesnola collection. In 1873 he returned to Cyprus and made other important discoveries. On his return to New York in 1877 he was made director of the museum; in 1880 Columbia College conferred on him the degree of LL. D. In 1878 he published *Researches and Discoveries in Cyprus*. See Cyprus.

Ces′pedes y Bor′ges, Carlos Manuel, de: Cuban revolutionist; b. in Bayamo, Apr. 18, 1819; studied law at Havana and at Barcelona, Spain, and in 1843 was banished from Spain for taking part in the conspiracy of Gen. Prim. Returning to Cuba in 1844, he practiced law in his native town, and was a leader of those who secretly endeavored to secure the independence of the island. In 1868 he headed an insurrection near Yara, and was soon joined by several thousand men, a great part of the rural population adhering to him. A congress of fifteen representatives met at Guaimaro in Apr., 1869, promulgated a republican constitution, and proclaimed Cespedes president. He had already issued a proclamation freeing the slaves. The first successes were followed by reverses. Cespedes was driven to the mountains, where he was shot while resisting an attempt to capture him, Mar. 22, 1874. Herbert H. Smith.

Cespedes, or **Razzionere**, Pablo, de: b. in Cordova, Spain, in 1538; educated at Alcalá de Henares; studied theology and Oriental languages there; went to Rome on leaving the university and studied painting under Federigo Zucchero, especially the works of Raphael and of Michael Angelo. Cespedes returned to Spain, and in 1577 was installed in a prebend of the cathedral at Cordova. He was noted as a poet, painter, architect, and sculptor; and executed the frescoes in S. Carlo in Corso, in Ara Cœli, and Trinitá di Monti. A *Last Supper*, at Cordova, is his best picture; wrote poem on *Art of Painting*. D. in Cordova, July 26, 1608. See his *Life* by Turino (Madrid, 1868).

Cesspool: a well for the reception of the sewage and drainage of a house. Its location should be at some distance from the house, and its walls should be cemented, in order to prevent the contamination of the soil. In a limestone region the cesspool is often carried down into the rock until fissures are found, and the sewage and water then run away. Usually, however, the cesspool is not deep, and its bottom is cemented, like the sides, so that its contents must be removed once or twice a year. Such a cesspool should be ventilated by free communication with the open air, in order that gases may not be driven back to the house. In small towns such methods of disposing of the sewage of houses are common, and many cases are on record of the pollution of wells and cisterns thereby. In cities cesspools are usually forbidden by law, and each householder is required to connect with the public sewer. (See Sewerage.) In order to ascertain if air from a cesspool enters a house a small quantity of the oil of peppermint may be thrown into it, when if such is the case the odor will soon be perceived in the house.
Mansfield Merriman.

Ces′tius, Pyramid of: an antique Roman monument standing close to the Porta San Paolo of Rome; is 125 feet high. It is built of brick and tufa, faced with Carrara marble. The internal walls were decorated with paintings. This pyramid is supposed to have been erected before the Christian era.

Cestoid Worms [*cestoid* is from Lat. *cestus*, girdle (from Gr. κεστός, girdle, liter., embroidered, stitched (sc. ἱμάς), deriv. of κεντεῖν) + suffix *-oid*, like; in allusion to the ribbon-like form of many species]: the *Cestoidea*, an order of parasitic flatworms (Plathelminthes, *q. v.*), the more common or better-known species of which are known as tapeworms. In all the body is elongate and is without mouth or alimentary canal, and in many forms it is divided by transverse constrictions into joints or proglottids. On the anterior end are hooks or suckers for fastening the worm to the lining of the intestine of the infested animal. A large proportion of vertebrates are subject to these parasites. The histories of but few, except those that infest man and the domestic animals, have been worked up. Many of the cestoids which infest the invertebrates are not jointed, but in those of man proglottids are produced by a division of the body. These proglottids are scarcely more than sexual sacs, and as they mature they are loosened from the rest, while new joints are constantly forming in front. The separated proglottids are carried with the fæces out of the body, and then discharge the eggs which they contain. These may be carried about by wind or water, and falling on grass, etc., be eaten by other animals—e. g. cow or pig. The eggs hatch in the stomach of this new host into a larva (ciliated in the *Bothriadæ*), the subsequent history of which presents many variations. In many the embryo swells up into a bladder (cysticercus), in one side of which the head, with its fixing armor, becomes inverted, just as one might push the finger of a glove into the palm. This cysticercus finds its way into the flesh of this host, where it may remain for a long time without further alteration. Meat like pork so infested is called "measly," and when eaten the cysticercus or bladder-worm is set free, and, fastening itself by its hooks and sucking disks to the wall of the intestine, grows into the perfect worm. Many families and several hundred species are known, but few are of general interest. Those affecting man are described in the article Tapeworm (*q. v.*). J. S. Kingsley.

Cestracion: See Heterodontidæ.

Cestui, ses′twĕ, or set′wĕ [Norm. Fr., he, that one]: a word used in law in several phrases: (1) *Cestui que trust*, he who has the beneficial interest in property the legal title to which is vested in a trustee. (See Trust.) (2) *Cestui que use*, he who has the right to the profits of lands or tenements the legal estate in which another holds as feoffee to uses. (See Use.) (3) *Cestui que vie*, the person during whose life an estate granted to another is to continue. F. Sturges Allen.

Ces′tus [Lat., girdle; see Cestoid Worms]: a girdle or band which women wore round the waist in ancient times. The cestus of Venus was supposed to have the power of exciting love. The gauntlet used by ancient pugilists to protect their hands was called *cestus* or *caestus*.

Ceta′cea, or **Cetaceans** [mod. deriv. of Lat. *cētus* = Gr. κῆτος, whale]: an order of mammals characterized by a fish-like form, adapted to strictly aquatic life, and a tail which spreads horizontally. Like other mammals, they have warm blood, respire by the lungs, and the young are born alive and nourished by the mother's milk. There are two existing sub-orders—the toothless cetacea (*Mysticete*) and the toothed cetacea (*Denticete*). The former comprises the *Balænidæ*, or right-whale family, and the *Balænopteridæ*, or fin-backs; the latter, the *Physeteridæ*, or sperm-whales, the *Ziphiidæ*, the *Delphinidæ*, or true dolphins, the *Iniidæ*, and the *Platanistidæ*, or fresh-water dolphins. Another sub-order (*Zeuglodonta*) was represented by certain Tertiary forms. See Cachelot, Dolphin, Physeteridæ, and Whale.

Cetewayo: See Zululand.

Cetot′olites [Gr. κῆτος, a whale + οὖς, ὠτός, ear + λίθος, a stone]: a term applied to the fossil ear-bones of whales. These occur so plentifully in the red crag (Pliocene) of Suffolk, England, that being rich in phosphates, they are ground up for manure. F. A. L.

Cetraria: See Iceland Moss.

Cette (on the ancient *Mons Setius*): a fortified seaport of France; department of Hérault, on the Mediterranean; on a strip of land between the sea and the broad inlet of Thau, the outlet of the Canal du Midi; on the railway to Bordeaux; 18 miles S. W. of Montpellier (see map of France, ref. 9–G). It has a good harbor and a considerable coasting and inland trade, large fisheries, manufactures of made wines, perfumery, glass, soap, etc., large ship-yards and salt-works, and the extensive export trade of the Canal du Midi, of which it is the port, and with which it is connected by the canal of Cette across the tongue of land. The harbor is protected by two large moles and a breakwater. The city

was founded in 1666. It forms a half circle about the cliff-like hill, on which is the fortress. Pop. (1896) 32,729.

Cettinje, set-tecn′yā, or **Cettigno**: capital of the principality of Montenegro; 19 miles E. of the Austrian town of Cattaro; 2,470 feet above the sea (see map of Austria-Hungary, ref. 11–G). It contains a convent which was founded in 1458 and is the residence of the bishop, the state prison, and the palace of the prince. Pop. estimated at 1,500.

Ce′tus [Lat., whale, from Gr. *κῆτος*]: a great constellation; one of those called southern by Ptolemy. It contains the variable star Mira, or *o* Ceti.

Ceu′ta (Sp. pron. thaў-oo′taă): a fortified seaport-town (anc. called *Septa* or *Septum*; Moorish *Sebta*) on the north coast of Africa; on the Mediterranean opposite to Gibraltar, which is 17 miles distant (see map of Africa, ref. 1–B). It is in Morocco, but it has belonged to Spain since 1580. The castle occupies the summit of a mountain which is the ancient *Abyla* and one of the Pillars of Hercules. Ceuta is the chief of the Spanish *presidios* on the African coast. It is the seat of a Roman Catholic bishop, and has several convents and a convict establishment. It occupied the site of the old Roman colony *Ad Septem Fratres*. It was strongly fortified by Justinian, but was taken by the Goths in 618. Through Ceuta Count Julian brought the Saracens into Spain in the eighth century. Under Arabic rule the town was noted for its manufacturing industry; it is said to have had the first paper-mill ever constructed and operated in the West. It was conquered from the Moors in 1415 by King John I. of Portugal. Pop. 9,700.

Cevallos, Pedro de: See Zeballos.

Cévennes, saў′ven′ (anc. *Cebenna Mons*): a mountain-range in the south of France; forms the watershed between the Rhône and the Garonne. It extends from the vicinity of Carcassonne in a N. N. E. direction to the Canal du Centre. The central mass of the Cévennes is in the departments of Ardèche, Lozère, and Haute-Loire. The highest summit is Mont Mezin or Mézen, which has an altitude of 5,764 feet. Some of the peaks are extinct volcanoes. These mountains were a stronghold of the Protestants called Camisards, and were the scene of several religious wars. See R. L. Stevenson, *Travels in the Cévennes* (1879).

Ceylon, sē̆e-lon′ (native *Singhala* or *Sinhala*; anc. *Taprobane*): an island of Asia, belonging to the British; in the Indian Ocean; about 55 miles from the southern extremity of Hindustan, from which it is separated by Palk Strait. It lies between lat. 5° 55′ and 9° 51′ N., and between lon. 79° 41′ and 81° 54′ E. Length from N. to S., 266 miles; greatest width, 140½ miles. Area, 25,364 sq. miles. The southern and eastern coasts are bold and rocky, and present a very picturesque appearance, which is increased by the luxuriant tropical vegetation, the verdant slopes of its mountains, and groves of noble palms draped in perennial green. The surface is finely diversified by mountains, valleys, and plains. The highest summit is Pedrotallagalla, which rises 8,260 feet above the level of the sea. The celebrated mountain called Adam's Peak is 7,420 feet high, and is remarkable for its conical form and the sacred associations with which it is connected. The Singhalese have a tradition that Buddha ascended to heaven from this peak. The mountains of Ceylon are mostly formed of gneiss and granite, and dolomite occurs in the more level parts of the island. Among the minerals are iron, tin, coal, plumbago, and salt. Many sapphires, rubies, amethysts, and other precious stones are found here. The climate is humid and hot, but more pleasant and moderate than the adjacent mainland of India. The average annual rainfall is about 80 inches.

Ceylon is remarkable for the luxuriance and variety of its flora. Among its indigenous trees are the cocoa-palm, palmyra, and other species of palms, the coral-tree (*Erythrina indica*), the breadfruit, the cinnamon, the satinwood, and ebony. The bo-tree or pipal (*Ficus religiosa*) attains a great age, and is deemed sacred by the natives. Coffee, cotton, rice, tobacco, and pepper are cultivated here. The chief articles of export are coffee, cinnamon, cocoanuts, cocoanut oil, coir, hides, pearls, and plumbago. Among the wild animals found here are the buffalo, bear, deer, leopard, and elephant. The last are very numerous.

The native population is composed mostly of Singhalese, whose historical records, extending back through many centuries, are partially corroborated by existing ruins of cities and temples, which indicate that Ceylon in a remote antiquity was inhabited by a numerous and civilized people. The most celebrated among its monuments is the cave-temple of Dambula, which was built about 100 B. C., and is profusely adorned with images and sculpture. It was dedicated to Buddha. Buddhism is still the prevailing religion of the island. The principal religious creeds numbered, in census of 1891, 1,877,043 Buddhists, 615,932 Hindus, 211,995 Mohammedans, and 302,127 Christians. The native Christians are mostly Singhalese and Tamils. Among the remarkable antiquities of Ceylon are numerous colossal ruined tanks, constructed for the irrigation of the soil.

Ceylon has three harbors—Point de Galle on the south coast, Trincomalee on the northeast coast, and Colombo on the southwest coast. The harbor of Trincomalee is one of the finest in the world, and is capable of admitting a number of the largest ships. It is the principal British naval-station in the Indian seas. The Oriental mail-steamers, which ply between England and Calcutta, touch at this island, which has an extensive commerce. The value of the exports from Ceylon in 1890 was (in round numbers) $17,000,000; of imports $21,000,000. The revenue for the same year was $5,400,000; the public expenditure $5,100,000. On Dec. 31, 1890, the public debt amounted to $12,577,000. In ancient times it was visited for the purpose of traffic by the Egyptians, Greeks, and Romans. The value of coffee exported in 1879 was $15,005,375, but in 1890 it was only $1,739,110. On the other hand, the export of tea increased in value from $600 in 1887 to $10,540,015 in 1890. Ceylon is divided into seven administrative provinces, called the Western, North Central, Central, Southern, Northern, Northwestern, and Eastern provinces. Capital, Colombo. Kandy, Trincomalee, Point de Galle, Jaffnapatam, and Singapadaya are also important cities. Ceylon had 181 miles of railway and 734 miles of telegraph in 1889.

History.—The aborigines, or Yakkhos, were conquered by Singhalese 543 B. C.; Malabars conquered Ceylon about A. D. 1200, but the Singhalese partly recovered it in 1235. The Portuguese came in 1505; were driven out by the Dutch 1658, and these by the British in 1795. Ceylon was annexed to the British crown in 1802, and the whole island was conquered 1815. It is one of the most prosperous of British colonies.

Population (1891) 3,008,466; of these the native tribes number 2,031,167; they are Singhalese, emigrants from Hindustan 543 B. C., and Buddhists; Kandyans, or Highlanders, and Malabars, both Brahmans; Moormen, originally Persians or Arabs, Mohammedans; Veddars or outcasts, of the lowest scale, without religion. The remainder are Eurasians or burghers, Romanists or Protestants, and Europeans, mostly Protestants. See Sir James E. Tennent, *Ceylon, Physical, Historical, and Topographical* (1859); J. Ferguson, *Ceylon in the Jubilee Year* (1887); Lady Gordon-Cumming, *Two Happy Years in Ceylon* (2 vols., 1892).

Revised by Mark W. Harrington.

Chabaneau, shaă′baă′nō′, Camille: French philologist; b. at Nontron, Dordogne, Mar. 4, 1831; since 1879 Professor of Romance Languages in the University of Montpellier. He has published many papers in the *Revue des langues romanes* and other learned journals. Among his works may be cited *Grammaire limousine*; *Phonétique* (1876); *Poésies inédites des troubadours du Périgord* (1885); *Les biographies des troubadours en langue provençale* (1885); *Sainte Marie-Madeleine dans la littérature provençale* (1887).

A. R. Marsh.

Chabrias, kay′bri-as (in Gr. *Χαβρίας*): Athenian general; had command of an army in 392 B. C. In 378 he commanded in a war against the Spartans; gained a naval victory at Naxos in 376; was killed at the siege of Chios, where he commanded a fleet in 357 B. C. He invented a famous manœuver, which consisted in receiving a charge in a kneeling posture, with shields resting on the ground and the spears pointed against the enemy.

Chabrier, Alexis E.: See the Appendix.

Chacabu′co: a western spur or branch of the Andes in Chili, about lat. 33° S., forming the northern boundary of the great central plain. During the revolution in Spanish South America, the patriot army of San Martin crossed the Andes, and approached Santiago by a pass, also called Chacabuco, in these mountains. The pass was defended by about 4,000 Spaniards under Brig.-Gen. Maroto. It was carried by a brilliant charge, led by the Chilian Gen. O'Higgins. As a result of this battle the patriots occupied Santiago, and ultimately secured the independence of Chili.

Chachapoyas, chaă-chaă-pō′yaăs: a province of Northern Peru; in the department of Amazonas; area, 4,300 sq. miles.

Capital, Chachapoyas. It contains a fertile valley between mountain-ranges, and to the north borders on the gorge of the upper Maranon. The mineral resources, believed to be extensive, have not been developed. Chachapoyas, formerly much larger, was an important district of the Incas. It was conquered by Alonso de Alvarado in 1535. Pop. about 20,000. H. H. S.

Chachapoyas: a city of Northern Peru; capital of province of the same name; near the river Utcubamba; 7,600 feet above the sea (see map of South America, ref. 5–B). It is the episcopal city of a diocese of the same name which embraces all Northeastern Peru. Chachapoyas is well built and attractive. Besides the cathedral, it contains several churches, barracks, and other public buildings. The town was founded by Alonso de Alvarado in 1540. Pop. about 5,000. See Orton, *The Andes and the Amazon*, p. 398.
HERBERT H. SMITH.

Chaco, El Gran: See GRAN CHACO, EL.

Chaco, or **Gran Chaco**: a territory of Argentina; W. of the Paraná and Paraguay, and extending from the river Salado to the frontiers of Bolivia; estimated area, 240,000 sq. miles; civilized population, a few thousand, gathered about the military frontier posts. There are supposed to be about 40,000 wild Indians. The portion north of the river Bermejo is separated as the Chaco Boreal, or Territorio del Bermejo. The whole region is included physically in the plains of the GRAN CHACO (*q. v.*). H. H. S.

Chacornac, shăă'kōr'năk', JEAN: astronomer; b. in Lyons, France, June 21, 1823. During the years 1853–54 he was in charge of the observatory of Marseilles, and in the latter year was appointed astronomer of the Paris Observatory. He was an astronomer of reputation, and distinguished for his discoveries of asteroids, as well as for his writings on the planetary systems. Napoleon III. made him chevalier of the Legion of Honor in 1858. He contributed the atlas to the *Annals of the Observatory of Paris* (1858 and 1863). D. in Paris, Sept. 26, 1873.

Chad, or **Tsad**: a large, shallow African lake, full of islands, but fluctuating in size with the season; lying in Central Sudan; on the southern margin of the Sahara Desert. It is little but an immense swamp overgrown with great reeds and swarming with tropical animals. The waters are fresh, though it has no outlet. The elevation is 1,150 feet above the sea, and the area varies from 10,000 to 50,000 sq. miles. Its principal tributaries are the great Shari river, which comes in from the S., and the little-known Komadugu from the W. The Bahr-el-Ghazal comes in from the E., and, though usually dry, sometimes brings in large quantities of water. Lake Chad has Kanem on the N. E., Bagirmi on the S., and Bornu on the S. W. The northern shores are sterile and thinly populated. An important caravan route runs along the western shore to the town of Kuka, which lies on the coast in the wet season, but 10 miles from it in the dry. M. W. H.

Chad'bourne, PAUL ANSEL, LL. D.: b. at North Berwick, Me., Oct. 21, 1823; educated at Williams College; studied theology in the Hartford Theological Seminary; was appointed principal of the high school at Great Falls, and then Professor of Chemistry and Natural History in Williams College (1853–67) and in Bowdoin College (1859–66). He was elected president of the University of Wisconsin and Professor of Metaphysics in the same (1867–70). He published *Natural Theology* (1867) and *Instinct in Animals and Men* (1872). He was editor-in-chief of *The Wealth of the United States*; chosen president of Williams College in 1872; in July, 1880, tendered his resignation, to take effect at the end of the next college year, and became president of Massachusetts Agricultural College 1882. D. in New York city, Feb. 23, 1883.

Chad'ron: city (founded in 1885); capital of Dawes co., Neb. (for location of county, see map of Nebraska, ref. 8–B); on Fremont, Elk and Mo. V. R. Rs.; in Northwestern Nebraska; 126 miles E. of Orin Junction, Wyoming. Chadron has numerous elegant public and private buildings, including five churches, a public school, and Chadron Academy. Here are the U. S. land-office for Chadron district (including Dawes, Sheridan, and Sioux Counties), a roller-mill, a large dairy, and four banks. Chadron has a large wholesale trade, and is an important shipping-point for cattle. Pop. (1890) 1,867; (1900) 1,665. MANAGER OF "DAWES COUNTY JOURNAL."

Chad'wick, GEORGE W.: musician; b. in Lowell, Mass., 1854; educated in Leipzig under Jadassohn and Reinecke, following with a course of conducting under Rheinberger and Abel. While a student at Leipzig he composed his *Rip Van Winkle* overture, to which were awarded the highest honors. He also composed ten string quartets, which were successfully performed. Upon his return to the U. S. he conducted at the Boston Händel and Haydn Society's festival in 1880, and he also directed his *Rip Van Winkle* overture at the Worcester festival. Several of his symphonies and overtures have been performed by the Boston Symphony Orchestra. He has also composed some short choral works, but he is best known as a composer for orchestras. He composed the music for the *Columbian Ode* for the dedication ceremonies of the World's Fair in Chicago, Oct. 21, 1892. D. E. HERVEY.

Chadwick, JAMES READ, A. M., M. D.: gynæcologist; A. B., Harvard, 1865; M. D., Harvard Medical School, 1871; Clinical Instructor in Gynæcology in Harvard Medical School 1878–88; secretary American Gynæcological Society 1875–82; became librarian Boston Medical Library Association, 1875; president Massachusetts Cremation Society 1892.

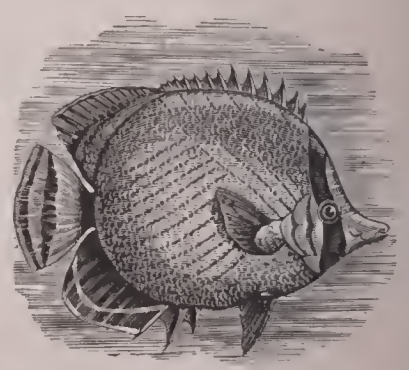
Chadwick, JOHN WHITE, A. M.: Unitarian minister of the radical school; b. in Marblehead, Mass., Oct. 19, 1840; educated at Exeter Academy and Harvard University; graduated at the Divinity School 1864; ordained Dec. 21, 1864, and at the same time installed as pastor of the Second Unitarian church in Brooklyn, N. Y., in which position he still (1901) remains. He has taken an active part in all denominational discussions, and has been a diligent contributor to periodical literature and to the daily press, mainly on biographical lines. Author of *Way, Truth, and Life*; *The Bible of To-day*; *The Faith of Reason*; *The Man Jesus*; *Some Aspects of Religion*; *Belief and Life*; *Origin and Destiny*; *A Daring Faith*; *Faith on the Earth*; *The Revelation of God and other Sermons*; *The Power of an Endless Life*; *A Book of Poems*, the 8th ed. of the latter including *In Nazareth Town and other Poems* first published as a separate volume; and *A Legend of Good Poets*, delivered before the Phi Beta Kappa Society of Harvard in 1886. A select volume of his sermons has been translated into German as *Religion ohne Dogma*. He has contributed largely to the present edition of *Johnson's Universal Cyclopædia*.
C. H. THURBER.

Chære'mon: Greek tragic poet who flourished at Athens about 380 B. C. He belonged to the group whose pieces were better suited for reading than for acting. Besides tragedies, Chæremon composed a dramatic medley of meters called *Centaurus*. Fragments in Nauck's *Fragmenta Tragicorum Græcorum*, pp. 781–792.

Chære'mon of Alexandria: a Stoic philosopher and historian of the first century, who went from Alexandria to Rome in order to take charge of the education of Nero. He wrote a work on hieroglyphics and one on the history and religion of Egypt. The fragments, not without interest, are collected in Müller's *Fragmenta Historicorum Græcorum*, iii., pp. 495–499.

Chærone'a (in Gr. Χαιρώνεια): an ancient town of Bœotia; 5 miles N. of Lebadea; the native place of Plutarch. Here Philip of Macedon gained an important victory over the Athenians and Thebans in 338 B. C., and Sulla defeated the army of Mithridates in 86 B. C. The site is occupied by the modern village of *Kapurna*. A few years ago a colossal lion was excavated from the mound which was raised in honor of the Thebans who were killed in battle here in 338 B. C. This lion is described by Col. Mure as a "noble piece of sculpture, and the most interesting sepulchral monument in Greece."

Chætodon'tidæ [deriv. of *chætodon*, from Gr. χαίτη, hair + ὀδούς, ὀδόντος, tooth]: a family of the spiny-rayed marine fishes, with very slender toothbrush-like teeth and the fins closely covered with scales. Most of the species are brilliantly colored, and they abound especially about coral-reefs. They are excellent food-fishes. The chief genus is *Chætodon*. They abound in the West Indies, rarely reaching the coasts of the U. S. or of Europe. DAVID S. JORDAN.



Chætodon.

Chætog'natha [from Gr. χαίτη, hair + γνάθος, jaw]: a group of small marine worms, so named from the slender, claw-like processes on either side of the mouth which serve as jaws. They are known as arrow worms on account of their elongate body, which bears on each side a fin-like structure suggestive of the vane of an arrow. The body terminates in a flattened tail. The *Chætognatha* are transparent, rarely exceed an inch in length, have a simple, straight alimentary canal, and are hermaphrodite. Eyes are present on the head, and numerous hairs, which serve as organs of touch, are scattered over the body. The group is widely distributed, and its two genera, *Sagitta* and *Spadella*, are divided into a considerable number of species. While the *Chætognatha* resemble the Nematode worms and the *Oligochæta* in many points of structure, their development is peculiar, and they are usually considered as forming a separate class of the sub-kingdom *Vermes*, or Worms (*q. v.*). F. A. Lucas.

Chætop'oda [from Gr. χαίτη, hair + πούς (gen. ποδός), foot]: an order of Annelids (jointed worms) most of which are characterized by the possession of regularly arranged bristles upon every segment of the body. In some, as the earthworms, these bristles are unsupported, but in others they are surrounded by a fleshy outgrowth (parapodium) on either side of each segment. In the *Archiannelida* (a group of small forms by some regarded as very primitive, by others as degenerate) the bristles are absent. The *Chætopoda* are divided into (1) *Archiannelida*; (2) *Polychætæ* (containing forms with many bristles in each segment, and in turn divided into *Errantia*, or forms which live free lives, and *Tubicola*, or those which build tubes); (3) *Oligochætæ* (see Earthworms); (4) *Echiurida*. J. S. Kingsley.

Chaffee, Adna R.: See the Appendix.

Chaffinch [*chaff* + *finch*, i. e. a species of finch which searches for its food in the chaff; cf. Late Lat. *furfu'rio*, deriv. of *furfur*, bran]: a common European, Asiatic, and African song-bird, *Fringilla cœlebs*, which devours not only seeds, but young plants, yet is very valuable as a destroyer of noxious insects. It is esteemed for the table in Southern Europe, and in Germany is prized for its loud song. See Nests of Birds.

Chafra: See Khafra.

Chagos (chaa'gos) **Archipelago**: a scattered group of small islands in the Indian Ocean; a southward extension of the Maldives; between lats. 6° 40′ and 9° 40′ S., and lons. 72° 22′ and 74° 48′ E. It is a dependency of the British colony of Mauritius. It consists of eight or ten separate clusters of islands, among which the Oil islands are most important. The largest of the latter, and of the archipelago, is the island Diego Garcia, lat. 7° S., lon. 72°–73° E., 12½ miles long, 6¼ broad, with 700 inhabitants, mostly Negro laborers from Mauritius. It is an important coaling-station, and annually exports about 50,000 gal. of cocoanut oil. It possesses a spacious harbor, and is on the route of the Australian and Red Sea steamers.

Chagres, chaa'gres: a small seaport-town of Colombia; on the Isthmus of Panama and on the Caribbean Sea; at the mouth of the Chagres river; about 9 miles W. S. W. of Aspinwall (see map of North America, ref. 11–H). It is a miserable collection of huts, with a shallow harbor.

Chagres: a river of Colombia; in the Isthmus of Panama, flowing into the Caribbean Sea; length, 102 miles, of which about 60 are navigable for small craft. It has been known to rise 40 feet in the rainy season. The line of the projected Panama canal is partly in the valley of the Chagres, crossing the river about a dozen times. It was proposed to utilize the water and avoid the danger of floods by immense regulative reservoirs. H. H. S.

Chagrin Falls: village; Cuyahoga co., O. (for location of county, see map of Ohio, ref. 2–H); on railroad and the Chagrin river; 17 miles E. S. E. of Cleveland. It has an iron-foundry, grist and paper mills. Pop. (1880) 1,211; (1890) 1,243; (1900) 1,586.

Chaillu, Paul du: See Du Chaillu.

Chain, or **Gunter's Chain**: in surveying, a measure 22 yards long, composed of 100 iron or steel links, each of which is 7·92 inches long. Ten square chains make an acre = 4,840 square yards. The chain now most commonly used by surveyors is 100 feet long, the ruder ones having 100 links, while the more precise ones are merely thin bands of steel with the distances marked upon them. See Surveying.

Chained Bible: See Bible, *Modern Versions*.

Chain Cable: See Cable.

Chain-mail: a fabric of small metal rings or links, interlinked together so that four or more links pass through each separate link and form a flexible material of which garments can be made. Armor made of chain-mail was rare in antiquity but common in the Middle Ages.

Chains and **Chain-making**: A *chain* consists of a series of links, usually elliptical, occasionally oval or circular, and in a few instances of rectangular or other forms, each interlocked with its adjacent neighbors in such manner as to form a continuous strong and flexible metal line, capable of sustaining heavy loads while "rendering" around a barrel or a wheel, or wrapped about any convenient object as a support. The chain is of unknown antiquity. It is especially familiar in literature of early date as a form of cable by which the anchors of ships were most safely held. It is commonly made of iron; but chains of brass, of bronze, gold and silver, and various other alloys and metals are often used as ornaments, and for some special purposes for which iron would be unsuitable as being too easily corroded and injured in appearance or in strength. Chains should be made of metal having ductility combined with strength and elasticity in the highest possible degree. In fact, brittleness is an irremediable defect; as all chains are at times subject to such sudden stresses, and such heavy surges of their loads, as could not safely be withstood if they were not elastic and ductile, and capable of taking up a considerable amount of energy of impact. Iron intended for such use must have not only excellent quality, as respects strength and ductility, but must also be capable of welding easily and strongly. Special grades are therefore selected for this purpose, and are often distinctively known as chain-irons.

Heavy chains, as those for ship's cables, are usually made with a cross-bar, or "stud," set between the two sides to hold them apart, and to prevent the sides closing in when subjected to great stress. Such are called stud-links. The proportions of links vary from 5 to 6 diameters' length, the diameter of the bar being taken as unity; the stud-link being longest to give space for the introduction of the stud. Their widths vary, similarly, between 3, 4, and 5 diameters of the bar.

The strength of the metal varies with its size, being much greater in the smallest than in the largest sizes of bar. Thus good cable-iron in rods of 1 inch diameter, as found in the market, should have a tenacity of about 60,000 lb. per square inch, while bars of 2 inches diameter yield at about 50,000, and similar iron, in shafting of 4 to 6 inches diameter, falls to about 45,000 lb. On the other hand, in smaller sizes, as drawn into wire, such iron rises in tenacity to 100,000, and even to 120,000 lb., per square inch. (See *Materials of Engineering*, by the writer, vol. ii., arts. 230, 231.) The best chain-iron is of rather soft quality, free especially from sulphur and phosphorus, and with just enough silicon to give good welding properties.

The process of manufacture consists in (1) cutting off the right length of bar for a link; (2) heating the body of the piece to a forging temperature, and bending it to shape with the aid of a good former and pattern, leaving, however, the ends of the piece separated sufficiently to permit the later manipulation of welding; (3) heating these ends and forming the surfaces for welding; (4) welding the link and giving it its final shape; (5) bringing it to gauge and smoothly finishing the surfaces, at the same time, if the stud is used, introducing it and closing down the link firmly upon it. The welding process is preceded by the introduction of the adjacent link of the chain. Sometimes quantities of links are made independently, and the intermediate links are afterward made and introduced between pairs of such, to constitute the continuous chain.

Chain-making machines, of which there are many known forms, commonly follow substantially the same programme of work; first heating and cutting off the piece of bar of the length required for the link, the cuts being made at the right angles to give the bevel required for the scarf of the weld; next heating and bending around the former or mandril to give them approximately the form of the finished link; the next link is then introduced and the new link welded, at the same time introducing the stud, if one is used. Each operation is performed by the machine, and in part automatically. The hammer in such machines is usually either operated by steam-pressure or is a modified

hydraulic press, and the action is that of a single pressure rather than a succession of blows. In addition to the standard forms of chains and cables the chain-making machines produce a great variety of forms of chain, some of which are given their peculiar shapes as a matter of economy and convenience in manufacture, others as being ornamental, especially when the precious metals are employed.

The link, to be satisfactory, should have not less than about 160 per cent. of the strength of the original bar, but it can not be expected to possess more than about 170 per cent. The average for good work is found by experience to be not far from 165. Proving stresses, as adopted by the U. S. Navy Department, range from 34,000 lb. on a 1-inch chain to 71,000 on 1½-inch and 121,000 on the 2-inch cable. These differences of quality between the bar and the link are due to the process of heating and working, which eliminates some of the hardening elements, reducing strength to some extent, while increasing ductility, and to the imperfection of welds, it being impossible to secure absolute certainty and thoroughness of union.

R. H. Thurston.

Chain-shot: a name of missiles formerly used in naval warfare, consisting of two balls, or half balls, which were connected by a chain about 8 inches long, and were discharged from a cannon.

Chalatenan'go: a city in the northern part of Salvador; capital of a department of the same name; beautifully situated at the foot of high mountains. It has an active trade, especially in cattle and indigo, and there are regular market-fairs. Pop. of the town about 8,000; of the department 55,000. H. H. S.

Chalcedon, kăl-see'don (in Gr. Χαλκηδών): an ancient Greek city of Bithynia; on the Bosphorus, opposite to Byzantium, from which it was about 1½ miles distant. On all the coins of Chalcedon the name is written Καλχηδών. It was founded 685 B. C., and became a large town, containing numerous temples. The Romans obtained possession of it in 74 B. C., and under the Roman empire it was a free city. The philosopher Xenocrates was born here about 396 B. C. In 451 A. D. a general council of the Church was held at Chalcedon, on the subject of the doctrinal disputes of the Nestorians and Monophysites. This, the fourth œcumenical council, condemned the heresy of Eutyches.

Chalcedony, kăl-sed'ō-ni [from Lat. *chalcedonius*, from Gr. χαλκηδών: so called because found near the ancient Chalcedon (Χαλκηδών), on the Bosphorus]: a name given to the crypto-crystalline varieties of quartz or silica, and comprising those from the translucent to semi-transparent kinds, many of which are beautiful ornamental stones. The opaque varieties are called Jasper (*q. v.*). Chalcedony is found in trap and other rocks in many regions, and in the gravels, etc., derived from their decomposition. It presents a variety of colors—white, gray, bluish, often red or brown, rarely yellow or green, and is frequently variegated or banded. The toughness and fine grain of all the varieties of chalcedony have made them the favorite material for gem-engravers from the earliest time to the present. Among the principal varieties that have distinct names are the following—(1) those of uniform color:

Carnelian, or *cornelian* (the latter form a deriv. of Lat. *cornu*, horn, the former a modif. due to false connection with Lat. *carneus*, flesh-like), includes fine semi-transparent varieties, usually light or dark red, also white, and sometimes yellow, the latter occasionally called *Ceragate*. Most of the red carnelian of commerce is chalcedony artificially stained by boiling in nitric acid and then subjecting to great heat. Formerly large natural pieces were highly prized, especially the bright clear red. Fine specimens are found in Hindustan, and are wrought into ornamental articles. Among the ancients it was also much used. *Chrysoprase* (from Gr. χρυσός, gold + πράσον, a leek, in allusion to its peculiar tint) is a green chalcedony, rare and highly valued as an ornamental gem. It is largely imitated in modern jewelry by staining chalcedony with salts of the protoxide of nickel. Choice specimens of chrysoprase have a fine apple-green tint. The color is liable to fade by long exposure to light, but dampness favors its retention, and chrysoprase is frequently kept in moist cotton. It is found in Lower Silesia, California, and Oregon, and fine examples line the walls of a chapel in the Church of St. Wenzel, at Prague. The stone called chrysoprasus by the Greeks and Romans is not certainly identified by modern authorities. *Plasma* (from Gr. πλάσμα, an image) is a deeper green variety, much used by the ancients and frequent in collections of antiques, but not much esteemed at present. *Sard* (from Lat. *sarda*, Gr. σάρδιον, stone, from Sardis in Lydia) is a rich deep-red variety, darker than carnelian and less semi-transparent, but of a fine blood-red color by transmitted light. Nearly all modern sard is artificially stained chalcedony, and ranges from cherry red to chocolate brown, erroneously called sardonyx by many jewelers (see below, under *Agate*).

(2) Banded and striped varieties. *Agate* (Gr. ἀχάτης, said to be named from the river Achates, in Sicily, where the stone was anciently found) is a name used for chalcedonies that are veined, layered, or variegated, presenting different colors or shades. This structure is due to their formation in successive layers on the walls of cavities, usually in trappean or volcanic rocks. Agate proper is clouded or has many fine layers, parallel, concentric, or angular; those with fewer and thicker layers are called onyx and sardonyx (see below), and are used particularly for cameo work. Agates occur in nearly all countries, though the greater part of those now used are brought from Uruguay and Brazil, and are taken to Oberstein and Idar, in Germany, to be cut and polished for articles of ornament. This industry, originally brought from Italy, has been an important one at these points for over three centuries, and now employs some 15,000 people. Great skill is shown in this work, and also in artificially coloring the stones. It is possible now to stain gray or bluish chalcedony any color, and restain it into onyxes of any color, a result only possible in ancient times through natural processes. The ancients used to cover sard, carnelian, or other stones with soda, and then on calcining a layer of white was formed by the alteration of surface. Agates in all ages, owing to their beauty and variety, have been a favorite material for seals, rings, pins, etc., and for costly vases, *coupes*, and ornaments, as well as mortars for chemists. *Agatized wood* is a natural replacement of wood by agate or chalcedony deposited by siliceous waters, whereby the ligneous matter is removed, but the form and structure retained. It is a beautiful material, frequent in the "petrified forests" of Colorado and of States of the American Union lying W. and S. of Colorado. The finest in the world occurs at Chalcedony Park, in Apache co., Arizona. *Fortification-agate* is a term applied to those agates in which the colored lines run in several directions and make sharp angles in their course, like the redoubts and bastions of a fort. *Moss-agate*, *moss-carnelian*, or *Mocha-stone* (from Mocha, in Arabia, whence it is often obtained), is a striking variety in which a white or light chalcedony contains dark, tree-like, or moss-like markings, sometimes almost resembling landscapes. These are due not to any vegetable growth, as often supposed, but to an infiltration of oxide of iron or of manganese, which has crystallized in these minute "dendritic" or tree-like forms, as frost does upon window-panes. Fine Mocha-stones come from India and Arabia, and they abound in some parts of Wyoming. *Onyx* (from Gr. ὄνυξ, a finger-nail, a veined gem) consists of parallel layers of different-colored chalcedony, generally some shade of red or brown alternating with white. If one or more of the layers are of a brown red or pink the stone is called *sardonyx*. These varieties were highly prized by the ancients, and were much valued for ornamental work when cameos were in vogue. In modern times they are artificially colored to heighten the contrast of the layers, and all the black and white onyx is of this kind. The stone is boiled in blood, sugar, molasses, etc., and some of the layers absorb the organic matter, while others do not. By immersion in sulphuric acid the organic matter is then carbonized, and remains as a black coloring-substance in the absorbent layers. Of late an entirely black chalcedony, thus stained and called black onyx, has almost displaced the use of jet in jewelry. *Chalcedonyx* is a name sometimes given to onyx or sardonyx in which one or more of the layers are transparent quartz or chalcedony. The term onyx belongs only to these varieties of banded chalcedony, though it is often wrongly applied to other striped minerals, especially in the name "Mexican onyx," which denotes an entirely different stone—a form of aragonite (carbonate of lime). See Mexican Onyx. When the lower layer is black and the upper white, if the white is ground very thin it gives a gray appearance to the onyx, which is then called *Nicolo*.

George F. Kunz.

Chalcedonyx: See Chalcedony.

Chalcid'idæ [from Gr. χαλκίς, a kind of lizard]: a family of lacertilian reptiles found in warm regions in both hemispheres. They are popularly considered snakes, having no

visible legs. They have movable eyelids, small ears, and a short thick tongue.—Also the name of a family allied to the ichneumon flies, which are of great service in the destruction of noxious insects upon which their larvæ feed.

Chalci'dius: a writer, probably of the fourth century, who translated into Latin the *Timæus* of Plato in part, adding a voluminous commentary, which is dedicated to a certain Osius, perhaps the Bishop of Cordova. He was probably a Christian. See ed. by I. Wrobel (Leipzig, 1876).

M. W.

Chal'cis: the name of three cities. 1. Chalcis, or Egrypo (Ital: *Negroponte*), the chief town of the island of Eubœa in Greece; 18 miles N. E. of Thebes; on the Strait of Euripus (at this point only 40 yards wide), and connected with the mainland by a bridge (see map of Greece, ref. 16–K). Is said to have been colonized from Athens. Aristotle died there 322 B. C. It was taken by the Venetians 1205 A. D., by the Turks 1470, and by the Greeks 1821. Pop. 6,900. It is the only town in Greece where any Mohammedans remain. 2. An ancient city of North Syria; 10 or 12 miles S. of Chalybon (modern *Aleppo*), on the old caravan route to Heliopolis (*Baalbek*); said to have been founded by Seleucus Nicator (312–280 B. C.). In 638 A. D. it was destroyed by the Arabs under Abu Obeidah, and its name was changed to *Kennisrin*. The ruins are extensive. 3. An ancient city of Cœle-Syria, mentioned repeatedly by Josephus in connection with the Herods. Its ruins, nearly a mile in circuit, now called *Anjar*, are close to the post-road between Beirut and Damascus.

Revised by R. Lilley.

Chalco: town of Mexico, state of Mexico; on the east shore of Lake Chalco (see map of Mexico, ref. 7–4). It was an ancient Aztec city, subject to Montezuma II., but the chiefs joined Cortez with their forces in 1521, and aided in the siege of Mexico. Pop. in 1893 about 3,000. H. H. S.

Chalco: one of the group of lakes surrounding Mexico city; about 12 miles S. E. of it, and separated from Lake Xochimilco only by a narrow causeway. Area about 40 sq. miles. It has two islands, one of them an extinct volcanic cone with a nearly perfect crater. The water is fresh; masses of grass and reeds float on the surface, somewhat resembling the Aztec *chiampas*, or floating gardens. This lake was formerly united to the others around Mexico.

Herbert H. Smith.

Chalcon'dylas, Demetrios: humanist of the early Renaissance; b. in Athens in 1428; removed to Italy shortly before the fall of Constantinople in 1453. After leading the restless life of an itinerant teacher in Padua, Perugia, Rome, and other Italian cities, he was finally called, about 1471, by Lorenzo de Medici, to the chair of Greek in Florence, where he lectured with extraordinary success. Pope Leo X. was one of his pupils. Shortly after the death of Lorenzo (in 1492), Chalcondylas went to Milan, where he died at the age of seventy-two. To him we owe the first printed edition of *Homer* (1488), of *Isocrates*, and of the *Lexicon of Suidas*. See H. Hodius, *De Græcis illustr. linguæ Græcæ, etc., instauratoribus* (London, 1742, pp. 211–226).

Alfred Gudeman.

Chaldæ'a: See Babylonia.

Chaldæ'an Christians, Syro-Chaldæans, or **Syro-Orientals**: a branch of the Church of Rome, consisting of those Christians in Assyria, Mesopotamia, and a part of Persia, who acknowledge the pope. They are of the Eastern rite, and are under the Patriarch of Babylonia, who resides in Mosul, and thirteen bishops, of whom five have archdioceses and three reside in Persia. They number about 90,000 souls, and are most numerous in the dioceses of Mosul and Bagdad. The Syro-Chaldaic is their liturgical language.

Chaldee Language, or **Eastern Aramaic**: See Aramaic.

Chaleurs (shăă-loorz') **Bay**: an inlet of the Gulf of St. Lawrence, Canada; separates Quebec from New Brunswick. It extends E. and W. about 90 miles; is about 22 miles wide at the broadest part. It affords good anchorage, and can be navigated without danger. It has important mackerel fisheries.

Chalice [O. Fr. < Lat. *calix*, cup: Gr. κύλιξ, cup]: the cup used in the celebration of the Holy Communion. The chalice has four parts—the foot, the stem, the knop, and the bowl. The foot or base should extend considerably beyond the bowl, to prevent upsetting. On one division of the foot it is usual to engrave a representation of the Passion, which should be always turned toward the celebrant. The stem unites the foot to the bowl, and on it is fixed the knop for holding the bowl of the chalice. The knop is variously enriched with enamel, jewels, tracery, and tabernacle-work. The stem is often engraved or enameled. The bowl should have a plain rim of about an inch, below which it may be enriched with engravings, inscriptions, and chasings.

W. S. Perry.

Chalk [O. Eng. *cealc*; O. H. Germ. *chalch* > Mod. Germ. *Kalk*, a common West Germ. loan-word from *calx*, lime. The limitation of meaning to chalk is peculiar to the English]: a calcareous earth; a soft variety of limestone or carbonate of lime. Its color is generally white. It is friable, easily pulverized, has an earthy fracture, and is very meager to the touch. In geology it is a sedimentary rock of great extent and importance, and a member of the cretaceous system. Chalk is abundant in England and France, and has recently been found to occur extensively in Texas and Arkansas. The strata often contain flint nodules, distributed in layers like chert or hornstone in the limestone. They are more or less rounded, and are all of concretionary origin. Chalk is of animal origin, and is mostly composed of the shells or carapaces of microscopic marine animals. According to Ehrenberg, a cubic inch of chalk often contains more than a million of microscopic organisms, among which far the most abundant are the rhizopods (called also foraminifera). Chalk is extensively used in the preparation of lime, and is commonly employed by carpenters to mark boards. The material sold under the name of whiting or Spanish white, and used to make putty, is chalk in a purified state. Purified chalk, also known as Vienna white, is employed by artists in pastel-work and crayon as a basis of pigments, and is administered in medicine as an antacid. Black chalk (a clayey formation), French chalk (a soapstone), and red chalk (ocher) are not chalks at all. See Cretaceous Period. G. K. G.

Challe, shaal, Michangelo: historical painter of eighteenth century; member of the Academy of France; painted the ceiling of the hall in the New Louvre where the Academy met.

Challcuchima, chaăl-koo-chee'maă, or **Chalicuchima**: an Inca general of Peru, native of Quito, and said to have been the uncle of Atahualpa, in whose army he served. He was prominent in the war with Huascar, and is said to have shown extreme cruelty in his treatment of the conquered provinces. Shortly after the seizure of Atahualpa by the Spaniards, Hernando Pizarro met Challcuchima at Xauxa, and induced him to go to Cajamarca under pretense that Atahualpa had sent for him. He was imprisoned there, and carried with the army on their march to Cuzco. At Chaquichaguana, 5 leagues from Cuzco, he was accused of inciting an Indian insurrection, and after a form of trial was burned alive (Nov., 1533). Herbert H. Smith.

Challemel-Lacour, shaăl'mel'laă'koor', Paul Armand: French senator; b. at Avranches, May 19, 1827: graduated at the Normal School in Paris 1849; banished after the *coup d'état* of 1851; returned to France after the amnesty 1859; prefect of the Rhône, Sept. 4, 1870; administered the affairs of the city of Lyons at the time of great excesses; elected deputy in the radical interest Jan. 7, 1872; senator Jan. 30, 1876; ambassador to the Swiss Confederation 1879; ambassador to London 1880–82; Minister of Foreign Affairs in the Ferry cabinet 1883; president of the senate 1893; elected to the academy 1893; editor *République Française*. D. at Paris, Oct. 26, 1896. C. H. Thurber.

Challenger Expedition: a scientific exploration of the Atlantic, Southern, and Pacific Oceans instituted by the British Government 1872–76. The corvette Challenger, of 2,306 tons, was placed at the disposal of a body of naval surveyors and scientists, headed by Capt. Nares and Prof. Wyville Thomson respectively. Investigations were made at 362 stations, and in its circuitous circumnavigation of the globe the vessel cruised over 68,900 nautical miles. See the *Reports on the Scientific Results of the Voyage of H. M. S. Challenger*, edited by Sir Wyville Thomson and Dr. John Murray (1880–89) in 37 volumes, of which 2 are devoted to a *Narrative*, 30 to *Zoölogy*, 3 to *Physics and Chemistry*, and 2 to *Botany*. C. H. Thurber.

Challoner, Richard: a Roman Catholic prelate; b. in Lewes, Sussex, England, Sept. 29, 1691; educated at Douay, where he was a professor until 1730; sent to London as a missionary priest; bishop *in partibus* 1741; Vicar Apostolic of London district 1758; d. in London, Jan. 12, 1781. His

works were both controversial and devout. In answer to Conyers Middleton's *Letters from Rome* he published *Catholic Christian Instructed*. His *Garden of the Soul* is still a *vade mecum* for devotional minds, and his version of the Douay Bible the standard one for English-speaking Roman Catholics. He published a martyrology of Roman Catholics in Great Britain from 1577 to end of reign of Charles II. (1741, 2 vols.), and *Britannia Sancta*, containing lives of British and Irish saints.

Chal'mers, Alexander: writer; b. in Aberdeen, Scotland, Mar. 29, 1759. He is noted as the author of a *General Biographical Dictionary* in 32 volumes (1812–17), and as the editor of a well-known edition of Johnson's British poets, with notes, and a still valuable collection of *British Essayists* in 45 volumes. D. in London, Dec. 10, 1834.

Chalmers George: antiquary and lawyer; b. in Fochabers, Scotland, in 1742; practiced law in Baltimore, Md., 1763–75; returned to London and was clerk to the Board of Trade from 1786 to 1825. His greatest work is entitled *Caledonia: An Account, Historical and Topographical, of North Britain* (3 vols., 1807–24), which displays profound research and much erudition (n. ed. Paisley, 7 vols., 1889). Among his other works are a *Life of Mary Queen of Scots* (1818) and a *Collection of Treaties* (1790). D. in London, May 31, 1825.

Chalmers, George Paul, R. S. A.: British artist; b. in Montrose, 1833; in 1853 began study under Scott Lauder in Edinburgh; first attracted notice by his *Favorite Air* (1854); is best known for his portraits and landscapes, among which are the *End of the Harvest* (1873) and *Running Water* (1875). D. in Edinburgh, Feb. 28, 1878.

Chalmers, Mackenzie Dalzell: See the Appendix.

Chalmers, Thomas, LL. D., D. C. L.: divine; b. at Anstruther, Fifeshire, Scotland, Mar. 17, 1780; educated in the University of St. Andrews. In 1803 he was ordained minister of the Fifeshire parish of Kilmany. His favorite studies for some years before and after this event were mathematics and natural philosophy. He published in 1808 an *Inquiry into the Extent and Stability of the National Resources*. While composing an article on Christianity for *Brewster's Encyclopædia* in 1809, he examined the evidences of its truth, and acquired convictions which rendered him a more earnest and devout preacher of the gospel. He married Miss Grace Pratt in 1812, and was elected minister of the Tron Church, Glasgow, in 1815. He soon gained distinction as an eloquent and powerful pulpit orator, and delivered a series of discourses on astronomy in connection with religion, which were published in 1817 and had wide circulation. In 1819 he became minister of St. John's parish, Glasgow, especially established for him to try his social and religious experiments in. He established schools and made strenuous efforts to improve the morals and economic condition of his parishioners. His scheme was the prototype of that now familiar as "charity organization," viz., that of restoring the neighborly methods of the old kirk, getting rid of official relief, reopening the natural springs of affection and kinship, and of employing a large number of deacons or volunteers in the duty of befriending, counseling, and restoring the poor to self-maintenance. He was appointed Professor of Moral Philosophy in the University of St. Andrews in 1823, and obtained the chair of Theology in the University of Edinburgh in 1828. He published in 1832 a work entitled *Political Economy*, and in 1833 his Bridgewater treatise *On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man*, which was received with great favor. Dr. Chalmers was the leader of the Evangelical party, which was involved with the "Moderate" party in a contest in relation to patronage. This contest resulted in the disruption of the Church of Scotland in May, 1843. Dr. Chalmers and 470 other clergymen then seceded and organized the Free Church. He expended the latter years of his life in perfecting his *Institutes of Theology* and in officiating as principal and Professor of Theology in New College, Edinburgh, instituted by the Free Church. He was an orator and a practical worker rather than a speculative theologian. He is probably no longer read, except in his Bridgewater treatise and some sermons, but he lives on in the Free Church of Scotland, which links his name with the greatest names in Christendom. He published his works in 25 volumes (Glasgow, 1836–42), and 9 volumes were published after his death (Edinburgh, 1847–49). See his *Life* by W. Hanna, his son-in-law (Edinburgh, 1849–52, 4 vols.; n. e. 1878, 2 vols., repr. New York), and by Donald Fraser (London and New York, 1881). D. in Edinburgh, May 30, 1847.

Revised by S. M. Jackson.

Chal'on, Alfred Edward: portrait-painter in water-colors; b. in Geneva, Switzerland, Feb. 15, 1781; d. in London, Oct. 3, 1860; went to England with his parents, who left France owing to reverses of the Revolution in 1789; pupil of Royal Academy, London; was appointed portrait-painter in water-colors to Queen Victoria.

Chalon, John James: landscape and genre painter; b. in Geneva, Switzerland, Mar. 27, 1778; d. in London, Nov. 14, 1854; pupil of Royal Academy, London; Royal Academician 1841; distinguished in his time as a water-color painter; elder brother of Alfred E. Chalon.

Châlons-sur-Marne, shăă'lōn'sür-maarn' (anc. *Catalauni* or *Catalaunum*): a city of France; capital of the department of Marne; on the right bank of the Marne, and on the railway from Paris to Strassburg; 107 miles E. of Paris (see map of France, ref. 3–G). It is situated in a fertile plain, which is part of the former province of Champagne, and has a stone bridge across the river. It is a bishop's see, and contains a fine cathedral, a botanic garden, and a public library of about 25,000 volumes; also manufactures of cotton, linen, and woolen fabrics. Champagne wine is produced in the vicinity. In the Catalaunian Plain adjacent to Châlons the Roman general Aëtius and Theodoric the Visigoth gained a great victory over Attila in 451 A. D. In the early part of the Dark Ages Châlons was one of the most important commercial cities of Europe, and had about 60,000 inhabitants. In 1857 the celebrated Champ de Châlons was established near Châlons, in which always one or two French army corps were kept for drilling; it was evacuated by the French in Aug., 1870, and entirely abandoned in 1871. Pop. (1891) 25,863; (1896) 26,630.

Châlon-sur-Saône, -sōn' (anc. *Cabillonum*): a town of France; department of Saône-et-Loire; on the right bank of the Saône; on the railway from Dijon to Lyons; 77 miles by rail N. of Lyons (see map of France, ref. 5–G). It is at the head of steamboat navigation, and has an active trade, being the eastern terminus of the Canal du Centre, which connects the Saône with the Loire. The chief public buildings are a cathedral founded in the thirteenth century, St. Peter's church, and the town-hall. It has a theater and a large public library; also manufactures of glass, jewelry, hosiery, linen fabrics, pottery, etc. Pop. (1896) 26,288. It is identified with the ancient *Cabillonum*, which became the capital of Burgundy under Gontran, King of Burgundy, who died in 593 A. D.

Chalybeate, kā-lib'ĕe-āt [from Gr. χάλυψ, steel, hardened iron; so named from the Chalybes, a people to the S. E. of the Black Sea]: that which contains iron in solution; applied to waters which are impregnated with iron. There are two kinds of chalybeate water—the carbonated, which contains carbonate of iron, and may be recognized by forming an ocherous deposit of red oxide of iron on the stones near the mouth of the spring; and the sulphated, which contain sulphate of iron (copperas) in solution. See Mineral Waters.

Cham, kaam [French for Ham, son of Noah]: assumed name of Amédée de Noé, a French caricaturist; b. in Paris, Jan. 26, 1819, of noble family; studied with Delaroche and Charlet. His first grotesque sketches appeared in 1842, and then followed an uninterrupted series in almanacs and in *Charivari*. The sketches are social rather than political pictorial satires, of which the best collections are *Douze Années Comiques* (1880) and *Les Folies Parisiennes* (1883). D. Sept. 6, 1879.

Chamæ'leon [the older Eng. spelling *camelion* has been in this century readapted to Gr. original χαμαιλέων; χαμαί, on ground + λέων, lion]: a saurian reptile of the genus *Chamæleo*, which constitutes a family (*Chamæleontidæ*), representing a separate tribe (*Dendrosaura*) of lizards. They have a compressed body, with granular scales; the head almost fixed, but the eyes with a wonderful power of motion, each eye being covered by a lid pierced with one small hole; ears beneath the skin; the tail prehensile; the movements extremely slow; the tongue cylindrical and extensile, in appearance resembling a common angle-worm; the toes in two opposible sets, fitted for grasping boughs, etc. About forty species are known, nearly half of which are found in Madagascar. The rest occur in Africa, one species extending into Asia and Southern Europe. Many fables have been related of the chamæleon, such as that it lives upon air,

has the power of changing color at will, or assuming the color of the object upon which it is placed. The food of the chamæleon is insects, which it catches by darting out its long, sticky tongue; but its lungs are large, and it has a habit of enormously dilating itself with air. Its changes of color are not altogether voluntary, and it does not appear to assimilate its color to the object upon which it is placed. But its colors are somewhat changeable. This has been explained (1) by the action of the nervous energy, which, as in blushing, may perhaps affect the circulation of the blood in the skin, and it is certain that fear or other emotions will cause the color to change; (2) by the varied amount of air in the animal's lungs; (3) by the action of light; (4) by the presence of two differently colored layers of pigment-cells in the skin, so arranged as to move upon each other and produce various effects of color. It is probable that all these conditions may contribnte to the result.

Chamæleon.

It is said that that lack of nervous co-ordination between the two sides, which in most animals is only seen in diseased or defective organizations, is either normal to the chamæleon or is very easily produced in it. It is even asserted that one side of the reptile may be awake while the other is asleep. In the Southern U. S. the term is popularly applied to *Anolis principalis*, a small green lizard of the family *Iguanidæ*. See Anolis. Revised by F. A. Lucas.

Chamæleon, of Heraclea on the Pontus: disciple of Aristotle or Theophrastus, and rival of Heraclides Ponticus. He was one of those Peripatetics who had an especial turn for the history of literature, and in his essays on the poets he undertook to idealize their lives as well as to criticise their works. His philosophical writings pertained chiefly to ethics. See Köpke, *De Chamæleonte Heracleota* (1856); Clinton, *Fasti Hellenici* (vol. iii., p. 493).

Chamæ'rops [Gr. χαμαίρωψ, the name of a plant; χαμαί, on the ground, low growing, ῥώψ, shrub or bush, alluding to the low growth of the plants]: a small genus of two or possibly a few species of fan-leaved palms, natives of the region bordering on the Mediterranean Sea. They usually form low trees a few feet high, but in favorable climates they attain a height of 20 or more feet. The edible fruit is globose or ovoid, one-seeded, and resembles an olive in appearance. The leaves yield a valuable fiber (made into carpets, cordage, paper, etc.), and are used also for making hats, brooms, chair-seats, etc. *C. humilis* and *C. macrocarpa* are the two species generally recognised by botanists. C. E. B.

Cham'ba: a native hill-state in the Punjab, British India, adjoining Kashmir; in lat. 33° N. and lon. 76° E. Area, 3,180 sq. miles. Pop. about 120,000. It is very mountainous, has extensive forests, and produces wheat, millet, timber, wax, nuts, honey, lime, and slate. The British sanatorium Dalhousie is within its limits.

Chamber: an apartment of a house; a private apartment; a lodging-room; a hollow or cavity, as the chamber of the ear. In politics the term is often applied to a legislative assembly, as the Chamber of Deputies in France. The room which the U. S. Senate occupies is called the Senate chamber. Chamber of commerce is the title of an association or body of merchants which is commonly formed in each large commercial city for the promotion of the mercantile interests and general prosperity of the place.

Chamber of a muzzle-loading cannon or small firearm is the contracted part of the bore at the breech end. The chamber contains the charge of powder, but it is too small to admit the shot or shell. These cavities are of various forms, spherical, cylindrical, conical, etc.

In breech-loading guns the chamber is cylindrical, and is larger in diameter than the bore to which it is joined by a case, which is made long to prevent erosion from the rush of gas against a sudden contraction in diameter.

Cham'berlain [viâ O. Fr. from Germ.; cf. O. H. Germ. *chamarling*]: an officer attached to the court of a monarch, and who formerly had charge of the private apartments of the palace. He was originally the keeper of the treasure-chamber. The office of chamberlain was one of the grand offices of the crown in France. The lord chamberlain of England is an officer of high rank in the royal household, and has the function of indorsing the king's answer on petitions presented to him, and often communicates his (or her) Majesty's pleasure to Parliament and to the council. He has control over all the officers and servants of the royal chambers except those of the bedchamber, issues invitations to court ceremonials, and regulates presentations to the sovereign. All tradesmen and artificers in the service of the sovereign are appointed by him. He is a member of the privy council, receives £2,000 a year, and goes out of office with his party.

The lord great chamberlain, another officer, is an official of the British court, of noble birth, and holds the title by inheritance. He has charge of the House of Lords during sessions, walks by the right hand of the sovereign in certain processions, and performs many other duties.

Chamberlain: city (founded in 1881); capital of Brulé co., S. Dak. (for location of county, see map of South Dakota, ref. 7–E); on the Missouri river, and Chicago, Milwaukee and St. Paul R. R.; 180 miles N. W. of Sioux City, Ia. It has a first-class steamboat landing, in a fertile country, and has a good river traffic and a wholesale trade with neighboring towns. Pop. (1890) 939; (1900) 874.

Editor of "Register."

Chamberlain, Alexander Francis: See the Appendix.

Chamberlain, Daniel Henry: b. in West Brookfield, Mass., June 23, 1835; graduated at Yale College with high honors 1862, and at the Harvard Law School; entered the army in 1864 as lieutenant in the Fifth Massachusetts Colored Cavalry; promoted to be captain, and served in Maryland, Louisiana, and Texas; went to South Carolina in 1866, and for two years was engaged as a cotton-planter. He was a delegate to the constitutional convention, and subsequently attorney-general of the State for four years: Governor of South Carolina 1875–76; renominated in 1876 and reinaugurated Jan., 1877; but, his election being contested by Wade Hampton, and President Hayes having removed the U. S. troops from the State, he withdrew Apr. 10, 1877. Became engaged in the practice of law in New York city June, 1877.

Chamberlain, Jacob: See the Appendix.

Chamberlain, Joseph, M. P., P. C.: English public man; b. in London, 1836; educated at University College School; became a member of his father's firm of wood-screw makers at Birmingham; retired from the firm in 1874; became noted for his advanced radical opinions and his ability as a speaker; chairman of the Birmingham School Board 1873–76; mayor of Birmingham 1874–76; stood for Parliament 1874, but was unsuccessful; elected to Parliament in June, 1876, from Birmingham; favored disestablishment and compulsory education; re-elected for Birmingham 1880; president of the Board of Trade in Mr. Gladstone's cabinet 1880; prepared and passed the Bankruptcy Act; president of the Local Government Board in Mr. Gladstone's cabinet 1886; resigned by reason of not agreeing with the Prime Minister's Irish Home Rule measures; elected in 1886 to Parliament as a Unionist and withdrew from the Liberal party; commissioner to the conference at Washington for the settlement of the dispute between the U. S. and Canada on the fisheries question, 1887; Secretary of State for the Colonies in Salisbury's cabinet since 1895. In Nov., 1888, he married a daughter of William C. Endicott, Secretary of War in President Cleveland's first administration, 1885–89. C. H. Thurber.

Chamberlain, Joshua Lawrence, LL. D.: general and educator; b. in Bangor, Me., Sept. 8, 1828; graduated at Bowdoin College in 1852, and Bangor Theological Seminary 1855; taught at Bowdoin until he entered the volunteer service of the U. S. in 1862; became a major-general Mar. 29, 1865; received the colors of Lee's army on its surrender in April. He was six times wounded while in the Army of the Potomac, three times severely, and was promoted brigadier-general on the field by Gen. Grant for signal gallantry in the assault on Petersburg, June 18, 1864. He returned to his professorship at Bowdoin College, and while there, from 1867 to 1871 inclusive, was Governor of Maine. He was president of Bowdoin College 1871–83. As major-general of Maine militia, he played an important part in maintaining the peace of the State during the political anarchy of 1880.

Chamberlain, Montague: See the Appendix.

Chamberlain, Thomas Chrowder, Ph. D., LL. D.: an American geologist and educator; b. near Mattoon, Ill.,

Sept. 25, 1843; educated at Beloit College and the University of Michigan; Professor of Natural Sciences in Whitewater Normal School 1869–73; afterward Professor of Geology in Beloit College; president of the University of Wisconsin 1887–92; dean of Scientific Faculty of University of Chicago since 1892. In 1873 he joined the Geological Survey of Wisconsin as an assistant, and in 1876 was made chief geologist. Under his direction the work was pushed to a conclusion and the results published. In the first volume of the final report he gave a general treatise on geology as illustrated by the phenomena of the State, and in other volumes he laid the foundation for the classification and interpretation of the glacial drift of the Northern States by tracing out the "Kettle" moraine and developing the theory of the lobation of the Pleistocene ice-sheet. In 1882 he accepted charge of the glacial division of the U. S. Geological Survey, and extended to a broader field the systematic investigations begun in Wisconsin. Among his later papers are *The Terminal Moraine of the Second Glacial Epoch*; *The Driftless Area of the Upper Mississippi Valley*; *The Rock Scorings of the Great Ice Invasion*; and *The Requisite and Qualifying Conditions of Artesian Wells*—all printed by the U. S. Geological Survey. G. K. G.

Chambers, in law. A judge is said to act at "chambers" when a legal proceeding is carried on before him out of court, either at his office or residence or other convenient place, including the court-room itself. Business done before a judge at chambers, as distinguished from that transacted in court, is increasing in modern times. The codes of procedure in some of the American States expressly provide that certain acts shall be done by the *court*, and others by a *judge*, referring in the last instance to an act done at chambers. Through the same medium a great change has been worked in England in the practice of the court of chancery. Formerly the details of business in that court were transacted by an officer termed "master in chancery," who exercised an almost independent jurisdiction, acting without communicating with the judge until he made report of his conclusions, which was then submitted to the court as a basis for its decree. By the 16 Vict., ch. 80, the office of master was abolished, and the business formerly committed to him was directed to be transacted under the direction and control of the judge, or, in other words, at chambers. Under this system each of the judges has under his control chief clerks and junior clerks, who act in his behalf in taking accounts and making inquiries, and who are more directly responsible to him than were the masters under the earlier practice. Under the law of 1873 (which went into effect Nov. 2, 1874) for the reorganization of the English courts (36 and 37 Vict., ch. 66), the duties of chamber clerks are to be performed by officers of the court in the permanent civil service of the crown. The same law also provides for official and special referees, who may, under the direction of a court or judge, perform acts similar to those formerly intrusted to masters in chancery.

Chambers, Edward T. D.: See the Appendix.

Chambers, Robert, LL. D.: author and publisher; b. at Peebles, Scotland, July 10, 1802; brother of William (*q. v.*); self-educated owing to his father's reverses; apprenticed in the book-trade in Edinburgh; published twenty volumes of his own authorship. He entered into partnership with his brother William in 1832, after which they published many cheap and popular works entited *Information for the People*; *Cyclopædia of English Literature*; *Papers for the People*; *Chambers's Encyclopædia* (1859–68), etc. Of his own books, *Vestiges of Creation* (1844) was a stirring scientific publication, anticipating many of the speculations of Charles Darwin. It appeared anonymously; was assailed by the orthodox; its authorship acknowledged in the twelfth edition (1884), although it had been credited to him since 1854. He also wrote a *History of Rebellions in Scotland* (3 vols., 1829); *Popular Rhymes of Scotland* (1847); *Life and Works of Robert Burns* (1851); *Domestic Annals of Scotland* (3 vols., 1861); and seven volumes of *Select Writings* (1847). See his brother's *Memoir of William and Robert Chambers* (13th ed. 1884). D. at St. Andrews, Scotland, Mar. 17, 1871.

Chambers, Talbot Wilson, LL. D.: b. in Carlisle, Pa., Feb. 25, 1819; graduated at Rutgers College 1834; studied theology at New Brunswick and at Princeton, N. J.; licensed to preach at Clinton, Miss., in 1838, and in Oct., 1839, became pastor of the Second Reformed Dutch church, Somerville, N. J.; in Dec., 1849, was installed as one of the pastors of the Collegiate Dutch church, New York. He published *The Noon Prayer-meeting in Fulton Street* (New York, 1857); *Memoir of Theodore Frelinghuysen*: *The Psalter a Witness for the Divine Origin of the Bible* (1876); *Companion to the Revised Version of the Old Testament* (1885), etc. He was a member of the American Bible Revision Committee. D. in New York, Feb. 3, 1896.

Chambers, Sir William: architect; b. of Scotch parents at Stockholm, Sweden, 1726; taken to England when two years old; after much travel settled in his profession at London 1744; taught the young prince who afterward became George III. the elements of architecture. He is chiefly known for his designs carried out in the Royal Gardens at Kew; for Somerset House, London; and Milton Abbey. Author of a *Treatise on Civil Architecture* (1759), and a *Dissertation on Oriental Gardening* (1772), which brought him much ridicule. D. in London, Mar. 8, 1796.

Chambers, William, LL. D.: author and editor; brother of Robert (*q. v.*); b. at Peebles, Scotland, Apr. 16, 1800. He founded Chambers's *Edinburgh Journal* in 1832, and became a partner with his brother in an extensive publishing-house of Edinburgh. They were distinguished for their enterprise and their successful efforts to supply the people with cheap and instructive literature. They were the founders of *Chambers's Encyclopædia* (1859–68; n. ed. 1888–93). He was the author of several works, among which is *Things as they are in America*. He was chosen lord provost of Edinburgh in 1865; served four years and greatly improved the sanitation of the city. He restored St. Giles's church, Edinburgh, at his own charges. The tender of a baronetcy reached his house on the day of his death, May 20, 1883.

Chambersburg: borough; capital of Franklin co., Pa. (for location of county, see map of Pennsylvania, ref. 6–E); on Cumb. Val., Mont Alto, and West. Ma. R. Rs.; on the Conococheague and Falling Spring creeks. It has manufactories of shoes, stockings, wool, paper, milling machinery, furniture, stationary engines, boilers, and iron; an academy, a female college, and well-conducted public schools. It was settled by the Scotch-Irish. On July 30, 1864, a body of Confederate cavalry under Gen. McCausland entered the town and laid it under tribute of $200,000 in gold or half a million in currency; this demand not being complied with by the inhabitants, McCausland ordered the town to be fired; loss, $1,000,000. About two-thirds of the place was destroyed and 2,500 persons were deprived of their homes. It has been entirely rebuilt. Pop. (1880) 6,877; (1890) 7,863; (1900) 8,864.

Editor of "Franklin Repository."

Chambersburg: Mercer co., N. J. (for location of county, see map of New Jersey, ref. 4–C); on railroad and on Delaware river; was formed in 1872 from part of Hamilton township, but since the census of 1880 has been annexed to Trenton. Pop. (1880) 5,437.

Chambers of Commerce: voluntary associations of merchants and others for the protection and promotion of the commercial interests of the city, district, or country in which such associations are formed. They are, as a rule, incorporated, and may accomplish their ends in various ways; as, for instance, by presenting petitions to legislative bodies or by urging the adoption of measures calculated to benefit the public; by collecting and publishing statistics; by obtaining peculiar advantages through combination with similar associations; or by serving as a court of arbitration to which disputes are referred. A chamber of commerce may exist as a distinct body, may form a department of a board of trade, as is sometimes the case in the U. S., or may correspond so closely with a board of trade as to be called indifferently by either name. France, which established courts for the decision of disputes in trade as early as 1549 (at Toulouse), has the credit of establishing the first chamber of commerce. This was formed at Marseilles, about the end of the fourteenth century or the beginning of the fifteenth, but was not fully organized until 1650. Dunkirk followed in 1700, and in that same year Paris established a council-general of commerce whose officers consisted of six councilors of state and twelve merchants, representing, as delegates, the chief commercial centers of France. Lyons instituted a chamber in 1702: Toulouse in 1703, and soon such organizations became very common in that country and in other parts of Europe. In 1791 the French chambers were suppressed by the National Assembly, but in 1802 were re-established, and have met with no further reverses

except that their organization has been thrice modified and their independence somewhat limited. A close connection exists between them and the general Government, which is kept informed by them as to the industrial as well as the commercial status of their respective districts.

The chamber of commerce at Glasgow, instituted and incorporated in Jan., 1783, is without doubt the oldest in Great Britain. That at Edinburgh was instituted in 1785 and incorporated in 1786. The Manchester chamber, which, like that of Edinburgh, has been prominent in advocating free-trade principles, was established in 1820. The next in order of establishment in England was that of Hull (1837). The chambers of Liverpool, Leeds, and Bradford were established in 1850. The London Chamber of Commerce, the most important in the United Kingdom, was not established until 1882. An association of chambers of commerce of the United Kingdom, established in 1860, has done much to promote the commercial interests of the empire, by bringing together annually delegates from the chambers of all the trading-centers of Great Britain and Ireland and the colonies.

The New York Chamber of Commerce, the oldest in the U. S., was formed in Apr., 1768, by twenty merchants, and received a royal charter in 1770. In Apr., 1784, it was reorganized and received a new charter from the State Legislature, which, in response to its petition, ordered that duties should be levied under a specific instead of an *ad valorem* tariff. It has an arbitrator, nominated by the Governor and appointed with the consent of the State Senate. Its membership is 1,000. The Boston Chamber of Commerce was established not many years after that of New York. Similar organizations exist in many other U. S. cities, as also in those of Canada, which are united in a Dominion Board of Trade. In 1850 a chamber of commerce was established in South Australia, and one may be found in nearly every city throughout the globe which has commerce of any importance.

Chambéry, shăăn'bā'ree' (in Ital. *Ciamberi*): a city of France; capital of Savoy; beautifully situated on the river Laisse, in a rich vine-clad valley; about 60 miles E. S. E. of Lyons (see map of France, ref. 6–H). It is on the railway which connects France with Italy and passes through a tunnel near Mont Cenis. It contains an old castle of the Dukes of Savoy, a cathedral, several convents, and a public library. Here are manufactures of clocks, silk gauze, lace, hats, etc. It was formerly subject to the King of the Sardinian states, but was ceded to France in 1860. Pop. (1891) 20,922; (1896) 21,762.

Chambeze River: one of the most important head-streams of the Congo. It rises on the southern slope of the plateau between Lakes Tanganyika and Nyassa, and flows southwest into Lake Bangweolo. Joseph Thomson discovered (1891) that in the dry season Lake Bangweolo shrinks so greatly that the Chambeze does not enter it at all, but flows directly into the Luapula outlet of the lake. In the wet season Bangweolo resumes nearly the dimensions seen on the maps, and the river again flows into it. The river is shallow, and has little commercial importance. Its name is probably the same as that of the Zambesi, and some geographers formerly thought it was the upper course of that river.

C. C. Adams.

Chambliss, William P.: lawyer and soldier; b. in Bedford co., Va., Mar. 20, 1827; served during the war with Mexico as lieutenant, subsequently captain, Third Tennessee Volunteers. At the close of the war he resumed the practice of his profession at Pulaski, Tenn.; was elected member of the State Legislature 1853–54; Mar., 1855, was commissioned in the army a first lieutenant Second Cavalry, and stationed in Texas, where he was mainly engaged till 1861 against the Comanches and other hostile Indians: promoted captain in April, he was transferred to the Fifth Cavalry in Aug., 1861, and became major Fourth Cavalry 1864. He was engaged in the actions of Manassas and Peninsular campaigns of 1862 up to June 27, when, at the battle of Gaines's Mill, after having been wounded six times, he was taken prisoner while leading a cavalry charge, receiving the brevet of lieutenant-colonel. Served at the U. S. Military Academy as instructor of cavalry tactics 1863–64, until sufficiently recovered to return to the field. Resigned from the army Nov., 1867, and became superintendent of a railway and mining company in Canada. Reinstated major and retired Dec. 21, 1886, by act of Congress. D. Feb. 22, 1887. Revised by J. Mercur.

Cham'bly Basin: a beautiful village of Chambly co., province of Quebec, Canada; at the mouth of the Chambly and St. John's Canal; on Richelieu or Sorel river, and Montreal, Portland and Boston Railway; 12 miles E. of Montreal; has an important trade with Lake Champlain; is the seat of Chambly College. It has a large hospital for the sick and poor, under the care of the Sisters of Charity. Pop. about 2,000.

Chambly Canton: a manufacturing village of Chambly co., province of Quebec, Canada; 2 miles above Chambly Basin and 14 miles from Montreal; on the Montreal, Portland and Boston Railway; at the rapids of the Richelieu, which furnishes water-power for extensive lumber and woolen mills, a foundry, etc. Pop. about 1,000.

Chambly, Capture of Fort: in 1775. The fort at Chambly was situated 12 miles below St. John, at the rapids of the Richelieu or Sorel, which forms the outlet of Lake Champlain. Gen. Carleton thought that the fort was safe and could not be reached by the republicans as long as the British held the post above, and he consequently kept only a small garrison there. Gen. Montgomery, however, who was besieging St. John, was informed of the state of affairs by Canadian scouts, and sent Col. Bedel, of New Hampshire, assisted by Majors Brown and Livingston and provided with a sufficient number of troops, to capture the post. The plan for the attack was laid by Canadians who were familiar with the place and all its surroundings. The artillery, whose conveyance to the point where it was needed presented the greatest difficulties, was placed in bateaux and during a dark night taken past the fort at St. John to the head of Chambly rapids, where the guns were mounted and taken to the place of attack. Only a slight resistance was made, after which the garrison surrendered. A large quantity of provisions and military stores was taken, besides the colors of the Seventh Regiment of British regulars. The colors were sent to the Continental Congress as trophies of victory, and, indeed, the capture of the fort hastened the surrender of St. John.

Chambord, shăăn'bōr': a village and royal château of France; department of Loir-et-Cher; 8 miles E. of Blois (see map of France, ref. 4–E). Here is a magnificent château begun by Francis I. in 1526, and finished by Louis XIV. It stands in the midst of a beautiful park 21 miles in circumference, and is built of black stone. It was the residence of Diana of Poitiers, and afterward of King Stanislas of Poland, the father-in-law of Louis XV. After his death it was given to Marshal Saxe by Louis XV., and was presented to Marshal Berthier by Napoleon I. In 1821 it was purchased by subscription for the Duke of Bordeaux, who was styled Count of Chambord. It is built in the Renaissance style, with a great number of towers, turrets, and gables, and has four large round towers, over 60 feet in diameter. Pop. of village 435.

Chambord, Henri Charles Ferdinand Marie Dieudonné d'Artois, Comte de, and Duc de Bordeaux: the last Bourbon prince of the elder line; b. in Paris, Sept. 29, 1820. His father was the Duke of Berri, son of King Charles X., both of whom abdicated in his favor in Aug., 1830. From that date he was recognized by the French legitimists as the heir to the throne, and they styled him Henry V. He married in 1836 a daughter of the Duke of Módena, but they had no children. He passed many years at the castle of Frohsdorf, near Vienna. He claimed the throne by divine right, and avowed his devotion to the antiquated political ideas of which the white flag is the symbol. After the deposition of Napoleon III. (1870) he issued a proclamation to the French people, which was not approved even by the royalists. Personally he was a man of great probity, and by no means destitute of literary and scientific interests. D. in Frohsdorf Castle, Lower Austria, Aug. 24, 1883.

Chambre ardente, shăăn'brăr'dăănt' [Fr., fiery chamber]: an extraordinary court, chiefly held for the trial of heresies, i. e. followers of the Reformed Church; first convened by Francis I. of France in 1535. Its name was given on account of the unusual severity of its sentences, burning alive being one of its most common punishments. Henry II.'s reign was especially distinguished for the cruelties practiced by this court against the Huguenots. The last victim of the Chambre Ardente was one Voisin, executed in 1680, in the reign of Louis XIV., on a charge of sorcery. In 1682 the court was finally dissolved. For its history between 1540 and 1550, see N. Weiss, *La Chambre ardente* (Paris,

1889); for its later history, see F. Ravaisson, *Archives de la Bastille* (Paris, 1866–84, 16 vols.).

Chambre introuvable, shaañ'brăñ'troo'vaăb'l': a sarcastic name given to the French Chamber of Deputies which was elected after the second restoration of Louis XVIII. in July, 1815. The majority of it were fanatical royalists, were hostile to the ministry, and supported an extremely reactionary policy. They showed no inclination to repress the outrages committed in the south of France by mobs of royalists and fanatics, who massacred many Protestants and liberals. This chamber was dissolved in 1816.

Chaminade, Cecile: See the Appendix.

Chamisso, shaă'meĕ'so', Adelbert, von: poet and naturalist; b. at the château of Boncourt, in Champagne, France, Jan. 27, 1781. He removed with his parents to Berlin in 1790: learned the German language (in which all his works are written); served for some years in the Prussian army. In the capacity of naturalist he accompanied an exploring expedition which sailed from Russia in 1814, and circumnavigated the globe. He wrote several works on natural history, but his reputation rests chiefly on his lyrical poems and ballads, which are very popular, and on the highly original tale of *Peter Schlemihl* (1814), translated by William Howitt (1843). D. in Berlin, Aug. 21, 1838. See J. E. Hitzig, *Leben und Briefe von A. von Chamisso* (2 vols., 1839); also K. Fulda, *Chamisso und seine Zeit* (Leipzig, 1881); E. Du Bois Raymond, *A. v. C. als Naturforscher* (Leipzig, 1889).

Chamois (in Ger. *Gemse*): a goat-like antelope (*Rupicapra tragus*) of the mountains of Central and Southern Europe and Western Asia; found especially in the Alps. It is about the size of a large goat, and is remarkable for its great speed,

Chamois.

for its ability to leap enormous chasms, and for its delicate power of scent. It is highly prized as food, and chamois-hunting is a favorite though perilous amusement in Switzerland and the Tyrol. Its summer haunts are in the high Alps, near the snow-line. Its skin furnishes true chamois leather, but the article generally sold under that name is made of sheepskin. The chamois is gregarious, and in the Caucasus, the Taurus, and the Carpathians, flocks of more than a hundred may be seen; but in the Swiss Alps their number has been much reduced.

Chamomile: plant. See Camomile.

Chamouni, shaă'moo'nee', **Valley of**: in the French department of Haute-Savoie: a wonderful valley in the Alps; 15 miles long and ¾ of a mile broad; traversed by a small stream, the Arve; 3,400 feet above the sea. It is entered on the N. E., from Martigny, by the Col de Tête Noire, and at the other end by diligence from Geneva, 53 miles distant, through the valley of the Arve. It is inclosed by Mont Blanc and the Aiguilles Rouges and Mont Breven. The glaciers Mer de Glace and Argentière are the most remarkable in Switzerland. This beautiful vale, now visited by innumerable travelers each summer, was scarcely known until it was explored and described by the Englishmen Pococke and Wyndham in 1740. Many peculiar plants grow in the valley, and furnish a remarkably rich-flavored honey. In 1099 a Benedictine monastery was established at the village of Chamonix or Prieuré. In early times this region was known as *Les Montagnes Maudites*—a name still retained for the roughest part between the Dome of Mont Blanc and the Mer de Glace.

Champagne: a former province in the N. E. part of France: bounded E. by Lorraine, S. by Burgundy. It is drained by the Marne, Seine, Aube, and other rivers and is now mostly comprised in the departments of Marne, Aube, Ardennes, Haute-Marne, and Yonne. The surface is diversified with plains and hills, on which latter is grown the famous Champagne Wine (*q. v.*). In the twelfth century Champagne was independent or governed by native princes. Thibaud, Count of Champagne and King of Navarre, who died in 1253, was the most powerful feudatory of the French king. By the marriage of Philip IV. of France with Joanna, the heiress of the King of Navarre, Champagne was annexed to France about 1285.

Champagne, Philippe, de: b. in Brussels, 1602; d. 1674; painter of religious subjects and landscapes, in the formal manner of the time, with a distinct emulation of the style of the Renaissance and of N. Poussin. He was painter to the queen, worked also for Richelieu, was professor and rector of the French Academy. His work is timid and cold, but he was a ready and fertile designer.

Champagne Wine: a name applied to wines of various kinds, white or red, still or sparkling, which are produced in Champagne. Of these the sparkling and foaming varieties (*vin mousseux* and *demi-mousseux*) are best known. After the vintage-season this wine stands till December, is then racked off, and fined or purged with isinglass; in the following March it is bottled and corked with care, the bottles being placed with the corks downward, so that the sediment may be drawn off. When this has been removed, some brandy and sugar are introduced, and the bottles are recorked. While this process is going on the breakage of bottles is often very great, and buyers estimate the value of the wines partly by the breakage—the best wines breaking the most bottles.

Even in France, but still more in other countries, a very large part of the so-called champagne wine is factitious, being made of cider, light Rhenish and other cheap wines, and other substances. Happily, in most cases these preparations are quite as harmless, and often quite as palatable, as the genuine product of the Champagne vineyards: for some of the imitations are nearly perfect representatives of the appearance, taste, and bouquet of the original article.

Champagne wine is prized in medicine as a restorative in certain low conditions, especially when the stomach is very irritable and will hardly tolerate any other stimulant, the carbonic acid present acting as a sedative to that organ.

Champagny, shaăm'paăn'yee', Jean Baptiste Vompère, de, Duke of Cadore: b. at Roanne, Aug. 4, 1756; d. in Paris, July 3, 1834. Educated in the Military Academy of Paris: entered the navy in 1780; was present in five battles. Elected a member of the States-General, the National Assembly, and the Constituent Assembly, he did good work whenever the navy was concerned. In 1793 he was imprisoned, and not released until the overthrow of Robespierre. Napoleon was eager to secure his services, and sent him in 1801 as ambassador to Vienna. In 1804 he was Minister of the Interior, and in 1807 Minister of Foreign Affairs, which latter position he resigned in 1811. After the restoration of the Bourbons he lived in retirement.

Champaign: city of Champaign co., Ill. (for location of county, see map of Illinois, ref. 6–F); on Ill. Cent., Clev., Cin., C. and St. L., and Wabash R. Rs.; 128 miles S. S. W. of Chicago and 83 miles N. E. of Springfield. It is favorably situated in the midst of a fertile agricultural district; has an excellent system of water-works, paved and tree-lined streets; is lighted by electricity and gas. An electric street railway threads the city and connects it with Urbana, the county-seat. The University of Illinois is located here. The city is well supplied with fine public and private school-buildings and churches, and contains numerous manufactories, chief among which are hemp, binder-twine, and merchant-twines. A beautiful park of 10 acres lies in the center

of the residence section, and there are large parks in other parts of the city. Pop. (1880) 5,103; (1890) 5,839; (1900) 9,098. W. H. MUNHALL, MANAGER OF "GAZETTE."

Cham'pak, or **Chum'pac** (*Michelia champaca*): an East Indian tree of the magnolia family, remarkable for the beauty of its flowers and foliage. The flowers are of a pale yellow tint, and have a sweet, oppressive perfume, much celebrated in Oriental poetry, and alluded to in the writings of Shelley. This tree is venerated by the Brahmans and Bûddhists.

Champaran': a district in the province of Behar; under the authority of the lieutenant-governor of Bengal: bounded N. by the independent state of Nepaul, E. by the district of Tirkut, S. by the district of Saran, and W. by the Oudh district of Gorakhpur. Area, 3,531 sq. miles: pop. 1,440,815. The surface forms one vast level, with the exception of the northwestern corner, where the ground rises and begins to undulate as it approaches the mountains of Nepaul. The land is excellently cultivated, and produces large crops of rice, corn, barley, sugar, opium, indigo, etc. Gold is found, washed down by the rivers.

Champ de Mars, shaăn'de-maar': a large oblong park or public square in Paris, between the Seine and the Military School; is 3,279 feet long by 1,611 feet in width. It is devoted to military exercises and public gatherings. Its name has a double reference to the *Campus Martius* of ancient Rome and other Italian cities, and to the old Frankish field-meetings, for legislative and other purposes, held annually in March or May, and historically known as *Champs de Mars* or *de Mai*. Furnishing as it does a large open space suitable for great gatherings, it has played no small part in the history of Paris. During the first revolution it was the scene of several important events, among them the celebration of the capture of the Bastile, the festival of the Supreme Being, etc. The buildings of the four great International Expositions of 1867, 1878, 1889, and 1900 were wholly or mainly located here. Revised by C. H. THURBER.

Champeaux, WILLIAM OF: See GUILLAUME DE CHAMPEAUX.

Champe'rico: a port of Guatemala, department of Retalhuleu: on the Pacific Ocean; 25 miles from Retalhuleu, with which it is connected by railroad. It has a good roadstead, but no harbor. Pop. about 2,000. H. H. S.

Cham'perty [deriv. of *champart* = Fr. *champart*, the portion of the produce received by a feudal lord < Lat. *campi pars*, liter., the portion of the field]: an agreement between a party to a suit and a third person that the latter shall carry on the proceeding at his own expense, the subject-matter of the suit to be divided between the parties to the contract in case of a successful result. It is a species of maintenance, and an indictable offense at common law. The offense is not confined to attorneys, but may be committed by laymen. In the U. S., the doctrine of the common law on this subject has not been received with much favor, and in some of the States, where it has been recognized by the courts, it has been abrogated by statutes, making it legal for a party to make such agreement with his attorney as seems to him to be for his interest. No one has been punished criminally for champerty within the memory of men now living. No action could be maintained to recover on a champertous agreement, although it seems to be generally thought that the making of such an agreement is no defense to the original action. HENRY WADE ROGERS.

Champfleury, shaăn'flö'ree' (pseudonym of JULES FRANÇOIS FÉLIX HUSSON FLEURY): a French story-teller and *littérateur*; one of the founders of so-called *realism*: b. at Laon, Sept. 10, 1821. Going early to Paris, he entered literature by the way of journalism, and for many years he continued to produce stories, reviews, bits of literary reminiscence, art criticisms, and all the other baggage of the Parisian writer. His first literary success was *Chien-Caillou* (1847), the story of the life of the aquafortist Rodolphe Bresdin. Among his collections of stories are worth mentioning *Contes vieux et nouveaux* (1853); *Contes d'été* (1853); *Contes d'automne* (1854). Perhaps his most noted book was *Les Bourgeois de Molinchart* (1855), a satirical realistic picture of French provincial life. Among his more or less serious critical studies are *Grandes figures d'hier et d'aujourd'hui* (1861); *Souvenirs et Portraits de jeunesse* (1872); *Documents pour servir à la biographie de Balzac* (1875–78). After 1872 Champfleury had charge of the collections of the porcelain-manufactory at Sèvres, and wrote several books upon the history of pottery. Most important of these was *Bibliographie céramique: nomenclature analytique de toutes les publications faites en Europe et en Orient sur les arts et l'industrie céramique, depuis le XVI^e^ Siècle jusqu'à nos jours* (1881). D. Nov. 6, 1889. A. R. MARSH.

Champigny, shaăn'peĕn'yee': a village near Paris, France; on the Marne: was on Nov. 30 and Dec. 2, 1870, the scene of protracted and bloody encounters between the French troops under Ducrot and the Germans. On Dec. 3 the French recrossed the Marne.

Champion [O. Fr. *champiun*: Span. *campion*: Ital. *campione*, from Germ.; cf. O. H. Germ. *chemphio*, a deriv. of *champf* > Mod. Germ. *Kampf*. Association with *campus*, field, undoubtedly assisted the introduction of these words into Romance]: a person in the Middle Ages, and even in more recent times, who appeared and took part in judicial combats as the hired representative of women, children, feeble persons, and other non-combatants, or acted as an official at a tournament or ceremony. The practice was of very ancient origin, but the occupation of the professional champion came to be looked upon as very disreputable. In the more romantic periods of chivalry, however, knights and gentlemen might contend, especially with those of their own rank, in behalf of injured ladies and children, and were called champions. The crown of England since the time of William the Conqueror has had a champion at coronations—a mounted official fully armed, who, by throwing down his glove, challenges all who refuse to recognize the king as the true sovereign. The championship has been hereditary in the family of Dymoke since the time of Henry IV. This function was carried out for the last time at the coronation of George IV.

Champion Hills: Hinds co., Miss.; about midway between Jackson and Vicksburg: the scene of a desperate struggle, May 16, 1863. The forces under Gen. Grant were marching from Jackson, Miss., toward Vicksburg, when they were met at this point by a Confederate force under Gen. Pemberton. A desperate battle of five hours' duration ensued, the Confederates being forced to retire to the Big Black river. The Confederate loss was heavy in men and artillery. The battle was mainly fought on the side of the U. S. forces by Hovey's division of McClernand's and Logan's and Crocker's division of McPherson's corps, which suffered heavily in killed and wounded. This battle is also known as that of Baker's Creek.

Champlain, shăm-playn': a county and town of Quebec, Canada. The county has a width of about 20 miles on the St. Lawrence river, and extends northwestward in a long strip to the limits of the province. Area, 9,150 sq. miles. Pop. about 30,000. Chief town, Batiscan. The town of Champlain, in the same county, is a station on the Canadian Pacific Ry., 7 miles S. W. of Batiscan and 65 miles S. E. of Montreal. Pop. 2,000.

Champlain: Clinton co., N. Y. (for location of county, see map of New York, ref. 1–J); on Ogdensburg and Lake Champlain (Central Vermont) R. R., and on the Chazy river; about 20 miles N. of Plattsburg. It has manufactures of iron, etc. Pop. (1880) 1,509; (1890) 1,275; (1900) 1,311.

Champlain, SAMUEL, de: geographer and hydrographer; founder of Quebec and governor of New France; b. in Brouage, in France, about 1570; d. in Quebec, Dec. 25, 1635. Having taken an active part in the wars of the League on the side of Henry IV., he received a pension from that monarch, and in 1599 he commanded a vessel in the Spanish fleet sailing for Mexico. On his return to France, Gov. de Chaste, of Dieppe, who had obtained letters-patent from the king for the continuation of the discoveries of Jacques Cartier and the establishment of colonies in New France, offered him an opportunity to take part in the expedition of Pont-Grave. He accepted the offer, left Honfleur Mar. 5, 1603, entered the St. Lawrence in May, and published a description of the voyage, accompanied with maps, after his return to France. He afterward made several expeditions to Canada, of which the third one (1608–10) especially is noteworthy on account of the foundation of Quebec, the defeat of the Iroquois, and the discovery of Lake Champlain. In 1612 he was appointed lieutenant-governor under the Prince of Condé, who bore the title of viceroy, and in 1620 he began the fortification of Quebec. In 1628 the city was, nevertheless, taken by the English, Champlain was captured, taken as prisoner to England, and released when by the treaty of peace in 1632 Canada was re-

stored to France. In the same year he published his *Voyages à la Nouvelle France*. In 1633 he was reinstated as governor, sailed from Dieppe, fortified Richelieu island, founded Three Rivers and a college for Indians in Quebec. A complete edition of his works, with fac-similes of his maps, appeared at Quebec in 1870, edited by Laverdier and Casgrain.

Champlain Epoch: in geology, a term applied to the events which in Northeastern North America closed the Pleistocene period. During this epoch the ice finally retreated from the Northern U. S. and Canada, and the local geography underwent great changes by reason of the elevation and subsidence of the land. At the beginning of the epoch the glaciated district was in general lower than now, the depression being greatest toward the N. and N. E. During the melting of the ice a series of lakes was contained between the ice-front and the upland constituting the southern boundary of the Laurentian basin. As the ice withdrew from the St. Lawrence valley it was replaced by the sea, which extended westward at least to Ogdensburg and southward over the basin of Lake Champlain. The land then rose to a position somewhat higher than the present, and was afterward depressed. The later part of the Champlain epoch is sometimes called the Terrace epoch. See Agassiz, Lake; Geology, Historic; and Pleistocene Period. G. K. G.

Champlain, Lake: forms part of the boundary between New York and Vermont; extends from Whitehall, N. Y., northward to Canada. It is about 125 miles long, and is narrow in proportion to its length. The southern half averages less than 2 miles wide, and in many places is less than a mile. In the northern part, where large islands occur in it, the width is 10 miles or more. The greatest depth is about 280 feet. The water of this lake is discharged by the Sorel or Richelieu river, which issues from its northern extremity. The chief towns on its shores are Burlington and Plattsburg. Occupying a basin between the Adirondack and Green Mountains, this lake is remarkable for its beautiful and picturesque scenery. A naval battle was fought on Lake Champlain between Gen. Arnold and the British Oct. 13, 1776, in which the latter had the advantage. Sept. 11, 1814, Com. McDonough gained an important victory over the British fleet near Plattsburg. This lake is connected with the Hudson river by the Champlain Canal.

Champ'lin, James Tift, D. D.: b. in Colchester, Conn., June 9, 1811: valedictorian of the class of 1834 Brown University, where he was tutor 1835–38. From 1838 to 1841 pastor of Baptist church, Portland, Me.; from 1841 to 1857 Professor of Ancient Languages in Waterville College (now Colby University); from 1857 to 1872 president of that institution. During his connection with the college (which contributed greatly to its prosperity) Dr. Champlin published editions of *Demosthenes on the Crown* (Boston, 1843); *Demosthenes's Select Orations* (1848); *Æschines on the Crown* (Cambridgeport, Mass., 1850); *A Text-book on Intellectual Philosophy* (Boston, 1860); *First Principles of Ethics* (1861); *A Text-book of Political Economy* (New York, 1868); *Constitution of the United States, with Brief Comments* (Boston, 1880); besides other works. D. in Portland, Me., Mar. 15, 1882.

Champlin, John Denison: author; b. in Stonington, Conn., Jan. 29, 1834; graduated at Yale 1856; admitted to the bar 1859; after practicing law for a short time in New York and New Orleans, took up literary work in 1862; became associate editor of the Bridgeport, Conn., *Standard* 1864; published *The Sentinel* in Litchfield 1865–69; edited *Fox's Mission to Russia* (New York, 1873); associate editor of the *American Cyclopædia* 1875. Author of *Young Folks' Cyclopædia of Common Things* (New York, 1879); *Young Folks' Catechism of Common Things* (1880); *Young Folks' Cyclopædia of Persons and Places* (1880); *Young Folks' Astronomy* (1881); *Young Folks' History of the War for the Union* (1881); *Chronicle of the Coach*, a description of a coaching-trip with Andrew Carnegie through Southern England in 1884 (1886); editor of Scribner's *Cyclopædia of Painters and Paintings* (4 vols., 1887), and *Cyclopædia of Music and Musicians* (3 vols., 1890).

Champ'ney, James Wells: genre and portrait painter; b. in Boston, July 16, 1843; pupil of the Antwerp Academy and of Edouard Frère, at Ecouen, France; associate National Academy, New York; member American Water-color Society. He paints portraits in pastel very skillfully, and genre pictures usually depicting scenes of country life in the U. S. Studios in New York and Deerfield, Mass.

William A. Coffin.

Champollion (Fr. pron. shaăn'pol'li-ōn), Jean François: linguist and Egyptologist; b. at Figeac, Lot, France, Dec. 23, 1790. He studied several Oriental languages in Paris; became in 1809 Professor of History in the Academy of Grenoble. In 1814 he published a *Geographical Description of Egypt under the Pharaohs*. From the inscriptions on the Rosetta stone he obtained a key to the mysterious symbols and hieroglyphics of ancient Egypt. His reputation is founded chiefly on this important discovery, which he announced to the Academy of Inscriptions in 1822. In 1824 he published a *Summary of the Hieroglyphic System of the Ancient Egyptians*, in which he proves that the phonetic alphabet is the key to the whole hieroglyphic system. In 1828 he visited Egypt, the monuments of which he explored in company with Rosellini. Having spent sixteen months in Egypt, he returned to France, and was admitted into the Institute in 1830. A chair of Egyptian antiquities was founded for him in the College of France. D. in Paris, Mar. 4, 1832. Among his chief works (published after his death by his brother, Jean Jacques) are an *Egyptian Grammar* (1836–41) and an *Egyptian Dictionary* (1842–44). The results of the researches of Champollion and Rosellini in Egypt appeared in a great work entitled *Monuments of Egypt and Nubia Considered in Relation to History, Religion, etc.* (4 vols., 1835–45). Bunsen expressed the opinion that the greatest discovery of the nineteenth century was that of the key to Egyptian hieroglyphics. See Silvestre de Sacy, *Notice sur Champollion* (1833); Rosellini, *Tributo di Riconoseenza alla Memoria di G. F. Champollion* (1832); and Aimé Champollion-Figeac, *Les deux Champollion, leur vie, leurs œuvres et leur correspondance archéologique relative au Dauphiné et à l'Égypte* (Grenoble, 1888). See Egypt, Ancient, and Egyptology.

Champollion-Figeac, -fee'zhaăk', Jean Jacques: antiquary; brother of the preceding; b. at Figeac, Oct. 5, 1778. He published, besides other works, *Chronicles of the Greek Kings of Egypt* (1819); *Treatise on Archæology* (1843); and, with his son Aimé, *Palæographic Documents Relating to the History of Fine Arts and Belles-Lettres in the Middle Ages* (1868). He became in 1849 librarian at Fontainebleau under Louis Napoleon; edited some posthumous works of his brother. D. May 9, 1867.

Chan'ca, Dr. (probably Dr. Diego Alvarez Chanca, author of a mathematical work): a physician, native of Seville, who accompanied Columbus in his second voyage of 1493, and wrote an account of it in a letter to the Cathedral Chapter of Seville. This letter, first published in Navarrete's collection, is the best historical authority on the voyage and the early days of the Hispaniola colony. H. H. S.

Chancel [O. Fr. *chancel*: Ital. *cancello* < Lat. *cancellus*; in plur. *cancelli*, grating, screen, hence sing., a space behind a grating; *cancelli* is dimin. of *cancer*, crab, in sense crab's claws]: the part of a church which contains the choir and sanctuary, the latter term being used to denote that portion of the chancel where the altar or communion-table is placed. It is the portion of a church occupied by the choristers and clergy, and is usually separated from the nave by a screen of lattice-work. The chancel of Gothic churches corresponds in position to the apsis of the ancient basilicas. In England the term chancel is usually confined to the space occupied by the officiating clergy and the vested choirs in parish churches which have no aisles or chapels around the choir. It is a noteworthy difference between Eastern and Western Churches that in the former the distinction between the bema (or sanctuary) and the choir is much more strongly marked than that between the choir and the nave, while in the latter the distinction between the nave and the choir is much more strongly marked than that between the choir and the sanctuary.

Chancellor [O. Fr. *chancelier*: Ital. *cancelliere* < Lat. *cancellarius*, deriv. of *cancelli*, screen, fence]: a law officer known to the polity of several countries. Originally, under the Roman emperors, he was an usher or official who prevented petitioners from crowding behind the railing or screen which inclosed the judgment-seat, and naturally in course of time he came to act as a "go-between," also serving as scribe. His duties gradually increased in importance until he became the virtual arbiter of suits and the counselor of courts and administrators of power—a conscience-

keeper to magistrates and a director of disputes. In the East he became a powerful officer. In the disruption of the empire and the rise of feudal courts he grew to be the first officer of the suzerain, helped on by the baronial appeals made from fendatories to lords. Yet in the more peaceful conditions of the East the cancellarius rose to the highest influence. The development of the idea in the West is here followed chronologically.

(1) *Ecclesiastical.*—(*a*) As imperial functions failed, the Church, the only permanent organization with precedents and rules, fell heir to the Roman customs. The papacy set up a chancery, and in early days it was soon followed by the bishops. Two auxiliary forms succeeded—monastic and educational, with jurisdictions separate from that of the secular clergy. The great monastic orders, with their independent jurisdictions, came to have chancellors, whose functions were of the highest administrative importance. Ancient universities, generally of monastic origin, followed the same course. In modern English usage, until ecclesiastical courts were abolished, a diocesan or provincial chancellor was a layman learned in the law to whom was referred all litigation left to the canon law. A bishop might be compelled to appoint a chancellor, but there was no appeal from the chancellor to the bishop. The dean of the Court of Arches, a tribunal now extinct, was judge of the appellate court of the province of Canterbury, which formerly reviewed for decisions from the king in chancery. The title is still accorded to the canonical adviser of a bishop, a diocese, or to the seal-keeper and secretary of a cathedral.

(*b*) English university chancellors are of ecclesiastical origin. No one could preach without authorization from the bishop. The early purpose of the university was to train men for the service of the Church. As degrees conferred preaching functions, and as these must come from the diocesan, his notary or chancellor became the medium through which degrees were allowed. From this circumstance grew his general supremacy in the university. In time the office became purely titular, and now at Oxford, Cambridge, Dublin, Edinburgh, Glasgow, and the other universities, the office is held by some eminent peer or statesman. The real duties of the place are discharged by a vice-chancellor in these institutions. In the U. S. many executive chiefs of universities are called chancellors simply by adaptation from precedent. Usually they are both deans of the faculties and presidents of the boards of trustees.

(2) *Political.—Continental Europe.*—The empire of Charlemagne gave precedents to the kingdoms which succeeded it. In France the chancellor became the minister of justice and head of the law administration, and thus charged with the great seal and the duty of presiding over the king's councils. In 1790 this potent office was abolished; Napoleon I. revived it, but in 1848 it was finally given up and its duties merged in the functions of the minister of justice. In Germany the title was revived and given to Bismarck as the chief administrative officer of the new German empire. The German chancellor is president of the imperial secretaries, who convene and act under his direction.

Great Britain.—Originally the chancellor was an adviser of the crown who received his precedents from the canon law and the civilians, and little by little became arbiter between common law and equity cases. Hence the chancery jurisdiction of equity cases grew up.

The Lord High Chancellor is an officer with diversely separable functions. In rank he is the highest civil officer of the crown, and takes precedence after the Archbishop of Canterbury, in sequence to the royal family. He is invariably raised to the peerage. By prescription he is keeper of the great seal, *ex-officio* privy-councilor, member of the cabinet, prolocutor, Speaker or chairman of the House of Lords, and on appeals presides over the court of last resort. The writs for a convocation of Parliament go in his name. He is keeper of the king's conscience, visitor of crown charitable foundations, and president of the chancery division of the High Court of Justice. His patronage is large, his salary £10,000 a year, and he falls with the ministry that appointed him, but then enters the peerage with an annuity of £5,000. His title is "Lord High Chancellor of Great Britain and Ireland." There are lord chancellors of Scotland and Ireland, from the development of whose offices the equity systems of those countries arose.

Chancellor of the Exchequer points to an ancient division between Government revenue cases and law cases. It was his business to adjudicate the revenues of the crown and keep them from detriment. In modern usage he is the head of the treasury department of the United Kingdom, and a cabinet minister. The Premier may take the office if he likes, with its income of £5,000 a year.

Chancellor of the Duchy of Lancaster.—Henry V. made the revenues of the palatine duchy of Lancaster crown perquisites. Formerly this officer was in charge of the Exchequer Court of the duchy, and had jurisdiction between the king and his tenants. It is now a sinecure office which usually carries with it a seat in the cabinet.

United States.—The title chancellor is of post-revolutionary custom. It was originally used to distinguish between control of equity and law jurisdictions, or chancery and law courts. The title has been disused in New York since 1849, when law judges were given equity jurisdiction. The name and courts still exist in Delaware and New Jersey, while there are elective district chancellors in Alabama, Mississippi, and Tennessee.

Miscellaneous.—The title chancellor is further used to designate the foreman of a Scotch jury, the chief officer of a palace, the secretary of an embassy or consulate, the chief administrative officer of an honorable or military order, e. g. Chancellor of the Order of the Garter, or the equivalent of dean in other orders; and it is even applied to Ezra as, in his day, master of decrees.

Chancellor, Charles Williams: physician; b. in Virginia, Feb. 19, 1833; educated at Georgetown College, D. C., and at the University of Virginia; in 1853 graduated at Jefferson Medical College, Philadelphia; he practiced medicine at Alexandria, Va., till 1861. During the civil war he was medical director on Maj.-Gen. Pickett's staff. He then practiced medicine in Memphis, Tenn., till 1868; was then elected Professor of Anatomy in the Washington University of Maryland; in 1869 was made dean of the faculty; in 1870 was transferred to the chair of Surgery; and in 1873 he severed his active connection with the school, retiring from general practice. He was commissioner of public schools in Baltimore two years; a member of the city council five years, two of which he was president of the board of aldermen; in 1876 was elected secretary of the State board of health; and in 1877 president of Maryland Insane Asylum. In 1876 he made an able report on the prisons, reformatories, and charitable institutions of Maryland, which attracted much attention; has published also *Contagious and Infectious Diseases* (Baltimore, 1878); *Mineral Waters and Seaside Resorts* (1883); *Heredity* (1886); *Sewerage of Cities* (1886); and numerous other monographs and papers on medical and sanitary subjects.

Chancellorsville: a small village of Spottsylvania co., Va.; near the Rappahannock river; about 65 miles N. by W. from Richmond (for location of county, see map of Virginia, ref. 5–H).

On assuming command of the Army of the Potomac, Jan., 1863, Gen. Hooker found it in a weakened and despondent condition; its numerical force had been greatly decreased by sickness and desertions, which latter were still frequent. On the contrary, the recent successes of the Confederates had inspired them with boldness and enthusiasm. Hooker devoted the remaining winter months to repairing the demoralized condition of his army, and gathering back those away from duty; his efforts were so far successful that by April he had not only restored confidence, but by additions found himself in command of a well-equipped army of upward of 132,000 men, composed of about 120,000 infantry and artillery, and the remainder cavalry, encamped around Falmouth, Va. The Confederate army under Lee, still encamped on the opposite bank of the Rappahannock, held a line running N. W. to S. E., its right wing extending to Port Royal on the Rappahannock, its left wing resting about 2 miles above Fredericksburg on the same river; thus affording lines of retreat to Richmond and Gordonsville. Its strength was probably upward of 60,000 men.

Everything being in readiness, Hooker decided to move at once upon Lee. The larger portion of the cavalry was placed under Gen. Stoneman, and (Apr. 13) dispatched in advance of the main army for the purpose of destroying the Confederate communications and harassing the retreat which it was deemed must result from the contemplated advance. Owing to frequent rains, which swelled the rivers, Stoneman did not get fairly away until the 29th, the general movement beginning on the 28th.

Gen. Hooker's plan of attack was as follows: His army was divided into seven corps—of these three were to be massed about 2 miles below Fredericksburg, to cross there

and make a bold feint, two of the corps to immediately return and join Hooker; in the meanwhile the remaining four corps were to cross above Fredericksburg.

This plan was successfully executed. The First Corps (Reynolds), Third (Sickles), and Sixth (Sedgwick), all under command of Sedgwick, were moved on the 28th to the position assigned them, and on the 29th one division of the Sixth crossed the river about 2 miles below Fredericksburg, and drove in the pickets, a division of the First crossing about 2 miles lower down, the other divisions with the Third Corps remaining on the north bank in plain view of Lee's army, whose columns were soon seen coming up from Port Royal. On the 30th Sickles silently withdrew his corps and proceeded to join Hooker. In the meanwhile the crossing of the Rappahannock above had been going on: the Eleventh Corps crossed first (28th), followed by the Twelfth, then the Fifth (29th); this column moved along, crossed the Rapidan at Germanna and Ely's Ford; both columns then advancing toward Chancellorsville, at the junction of the Gordonsville turnpike with the Culpeper and Orange C. H. plank road. By the evening of the 30th the Second Corps (two divisions) had crossed and were massed at the same point, and Gen. Hooker had arrived and taken up his headquarters at Chancellorsville. Lee, though thus far outgeneraled, appears to have been undismayed, and, quickly realizing the movement below to be a feint, concentrated his army in front of Hooker, leaving but a small force in his works on the Fredericksburg heights.

Reconnoissances having been made by Hooker on Friday morning (May 1) toward Fredericksburg without opposition, an advance of the Fifth and Twelfth Corps was ordered to be made on two roads leading toward Fredericksburg, which was soon met by the Confederates: a favorable position had been secured, however, when orders were received from Gen. Hooker to fall back to the inferior one of the night before. The right of Hooker's army was held by Howard (Eleventh Corps), then a division of Sickles (Third Corps), who had now arrived from below, then Slocum (Twelfth Corps), Couch (Second Corps), with Meade (Fifth Corps) on the left. The other divisions were held in reserve.

Early in the morning of the 2d a movement of Confederates was observed along Sickles's front and in direction of the Union right, which being continued, Birney (in command first division Third Corps) reported to Sickles, who was ordered to make a reconnoissance in force and ascertain the nature of the movement, which being promptly executed struck the rear of the advancing column, capturing many prisoners, from whom the intelligence was gained that the movement was under command of Stonewall Jackson. Up to this time the movement had been interpreted as a retreat, but in anticipation of its purpose being a flank attack, Howard had been notified of the fact, and ordered to be on the alert. Sickles now obtained permission to move in force upon the flank of the advancing column, and being re-enforced by a brigade from the Twelfth and one from the Eleventh Corps, together with 1,000 cavalry and a horse-battery under Pleasonton, had completed his preparations, when informed that Jackson had struck his blow and was in his rear. Although not entirely unanticipated, it was believed the attack on the right would be resisted; but, being surprised, Devens's division gave way, followed by that of Schurz, and though Buschbeck's brigade gallantly resisted it was finally compelled to fall back, and the woods now swarmed with fugitive corps, closely pursued by the victorious Confederates. The position of Sickles was critical; but fortunately at this moment Pleasonton, returning from the front with about 500 cavalry, met the advancing Confederates; the Eighth Pennsylvania Cavalry charged vigorously into the woods, while Pleasonton got his own battery and such other guns as he could stop, twenty-two in all, into position, double-shotted them, and aiming low was just in time to receive the enemy, who, having overcome the slender opposition of the cavalry, now rushed furiously and repeatedly right up to the guns, but were each time repelled with great loss; and the farther advance in this direction was finally stayed. Meantime, Berry's division (Third Corps), with Hays's brigade (Second Corps), and the artillery under Capt. Best, though unable to check the flying troops of the Eleventh Corps, had, after a severe contest, checked the advance in front. It was during this attack that Stonewall Jackson was mortally wounded—at the hands of his own men, it is said—the greatest loss the South had yet been called upon to bear.

During the day Lee kept up a vigorous attack in front of Hooker, especially along Hancock's line, but was always handsomely repulsed by the troops in the advanced line of rifle-pits. During the night Hooker contracted and reformed his lines. The First Corps (Reynolds) arrived during the evening, and was posted on the right with Meade; the Eleventh Corps, which had been reorganized, was placed in the intrenchments on the left.

At daylight of the 3d the attack was renewed, the Confederates opening a musketry fire along the whole line; but the great effort was in the same direction as the day before, the possession of the plank road to Chancellorsville; and here they met the same troops which had sustained and repelled their assaults of the day before. Berry's and Birney's divisions (Third Corps), supported by Whipple's (Third) and Williams's (Twelfth Corps), supported the artillery of Sickles, against which the Confederates threw themselves again and again, only to be cut down and hurled back, until Sickles, for want of ammunition, was compelled to retire to a second line. Sickles had before retiring sent for assistance to enable him to hold his position; but Hooker, who had been stunned by a ball which struck a pillar against which he was leaning, was in a dazed condition, and his appeal was unanswered. French and Hancock, of the Second Corps, had done gallant work in charging and driving back the Confederate left; but Sickles was not reenforced; yet though his ammunition was exhausted he continued to maintain his position, repelling successive charges at the point of the bayonet till he was again compelled to retire, and the whole line was now withdrawn a mile back from Chancellorsville, which position was strongly fortified.

Sedgwick meanwhile (May 2) had received orders to cross the Rappahannock and advance on Chancellorsville until he should come up with the rear of Lee's army, which he was to attack simultaneously with Hooker's attack on the front. This order was not received by Sedgwick till nearly midnight, but he soon had his corps in motion, and by noon of the 3d had stormed and carried Cemetery and Marye heights, and after reforming his command moved on the road to Chancellorsville; but he was soon met by the force he had driven from the heights, re-enforced by a portion of the army of Lee, who being now disengaged from Hooker turned to check Sedgwick's advance; severe fighting continued till dark, Sedgwick being unable to force the Confederates from the strong position they had taken; the chance of joining Hooker was now small, and the next day made it impossible, for the army of Lee now concentrated against him in large numbers. During the night of the 4th and 5th he crossed the river at Bank's ford, having rescued his corps from its critical position by desperate fighting but with fearful loss.

On the 5th Hooker recrossed his whole army over the Rappahannock without opposition, and the terrible struggle was ended. The losses on the Union side, 18,000; Confederate, 13,000.

Stoneman returned on the 8th, having been nine days in the rear of Lee's army, and having advanced to within 2 miles of Richmond, but his operations conferred no benefit on the Federal army. Revised by JAS. MERCUR.

Chance-medley: in law, the killing of a person in self-defense upon a sudden and unpremeditated encounter or a casual affray.

Chancery, Court of: See COURTS.

Chancre: See SYPHILIS.

Chan'da: a district (and town) of Nagpur, Central Provinces, British India; between the parallels 19° 7′ and 20° 51′ N., and the meridians 78° 51′ and 80° 51′ E. Area, 10,785 sq. miles. It is in part hilly, in part a table-land 2,000 feet above the sea, densely wooded and but little cultivated. Iron and coal are important productions. Pop. about 700,000, chiefly Hindus. The town of Chanda, lat. 20° N. (see map of South India, ref. 3–E), has a population of 17,000, and is connected by a branch line with the Bombay railway system.

Chandeleur (shăn-de-loor′) **Islands**: a range of low islands in the Gulf of Mexico; off the east coast of St. Bernard's parish, La.; separating Chandeleur Sound from the Gulf. The sound has also numerous small islands. At the north end of the northernmost island stands Chandeleur lighthouse, in lat. 30° 3′ 8″ N., lon. 88° 51′ 38″ W. It is built of brick, and is 56 feet high, with a fixed white light.

Chandernagar, shaăn-der-naă-gaar′: a town in India belonging to France; on the river Hugli; about 22 miles above Calcutta (see map of North India, ref. 8–I). It was founded by the French in 1673, and had a considerable trade. It was taken by Lord Clive in 1757, and restored to the French in 1816. Pop. (1895) 24,059.

Chan'dler, Prof. Charles Frederick, M. D., LL. D.: b. in Lancaster, Mass., Dec. 6, 1836; educated at the Lawrence Scientific School of Harvard College, at Göttingen, and Berlin; received the degree of doctor of philosophy in Göttingen in 1856. In 1857 he took charge of the chemical department of Union College at Schenectady, N. Y.; in 1864 was appointed Professor of Analytical and Applied Chemistry in the School of Mines of Columbia College, which position he still holds. In 1858 he was appointed to the chair of Chemistry in the New York College of Pharmacy; in 1872 to a portion of the duties of the chair of Chemistry; and in 1876 to the full chair of Chemistry and Medical Jurisprudence in the College of Physicians and Surgeons. In 1865 he became chemist to the Metropolitan Board of Health, which position he retained till 1873, when he was appointed president of the board. In the same year he received the degrees of M. D. from the University of New York and LL. D. from Union College. In 1869 he was elected a member of the Chemical Society of Berlin; in 1871 of London; in 1872 of Paris; in 1874 of the National Academy of Sciences; has been chairman of the sanitary committee of the New York State Board of Health. In 1870 he established, with his brother, Prof. W. H. Chandler, of Lehigh University of Bethlehem, Pa., the *American Chemist*, a monthly journal devoted to chemical science. Though chiefly employed in instruction, he has published a number of papers on chemical subjects, among which are *The Inaugural Dissertation* (Göttingen, 1856), containing miscellaneous chemical researches: *Report on Waters for Locomotives and Boiler Incrustations* (1865); *Examinations of Various Rocks and Minerals*, published in the geological reports of Iowa and Wisconsin; *Investigations on Numerous Mineral Waters of Saratoga, Ballston, Chittenango*, etc., and of various waters designed for the supply of cities, as well as papers on the purification of coal-gas, on petroleum, milk, sorghum, and glucose. Most of these papers have appeared in the *American Chemist* and in the annual reports of the health department of New York.

Chandler, John: b. in Epping, N. H., in 1760. He was the son of parents in the most humble circumstances, and although apprenticed to learn the trade of a blacksmith he became afterward, by his own industry and perseverance, very wealthy. On the outbreak of war with Great Britain in 1812, he was commissioned a brigadier-general by the President, being at that time a major-general of militia. Settled in Maine; represented his district in Congress (1805–08); was U. S. Senator from Maine (1820–29); U. S. collector of Portland district, Maine (1829–37). D. in Augusta, Me., Sept. 25, 1841.

Chandler, Ralph: rear-admiral U. S. navy; b. in New York, Aug., 23, 1829; entered the navy as a midshipman, Sept. 27, 1845; served on the west coast of Mexico during the Mexican war, and participated in several slight engagements with the enemy near Mazatlan; in sloop of war Vandalia at battle of Port Royal, Nov. 7, 1861; commanded steamer Maumee in both attacks on Fort Fisher; recommended for promotion by Rear-Admiral Porter; commanded U. S. S. Swatara to the southern seas in 1874 to observe the transit of Venus; became rear-admiral in 1886. D. in Hongkong, China, Feb. 11, 1889.

Chandler, Seth C.: astronomer; b. in Boston, Mass., Sept. 16, 1845; as a volunteer at the observatory of Harvard College invented and used the instrument which he called the almucantar; has since devoted himself principally to the subject of the variable stars, of which he has prepared a catalogue, now the standard. In 1891–93 he made a series of investigations, showing the variation of terrestrial latitudes. His investigations on Brooks's comet, 1889, showed that it was probably identical with the celebrated comet of Lexell seen in 1770. Simon Newcomb.

Chandler, William E.: b. in Concord, N. H., Dec. 28, 1835; graduated at Harvard Law School in 1855; member of New Hampshire Legislature 1862–64; was first solicitor and judge-advocate-general of Navy Department 1865; first assistant Secretary of the Treasury 1866–67; chairman of Republican State Committee of New Hampshire 1863–65; secretary National Republican Committee 1868 and 1872; member of Republican National Convention in 1880; Secretary of the Navy Apr. 12, 1882, to Mar. 5, 1885; elected U. S. Senator from New Hampshire June 14, 1887; re-elected 1889 and 1895.

Chandler, Zachariah: b. in Bedford, N. H., Dec. 10, 1813; removed to Detroit, Mich., in 1833; engaged successfully in mercantile business; was elected mayor of Detroit in 1851; U. S. Senator from Michigan (1857–75), and from Feb. 18, 1879, till his death; chairman of committee on commerce, etc. Secretary of the Interior under President Grant 1875–77; chairman of Republican National Committee in 1868 and again in 1876. D. in Chicago, Ill., Nov. 1, 1879.

Chandos: noble English family, descended from a follower of William the Conqueror. The direct male line ended with the death of John Chandos in 1428. Sir John Brydges, a descendant of his sister, was made Baron Chandos in 1554. James Brydges, eighth Lord Chandos, became Duke of Chandos in 1719. Fifty years later this title passed by marriage to the family of Grenville, which at present holds the title in the English peerage of Duke of Buckingham and Chandos.

Chang and Eng: See Eng and Chang.

Changarnier, shaăn′gaăr′niā′, Nicolas Anne Théodule: French general; b. at Autun, Apr. 26, 1793; served with distinction in Algeria 1830–43; May, 1848, appointed governor-general of Algeria; before the end of the year obtained command of the national guard at Paris and of the first military division; became a member of the National Assembly 1849, but continued to command the army or garrison of Paris until 1851. At the *coup d'état* of Dec. 2, 1851, he was arrested and confined for a short time. He afterward passed many years in exile. After the outbreak of the Franco-German war he offered his services to the emperor, and although he did not receive a command he took a leading part in the defense of Metz, and signed, with Bazaine and other generals, the capitulation; returned to Paris in 1871 and reorganized the army under Thiers. D. in Versailles, Feb. 14, 1877.

Chang-Chow-Foo: a city of China; province of Fuh-kien; chief city of department of same name; 35 miles W. from Amoy; on a tributary of the Kian-Long-Kiang (see map of China, ref. 8–J). The city is surrounded by a wall 4½ miles in circumference. The entrance is over a bridge 780 feet in length, with twenty-two water-passages. In the city is a magnificent Buddhist temple built in the eighth century. The streets are broad, and are adorned with fine shops, ornamented arches, and trees. The inhabitants are amiable. There is a considerable manufacture of silk, besides sugar, mirrors, crystal, and quicksilver. The exports are mostly of tea, sugar, porcelain, and paper. Pop. less than 900,000.

Change-of-day Line: See the Appendix.

Change-ringing: See Bell-ringing.

Chang-Sha-Foo: a city of China; capital of the province of Hunan; on the Siang-Kiang; about 360 miles N. of Canton (see map of China, ref. 7–I). It is well built and surrounded with a wall. It is a center of the silk manufacture and also of the silk-trade. Pop. 300,000.

Chank Shell [from the Hindu name *chank* or *changh*]: a name given to various mollusks of the family *Turbinellidæ*, but more particularly to the large, solid, top-shaped shell, technically known as *Turbinella pyrum*, which is abundant about Ceylon, and especially in the Gulf of Manaar. It occurs in shallow water, one or two fathoms deep, and is readily obtained by divers. It is sacred to Vishnu, who is represented with one in his hand, and the shell is in much demand in India, where it is made into bangles, bracelets, anklets, and other ornaments. A left-handed specimen is particularly valuable. F. A. L.

Chanler, Amélie (*Rives*): novelist; b. in Richmond, Va., Aug. 23, 1863; granddaughter of William Cabell Rives, U. S. Senator; married John A. Chanler, of New York, 1888; divorced in 1895, and later married Prince Troubetzkoi. Author of *A Brother to Dragons* (1888); *The Quick or the Dead* (1888); *Herod* (1889), a tragedy in blank verse; *Athelwold* (1893), etc.

Channel: a port of entry in Newfoundland; the most western town of any importance in that island. It has connection by steamers with St. John's, 300 miles distant. It has considerable trade. The cod and halibut fishery is carried on here. Pop. 584.

Channel Islands: a group of islands off the northwest coast of France; belong to Great Britain; governed by their own laws. They are the only parts of the dukedom of Normandy now belonging to the British crown. King John in 1204 lost all the rest. The chief islands of the group are Jersey, Guernsey, Alderney, and Sark (*qq. v.*). The area of the whole is 64½ sq. miles. They are divided into two bailiwicks, viz., Jersey and Guernsey, with the other islands as dependencies. They are not represented in Parliament, but have their own institutions and laws. The legislature of Jersey consists of fourteen deputies, twelve rectors, twelve constables, and twelve jurats, presided over by the bailiff. Guernsey is controlled by the royal court. These are the crown officers, lieutenant-general, attorney-general, solicitor-general, and prévôt. Taxation is light; land holdings are small and mostly of yeoman tenure. The climate is mild and equable; the scenery varied and exceedingly beautiful. The rocks are primary. The chief industries are agriculture and the breeding of cattle. Pop. (1891) 92,272.

Channing, Edward Tyrrel, LL. D.: scholar; b. in Newport, R. I., Dec. 12, 1790. He was brother to William Ellery Channing, and one of the founders of the *North American Review*, to which he contributed many critical and biographical articles. Professor of Rhetoric at Harvard from 1819 to 1851. A volume of his lectures was published in 1856. D. in Cambridge, Mass., Feb. 8, 1856. Revised by H. A. Beers.

Channing, William Ellery, D. D.: the most distinguished of Unitarian preachers and writers in the U. S.; b. in Newport, R. I., Apr. 7, 1780. His maternal grandfather, William Ellery, was a signer of the Declaration of Independence, and his own father entertained at his home the most distinguished Federalists of the time. Graduating at Harvard in 1798 with the highest honors, he soon after went to Richmond, Va., to act as tutor in the family of D. F. Randolph. The ascetic rigors to which he there subjected himself lest he should be effeminate impaired his health so much that it was always delicate. At the same time he acquired a knowledge of slavery as a working institution which contributed largely to his later anti-slavery principles. He studied theology at Cambridge and Newport (1800–1803). At Newport he became intimate with Dr. Hopkins, the famous theologian, whose independent habit of thought and philanthropy he greatly admired. As soon as Channing began to preach he was called by two societies, and, accepting that to the Federal Street Society, Boston, he was ordained June 1, 1803. From the first he made an impression of great spiritual fervor and moral earnestness. He and Buckminster were the first New England preachers who did not disdain to give their sermons literary form. The great merits of Channing's style, both in his sermons and his literary productions, were an absolute lucidity and a remarkable flow of language. His literary reputation was out of all proportion with the amount of his purely literary work, which was limited to a few elaborate essays or discussions, the most remarkable of which was that on the *Life and Character of Napoleon Bonaparte*. It was the moral quality of these essays, even more than their intellectual clearness and their engaging style, that made his reputation. For twelve years after his ordination his life was that of a faithful preacher and pastor. In the meantime the seeds of the Unitarian controversy had been widely scattered, and in 1815 they bore abundant fruit. For many years Calvinism had been undergoing a process of softening and abridgment in some of the New England churches. Since the beginning of the century this process had been much accelerated by some of the most prominent Congregational ministers in and around Boston. The policy of these liberal Christians, as they were called, because they put a liberal construction on Calvinism, was to say very little about the doctrines which they had come to disbelieve. The more conservative could not endure this, and in 1815 charged the liberals with dishonesty and hypocrisy. Channing replied in an elaborate public letter that at once gave him the headship of the liberal party, a position which he held throughout the controversy, though his contributions to it were but few. The most notable were a sermon preached in Baltimore (1819) at the ordination of Jared Sparks, a sermon at the dedication of the Second Unitarian church in New York, a few articles in the *Christian Examiner* and a few public letters. Channing had no liking for controversy and disdained all personalities. The manner of his habitual preaching was the same after the beginning of the controversy as before. His three great affirmations were the Dignity of Human Nature, the Supremacy of Reason as the organ of spiritual knowledge, Religious Liberty without sectarian exclusiveness. He believed that all men are partakers of the Divine Nature, and have in them an infinite element. Accepting Christianity as a reasonable revelation, he said: "I am surer that my rational nature is from God than that any book is the expression of His will"; and again: "The truth is, and it ought not to be disguised, that our ultimate reliance is and must be on our own reason." Denying the deity of Christ, he at first held to his superangelic nature, as did the majority of American Unitarians, while those in England, with Priestley at their head, were generally Socinians holding to the human nature of Jesus. But the moral character of Jesus attracted him more than his special nature, and as he grew older his Arian doctrine became almost or quite humanitarian. He regretted the development of what he called "a Unitarian Orthodoxy" and "a swollen way of talking about Christ." For Theodore Parker and other young radicals of the denomination he always had a willing ear. When Dr. Gannett became his colleague (1824) he had more time for the expression of his philanthropic sympathies. Problems of temperance and social reform interested him deeply, and he spoke and wrote concerning them with impressive seriousness and real illumination. Especially did the anti-slavery conflict excite his interest. Without being himself an abolitionist, he steadily approximated to Garrison's position. Alone among Boston clergymen he invited the agent of the Anti-Slavery Society into his pulpit. When Lovejoy was murdered he was the first to suggest an indignation meeting in Faneuil Hall, and his speech was only less memorable than that of Wendell Phillips made on the same occasion. His last public utterance, Aug. 1, 1842, at Lenox, Mass., was commemorative of emancipation in the West Indies, and he demanded speedy following by the U. S. of that example. D. in Bennington, Vt., Oct. 2, 1842. His works are published by the American Unitarian Association in six 12mo volumes, and his *Life* by his nephew, William Henry Channing (Boston, 1848) in three. The *Works* and *Life* are also published in one volume 8vo. The centennial of his birth was widely celebrated in 1880, and much new biographical matter was published at that time. John W. Chadwick.

Channing, William Ellery: second son of Dr. Walter Channing and nephew of the first William Ellery Channing; b. in Boston, June 10, 1818; was connected with various journals; published several volumes of poems, and wrote in prose, *Thoreau, the Poet-naturalist* (1873), and *Conversations in Rome* (1847). Revised by H. A. Beers.

Channing, William Henry: Unitarian minister; a nephew of William E. Channing; b. in Boston, May 25, 1810. He graduated at Harvard in 1829, and at the divinity school 1833; preached in the cities of New York, Boston, Cincinnati, and Liverpool, England. He was deeply interested in the Brook Farm experiment, and in general in socialism as the religious expression of the brotherhood of man. He was a preacher of great eloquence, but too little self-restraint. His biography by Rev. O. B. Frothingham (1886) is a full and sympathetic account of one of the most interesting representatives of the transcendental movement in New England. His daughter was married to Sir Edwin Arnold (*q. v.*). He contributed to the *North American Review*, and published, besides other works, a *Memoir of William Ellery Channing* (3 vols., 1848). D. in London, Dec. 23, 1884.

Chant [Fr. *chant*: Ital., Span., Portug. *canto* < Lat. *cantus*, song, deriv. of *ca'nere*, sing]: originally plain vocal music, especially such as was used in Christian congregations; now such musical compositions as are sung to words which are not metrical, or if metrical words are used the verbal cadences are not observed in the music. St. Ambrose and Pope Gregory the Great greatly improved the chant, which was, and still is, chiefly used in liturgical worship, though in non-liturgical services passages of Scripture often are chanted in simple harmonies.

The reading of the service in a half-chanting style by the clergyman is called *intonation*, and a somewhat similar method of reading the Scripture in Jewish synagogues is called *cantillation*.

Chantilly, shăn-til'li, or Fr. pron. shăn'tĕe'yee': a town of France; department of Oise; on the railway from Paris to Amiens; 25 miles N. N. E. of Paris (see map of France, ref. 3–F). It has a fine hospital, and celebrated manufactures of blond lace and porcelain, but the lace industry has declined. Annual races are held here. Here is a castle

which was once the residence of the great Prince of Condé, and one of the finest in France. It was destroyed during the Revolution in 1793, but the estate was bought in 1872 by the Duc d'Aumale, who rebuilt the château, filled it with collections of art works, and in 1886 presented it to the French Institute for public uses, at a cost of nearly $10,000,000. The castle park and forest contain 6,500 acres. Pop. (1896) 4,211.

Chantilly: a post-village of Fairfax co., Va.; about 20 miles W. of Washington (for location of county, see map of Virginia, ref. 4–H). On the afternoon of Sept. 1, 1862, the right of Gen. Pope's army was here attacked by the Confederate army under "Stonewall" Jackson. A severe struggle ensued, which was continued till dark in the midst of a terrific thunder-storm. Gen. Isaac I. Stevens, U. S. army, was killed in this action, and Gen. Phil. Kearny after its close.

Chantrey, Sir FRANCIS: sculptor; b. in Jordanthorpe, Derbyshire, England, Apr. 7, 1781; son of a carpenter who died when the lad was only twelve years of age. He learned the trade of carver in Sheffield; bought his freedom with the proceeds of his portrait-painting; removed about 1804 to London, where he devoted himself to sculpture. He was a pupil of Nollekens, and excelled in portraits and monumental sculpture. In 1818 he was chosen a member of the Royal Academy. Among his best works are a statue of Sir Joseph Banks, one in bronze of William Pitt in London, a statue of Canning at Liverpool, and one of Washington in the State-house at Boston, Mass.; *Sleeping Children* in Lichfield Cathedral, erroneously credited to Flaxman; and a *Penelope* at Woburn. He was knighted in 1837. D. Nov. 25, 1841, bequeathing a large sum to the Royal Academy for the extension of its art collection. See John Holland, *Memorials of Chantrey* (1851).

Chantry [O. Fr. *chanterie*, deriv. of *chanter*, sing]: a term signifying (1) an endowment or bequest to provide masses to be sung for the soul of the testator or the souls of others; (2) the office or position held by one who celebrates such masses; (3) a chapel founded with the purpose of insuring the constant chanting of masses either for the good estate of the living or for the repose of the souls of the faithful.

Chanute': city; Neosho co., Kan. (for location of county, see map of Kansas, ref. 7–J); on Atch., Top. and S. Fé and Mo., Kan. and Tex. R. Rs.; 125 miles S. of Kansas City, in an undulating agricultural region; has fine schools. Chanute is the headquarters for the So. Kan. Div. of Atch., Top. and S. Fé R. R. Pop. (1880) 887; (1890) 2,826; (1900) 4,208. EDITOR OF "BLADE."

Chanute, shăă-noot', OCTAVE: civil engineer; b. in Paris, France, Feb. 18, 1832; went to the U. S. in 1838; educated in a private school in New York city; began the practice of his profession in 1849 in the Hudson River Railroad service, and was actively engaged in railway work until 1889, having been chief engineer of the Chicago and Alton Railroad 1863–67, and of the Erie Railway 1873–83. He planned and superintended the construction of the Kansas City bridge across the Missouri river, completed in 1868. He is the author of *The Kansas City Bridge*, published in 1870, and of many papers in engineering journals, among which may be mentioned *The Elements of Cost of Railroad Freight Traffic*; *Rapid Transit and Terminal Freight Facilities*; *The Preservation of Timber*; *Uniformity in Railway Rolling Stock*; *The Sibley Bridge*; and *Progress in Aërial Navigation*. He was a vice-president of the American Society of Civil Engineers 1880–81, president 1891.

Chanzy, shăăń'zee', ANTOINE EUGÈNE ALFRED: French general; b. at Nouart, Mar. 18, 1823; entered the military school of St.-Cyr in 1841; was made a lieutenant of Zouaves in 1843; served chiefly in Algeria, becoming a general of brigade in 1868. In Oct., 1870, he was called to France with the rank of a general of division, and in December was appointed commander-in-chief of the Army of the West, consisting of four corps. In Jan., 1871, in the battles at Le Mans, his army was almost annihilated by three Prussian army-corps of vastly superior numbers. He was elected member of the National Assembly in Feb., 1871; governor-general of Algeria 1873; ambassador at St. Petersburg 1879–81. He wrote *La deuxième armée de la Loire* (9th ed. 1888). D. at Châlons, Jan. 4, 1883.

Chaosien, chow'syen' [Chinese, literally, morning freshness]: the name of a district in the northeast of Korea, applied since the close of the fourteenth century to the whole country. By the Japanese it is pronounced *Cho'sen'*, and by the Koreans *Chosŏn*. See KOREA.

Chapala, shăă-paa'lăă: the largest lake in Mexico; in Jalisco; 40 miles S. of Guadalajara; receives the Rio de Lerma and empties into the Rio Grande de Santiago; area 415 sq. miles. It contains several islands, on one of which are ruins. A small steamer makes the tour of the lake daily. The depth is unknown.

Chapanecs: See INDIANS OF CENTRAL AMERICA.

Chap-books [*chap* is the clip-form of *chapman* < O. Eng. *cēapman*, trader: Germ. *Kaufmann*]: a humble variety of literature which was formerly vended by itinerant chapmen or peddlers. They were small volumes printed on coarse paper, dealing with popular theology or history, the lives of godly or famous personages, fortune-telling and the reading of dreams, and giant, witch, and goblin tales in verse or in prose. The older black-letter chap-books, without dates, are extremely rare. Revised by H. A. BEERS.

Chapel [O. Fr. *chapele*: Ital. *cappella* < Lat. *cappella*, little cloak, place where a piece of the mantle of St. Martin was kept, extended to denote a sanctuary where holy relics were kept, and finally an apartment for worship]: a minor or supplementary place of worship. The term is applied to small edifices for special or occasional services, as cemetery chapels; to structures erected to accommodate parishioners living at a distance from the parish church (chapels of ease); to domestic oratories and places of worship erected by private individuals or attached to public institutions, as hospital-chapels. It also designates a distinct portion or subdivision of a church containing the altar or dedicated to the worship of a particular saint; if of the Virgin Mary, it is called a lady-chapel. In England, places of worship erected by Dissenters are commonly called chapels.

On the introduction of the Church of England into Massachusetts at the close of the seventeenth century, where the Congregationalists were the "standing order" or the "establishment," the first Episcopal church in Boston received the designation of the *King's Chapel*, which it retains today. In the U. S. a chapel is considered as attached to a parochial church, and is under the control of the ecclesiastical corporation of the parent church.

Probably the earliest instance of a chapel having been provided to serve the double purpose of a place of sepulture and of divine worship is that of the *Templum Probi*, a small basilica attached to the exterior of the apse of St. Peter's at Rome, and built by Sixtus Anicius Petronius Probus, who died A. D. 395. Probus and his wife were buried in this building, and the form of the structure attests its purpose for the celebration of the divine offices.

In printing, the workshop is called a chapel, probably because Caxton first set up his press in a chapel of Westminster Abbey; also the body of workmen in a printing-house, when organized, is called a chapel.

Chapelain, shaăp'lăń', JEAN: French poet; b. in Paris, Dec. 4, 1595; d. in Paris, Feb. 22, 1674. He was the chief of the school of pedantic and unnatural poets which Boileau destroyed, and the author of the epic upon Jeanne d'Arc (*La Pucelle*, 1656), which was the object of the great critic's sharpest satire. He produced also odes, now unreadable. His letters (published in part by M. Tamizey de Larroque, 2 vols., Paris, 1880–83) are full of interest, however. See É. de Molènes, *La Pucelle par Jean Chapelain* (2 vols., Paris, 1891). A. R. MARSH.

Chapel Hill: town; Orange co., N. C. (for location of county, see map of North Carolina, ref. 2–G); on Richmond and Danville R. R., and on New Hope river; 28 miles W. N. W. of Raleigh. It is the seat of the University of North Carolina, which was founded in 1789. Pop. (1880) 831; (1890) 1,017; (1900) 1,099.

Cha'pin, AARON LUCIUS, D. D., LL. D.: clergyman; b. in Hartford, Conn., Feb. 6, 1817; graduated at Yale in 1837, and at the Union Theological Seminary in New York in 1842; professor in the New York Institution for the Deaf and Dumb 1838–43; ordained pastor of the First Presbyterian church in Milwaukee, Wis., Jan. 24, 1844; inaugurated as first president of Beloit College, Wis., July 24, 1850, which office he resigned in 1886; was for some years one of the editors of the *Congregational Review*; contributed several articles to that and other like journals, and published occasional sermons. D. July 22, 1892.

Chapin, ALFRED CLARK: U. S. politician; b. in South Hadley, Mass., Mar. 8, 1848; graduated from Williams Col-

lege 1869 and Harvard Law School 1871; removed to New York 1871; member New York Assembly 1882–83, and Speaker 1883: Comptroller of the State 1884–87; mayor of Brooklyn 1888–91; sat as a Democrat in Fifty-second Congress; railroad commissioner for State of New York 1892.

Chapin, Edwin Hubbell, D. D.: b. in Union Village, Washington co., N. Y., Dec. 29, 1814; educated at the seminary in Bennington, Vt.; made D. D. at Harvard University in 1856; commenced preaching in 1837; first settled over a society of Universalists and Unitarians in Richmond, Va.; removed to Charlestown, Mass., in 1840; thence to Boston in 1846, to New York in 1848, where he became pastor of the Fourth Universalist church, corner Fifth Avenue and Forty-fifth Street, one of the wealthiest societies in the city. Dr. Chapin was a powerful and effective pulpit orator, a frequent lecturer before lyceums, etc., and exercised great influence for good. His speech before the Peace Convention at Frankfort-on-the-Main in 1850 commanded great attention. He was the author of *Moral Aspects of City Life* (1853); *True Manliness* (1854); several volumes of sermons and religious lectures, and some occasional discourses. His *Crown of Thorns* had a large circulation. D. in New York city, Dec. 26, 1880. See his *Life* by Sumner Ellis (Boston, 1882).

Chaplain [O. Fr. *chapelain* : Ital. *cappelano* < Late Lat. *cappella'nus*, deriv. of *capel'la*. See Chapel]: a clergyman attached to a chapel without a parish, to the household of any dignitary or nobleman, to a public institution, regiment, or an army post, or ship of war. Army chaplains once carried the relics of a patron saint at the head of the troops. The U. S. army has both post and regimental chaplains. The U. S. Senate and House of Representatives, as well as most State Legislatures, also have chaplains. Many prisons and large almshouses have chaplains attached. The British army and navy have chaplains from the Churches of England and Scotland and the Roman Catholic Church. Forty-eight Anglican and six Scottish ministers are chaplains to the British sovereign.

Chapleau, shăp'lō', Joseph Adolphe, LL. D.: Canadian statesman: b. at Ste. Thérèse de Blainville, Terrebonne, P. Q., Nov. 10, 1840; educated at the colleges of Terrebonne and St. Hyacinthe; admitted to the bar in 1861; was Professor of Criminal Jurisprudence, and afterward Professor of International Law, in Laval University. Meanwhile, he represented Terrebonne in the Quebec Assembly 1867–82, and was then elected to the Dominion Parliament for the same constituency; was re-elected in 1887, and again in 1891. He held in turn the portfolios of Solicitor-General, Provincial Secretary, Premier, and Minister of Railways and of Agriculture and Public Works in the Government of the province of Quebec; was appointed Secretary of State of Canada July 29, 1882, an office which he held till 1892, when he became Minister of Customs, and in December of the same year was appointed Lieutenant-Governor of the province of Quebec. In 1884 he was appointed a commissioner to investigate and report on Chinese immigration into Canada. He was a distinguished orator, a leader of the Conservatives in the province of Quebec, and was the trusted friend and coadjutor of the late Sir John A. Macdonald. In 1881 Mr. Chapleau was created a commander of the Order of St. Gregory the Great (Roman), and in 1882 a commander of the Legion of Honor (France). D. in Montreal, June 13, 1898. Neil Macdonald.

Chaplet [O. Fr. *chapelet*, dimin. of *chape* < Lat. *cappa*, head-covering]: a garland or wreath to be worn on the head; the circle of a crown; a string of beads used by Roman Catholics (see Rosary) by which they enumerate their prayers; in architecture a little molding carved into round beads, pearls, olives, etc.

Chaplin, Charles Joshua: figure and portrait painter; b. of English parents at Les Andelys, France, June 6, 1825; naturalized French citizen; d. in Paris, Jan. 30, 1891; pupil of the École des Beaux-Arts; second-class medal, Salon, 1852; officer Legion of Honor 1877; employed under the Empire in the decoration of the Tuileries and the Elysée; painted ceilings and wall decorations in various public and private buildings in Paris, and numerous portraits, principally of women. His pictures are remarkable for delicate color and clever modeling, and are much appreciated by collectors.

William A. Coffin.

Chaplin, Winfield Scott, M. A.: b. in Glenburn, Me., Aug. 22, 1847; after finishing his course at the high school in Bangor, Me., was appointed in 1866 cadet in the U. S. Military Academy, where he graduated second in the class in 1870; was appointed second lieutenant Fifth U. S. Artillery, where he served until he resigned Apr. 6, 1872. Employed at railroad engineering 1872–74; Professor of Mechanics in the Maine State College 1874–77; Professor of Civil Engineering in the Imperial University of Tokio, Japan, 1877–82. Returning to the U. S. he was for one year employed in railroad engineering; then Professor of Mathematics in Union College, Schenectady, N. Y., 1883–85; Professor of Engineering in Harvard University 1885–91; in 1886 dean of the Lawrence Scientific School; in Sept., 1891, was appointed chancellor of Washington University, St. Louis, Mo.

James Mercur.

Chapman, Alvan Wentworth, M. D.: b. at Southampton, Mass., Sept. 26, 1809; graduated at Amherst College 1830; removed to Appalachicola, Fla., where he attained fame as a botanist. The genus *Chapmannia* was named in his honor. He published *Flora of the Southern United States* (1860). D. Apr. 6, 1899.

Chapman, George: an English poet and translator; b. at Hitchin Hill, Hertfordshire, England, in 1557; became a resident of London and a friend of Shakspeare and Spenser. He produced numerous comedies and tragedies, and was the first translator of Homer into English verse. His version of the *Iliad* was published 1598–1611, and that of the *Odyssey* 1614–15. Of his tragedies, the most noticeable are *Bussy d'Ambois* (1607) and *Cæsar and Pompey*; among his comedies, *All Fools*, *Monsieur d'Olive*, *The Gentleman Usher*, all published in 1607, and *The Widow's Tears*. D. in London, May 12, 1634. A complete edition of his works in three volumes appeared in 1873–75.

Revised by H. A. Beers.

Chapman, John Gadsby, N. A.: b. in Alexandria, Va., in 1808; received his training as a painter in Italy, which was for many years his home. He executed the painting called the *Baptism of Pocahontas*, in the Capitol at Washington, and published a drawing-book. D. Nov. 28, 1889.

Chapman, William: U. S. military officer; b. in St. John's, Md., Jan. 22, 1810; graduated at West Point in 1831; on Feb. 20, 1862, became lieutenant-colonel of Third Infantry. He served chiefly at frontier posts 1831–61; in Black Hawk expedition 1832; at Military Academy as assistant instructor 1832–33; as adjutant Fifth Infantry 1833–38; in military occupation of Texas 1845–46; in the war with Mexico 1846–48; engaged at Palo Alto, Resaca de la Palma, Monterey, Vera Cruz, San Antonio (wounded), Churubuseo (brevet major), Molino del Rey (brevet lieutenant-colonel), Chapultepec, and city of Mexico; in Florida hostilities 1857; on Utah expedition 1857–60. In the civil war he served in the Virginia Peninsula 1862; engaged at Yorktown and Malvern Hill; in North Virginia campaign 1862, engaged at Manassas (brevet colonel). Retired from active service Aug. 26, 1863, and chiefly employed in command of draft rendezvous at Madison, Wis., 1863–65, and in various special duties. D. Dec. 17, 1887.

Chapoo: See Chapu.

Chap'paqua: a post-village and summer resort of New Castle township, Westchester co., N. Y. (for location, see map of New York, ref. 8–J); on the N. Y. C. and H. R. R. R.; 32 miles from New York. It has some manufactures, and an excellent boarding-school under the patronage of the Society of Friends; there is also a saline chalybeate spring near the place. Pop. (1880) 330; (1890) 733; (1900) not returned separately.

Chapparal Cock: See Cuckoo.

Chappe, shăp, Claude: engineer; b. in Rouen, France, 1760; inventor of a telegraph. He produced in 1792 a system of signals and a machine which he called a telegraph, by which a dispatch was transmitted from Paris to Lille, 48 leagues, in thirteen minutes and forty seconds. Numerous lines of his telegraph were soon extended through other parts of France. D. in Brûlon, Jan. 23, 1805.

Chapped Hands are sometimes a sort of chilblain on the hands, and, like chilblain, this disease appears to pass by insensible gradations into a form of eczema, while many cases of chapped hands are simply eczematous, without any recognizable connection with chilblain. Glycerine, borax, benzoated oxide-of-zinc ointment, and various like applications are useful.

Chappell, William, F. S. A.: English musical antiquary; b. Nov. 20, 1809; resided in London, where he belonged for

some time to a music publishing house. Among his works are *Popular Music of the Olden Time*, a most valuable collection of over 400 airs (2 vols., 1855–59); and the first volume of a *History of Music* (1874). D. in London, Aug. 20, 1888.

Chap'ra, or **Chŭp'ra**: a town of British India; capital of Sarun district, Patna division, Bengal; near the Ganges; 34 miles N. W. of Patna city (see map of N. India, ref. 6–H); distinguished for its wealth, its pottery, and brass goods. It has a considerable trade in saltpeter. Pop. (1881) 51,670; (1891) 56,980.

Chapsal, shăăp'săl', Charles Pierre: grammarian; b. in Paris, France, 1788; author of numerous grammatical works: made a fortune from the proceeds of the *Nouvelle Grammaire Française*, written in conjunction with M. François Noel (1st ed. 1823). D. 1858.

Chaptal, shăăp'tăl', Jean Antoine, Comte de Chanteloup: chemist; b. at Nogaret, Lozère, France, June 5, 1756. He graduated as M. D. at Montpelier in 1777; became Professor of Chemistry at that place in 1781; supported the popular cause in the Revolution; introduced the manufacture of certain chemicals for which France had previously been dependent on foreigners. About 1796 he was chosen a member of the Institute. He was Minister of the Interior for five years (1801–05); made a count by Napoleon I.; afterward a senator. His chief works are *Chemistry Applied to the Arts* (1806) and *Elements of Chemistry*. D. in Paris, July 30, 1832. See Flourens, *Éloge historique de Chaptal* (1835).

Chapter [O. Fr. *chapitre* for *chapitle*: Span. *capitulo* < Lat. *capitulum*, little head (*caput*), heading of a column, of a section of a book, etc.]: the body of the clergy of a cathedral united under the bishop, or, where the bishop is not in residence, under the presidency of a dean. The dean, however, was a late addition, dating back no further than the tenth century. W. S. Perry.

Chapter-house: the meeting-hall for the deliberations of the dean, canons, and prebendaries of a cathedral or collegiate church. Many of the splendid chapter-houses of English cathedrals were built for the *chapters* of the monastic orders whose abbeys these cathedrals originally were. Those for the secular clergy were usually polygonal, lofty, and vaulted, with or without a central column, as at Salisbury and York. A. D. F. Hamlin.

Chapu': a town of China; in the province of Cheh-Kiang; port of the important city of Hang-Chow, with which it is connected by a canal (see map of China, ref. 6–K). It was formerly the only Chinese port trading with Japan. The city has a circuit of 5 miles, excluding suburbs.

Chapul'tepec: a strong Mexican fortress; stormed by the forces under Gen. Scott Sept. 13, 1847, during the war between the U. S. and Mexico (1846–47). It is situated about 2 miles S. W. of the city of Mexico, and consists of an isolated eminence about 150 feet high, fortified by a strong citadel which crowns the hill, designed to protect the causeway forming the approach to the city. Its approaches were also strongly guarded by outworks at its base and on its acclivities. The castle contained, besides a strong garrison, the military school of the republic.

In the plan for the capture of the city of Mexico the reduction of Chapultepec was considered indispensable to success. The extraordinary natural strength of this place, and the skill and money which had been expended to make it impregnable, rendered this a hazardous undertaking. To mask the intended attack, Twiggs, with Riley's brigade and Taylor's and Steptoe's batteries, was left at the southern gates of the city, and kept up an effectual fire during Sept. 12, and down to the afternoon of the 13th, compelling the enemy to withdraw within the walls of the city, and thus holding a good part of the Mexican army, under Santa Anna, on the defensive. Heavy batteries at well-selected points were established on the night of the 11th, and a vigorous fire was opened on the castle and outworks on the morning of the 12th, continuing with good effect throughout the day and on the morning of the 13th, while preparations for the attack were being made. Pillow's and Quitman's divisions were to assault, the former on the west and Quitman on the southeast side; Worth's division to support Pillow, and Smith's brigade of Twiggs's division to support Quitman. An assaulting party of 260 men, under Capt. McKenzie, Second Artillery, was furnished Pillow, and Twiggs's division supplied a similar one, under Capt. Casey, Second Infantry, to Quitman. The signal for attack was to be the momentary cessation of firing from the heavy batteries. About 8 A. M. of the 13th notice was sent to Pillow and Quitman that the concerted signal was about to be given, and both columns shortly after moved forward with great vigor, the batteries throwing shot and shell upon the enemy over the heads of the attacking columns.

Pillow's approach on the west side lay through an open grove filled with sharpshooters, who were quickly dislodged; on emerging into an open space at the foot of a rocky hill, Pillow was severely wounded, the immediate command devolving upon Gen. Cadwalader. Clark's brigade of Worth's division was now sent to Pillow's support. A strong redoubt, midway, was to be carried before reaching the heights. The advance was over rocks, chasms, and mines, and in the face of a heavy fire of cannon and musketry. Without wavering the redoubt was carried, and the enemy driven from shelter to shelter, without time to fire a single mine unless endangering the lives of their own men. The ditch and main wall of the work were reached, scaling-ladders were brought in use, and a lodgment soon made, followed by streams of troops.

Simultaneously with Pillow's advance on the west, Quitman approached the southeast of the same works over a causeway strongly fortified and defended. Smith's brigade had been thrown out to the right, to turn the batteries near the foot of Chapultepec and support Quitman's storming party. The contest was desperate for a short time, but the valor of the U. S. troops overcame every obstacle, the batteries and works were carried, and the ascent was continued; the enemy were driven from their stronghold, and the Stars and Stripes floated from the heights of Chapultepec. This victory virtually ended the war, the city of Mexico being entered the next day, the 14th. The U. S. loss in killed and wounded during the 12th, 13th, and 14th, was 863; the Mexican loss was much greater.

At present Chapultepec is the summer palace of the president of Mexico, as it was of the Emperor Maximilian. The military school occupies a portion of it, and the castle is surrounded by a beautiful park.

Cha'ra [from Gr. χαρά, joy, probably in allusion to the beautifully regular habit of branching]: a genus of Stoneworts (*q. v.*) including about sixty-two species, of which twenty-five or thirty occur in North America. C. E. B.

Chara'ceæ [from *Chara*, the principal genus]: an order of aquatic flowerless plants allied to the red seaweeds, and popularly known as Stoneworts (*q. v.*).

Chara'chera: a genus of diffusely shrubby plants including but one species (*C. viburnoides*), native of Arabia. The flowers consist of a five-foliate calyx, gamopetalous, tubular, violet corolla, four stamens, and a four-angled two-celled ovary, each cell two-ovuled. Its affinities are uncertain, but it probably belongs to the family *Acanthaceæ*. C. E. B.

Character [viâ Fr. and Lat. from Gr. χαρακτήρ, stamp, token, distinctive mark, characteristic: deriv. of χαράσσειν, engrave]: a mark or figure engraven on an object; a letter or type used in writing or printing; the peculiar qualities impressed on a person by nature or habit; distinctive qualities of heart, mind, and manners. The term is often used to denote a person or actor in an epic poem or drama. In the arts of painting and sculpture, after the proper representation of form or color, the expression of character is the most important part of the artist's work. In botany and other branches of natural history character is an enumeration or brief description in scientific terms of the essential and distinctive marks of a species, genus, order, etc.

Charade, sha-rād' [Mod. Fr. *charade* < Lat. **caracta*, mystical word, spell; cf. *character*, Gr. χαρακτήρ. A derivation from Span. *charrada*, a country dance, merry-making, has been also suggested]: a social amusement, consisting sometimes of the division of a word into its constituent syllables or letters, and then making some statement as to each syllable and the whole word, the company being required to guess the word. In "acting charades" each syllable is introduced prominently, but not too conspicuously, into the successive scenes of a dialogue, the whole word being brought into the last scene. Sometimes the name *charade* is used to designate any parlor drama.

Charaes, **Jaraes**, or **Xaraes**, shăă-rīz': the name given on old maps of South America to a large lake, represented as the source of the river Paraguay. The report of this lake probably arose from the vast plains which border the

upper Paraguay, and during the annual floods form, in fact, a shallow lake. They are now known as the Charaes marshes. See PARAGUAY RIVER. H. H. S.

Charcas: the name given in colonial times to the region now called BOLIVIA (*q. v.*). The *audiencia* or government of Charcas was at Chuquisaca, and in common parlance that city was often called Charcas. The name is still sometimes used for the province of Chuquisaca. H. H. S.

Cha'rax of Per'gamus: priest and philosopher; supposed to have flourished in the time of Marcus Aurelius. His historical works were prolix, and treated with minute detail the mythical period. Fragments in Müller's *Fragmenta Historicorum Græcorum*, vol. iii., pp. 636–45.

Charcoal [etym. doubtful; perhaps connected with obsol. verb *chare*, turn]: a common name of a variety of carbon; a carbonaceous substance obtained by heating wood and other vegetable matters in close vessels, or by partially burning them. The term is also applied to the solid residuum which results from the destructive distillation of animal matter and peat. (See BONE BLACK and ANIMAL CHARCOAL.) The composition of charcoal depends on the temperature at which it is produced. At high temperatures all the oxygen and hydrogen of the materials are expelled, and the black charcoal consists of carbon and the mineral matter (ashes) originally present. When produced at lower temperatures, the charring is imperfect, and a reddish charcoal results, which contains both hydrogen and oxygen. It burns without flame or smoke, and produces a greater heat than an equal weight of wood. It is used as an ingredient in the composition of gunpowder, as an agent in clarifying liquors, and for other purposes, among which is the smelting of ores. It has an extraordinary capacity for absorbing gases. It is said that it will absorb ninety times its bulk of ammoniacal gas. It is infusible, is not soluble in acids or other liquids, is not liable to decay, and is not altered by any degree of heat if it be not exposed to the air or to oxygen. It is a very bad conductor of heat, and hence powdered charcoal is placed round tubes to prevent the escape of heat. Powdered charcoal is used to preserve flesh, or sweeten it when tainted. Common charcoal intended for fuel is made by burning or heating a pile of wood without free access of air. The sticks of wood, which are not more than 4 feet long, are arranged in a conical pile around a central aperture, and covered with turf, sods, or other material which prevents the free access of air. Charcoal-dust, mixed with earth and moistened, makes a good outer covering. An opening is left at the top for the escape of smoke and vapor. The pile is usually ignited at the top, and continues burning with a slow smoldering fire for a week or more. The charcoal used as an ingredient of gunpowder is made from wood which is free from resin, such as willow or poplar. Charcoal is often prepared by roasting wood in iron cylinders. By this method there is a larger proportion of charcoal saved and the product is of better quality; there is also a larger quantity of pyroligneous acid secured, which is of great value in the arts.

Charbon rouge (i. e. red charcoal) is charcoal obtained by subjecting wood to heated air or steam raised to the temperature of 572° F. By this process from 36 to 42 per cent. of charbon rouge is obtained, whereas not more than 25 per cent. of charcoal is obtained by the ordinary method. It has a dark-red color, and contains 75 per cent. of carbon. It is extensively used in Europe in the manufacture of gunpowder and iron blooms.

Charcoal Blacks: pigments made from any charred material, of which LAMPBLACK (*q. v.*) is the most common instance. The charcoal crayons used for making drawings are another instance. The name charcoal black is given especially to pigments made from charred grapevine twigs.

Charcot, shaar'kō', JEAN MARTIN: French neurologist; b. in Paris, Nov. 29, 1825; M. D. 1853; member of the Academy of Medicine 1873; and of Legion of Honor. He made important investigations in nervous pathology and hypnotism. Author of *Les Maladies des Vieillards et les Maladies Chroniques* (1868); *Les Maladies du Système Nerveux* (4th ed. 1880); *Localisations dans les Maladies du Cerveau et de la Moelle Épinière* (1876–80); *Œuvres complètes* (12 vols., 1886 ff.). D. at Morovan, France, Aug. 18, 1893.

Chard: See BEET.

Chardin, shaar'dăñ, JEAN BAPTISTE SIMEON: painter; b. in Paris, 1698; son of a carpenter; pupil of Cazes and of Noel Coypel; was made member and then treasurer of the Academy; was the friend of Diderot. His works are naturalistic and comprise still-life, flower, and animal subjects, and have passed among the classics in their vein. D. in Paris, 1779. W. J. S.

Chardin, Sir JOHN: celebrated Oriental traveler; b. in Paris, France, Nov. 26, 1643; was educated as a jeweler, but his love for travel led him to make a journey to India and Persia in 1664, to trade in gems. He made two voyages to the East; spent many years in Persia, where he became a favorite with the shah; studied the language, history, and customs of the country. On his return to Europe, in 1681, he settled in London. He was knighted by Charles II., and sent in the following year on a mission to Holland. In 1686 was published the first part of his noble work, *Travels into Persia and the East Indies* (London, 1686), which appeared latter in its complete form, as *Journal du Voyage du Chevalier Chardin en Perse et aux Indes Orientales* (4 vols., Amsterdam, 1711, 1735, and an enlarged edition by Langlès, Paris, 1811). The work is one of much merit, full of interest and very trustworthy, especially in everything relating to Persia. Sir John died in London, Jan. 26, 1713, and is interred in Westminster Abbey.
Revised by A. V. WILLIAMS JACKSON.

Chardon, shaar'don: capital of Geauga co., O. (for location of county, see map of Ohio, ref. 2–I); on Pitts. and West. R. R.; on a ridge 14 miles from Lake Erie, and about 28 miles E. of Cleveland; has four churches, fine courthouse, and school-building. The chief industry is agriculture. Pop. (1880) 1,081; (1890) 1,084; (1900) 1,360.
EDITOR OF "GEAUGA REPUBLICAN."

Charente, shaă'raăṅt': a river of France; rises in Haute-Vienne, and flows in a very tortuous course westward through the departments of Charente and Charente-Inférieure, and enters the Atlantic opposite the isle of Oléron. Total length about 157 miles. It is navigable for steamboats from its mouth to Saintes, and by means of twenty-seven locks is navigable for 102 miles.

Charente: a department in the western part of France; area, 2,294 sq. miles. It is intersected by the rivers Charente and Vienne. The surface is undulating, and in some parts hilly; the soil is mostly calcareous and dry. Several deep limestone caverns occur here. Extensive forests of chestnut-trees grow on the hills. Truffles are found in abundance. A large part of Charente is occupied by vineyards, the product of which is mostly converted into brandy. The chief article of export is Cognac and Jarnac brandy. Here are manufactures of iron, paper, and leather. Capital, Angoulême. Pop. (1896) 356,236.

Charente-Inférieure, -aṅ'fay'rĕc'ör': a department in the western part of France; bounded W. by the Atlantic, and S. W. by the estuary of the Gironde; intersected by the river Charente. Area, 2,635 sq. miles. The surface is nearly level; the soil is very fertile. The staple products are grain, wine (which is mostly converted into brandy), hemp, and flax. The salt-works on the seacoast are the most valuable in France. It has manufactures of glass, earthenware, and leather. Capital, La Rochelle. Pop. (1881) 466,416; (1896) 453,455.

Charenton-le-Pont, shaă'raăṅ'tōṅ'-le-pōṅ': a town of France; department of Seine; on the right bank of the Marne; 5 miles S. E. of Paris (see map of France, ref. 3–F). It has large chemical works. A bridge across the river connects this town with St.-Maurice, where is the large national asylum for lunatics. This bridge has been the scene of several conflicts between armies contending for the possession of Paris. Pop. (1896) 16,811; of St.-Maurice, 6,927.

Cha'res (in Gr. Χάρης): an Athenian general notorious for his corruption and incompetence; was chosen commander-in-chief in the Social war, which began in 357 B. C. This war was provoked by his extortions.

Chares: a Greek statuary; b. at Lindus; was a pupil of Lysippus and the founder of the Rhodian school of sculpture. He lived about 300 B. C. Among his works was the Colossus at Rhodes, regarded as one of the Seven Wonders of the world. It was a bronze statue of Apollo, or rather of the sun-god, about 105 feet high, and was thrown down by an earthquake in 224 B. C.

Chares of Mytilene: Greek historian; his position as master of ceremonies to Alexander the Great enabled him to collect much gossip about that monarch, which he afterward published in a work, quoted by Athenæus and used by Plu-

tarch. Fragments collected in Müller's *Scriptores Rerum Alexandri Magni*, pp. 114–120.

Charge: See Heraldry.

Charge: in law, a burden imposed on a thing; a duty or obligation imposed upon a person; sometimes merely a formal and distinct allegation. More specifically it is used in the following connections: (1) A burden imposed upon land, particularly in a court of equity. It is a common course in a will to "charge" the devisor's estate with the general payment of debts or legacies, or with the payment of a particular debt or legacy. In such a case the land is burdened with the debt, so that it is a lien or incumbrance upon it; and this would follow it into the hands of a purchaser. A charge of this kind may be created by implication. Thus if a testator should provide as follows, "*After* the payment of $1,000 to A, I devise my mansion-house to B," that sum would be charged upon the land as owned by B, and would follow it in case of a sale or other transfer. (2) A charge upon the person. A will or other instrument may be so drawn as to confer a benefit upon a person, and at the same time impose upon him an obligation. Should he accept the benefit, he will by implication take upon himself the burden or obligation, though it may outweigh the benefit. No person is bound to accept such a devise or provision, so that the charge in the case supposed is in truth created by the grantee's or devisee's own act, in conjunction with the grantor's or testator's direction. (3) Directions to a jury. In a jury trial, as the decision of questions of law appertains to a judge, and matters of fact belong to the jury, it is a common practice for the judge to instruct or "charge" the jury upon the questions of law. These instructions the jury are legally bound to follow. The idea lying at the root of the word "charge" in this case would seem to be the obligation or duty of the jury to accept the version of the law propounded by the judge. (4) In equity practice the words "charge and discharge" are found in connection with the taking of accounts in that court of moneys paid and received. The *charge* means the statement of debts due by the party against whom the account is rendered, and *discharge* means the items of credit presented by the latter. These might be so presented as to make counter-statements necessary. This practice, in its details, is disfigured by much technicality, and has been generally abandoned. (5) In equity pleadings there is a statement made by the plaintiff, known as the charging part of the bill (or complaint), in which he sets forth certain facts, anticipatory of a defense which he supposes that the defendant will make. The word charge here means a distinct and formal affirmation, and the pleader sets forth the defendant's claim as a mere pretense on his part, and alleges on his own part the facts in opposition to it. T. W. Dwight.

Chargé d'Affaires, shăär'zhay'dăaf'fār' [Fr.]: a diplomatic agent of the fourth or lowest rank, the others being (1) ambassador; (2) envoy or minister; and (3) resident minister. The first two are accredited to a sovereign. The *chargé d'affaires* is accredited to the Foreign Minister or Secretary of State of the country to which he is sent.

Chariot [O. Fr. *chariot*, deriv. of *char* < Late Lat. *carrum*, wagon, of Celtic origin]: a vehicle used by the ancients in war and in journeys of pleasure. It had two wheels and was drawn by two horses, or sometimes with one or two more. It was closed in front and open behind. War-chariots were used by the ancient Greeks, Romans, Assyrians, Britons, and other nations. The four-horse chariot in which Roman generals rode when they entered Rome in triumph was called a *quadriga*. See Carriages.

Charis'ius: an Attic orator: contemporary of Demochares, the nephew of Demosthenes; imitator of Lysias; mentioned by Cicero and Quintilian. Three passages are translated by Rutilius Lupus in his work *De Figuris* to illustrate certain rhetorical figures. See Blass, *Attische Beredsamkeit*.

Charisius, Aurelius Arcadius: a learned jurist who lived under Constantine and his sons, and filled the office of "magister libellorum." He wrote several works on legal subjects. Extracts from three of his writings are contained in the *Digest*.

Charisius, Flavius Sosipater: probably from Africa; a celebrated grammarian, whose date falls in the latter half of the fourth century. He was a man of some distinction, and is styled "magister urbis" in the inscription of his work, which is a Latin grammar in five books, *Institutionum Grammaticarum libri quinque*, written for the use of his son. Portions of the work have been lost; the remainder is given in the various collections of Latin grammarians, most recently in the first volume of Keil's edition, 1857.

Revised by M. Warren.

Charitable Uses: uses in property, either real or personal, held by a trustee to be devoted by him to charitable purposes. The word "charitable" in this connection is nearly synonymous with public. Trusts for charitable purposes would include funds in the hands of trustees devoted to the repair of highways or streets in cities, the support of paupers, the foundation of colleges, churches, and hospitals, etc. Charitable uses are sometimes loosely called simply charities. They are often sustained by the courts when trusts for the benefit of individuals would be held invalid, especially with respect to the creation of perpetuities. See Trusts (*Charitable Trusts*). Revised by F. Sturges Allen.

Charites, kăr'i-tēēz (in Gr. Χάρις, Χάριτες; in Lat. *Gratiæ*): the Graces of classic mythology; were said to be the daughters of Jupiter. They were patrons of poetry and art, and presided over festivals and social enjoyments. There were three Graces, Aglaia, Euphrosyne, and Thalia.

Char'iton: a river of the U. S.; rises in the south part of Iowa. Having crossed the boundary between Iowa and Missouri, it flows southward through Adair, Macon, and Chariton Counties of the latter State, and enters the Missouri river 3 miles above Glasgow. Total length about 250 miles.

Chariton: city; capital of Lucas co., Ia. (for location of county, see map of Iowa, ref. 7–H); is on the Chicago, Burlington and Quincy R. R. and the Chariton river; 55 miles W. of Ottumwa. It has a large public hall. Pop. (1880) 2,977; (1890) 3,122; (1900) 3,989.

Chariton, kăr'i-ton, of Aphrodisias in Caria: pseudonym of a Greek writer of a late historical romance, *The Story of Chæreas and Callirrhöe*. The scene is laid in the time of the Peloponnesian war; the father of Callirrhöe is the famous Hermocrates, and the author is the secretary of Athenagoras, characters known from Thucydides. It is a poor imitation of romances by Xenophon of Ephesus and by Heliodorus. Edited by D'Orville, with copious notes (rev. ed. 1783). See also Rohde, *Griechischer Roman*, p. 485 fol.

Charities: See Charitable Uses.

Charity Organization: a development of recent times, born of the multiplication of relief agencies in large centers of population, and of the wastes and mischiefs wrought by their independent action. As a specialty it aims at building up voluntary unity of every sort of benevolent endeavor. It is to charity in general what confederations of workmen, exchanges, and clearing-houses are to the industrial and commercial circles: a necessity in the interest of economy and effectiveness. The name is derived from the title of the London Society for Organizing Charitable Relief and Repressing Mendicity, a title so cumbrous that it was popularly abbreviated into Charity Organization Society. As this society began in 1869, that date may be taken for the birth of this reformatory movement. Its principles were the outcome of the experience and experiments of Europe for the previous fifty years. The Rev. Dr. Chalmers made practical trial of kindred principles from 1819 to 1823. The parish of St. John's in Glasgow, embracing 10,000 souls, and in the poorest part of the city, was assigned to him to put his convictions in operation. He required the civic and great voluntary charities of the city not to invade his domain; nor would he turn any applicant for relief over to them. A large corps of friendly visitors was organized until there was one visitor for about every three persons seeking aid. They were not to give alms except in cases of extreme necessity, but were first to elicit the resources of the poor themselves. To carry on his work he relied upon the church-door collections of his evening (which was his poor) congregation, and these amounted to about £40 a year. Forty pauper families disappeared from his lists, and only twenty were added, and the office of his friendly visitors became a sinecure. His poor-collections gave him a surplus with which he endowed two parish schools, and for which he taxed his ingenuity to find a harmless expenditure. In 1823 Chalmers removed to Edinburgh, but his methods of administration went on for fourteen years in St. John's parish, and finally ceased, partly through the encroachment of the poor-laws, and partly owing to dissensions fast growing in the Scotch Kirk.

The London society named was to some extent a sequel to

the large funds raised in England for the relief of the Lancashire sufferers by the cotton famine caused by the blockade of the Southern ports of the U. S. during the civil war. The administration of that and other emergency funds in London was felt to have miscarried, and people had grown ready for surer and better methods.

Effective, too, was the voice of Edward Denison, the son of a bishop and a member of Parliament, who went to live in the East End of London in order to learn by daily contact with the destitute and depraved the secret of their lives, and what they really needed for their redemption from wretched situations. Influential friends, spurred on by Octavia Hill's success with her poor tenants in the same part of London, joined him to create some agency for staying the waste of benevolent money and exertion through disconnected agencies and almoners, and for reaching the roots of pauperism with effective remedies. The society they founded in 1869 has thirty-eight district agencies in as many parishes or unions of London, and has made for itself a world-wide reputation for the exercise of the true art of philanthropy. Its influence has permeated the kingdom to such a degree that there are now (1893) ninety-one analogous societies in as many towns and cities of Great Britain, and seventy-eight corresponding societies on the Continent and in the British possessions.

Its methods were first copied in the U. S. in the Germantown suburb of Philadelphia, under the leadership of Rev. Charles G. Ames (1873). Then came in 1878 the Buffalo Charity Organization Society, virtually founded by Rev. S. H. Gurteen, a clergyman who had been one of the workers in the London society. From Buffalo it spread within two years to Boston, Brooklyn, Cincinnati, Indianapolis, Newport, Philadelphia, Portland, Me., Syracuse, and in 1882 to New York city. Since that time kindred societies have been formed in all of the principal cities and towns of the U. S., and in many other places the principal relief societies have adopted what are called "charity organization" principles. These municipalities include about one-sixth of the total population of the U. S. These societies have taken the diverse names of associated charities, bureau of charities, societies for organizing charity, etc., but all are alike in purpose, principles, and practice. They are allied with each other through representatives sent to the National Conference of Charities and Correction, which meets annually, and are also closely affiliated with each other and with similar organizations all over the world (some 270 in number) by correspondence and interchange of services. This connection is voluntary, but none the less real and practical; and it rests on the inherent unity of the movement and the now general recognition of the fact that the truest welfare of the poor requires intelligent and philosophical research and methods.

What is new about the organization of charities is not its fundamental principles, for these had been elicited bit by bit through years of experiment, but the devising of a plan to apply these principles systematically to the legal, ecclesiastical, and social conditions of English-speaking states. These conditions, at first confronted by the London society, were very complex, but the adaptation of the society to them was ingenious and simple. The scheme was so flexible in operation, so interwoven into the usages and traditions of the people, and yet so distinctly embodying the convictions of humane thinkers, that it was hopefully and loyally approved by those who earnestly desired that benevolence should no longer miscarry but indeed become beneficent.

Among the essential characteristics of "charity organization" are these:

I. Voluntary Principle.—It is purely a voluntary alliance among persons interested or engaged in the administration of civic, congregational, associated, and individual relief. There are three types of relief which pertain to modern life: (*a*) The voluntary, the product of humane or religious sentiment, Italy having, at least until recently, afforded the most striking example of it; (*b*) a state-supervised administration of confiscated endowments and voluntary contributions, which has its best development in France and Belgium; (*c*) and a public charity, officially managed and sustained by taxation, such as obtains in Elberfeld, Prussia, Denmark, and Sweden, where the statutes declare the right of a pauper to state relief. In Great Britain and the U. S. the voluntary and legal methods grew up side by side, and, especially in England, in great prodigality. So lavish had the dual practice grown that Edward Denison, shortly before his death in 1870, wrote: "Certain calculations put the London charities at a total of £7,000,000—enough to give £17 a head to 400,000 souls." This meant that every seventh person in London at that time received relief, and that, if three of these persons (the probable numbers of bread-winners in the average family among the poor) be counted to a household, its income from public charity would be $255 a year, or all that an unskilled workman steadily employed could earn in wages during the same period. The Elberfeld system, most influentially quoted in 1869, is not a voluntary one; but while it is carried out by private citizens of high standing, and serving without pay, their work is practically as compulsory as the enforcement of jury duty in the U. S., and it is bolstered up by taxation.

II. Co-operation.—The next fundamental feature is co-operation or association. When Robert C. Winthrop, about 1859, wrote the report of the Boston Provident Association, in advocating the erection of a building in which the offices of the various civic charities and of the principal voluntary societies of the city might bring their administrations under one roof, he urged as a motive thereto the usefulness of association, and it was partially realized when the Charity Building in Chardon Street in 1869 was authorized and erected. This was an important preliminary step in charity organization in the U. S., and its history has made the term "associated charities" the equivalent in the U. S. of "charity organization." Prior to the invention of an available scheme for concerting the action of charitable agencies, the principle of individualism, or dissociation, ruled public and private benevolence. In the United Kingdom and in most of the U. S., especially in centers of population, legal provisions for relief embraced every form of destitution, and were generally ample except in great emergencies. It was so profuse that it corrupted the poor by its temptations to relax effort, and to depend on temporary relief; it worked harm to wages, to industrial organization, to character, and to tax-payers, some of whom in England saw their property nearly confiscated by the poor-rates. But, notwithstanding this, voluntary charity went on to duplicate the legal provision in every imaginable way. Thus in New York city a *Directory of Charities*, published in 1892, enumerates thirty-nine official agencies of relief sustained by taxation under the city Commissioners of Charities and Correction, and then describes 590 more voluntary associations covering like ground. The latter are sectarian, secular, national, and racial, and devised for all sorts of distress. Each of these agencies, so common in large towns and cities, worked alone; they overlapped; they competed; they fostered indolence; they encouraged deceit; they disappointed the humane; they augmented the evils they professed to cure. Charity organization holds that if all this wasted strength were saved by co-operative action, the generous provision of society would be adequate to overcome every form of misery arising from real misfortune or indigence, and even to abate many caused by vice.

Clearing-house.—A chief appliance provided for this concerted action is a clearing-house or registration bureau, where every private individual, voluntary society, church agency, and civic relief officer can send information regarding the beneficiaries of each. Here that information is classified, tabulated, and exchanged among all who wish to profit by it. Its results are available for the guidance of any one wishing to do an act of charity. There is no dictation by the Charity Organization Society, and there are no restrictions beyond those necessary to protect the reputations of the poor. With the Charity Organization Society of New York city, in Jan., 1893, more than 480 relief agencies and 1,500 private individuals were co-operating through its registration bureau, which contained records, more or less detailed, concerning fully 175,000 families which had been investigated by it or reported to it as applicants for or recipients of charitable relief. This society was appealed to for information 16,244 times during 1892. By the simple expedient of a central registration bureau (often compared to the bankers' "clearing-house" or a "mercantile agency") benevolent activities that formerly counteracted each other now co-operate, the haunts and methods of professional mendicants and impostors are revealed, better adaptations of relief and friendly treatment are brought into view, and rills of service by the score are combined in one effective stream of helpfulness and adequacy.

III. Repression is a third feature of the organization of charity. Organized charity aims not so much to protect givers or workers as to protect the wretched, the tempted, and the fallen, not only from themselves, but from the demoralizing

and degrading effects of sentimentality and its cruel self-indulgence. It believes that to give alms without knowledge of the case is as absurd as to give medicine without a diagnosis, and should incur like censure, and that no one remedy is a panacea for all diseases. It pleads that the strong and prosperous should not damage and degrade the weak; but, not recoiling from any condition, however debased, by an intelligent acquaintance with the state of each, should adapt their help and treatment to the precise case in hand, with the constant aim of restoring each sufferer to true manhood or womanhood, as well as to independence and self-support.

IV. And this RESTORATION may be called the fourth and the most humane feature of charity organization. When human beings lapse into poverty or vice they too often lose their helpful social connections, and exchange them for those with a more degraded class; and their only proper cure is restoration to right social relations. It is this view of charity which finds expression in college and university settlements, Toynbee halls, Andover houses, Hull houses, neighborhood guilds, and all the contrivances for reknitting the social relations between the prosperous and the poor. Edward Denison, as the result of his observations in Stepney, wrote: "I am beginning seriously to believe that all bodily aid to the poor is a mistake; that the real thing is to let things work themselves straight; whereas, by giving alms you keep them permanently crooked. Build schoolhouses, pay teachers, give prizes, frame workmen's clubs, help them to help themselves, lend them your brains; but give no money but what you sink in such undertakings." Thus he, and all likeminded, thoughtful philanthropists, would restore the poor to a useful and honorable place in society.

Friendly Visitors.—The poor fall behind because of their isolation, inferior intelligence, moral weakness, and low ambitions. Bind together aspiration and aimlessness, strength and weakness, culture and ignorance, hopefulness and self-abandonment, and restoration is not only possible but probable; for the disordered class is only one-tenth of the number of the normal. Friendly visitors are charged to go to the poor as neighbors, and to stand by them patiently as friends; to discover and remove the causes of their depression; to give them the sympathy and counsel which they need; to impart the energy, hopefulness, and ambition which wholesome friends alone can give. They also suggest how to improve the health of the family in matters of ventilation, personal and home cleanliness, clothing, diet, care of children and of the sick; how to improve their homes or to remove to sunnier and purer quarters; how to find work; how to practice thrift and foresight; how to overcome debasing habits; how to train the children to become good men and women; and they carry to the impoverished the cheer and encouragement which come only from realizing that they have a living union with the great brotherhood of man. And this is what charity organization means by "restoration."

CHARLES D. KELLOGG.

Charity, Sisters of [in Fr. *sœurs* (or *filles*) *de la charité*, or *sœurs grises*, i. e. Gray Sisters, so called from their dress]: a name applied to several orders of celibate women in the Roman Catholic Church. The first congregation of this name was established at Châtillon, in France, by St. Vincent de Paul in 1629. Confirmed by the see of Rome, this congregation greatly multiplied, and its houses are now found in all parts of the world. This order is devoted to the care of the sick and the protection of foundling or destitute children and aged persons, and hence is popularly regarded with more favor than almost any other order of nuns. It alone, of all religious orders, was able to weather the storm of the Revolution in France. In spite of the edict of 1790, which suppressed all religious orders, the Sisters of Charity continued their activity and were not interfered with. In 1800 Napoleon officially recognized them and gave them public support. Under such circumstances the community developed an extraordinary energy; it became, indeed, the center into which was gathered the whole practical religious energy of the time. Their special name is Sisters of St. Vincent de Paul, and different from them, though having the same rules and the same purposes, is another order of Sisters of Charity, called Daughters of St. Borromeo. It was founded in 1652 by Abbot Epiphanius Louys of Estival, at that time general of the order of the Premonstrants. Its name is derived from the circumstance that its first members served in the hospital of St. Carlo Borromeo at Nancy. It also became very flourishing in France.

Mrs. Eliza Ann Seton, of Maryland, in 1809 founded a congregation of Sisters of Charity under a distinct rule, which is still followed to a considerable extent in the U. S., though many of its houses have united with the French order. Several congregations of Augustinian nuns and of other Roman Catholic orders are called Sisters of Charity and Sisters of Mercy, and have branches in the U. S.

Charkof: See KHARKOF.

Charlemagne, shaar'le-mān: See CHARLES THE GREAT.

Charlemont, shăarl'mōn', EDWARD: portrait and genre painter; b. at Znaim, Moravia, 1848; pupil of Vienna Academy and Makart; honorable mention, Paris Salon, 1878; third-class medal, Paris Salon, 1885. *The Pages* is one of his best works. W. A. C.

Charleroi, shăarl'rwăă': a strongly fortified town of Hainaut, Belgium; on the river Sambre, and on the railway between Brussels and Namur; 33 miles S. of Brussels (see map of Holland and Belgium, ref. 11–D). This place was fortified by Vauban, and was held alternately by the French and Spaniards. It has important manufactures of cutlery, glass, nails, etc. In this vicinity are extensive coal mines, and smelting furnaces which produce cast iron. Railways extending in various directions connect it with Paris and other towns. Pop. (1896) 23,042.

Charles (I.) the Great (in Lat. *Carolus Magnus*, Germ. *Karl der Grosse*, Fr. *Charlemagne*): Frankish king and founder of the Holy Roman empire; b. Apr. 2, 742. He was the eldest son of Pepin the Less, and of Bertha, his wife, daughter of one of the Counts of Laon. The place of his birth has not been positively determined, but it is now regarded as certain that he was German in his origin and belonged to the race of Ripuarian Franks. His father had arisen to the kingship in 751, and thus Charles, in his boyhood, was made familiar with the ceremonies of royalty. Two years later the king was visited by Pope Stephen III., and in 754 a deep ecclesiastical impression was made on the boy's mind by the ceremonies connected with the anointing of Pepin and Bertha, as well as of the two sons, in the cloister chapel of St.-Denis. Though not without mental and moral training, his education, according to the custom of the Franks, was largely devoted to the development of his physical prowess. In 761 he first accompanied his father on a military expedition against several of the strongholds in Aquitaine, and in 762 he witnessed the fall of Bourges. The successes of this difficult expedition testified to the growing power of the ruling family. On the death of Pepin, Sept. 24, 768, Charles succeeded to a large part of the domains of his father; but his rights to a portion of the territory were contested by his brother Carloman. War between the brothers was averted by the fatal illness of Carloman, who died Dec. 4, 771. Charles was immediately hailed and anointed as ruler over the united kingdom of the Franks. The same year he secured a divorce from his first wife, with whom, apparently in opposition to his own inclination, he had been brought into alliance by his mother. Soon after he married Hildegard, a young princess of the house of Alemania. By this alliance the claim of his family over a large part of Southwestern Germany was established. Affairs were complicated, however, by the fact that Desiderius, the father of his divorced wife, raised a revolt in behalf of Gerberga, the widow of Carloman, and her two infant sons. By the ceremony of 754 in St.-Denis, the Frankish kings were brought into peculiar relations with Italy, for the two sons of Pepin, having been specially named as Roman patricians, by receiving this title were made the official protectors of the Church. The responsibilities of this inheritance, whatever they were, were shared by the sons of Carloman as well as by Charles; but when Desiderius applied to Pope Hadrian, the successor of Stephen III., for recognition of royal authority for the sons of Carloman, the pontiff declined the petition. Desiderius enlisted the King of the Lombards in his behalf, and a war ensued. Hadrian appealed to Charles for protection. Assembling his army at Geneva, he sent one division into Italy by the pass of the Great St. Bernard, and the other he led himself across Mont Cenis. Marshaling his forces with great skill at the foot of the Alps, he succeeded in dividing the army of the enemy, driving a portion of it to Verona, and shutting up the rest at Pavia. The widow of Carloman and her sons were obliged to surrender at Verona. While the siege at Pavia was going on Charles paid a visit (774) to Rome, when at the hands of the pope he received confirmation of the pow-

ers granted at St.-Denis twenty years before. Returning to the army, he prosecuted the war with such success that from the year 776 he claimed the title of King of the Lombards as well as King of the Franks. The territory owning his sway reached as far S. as Spoleto. An outbreak in the north called him back, however, and in the winter of 776 he recrossed the Alps with his army and not only defeated the opposing forces, but reduced several cities to ashes. In 781 affairs in Italy once more required his attention, for the pope had been unwilling to abandon his overlordship of Spoleto. The greater part of Italy was soon reorganized in principalities, with the King of the Franks as suzerain. To the pope, however, was granted the exarchate of Ravenna and the territory along the Adriatic as far S. as Ancona, together with a large number of minor cities and estates in Southern Italy. This agreement was the basis of the pope's temporal power during the following centuries. Affairs were not settled, however, until after a long and stubborn campaign ending in 787, but the effects of Charles's policy in Italy were strongly felt in all Italian affairs for more than a thousand years.

While Charles was devoting himself to matters in Italy, affairs in the north were assuming an attitude that required his immediate attention. One of the most turbulent of all the Germanic tribes was the Saxons. Starting from a small beginning about the mouth of the Elbe, they had grown in number and power until they had not only made themselves masters of a large part of Northern Germany, but had made their name dreaded on the sea as well as on the land. With their kindred tribes about the months of the German rivers, the Jutes and the Angles, they had conquered Britain, and now, having overfilled their own territory, they were about to fall with resistless power on the territory of the neighboring Franks. In the absence of national boundaries, collisions along the borders had for years been inevitable. These had become somewhat serious as early as 772. In 774 and 776 they became formidable; but the Saxons were speedily reduced to terms in 777 by Charles himself, who took time enough from his Italian campaigns to march against them. Just after Charles had settled affairs at Paderborn, he received an embassy from Solyman el Arabi, the ruler of Barcelona, who desired to throw off the yoke of the Mohammedan Amiades, inviting the assistance of the powerful King of the Franks. The invitation was welcome, for the Franks and the Mohammedans had been deadly enemies for more than a hundred years. Putting his forces in order, Charles at once turned toward Spain. The campaign began in a most brilliant manner. He took Pamperuna by storm and advanced as far as the Ebro. Saragossa, however, opposed a successful resistance. Obliged at length to return, on Aug. 15, 778, his army was attacked by a horde of Basques and defeated at Roncesvalles. A large number of prisoners were taken, and a large part of the supplies fell into the hands of the enemy. News of this defeat was the signal for another uprising of the Saxons. Against these Charles was obliged to turn at once. He defeated them in 779, and in 780 he began the reorganization of the government of the conquered territory by putting Saxon nobles in power under his suzerainty. As the people were still pagans, he also organized a systematic missionary service for their conversion. The work of reducing the Saxons, however, was one of stupendous difficulties. Campaign after campaign was necessary during the next twenty years. The Avars, occupying the right bank of the Elbe, were not only reduced to subjection, but brought to at least a nominal acceptance of Christianity. In the year 796 Charles was able to report to the pope that the land as far as the Danube had been conquered and brought to acknowledge Christianity. But opposition was by no means broken. In 799 and again in 804 revolts broke out which were repressed with difficulty. But it was now evident that the conquest was substantially complete. It was in the year 804 that government was established in something like a civilized form, and the bishopries were founded which, with unimportant modifications, endured to the time of the Reformation.

By a series of campaigns, in many respects unrivaled in the history of the world, Charles had now extended his power from the Ebro to the Eider, from the Atlantic to the Adriatic, and from the North Sea to the Gulf of Beneventum. He had so conciliated the favor of the pope that he not only received papal sanction but was officially recognized as the protector and defender of the Church. The relations of the Frankish king to the pope, which had been begun in the time of his father, were in many ways elaborated and strengthened by Charles himself; and the seal of ecclesiastical sanction was placed upon these relations when on Christmas Day in the year 800 he was crowned by the pope as Roman emperor.

As a conqueror Charles not only brought the whole of Central Europe into subjection, but he also reduced the turbulent warlike tribes of the time to something like the methods of civilization. Even in those restless days he did much to develop the economic and agricultural resources of his domain. The minor governments which he invested with local responsibility proved an important barrier against the nomadic tendencies of the time, and had not a little influence in promoting peace within the empire. He established schools at various points throughout the empire as well as in the court, and drew about him the greatest scholars of the time. He died at Aix-la-Chapelle, Jan. 28, 814, leaving behind him, as Gibbon has remarked, the only name in all history with which the appellation "The Great" has become permanently incorporated. About his name many mediæval legends gathered which entered into the romances of rising European literatures.

AUTHORITIES.—Einhard, *Vita Caroli Magni*, written by Charles's son-in-law, and of the first importance (best edition Germ. trans. in 2 vols., 1839, by Jaffé, in *Bibliotheca Rerum Germanicarum*; separate volume 1876; Eng. trans. by Glaister, London, 1877); Mullinger, *The Schools of Charles the Great* (1877); Gaston Paris, *Histoire Poétique de Charlemagne* (1865); Guizot, *Charlemagne and the Carlovingians* (2 vols., 1880); Dummler, *Karl I.*, in *Allge. Deuts. Biog.*, xv., ss. 127–152; Mombert, *History of Charles the Great* (1888); Brosien, *Karl der Grosse* (1885); Haureau, *Charlemagne et son Cour* (1888); Burr, *Charlemagne* (in Heroes of History Series). C. K. ADAMS.

Charles I. (called THE BALD): King of France and second Holy Roman emperor; fourth son of Louis (I.) le Débonnaire and his second wife, Judith of Bavaria; b. in Frankfort-on-the-Main in 823; received a kingdom carved out of a territory assigned to his elder brothers, on account of which wars between them ensued; on the death of his father, 840, he received all of France W. of the Rhône, and in order to obtain the imperial title allied himself with his brother, Louis the German, to wrest it from Lothaire, the eldest brother; the battle of Fontanet ensued in 841, in which Lothaire was defeated in a bloody encounter ruinous to both sides. The next year the allied brothers renewed their treaty, Louis taking the oath in the Romance language and Charles in German. The words of the oath taken by Louis are among the earliest specimens of the Romance language. By treaty of Verdun, 843, Charles received France, Louis Germany, and Lothaire Italy and Lotharingia. This France embraced all territory W. of the Scheldt, Meuse, Saône, and Rhône, and Spain from the Ebro to the Pyrenees. The reign of Charles was passed in efforts to subdue Brittany, Septimania, and Aquitaine, and in feeble attempts to repress the ravages of the Norsemen. On the death of Lothaire the allied brothers fought over the division of Lotharingia, but Charles was weakened by the independence of his feudal barons just coming into power, and resorted to the Church for aid. In 875 Charles was crowned emperor by the pope. To secure the aid of his great barons in his project of wresting the German crown from the children of his brother Louis, he signed for them a capitulary at Quiersy-sur-Oise, which became the Magna Charta of French feudalism. Soon after he died (877), near Mont Cenis, while marching to relieve the pope from incursions of the Saracens.

C. K. ADAMS.

Charles II. (called THE FAT): King of France and third Holy Roman emperor; son of Louis the German; b. 832; on the death of his brother, Carloman of Bavaria, became King of Italy in 880; was crowned emperor 881; gained possession of Germany on the death of his brother Louis of Saxony in 882, and of France on the death of Carloman of France in 885; on account of his great weakness in resisting the invasions of the Norsemen was deposed in 887. D. in the cloister at Tribur, 888.

Charles IV. of the Holy Roman empire: b. in Prague, May 14, 1316; was son of John of Luxembourg, King of Bohemia; viceroy in Italy 1332; King of Bohemia on death of his father 1346, and the same year, through the influence of Pope Clement VI., was elected emperor as the successor of Louis V., whom the pope had deposed. This dignity he maintained at the cost of many humiliating concessions. He was generally submissive to the pope, given to the ag-

grandizement of his own house, and spiritless in repressing disorder. He issued in 1356 the Golden Bull, which for more than four centuries was the fundamental law to regulate the election of German emperors. This bull, by decreeing that the number of electors should be seven, three archbishops and four secular electoral princes, weakened the influence of the pope in the choice of an emperor, and Charles, to conciliate the pontiff, granted him a tithe of all ecclesiastical revenues. D. in Prague, Nov. 29, 1378, and was succeeded in Bohemia and the imperial dignity by his son Wenceslaus.

Charles V. of the Holy Roman empire, or Don Carlos I. of Spain; the eldest son of the Archduke Philip of Austria, and a grandson of the Emperor Maximilian I. His mother was Joanna, the daughter and sole heiress of Ferdinand of Aragon and Isabella of Castile. His vast inheritances, united with his great ability, made him the ablest and the most powerful monarch of the sixteenth century. He was born in Ghent, Feb. 24, 1500, and educated in Flanders, having as his preceptor Adrian of Utrecht. On the death of his father in 1506, Charles inherited the Low Countries and Franche-Comté, and in 1516 he succeeded Ferdinand as King of Spain, whither he removed his court in 1517. In 1519 he was elected Emperor of Germany, defeating Francis I. of France, who was also a competitor for that dignity. He was crowned as emperor at Aix-la-Chapelle Oct. 22, 1520. Charles V. and Francis I. of France were then the most powerful sovereigns on the continent of Europe, and were rivals. Their ambitious designs against Italy led to hostilities, which commenced in 1522. In this war Henry VIII. of England was the ally of Charles V., whose army defeated Francis at the battle of Pavia (1525), and took him prisoner. The war was suspended by the treaty of Madrid in 1526. Charles married in that year Isabella, a daughter of Immanuel, King of Portugal. The war was renewed in 1527 by Francis I. and Pope Clement VII., who had formed an alliance against the emperor. Under the Constable of Bourbon the army of Charles assaulted Rome and took the pope prisoner in 1527. Peace was restored by the treaty of Cambrai in 1529. Charles employed his power to check the progress of the Protestant Reformation, for which purpose he assembled the Diet of Augsburg in 1530. This Diet ordained that severe penalties should be inflicted on the Protestants. In 1531 the German Protestant princes formed for mutual defense the League of Schmalkald, and extorted some concessions from Charles, who, being then engaged in a war against the Turks, thought it expedient to temporize. In 1535 he conducted in person an expedition against Barbarossa, whom he defeated at Tunis. In 1536 his army invaded the south of France, but was not successful, and was soon forced to retreat. A truce of ten years was concluded between Charles and Francis I. in 1538, but it was broken in 1542. The French gained a victory at Ceresole, in Italy, in 1544, soon after which the war was ended by a treaty of peace. Resolving to extirpate heresy among his subjects, Charles published in 1546 the ban of the empire against the Elector of Saxony and the Landgrave of Hesse, who were chiefs of the Protestant party. They took arms in self-defense, but were defeated at Mühlberg in Apr., 1547. Their cause, however, found an able defender in Maurice of Saxony, who, as the head of a league, allied himself with Henry II. of France and took arms against Charles early in 1552. The French king invaded Lorraine; Maurice, South Germany; surprising the emperor at Innsbruck. Charles was compelled to flee into Carinthia; an attempt by him to recover Metz was attended with great loss, and hostilities were ended by the important treaty of Passau, Aug. 22, 1552, which secured religious liberty to the German Protestants. In the autumn of 1555 he formally resigned to his son Philip the sovereignty of the Low Countries, Spain, and his other hereditary dominions. He also abdicated the imperial crown, and was succeeded as emperor by his brother Ferdinand. His motives for abdicating have been matters of much dispute. He retired to the monastery of Yuste, near Plasencia, in Spain, where he died Sept. 21, 1558. His wife, to whom he was devotedly attached, died in 1539. See Robertson, *History of the Reign of Charles V.*; Prescott, *History of Philip II. of Spain*, vol. i.; Luigi Dolce, *Vita di Carolo V.* (1561); A. Pichot, *Charles Quint* (1854); Stirling-Maxwell, *The Cloister Life of the Emperor Charles V.* (1852); Sandoval, *Historia de la Vida de Carlos V.* (1606); Kervyn de Lettenhove, *Commentaires de Charles V.* (Brussels, 1862).

Charles VI. of the Holy Roman empire: second son of the Emperor Leopold I.; b. Oct. 1, 1685. He claimed the throne of Spain as a relative of Charles II., who died without issue in 1700, and who appointed Philip of Anjou as his heir. In 1703 Charles was proclaimed at Vienna under the title of Charles III. of Spain. In the war of the Spanish succession, which ensued, the cause of Charles was supported by Austria, England, and a portion of the Spaniards, and in 1706 was again proclaimed king at Madrid. The allies were defeated at Almanza in 1707 by the army of Philip, who finally obtained the throne by the aid of Louis XIV. of France, and Charles abandoned his chief claims, retaining only the Spanish possessions in the Netherlands and Italy. On the death of his brother, Joseph I., in 1711, Charles was chosen emperor. In 1715 he undertook the defense of the Venetian republic against the Turks, and as a result of victories gained increased the area of his dominions. He was next engaged in repelling an attempt on the part of Spain to recover Sicily, and was aided by England, France, and Holland. Having no son, he wished to secure for his daughter, Maria Theresa, the succession to his hereditary dominions, and appointed her his heir by a pragmatic sanction (1713). In his later years he was involved in wars with France, Spain, and Sardinia, and also with the Turks, and lost large portions of his territory. D. Oct. 20, 1740. See Schirach, *Biographie Kaiser Karl VI.* (1778).

Charles VII. of the Holy Roman empire, Charles Albert: son of Maximilian Emmanuel, Elector of Bavaria; b. in Brussels, Aug. 6, 1697. He married a daughter of the Emperor Joseph I. in 1722, and became Elector of Bavaria on the death of his father in 1726. When Charles VI. died, in 1740, this elector claimed part of the Austrian dominions. To obtain these he and his allies, France and Prussia, waged war against Maria Theresa. He was elected emperor in 1742, but his army was defeated by that of Maria Theresa. D. in Munich, Jan. 20, 1745.

Charles I., Charles Stuart: King of Great Britain and Ireland; b. at Dunfermline, Scotland, Nov. 19, 1600; second son of James I. and Anne of Denmark. He became heir-apparent to the throne on the death of his brother Henry in 1612, and was created Prince of Wales in 1616. His father tried to marry him to the Infanta of Spain, and he went *incognito* with Buckingham to Madrid to obtain her as a bride; the errand was fruitless, as it was obnoxious to the English. He inherited extreme notions in relation to royal prerogatives from his father, whom he succeeded in Mar., 1625. He married Henrietta Maria, a daughter of Henry IV. of France, conceding in the marriage treaty religious freedom to her and her attendants in violation of his parliamentary engagements. In the same year, and in disregard of public opinion, he chose for his Prime Minister and adviser the unpopular Duke of Buckingham, who had been his father's favorite. Parliament, animated by a growing spirit of liberty, was sparing in its grants of supplies, and was soon involved in a contest with the court. Charles dissolved several Parliaments in the first five years of his reign, and had recourse to arbitrary methods of raising money. He governed for eleven years (Mar., 1629, to Apr., 1640) without a Parliament, and after the death of Buckingham employed Laud and the Earl of Strafford as his chief ministers. During this period the Puritans were severely persecuted, and the patriot Hampden was prosecuted because he refused to pay the illegal tax called ship-money. In 1638 the Scottish people, on whom he attempted to impose a liturgy, rose in arms to assert their liberty, and subscribed the National Covenant. Charles, who had not power to enforce his policy in Scotland, summoned a Parliament, which met in Apr., 1640, but, as it was not subservient, it was dissolved in the next month. The Scottish insurgents invaded England in August, and defeated the royal army at Newburn-on-Tyne. This disaster and the want of money induced the king to call a new Parliament, which met in Nov., 1640, and was the famous Long Parliament. Both Houses were resolute in resistance to despotic power. They impeached the Earl of Strafford, who was executed in 1641, and they imprisoned Laud. In Jan., 1642, the king made a rash and abortive attempt to arrest Pym, Hampden, and three other members of the House of Commons. Provoked by this outrage, the Parliament appealed to arms. The royalists at first gained several victories, but they were defeated at Marston Moor in 1644, and again in June, 1645, at the battle of Naseby, where Charles commanded in person and Cromwell led the right wing of the Roundhead army. He was here so completely beaten that he soon gave himself up to the Scottish army, which transferred him in 1647 to the custody

of the English Parliament. Having been tried and convicted in a high court appointed for the occasion, he was beheaded at Whitehall Jan. 30, 1649. Six of his eight children survived him: Charles and James, afterward kings of England; Henry, Duke of Gloucester; Mary, the wife of William, Prince of Orange; Elizabeth; and Henrietta Anna, wife of Philip, Duke of Orleans. He was distinguished for his literary culture and good taste in the fine arts. He was regarded as a martyr by a large portion of his subjects.

AUTHORITIES.—Guizot, *History of the English Revolution*; Forster, *Sir John Eliot*; Chancellor, *Life of Charles I., 1600–25* (1886); especially S. R. Gardiner's *Prince Charles and the Spanish Marriage*, with the subsequent works of the same author.

Charles II.: King of Great Britain and Ireland; son of Charles I.; b. in London, May 29, 1630. He went into exile in 1645, and joined his mother in Paris. In 1649 he assumed the title of king, and was proclaimed king by the Scottish Parliament "on condition of his good behavior." He landed in Scotland in June, 1650, and was crowned at Scone Jan. 1, 1651. The austere Covenanters required him to sign "articles of repentance," and subjected him to restraints which were very irksome to a man who was naturally fond of ease and pleasure. A Scottish army fighting for the king was defeated by Cromwell at Dunbar in Sept., 1650. Charles, having recruited his army, led it into England, hoping that many English royalists would rally to his support. He was pursued by Cromwell, who gained a decisive victory over the royal army at Worcester, Sept. 3, 1651. Charles then became a fugitive, and, after several narrow escapes from capture in the Highlands, took refuge in France. After the death of Cromwell, the royalist party, which was always the most numerous, and was now favored by the law of reaction, easily regained the ascendency. Charles was restored in 1660 to almost unlimited power. He appointed Lord Clarendon Prime Minister, and married in 1662 Catherine, a daughter of the King of Portugal. In 1665, without good reason, he declared war against the Dutch—a war which was contrary alike to the feelings and commercial interests of the English people. The Dutch admiral De Ruyter, by entering the Medway and burning some ships of war at Chatham, induced him to make peace in 1667. Lord Clarendon was removed from power in 1667, and was succeeded by a corrupt ministry called the CABAL (*q. v.*). These ministers abused their power to promote popery and absolute monarchy, and in their foreign policy were subservient to Louis XIV. Charles accepted a pension from the French court, that he might be enabled to reign without the aid or control of parliaments. He also became an ally of France in another war against the Dutch in 1672, but this war, which was unpopular, was ended in 1674. The king showed partiality to the Roman Catholic Church, of which he had secretly become a member. A rumor of a popish plot caused a violent excitement among the people in 1678. Charles dissolved Parliament in that year, and called another, which in 1679 passed the Habeas Corpus Act in opposition to the will of the court. The prevalence of corruption and profligacy in politics and morals, together with the despotic policy of the court, rendered this reign one of the most disgraceful in English history. In 1683 the patriots Algernon Sidney and Lord Russell were put to death for their complicity in the Rye House Plot. Charles died without lawful issue Feb. 6, 1685, and was succeeded by his brother, James II. Charles II. was indolent, unambitious, and depraved in morals. He conferred the highest rank in the peerage upon his many mistresses and their children. See Hume, *History of England*; Macaulay, *History of England*, vol. i.; William Harris, *Life of Charles II.* (1765); Lord Halifax, *Character of Charles II.* (1750)

Charles I. of France: See CHARLES I., THE BALD, Emperor.

Charles II. of France: See CHARLES II., THE FAT, Emperor.

Charles III. of France (called THE SIMPLE): son of Louis le Bègue; b. in 879 A. D. Eudes, Count of Paris, was elected king by the barons in 887. Charles assumed the title of king in 893, and after the death of Eudes in 898 he reigned alone. He was a feeble prince, and failed to defend his kingdom from the Normans, but made a treaty in 911 with them, creating Rollo a duke, giving him his sister in marriage, and creating for him the duchy of Normandy. In 922 his barons revolted, and chose Robert king, who perished at Soissons. The next year the nobles elected Raoul (or Rodolph) of Burgundy to the throne, and Charles was imprisoned by the Count of Vermandois. He was released by Raoul, and died in Peronne in 929, leaving a son, Louis d'Outremer.

Charles IV. of France (called THE FAIR): third son of Philippe le Bel: b. in 1294. He began to reign in 1322 as successor to his brother, Philip V. of France and Navarre. He aided his sister Isabella to dethrone her husband, Edward II. of England. He died without male issue in 1328, and was succeeded by Philip of Valois.

Charles V. (called THE WISE): King of France; b. Jan. 21, 1337; son of John II. He acted as regent during the captivity of John, who was taken prisoner by the English in 1356. His regency was vexed by the States-General, which he convoked, and which refused subsidies, and, led by Stephen Marcel, endeavored to repress the authority of the crown. The murder of Marcel gave Charles control again, but in 1360 his father returned and resumed the government. Charles became king on the death of his father in 1364, at a time when France was invaded by English armies. He acted on the defensive, and avoided a general battle. The French general Du Guesclin expelled the English from Poitou, Saintonge, Brittany, and Guienne, and reduced to submission the King of Navarre. He increased the relative preponderance of the crown over the nobles, and reformed the administration of justice and the procedure of Parliament. Charles founded the Royal Library of Paris. He died at Vincennes, Sept. 16, 1380, leaving the throne to his son, Charles VI. See Roy's *Histoire de Charles V.* (1849).

C. H. T.

Charles VI. (called THE BELOVED): son of Charles V.; b. in Paris, Dec. 3, 1368, and was the first prince who received the title of dauphin. He succeeded to the crown at twelve years of age, and his minority was troubled by the rapacity and turbulence of his uncles of Berry, Burgundy, Anjou, and Bourbon, against whom rebellions broke out in the cities of France and Flanders, where they were directed by Philip van Artevelde, who was overthrown in 1382 at Roosebeke. In 1388 Charles threw off the control of his uncles and assumed the government, but he became insane in 1392, after which the kingdom was distracted by the rivalry between the Dukes of Burgundy and Orleans. In 1407 a civil war broke out between the Burgundians and the Armagnacs (as his party was called) led by the Duke of Orleans, who was assassinated by John the Fearless, of Burgundy, an atrocity which increased the virulence of the civil war. In this disturbed state of the country France was also invaded by Henry V. of England, who gained a great victory at Agincourt Oct. 21, 1415. Charles died in neglect Oct. 22, 1422.

Charles VII. (called THE VICTORIOUS): King of France; b. Feb. 22, 1403; a son of Charles VI., whom he succeeded in 1422. At that time the kingdom was rent by the Burgundian and Armagnac factions during the insanity of his father. The assassination of John the Fearless, of Burgundy, in the presence of the dauphin, was followed by an alliance of the English with the Burgundians, who gained almost a complete mastery of France. In 1420 Henry V., of England, who had married a sister of Charles, had his right of succession confirmed by the treaty of Troyes, but he died in 1422, and the administration of English interests in France was committed to the able DUKE OF BEDFORD (*q. v.*), who carried conquest still further. The court seemed ingulfed in frivolity and dissipation, and the infant King Henry VI. of England was recognized as King of France by a faction which had possession of Paris while France was partially occupied by the English, who besieged Orleans in 1428. From the ruinous state to which the country was reduced by intestine discord and foreign invasion, it was restored by the heroism of JOAN OF ARC (*q. v.*), and the prudent policy of Charles, who had fallen among better advisers. Burgundy withdrew from the English alliance and joined France; the Duke of Bedford died, and Charles became master of Paris in 1436. He waged war with success against the English, reducing their possessions in France to Calais, and recovered Normandy in 1450. The great events of this reign, besides the expulsion of the English and of mercenary soldiers, were the creation of a standing army, the introduction of commoners, as Jacques Cœur, into the royal council, and the Pragmatic Sanction which, by adopting the decrees of the Council of Basel, laid the basis of the liberties of the Gallican Church. Charles's last years were shameless; he embittered his son, and, fear-

ing assassination at his hands, starved himself to death at Melun, July 22, 1461, and was succeeded by his son, Louis XI.

Charles VIII. (called THE AFFABLE): King of France; b. at Amboise, July 30, 1470; a son of Louis XI., whom he succeeded in 1483. His reign began under the regency of his sister, Anne of Beaujeu, who caused the defeat of Count Dunois in Guienne, of the Duke of Orleans at St.-Aubin, and the reform of the States-General, making the peers and bishops representatives of their order and not of personal right, and recognizing the *tiers-état* of the peasantry. In 1490 Charles released the Duke of Orleans, assumed the government with Dunois as his counselor, and married in 1491 Anne, Duchess of Brittany, who had been betrothed to the Emperor Maximilian, and on this account became involved in war with Spain and England. He escaped hostilities by ceding Franche-Comté and Artois to the emperor, Roussillon and Cerdagne to Spain, and by buying off Henry VII. of England. Brittany was thus added to France, and the king turned his attention to foreign conquest. The claims of Anjou to Naples having been purchased, he led an army into Italy in 1494 and conquered that kingdom early in 1495. Alarmed by his victorious progress, the King of Spain, the German emperor, and other powers formed a league against him. As Charles was marching homeward he encountered and repulsed the army of the allies at Fornova, and then returned to France. He died without issue from an accident in his twenty-ninth year, at Amboise, Apr. 7, 1498, and was succeeded by Louis XII.

Charles IX.: King of France; second son of Henry II. and Catherine de' Médici; b. at St.-Germain-en-Laye, June 27, 1550. He succeeded his brother, Francis II., in 1560. During his minority his mother had the chief control of the Government. His reign was disturbed by civil or religious wars, which began in 1562, between the Catholics and Huguenots. The court generally co-operated with the Catholic party, but Catherine was jealous of the Duke of Guise, the leader of the Catholics, and sometimes opposed him by her intrigues. The civil war was several times suspended by treaties, and renewed in consequence of the perfidy of the court. Charles married in 1570 Elizabeth, a daughter of the Emperor Maximilian II. He made overtures of peace to the Huguenots, and negotiated a marriage between his sister Margaret and Henry of Navarre. On the occasion of this wedding he invited Coligny and other Protestant leaders to court, and treated them with a simulated favor which lulled their suspicions. It appears that he and his mother were responsible for the massacre of the Protestants which commenced Aug. 24, 1572 (St. Bartholomew's Day). Charles admitted that he had consented to this crime, which his mother probably suggested. He died in a bloody sweat, full of remorse for the innocent blood he had shed, and without issue, May 30, 1574. A book of his on hunting, *La Chasse Royale*, containing verse of his composition, was published in 1857. See Varillas, *Histoire de Charles IX.* (1683); Sismondi, *History of France.*

Charles X.: King of France; b. at Versailles, Oct. 9, 1757; a younger brother of Louis XVI. He was originally styled the Count of Artois. In 1773 he married Maria Theresa of Savoy; emigrated in 1789; instigated the French royalists to revolt in 1795; remained in exile until 1814; began to reign on the death of Louis XVIII. in Sept., 1824. His policy was reactionary, and his advisers were a conclave of fanatical priests. In Aug., 1829, he formed an ultra-royalist ministry under the absolutist PRINCE POLIGNAC (*q. v.*), which was obnoxious to the people, and on July 25, 1830, the Parisians appealed to arms, barricaded the streets, and after a contest of three days were completely victorious. Charles abdicated in favor of his grandson, the Duke of Bordeaux, or COMTE DE CHAMBORD (*q. v.*), and escaped to Scotland. He died at Göritz, Austria, Nov. 6, 1836, while expiating the follies of his early life by pious austerities. See Lorieux, *Histoire du Règne de Charles X.* (1834); Lamartine, *History of the Restoration.*

Charles I. of Anjou: King of Naples; Count of Anjou and Provence; b. about 1220; the youngest son of Louis VIII. of France, and a brother of St. Louis. He married Beatrice, a daughter of Raimond Berenger, Count of Provence, and became his heir; went on a crusade with his brother, Louis IX., and was captured with him; on his return subdued the republican revolt which had broken out in the cities of Provence; fought for Margaret of Flanders, who was endeavoring to gain Hainault, which Louis forced him to relinquish. At the instigation of Pope Urban IV. he attacked and defeated Manfred, King of Naples, in 1266, usurped his throne and executed the legitimate heir, the little Conradin. He started on a second crusade, but was baffled by a storm. Pope Nicholas, incensed by his haughtiness, deprived him of his offices as senator of Rome and vicar-general of Italy; on this pope's death Charles secured the succession for Martin IV., who restored his Roman offices. Provoked by his tyranny, the Sicilians revolted and massacred a multitude of Frenchmen on Mar. 30, 1282. This event was called "THE SICILIAN VESPERS" (*q. v.*). Charles in retaliation laid siege to Messina, but his fleet was burned and his efforts proved disastrous. D. at Foggia, Jan. 7, 1285.

Charles (or DON CARLOS) **I.** of Spain: See CHARLES V., Emperor.

Charles (or **Carlos**) **II.**: King of Spain; b. Nov. 6, 1661; son of Philip IV., who died in 1665, and Anne of Austria. Anne became regent on the death of her husband, but in 1675 Charles assumed the government and took his natural brother, Don John, as his chief minister, an able man, but he was forced by the treaty of Nimeguen to cede in 1678 Franche-Comté to France. He married in 1678 Louise of Orleans, a niece of Louis XIV. of France. In 1689, having married a sister of Emperor Leopold I., he became an ally of England and Austria in a war against Louis XIV., but the hostilities of Spain were harmless. He was an incapable ruler, and a man of morbid condition of mind and body. As he was childless, he became in the latter part of his life anxious and irresolute about the choice of his successor. By his last will he appointed Philip, Duke of Anjou, as his heir. D. Nov. 1, 1700.

Charles III.: King of Spain; son of Philip V.; b. Jan. 20, 1716. Parma, Piacenza, and Tuscany were formed into a principality for him, and at fifteen he was given an army and sent to take possession of it; at eighteen he subdued Naples and Sicily and was made king thereof; he ascended the throne on the death of his brother, Ferdinand VI., in 1759, and was an ally of France in the war against England which began in 1762. He promoted education and reform, and expelled the Jesuits from Spain in 1767. In 1779, as an ally of France, he declared war against England, joining France in sending aid to the revolted colonies in America, but he reaped little advantage from the alliance. These allies besieged Gibraltar without success. He bartered Florida for Cuba with Great Britain, but received Florida back and gained Minorca at the conclusion of peace. An able sovereign, he was served by able statesmen, who reformed the finances of Spain, banished the Jesuits, and sought to bring the Inquisition under civil control. He died in Madrid, Dec. 14, 1788, and was succeeded by his son, Charles IV.

Charles IV. of Spain: son of Charles III.; b. in Naples, Nov. 12, 1748. He became king in 1788, before which he had married his cousin, Maria Louisa Theresa of Parma, who had great ascendency over him. In 1792, through the evil influence of the queen, her depraved favorite Godoy was appointed Prime Minister. In 1793 war was declared by the French against the Spaniards, who were defeated in many battles. Charles sued for peace, and the war ended in July, 1795. As an ally of France he declared war against England in 1796, but his fleet was ruined by Nelson at Trafalgar (1805). In 1807 he conspired with Napoleon to seize Portugal and divide it into principalities for Godoy and the Queen of Etruria, while Charles was to become Emperor of America by title. The king thereupon sent 16,000 troops to Denmark to aid Napoleon in recovering it from British control. His son conspired against him and plotted his assassination. Charles abdicated in favor of his son Ferdinand in Mar., 1808, but Napoleon in the same year deposed him, and placed his own brother Joseph on the throne. Charles retired to Chambord, and became a pensioner of France with an annuity of $1,200,000. He refused to embroil himself thereafter in Spanish politics. D. in Rome, Jan. 19, 1819.

C. H. T.

Charles IX. of Sweden: fourth son of Gustavus Vasa; b. Oct. 5, 1550; joined his brother John in deposing (1568) their eldest brother, King Eric, who was murdered in 1577; John married Catherine of Poland; turned Roman Catholic; d. in 1592, leaving the throne to his son Sigismund, a Roman Catholic, and King of Poland. Charles took possession of the Government while awaiting Sigismund's arrival, and, assembling a great concourse of magnates at Upsala, pro-

cured a decree in 1593 that the *Augsburg Confession* should be the authoritative standard of the Swedish Church, an event regarded as a new epoch in that country. In 1594 Sigismund was crowned, and began to intrigue for the domination of his own creed. Sigismund returned to Poland, leaving Charles as his viceroy, who then undertook to abridge the pretensions of the nobles and to promote Protestantism, and in 1598 defeated his nephew, who had invaded Sweden, at Stängebro. Sigismund, disregarding the request of the Diet that he should reside in Sweden or send his son to be educated there, was deposed in 1604, and Charles chosen king—an act which increased the hostile feeling between Sweden and Poland. As king, Charles IX. promoted mining and trade; established the University of Gothenburg; secured the burghers and peasantry a larger part in the business of the Diet; reduced the nobles to subordination; and allied himself with the Protestant princes of Germany. He aided Russia against the false Dimitri, whose claims Sigismund upheld, and began the Calmar war with Denmark. D. in Nyköping, Oct. 30, 1611.

C. H. THURBER.

Charles X., or **Charles Gustavus**: King of Sweden: b. at Nyköping, Nov. 8, 1622; son of John Casimir, Elector Palatine of the Rhine. His mother, a daughter of Charles IX. of Sweden, was a sister of King Gustavus Adolphus. He was the heir-apparent in the reign of Christina, and became king when she abdicated in June, 1654. He was an able and a warlike ruler. In 1655 he invaded Poland because the Polish king had not renounced his claim to the throne of Sweden. He took Warsaw, and speedily drove the king out of Poland. During his absence the Danes declared war against him. He defeated them, and compelled them to cede Scania and other territory to Sweden (1658). He died in Gothenburg, Feb. 13, 1660, and left the throne to his son Charles. See Lundblad, *Konung Carl X. Gustaf's Historia* (2 vols., 1823–29).

Charles XI.: King of Sweden; son of Charles X.; b. Dec. 25, 1655, and became king in the fifth year of his age, but the country was governed by a regency under his mother. By a treaty with Poland in 1660, Esthonia and other provinces which Charles X. had conquered were ceded to Sweden. Charles XI. assumed the royal functions in 1672, and formed an alliance with Louis XIV. of France, sending troops to his aid into Germany, which were defeated at Fehrbellin, and a part of Pomerania lost finally to Brandenburg. The Danes now made war upon him in 1677, but he drove them from Scania, and in 1679 signed a treaty of peace and married a sister of the King of Denmark. His reign thenceforth was pacific and prosperous. In 1680 he was invested by the states with absolute power in order to restore the finances. The crown lands had been recklessly given to the nobles, and taxation was oppressive. He recovered ten counties, seventy baronies, and many smaller estates, and rendered the crown independent of the aristocracy and Diet. He founded the University of Lund, promoted parochial schools, reorganized the army and navy, and strengthened the fortresses of Sweden. He died in Stockholm, Apr. 15, 1697, and was succeeded by his son, Charles XII.

Charles XII. of Sweden: b. in Stockholm, June 27, 1682; eldest son of Charles XI. and Ulrica Eleonora of Denmark. He learned Latin, French, and German, and formed in his youth simple and frugal habits of living. He began to reign in Apr., 1697, and chose Count Piper as his chief minister and adviser. In 1700 a league was formed against Sweden by Peter I. of Russia and the Kings of Denmark and Poland, who designed to aggrandize their dominions at his expense. At the head of a well-disciplined army Charles assumed the offensive in May, 1700. He marched first against Copenhagen, and compelled the Danish king to sue for peace, which was concluded Aug., 1700. With prompt and rapid movement he then led about 8,000 men against Peter the Great, who was besieging Narva with nearly 70,000 men. Charles gained a decisive victory at Narva in Nov., 1700, soon after which he invaded Poland. He defeated the Poles in several battles, and deposed Augustus, King of Poland, in 1704. Provoked by recent acts of hostility on the part of the Czar Peter, he advanced toward Moscow in Sept., 1707, with an army of 43,000 men. The Russian army was not able to resist his impetuous progress, and he crossed the Beresina in June, 1708. Having arrived at Smolensko, he was induced by Mazeppa, hetman of the Cossacks, to march southward into the Ukraine. Here many of his men perished from cold and want of provisions, and his army remained inactive during the severe winter of 1708–09. At the beginning of the next campaign he had only 18,000 Swedes in his army. He besieged Poltava, to relieve which Peter advanced with an army of 70,000 men. The decisive battle of Poltava, July 8, 1709, resulted in the defeat of Charles, who lost about 9,000 men killed and 6,000 prisoners. He escaped into Turkey, and was kindly received by the sultan, who gave him a residence at Bender. He induced the sultan to declare war against Russia, but this war was soon ended by a treaty. Charles remained in Turkey several years, and at length was involved in a quarrel with the Turkish rulers, who treated him as a prisoner. He escaped in 1714, and traveling *incognito* through Hungary and Germany, reached Stralsund in November of that year. The Russians, Danes, and Prussians continued to wage war against the King of Sweden, and they took Stralsund in Dec., 1715, after a long siege. The energy and audacity of Charles remained unabated, notwithstanding his reverses, and while the allies threatened to invade Sweden he invaded Norway. He was killed at the siege of Frederikshall Nov. 30, 1718, and left a great reputation as a military genius. The long-current belief that he was treacherously shot by one of his own officers was effectually dissipated in 1859 by an examination of his skull. He was never married, and his sister, Ulrica Eleonora, inherited the throne. See Voltaire, *Life of Charles XII.*; Nordberg, *Karls XII. Historia* (1740); Lundblad, *Konung Carls XII. Historia* (2 vols., 1830); Posselt, *Geschichte Carls XII.* (1804).

Charles XIII.: King of Sweden; b. Oct. 7, 1748; son of King Adolphus Frederick, and nephew of Frederick the Great. Before his accession he was an admiral of the Swedish navy, and gained a naval victory over the Russians in 1788. In 1792 he became regent during the minority of his nephew, Gustavus IV., and retained that office until 1796. The States-General deposed Gustavus in 1809, and elected Charles as his successor. Having no son, Charles, with the consent of the Swedish Diet, adopted Gen. Bernadotte as his son and heir in 1810, and gave the administration almost wholly up to him. D. Feb. 5, 1818.

Charles XIV. of Sweden: See BERNADOTTE.

Charles (or **Carl**) **XV.** (*Louis Eugène*): King of Sweden and Norway; b. May 3, 1826. He succeeded his father, Oscar I., July 8, 1859. He married in 1850 a Princess of Orange. The Storthing, or parliament, was remodeled in this reign and made more representative. The king wrote a book of poems, of which there is a German translation (Berlin, 1866). D. Sept. 18, 1872, leaving a daughter, Louisa, Crown Princess of Denmark. The crown descended to his brother, Oscar II., Frederick, Duke of Östergötland.

Charles I., KARL EITEL FRIEDRICH ZEPHYRIN LUDWIG of Hohenzollern-Sigmaringen: King of Roumania, which until 1861 was the United Danubian Principalities of Moldavia and Wallachia. He was born in Germany, Apr. 20, 1839, and is the second son of Prince Karl of Hohenzollern. He entered the Prussian army at an early age, and was a lieutenant in the Second Regiment of Prussian dragoons when, on May 10, 1866, he was elected *domnul*, or Prince, of Roumania, at the instance of the Prussian ambassador. He arrived in Bucharest May 2, was recognized by the people May 22, and received formal investiture from the sultan, who was his suzerain, July 11, 1866. His administration has been successful as a whole. He declared Roumania independent, and was proclaimed king Mar. 26, 1881. In 1869 he married Princess Elisabeth von Neuwied, known in literature as CARMEN SYLVA (*q. v.*).

Charles, Archduke of Austria: general; b. in Florence, Sept. 5, 1771; son of the German Emperor Leopold II. Having served in several campaigns against the French, he obtained in 1796 the chief command of the Austrian army of the Rhine, and defeated the French general Jourdan at Würzburg in September of that year, and also compelled Moreau to retire across the Rhine. He retired from active service on account of ill-health in 1800, and was appointed governor of Bohemia, but soon returned to the field and in 1805 commanded in Italy, and defeated Masséna at Caldiero. He became general-in-chief of the Austrian armies in 1806. Although he could not prevent Napoleon from entering Vienna, he encountered him with success at the great battle of Aspern in May, 1809. The archduke and Napoleon commanded the armies at Wagram July, 1809, where the French claimed the victory. Charles resigned the command soon

after this event. He wrote an able work called *Principles of Strategy* (1814). D. Apr. 30, 1847, leaving a son, Albert.

Charles Albert: King of Sardinia; b. Oct. 29, 1798. He was a son of Prince Charles Emmanuel of Savoy-Carignan; married in 1817 Maria Theresa, Archduchess of Tuscany; was regent in 1821 on the abdication of Victor Emmanuel; Viceroy of Sardinia in 1829; became king on the death of Charles Felix in 1831, and adopted a liberal policy. Co-operating with the movements of the popular party in the cause of the unity and liberation of Italy, he declared war against Austria in the spring of 1848. Having been defeated at Novara in Mar., 1849, he abdicated in favor of his son, Victor Emmanuel. D. in Oporto, Portugal, July 28, 1849.

Charles Augustus: Grand Duke of Saxe-Weimar; b. Sept. 3, 1757; began to reign in 1775; general in the Prussian army 1792–93; joined the Rhenish Confederacy in Dec., 1806; fought with the allies against Napoleon 1813–15. The congress of Vienna made his principality a grand duchy. He was a patron of the arts and sciences, and an intimate friend of Goethe and other men of letters. Under his reign Weimar, his capital, became the literary center of Germany.

Charles, surnamed **the Bold**, sometimes called **Charles the Rash** (in Fr. *Charles le Téméraire*): Duke of Burgundy; b. in Dijon, Nov. 10, 1433; was a son of Philip the Good. He was styled Count de Charolais until he became duke in 1467. He married Margaret, a sister of Edward IV. of England, in 1468, and became one of the most powerful sovereigns of his time. His dominions included the Netherlands. He waged war against Louis XI. of France, whom he seized at a conference and carried prisoner to Liège, compelling him to witness the terrible punishments inflicted for the revolt the king had instigated; made a truce in 1475, and overran Lorraine. In 1470 he laid siege to Granson and massacred the garrison, but was badly defeated by the Swiss. Three months later he again invaded Switzerland, and was defeated at Morat. He afterward invaded Lorraine to put down the revolting Duke René; was defeated and killed at Nancy, Jan. 5, 1477. He was succeeded by his daughter Mary, who was married to the Emperor Maximilian I. With him ended the resistance of great feudatories to the crown in France. It was the political aim of this prince to restore the kingdom of Burgundy, embracing Provence, Lorraine, Dauphiné, Switzerland, and his own inheritance. See Kirk, *History of Charles the Bold* (1868); Comines, *Mémoires*.

Charles, Cape: See CAPE CHARLES.

Charles City: capital (settled in 1855) of Floyd co., Ia. (for location of county, see map of Iowa, ref. 2–H); on C., M. and St. P. and Ill. Cent. R. Rs., and on Cedar river; 139 miles W. N. W. of Dubuque. Here are 9 churches, 6 schools, a furniture-factory, harrow-factory, roller flouring-mill, 2 foundries, and various other industries. It has the best water-power in Northern Iowa. Pop. (1880) 2,421; (1890) 2,802; (1900) 4,227.

EDITOR OF "INTELLIGENCER."

Charles d'Orléans, shaarl'dōr'lay'ăañ': nobleman and poet; son of Duke Louis of Orleans, and father of Louis XII., King of France; b. May 26, 1391; d. Jan. 4, 1465. His youth was spent at Blois, in the brilliant society of knights and scholars and poets his father liked to have about him. In 1407 his father was assassinated; in 1408 his mother died. He governed his estates till 1415, when he was taken prisoner in the battle of Agincourt and carried to England, to be kept there in captivity for nearly twenty-five years. In his prison he turned for solace to poetry, and composed many *ballades* in praise of *Beauté*, of a *dame*, of a *très belle maîtresse*, the memory of whom afflicts his heart with what must be admitted to be a somewhat monotonous pain. In his *Ballade sur la Paix*, however, and his *Invocation à la France* we have strains that partly justify the inclination of certain scholars to make him, instead of Villon, the first of the band of modern French poets. See Constant Beaufils, *Thèse sur Charles d'Orléans* (1861); Ch. d'Héricault, *Vie de Charles d'Orléans*, and *Poésies de Charles d'Orléans* (1874–75). During his captivity Charles d'Orléans turned some of his poems into English; others were translated under his eye. These translations have been edited by G. W. Taylor for the Roxburghe Club (London, 1827). A. R. MARSH.

Charles Edward, "the Young Pretender," or more fully **Charles Edward Louis Philip Casimir Stuart**: son of James Stuart, the first "Pretender," and of the Polish princess Clementina Sobieski: b. in Rome, Dec. 31, 1720. Unlike his father and his grandfather, James II., he had much native talent and firmness of purpose. He was well educated and skilled in athletic exercises, as well as in music and the fine arts. In early youth he served with much honor in the Spanish army against Austria. War having broken out between France and Great Britain, and his father having abdicated his claim to the British throne, he in 1744 embarked with a powerful fleet and army for England, Marshal Saxe being in command; but the expedition was broken up by a great storm, which destroyed a large part of the fleet. In the following year (July 25) he landed with a few attendants at Moidart. He soon had a large following, mostly of Highlanders. With these he entered Edinburgh Sept. 17, destroyed Sir John Cope's army at Preston Pans Sept. 21, entered England, and could easily have taken London but for the insubordination of the Highland chiefs, who compelled him to retreat to Scotland, repulsing the royal troops at Clifton. On Jan. 17, 1746, he defeated Hawley at Falkirk. The character of his forces soon compelled his retreat to the Highlands, whither he was followed by the Duke of Cumberland. He fought the latter at Culloden Muir (Apr. 16), and was there utterly overthrown: but though his army was inferior in numbers and worn out by exposure and hunger, he would doubtless have won a complete victory but for the jealousy of the clan MacDonald. As it was, the battle was totally lost, and with it the last reasonable hope of the Stuart line. After many months of suffering he escaped from the Western islands by the aid of the famous Flora MacDonald. In Italy he was known under the title of Count of Albany, a title which passed to his natural daughter by Miss Walkenshaw. He was compelled to leave France, though it is suspected that the Government connived at his subsequent secret residence in Paris. He wandered much in Europe, became a confirmed profligate, married in 1772 Louisa of Stolberg, whom he forced to take refuge in a convent through fear of her life. The couple formally separated, partly because she was suspected of an attachment to the poet Alfieri (see ALBANY, LOUISA MARIA CAROLINE), and he remained at Florence. His natural daughter nursed him through his last two years. D. in Rome, Jan. 31, 1788.

Charles, ELIZABETH RUNDLE: an English authoress: b. 1826; was married to Andrew P. Charles, of London, in 1851. Among her works, which are very popular and religious, are *The Draytons and Davenants* (1841); *Chronicles of the Schönberg-Cotta Family* (1863); *Diary of Mrs. Kitty Trevylyan* (1864); *Winifred Bertram* (1866); *Martyrs of Spain* (1870); *The Bertram Family* (1876); *Lapsed, but not Lost* (1881). D. at Hampstead, London, Mar. 28, 1896.

Charles Emmanuel I.: Duke of Savoy (called THE GREAT); b. Jan. 12, 1562. He succeeded his father, Philibert Emmanuel, Aug. 31, 1580, and married Catherine, a daughter of Philip II. of Spain. He was an ambitious prince, and waged war against Henry IV. of France and other sovereigns. D. July 26, 1630.

Charles Friedrich August Wilhelm: Duke of Brunswick; b. Oct. 30, 1804; son of Friedrich Wilhelm who perished at the battle of Quatre-Bras; had for his guardian George IV. of England. Assuming the reins of government in 1823, he ruled so capriciously and arbitrarily that he was deposed by the German Diet. He lived afterward in Paris and London, and died in Aug., 1873, bequeathing his immense fortune to the city of Geneva.

Charles, shaarl, JACQUES ALEXANDER CÉSAR: savant and aëronaut; b. at Beaugency, France, Nov. 12, 1746. He was a popular lecturer on physical science in Paris, and gained distinction by his experiments in electricity. He also made an improvement in the art of ballooning by substituting hydrogen gas for heated air. He and M. Robert were the first persons who ever ascended in a balloon. They ascended in 1783 to the height of 7,000 feet. D. Apr. 7, 1823.

Charles Martel: King of the Franks; b. about 689 A. D.; illegitimate son of Pepin d'Héristal, Duke of Austrasia, who, estranged by the suspicion that Charles had murdered his brother, left the government to his wife and grandson. Deriding the rule of a woman and child, the Austrasians elected Charles their duke. He subdued Neustria, and made himself mayor of the palace, while Chilperic was the nominal king. He made Aquitaine his feudatory, cleared his frontiers of the marauding German tribes, and brought the Frisians to embrace Christianity. His most famous achieve-

ment lay in repelling Asiatic domination from Europe. He gained near Poitiers in 732 a most important victory over a large army of Saracens who had invaded the kingdom. This is known as the battle of Tours, and is regarded as one of the decisive battles of the world's history. For this victory he was surnamed Martel (i. e. the Hammer). When Thierry IV. died, Charles allowed the crown to lie in abeyance, neither changing his titles nor replacing the king, and thus ended the Merovingian dynasty. Charles bequeathed Austrasia to his son Carloman, and Neustria to Pepin, who by the death of Carloman obtained the whole dominion and took the title of king. Charles was detested by the Church because he seized its lands to maintain his wars. D. Oct. 22, 741.

Charles River, Mass.: rises in Worcester County; pursues a very tortuous course through Norfolk and Middlesex Counties; meets the tide-water at Boston, forming part of Boston harbor, and separating that city from Cambridge. Total length about 75 miles.

Charleston: city and railroad junction; capital of Coles co., Ill. (for location of county, see map of Illinois, ref. 7–F); 46 miles W. of Terre Haute, Ind. It is in an agricultural region, and has flouring and woolen mills, a canning-factory, a cigar factory, and a foundry, electric lights, etc. Pop. (1880) 2,867; (1890) 4,135; (1900) 5,488. EDITOR OF "PLAINDEALER."

Charleston: town and railroad junction; capital of Mississippi co., Mo. (for location of county, see map of Missouri, ref. 7–K); 12 miles S. W. of Cairo, Ill. It is in a lumber and agricultural district, and has an academy. Pop. (1880) 1,028; (1890) 1,381; (1900) 1,893.

Charleston: an important railroad and commercial center, the chief city of South Carolina, and capital of Charleston County (for location of county, see map of South Carolina, ref. 7–F); situated in lat. 32° 46′ N., lon. 79° 57′ W.; 100 miles S. S. E. of Columbia, the capital of the State, 82 miles N. E. of Savannah, Ga., and 455 miles S. S. W. of Washington, D. C. The city is built on a peninsula, formed by the confluence of the Ashley and Cooper rivers, having an average elevation of 8 to 10 feet above high water, and is about 3½ miles long, and varies in width from ½ to 2 miles. Northward stretches an extended plain, mostly occupied by fruit, flower, and vegetable farms. The two rivers unite their waters at the south in a spacious and beautiful harbor, which opens to the sea at a point about 6 miles to the S. E. This harbor has a depth of 40 feet at the city, and is one of the safest and most commodious on the Atlantic coast. Formerly the depth of its entrance was insufficient to permit the passage of vessels of great draught, but within recent years jetties have been constructed to create currents of sufficient force to cut a channel through the bar, and the high-water depth on each side of the bar is rapidly increasing. The harbor is defended by Fort Moultrie, situated on Sullivan's island, and by Fort Sumter, which commands the channel. The Ashley river to the westward is spanned by two bridges, the Charleston and Savannah R. R. bridge and another, known as the "New Bridge," and owned by a stock company. Plans have been made to connect the city by a railroad with the suburbs across the Cooper river on the E., including Mt. Pleasant, a growing village, and Sullivan's island, which is a popular summer resort, affording a fine beach for surf-bathing, now reached by ferry. Summerville, 22 miles distant to the N. W., is the home of many of the business men of Charleston, and has a mild climate grateful to consumptives.

The city is laid out in a generally regular way; two wide streets, King and Meeting, running N. and S. and being intersected by streets extending from E. to W. The houses are mostly of brick or wood, and numerous gardens, with a great variety of trees and flowering plants, impart a cheerful aspect. The principal open-air resort is the Battery, a small park at the south end of the city, near the water's edge; another is Colonial Lake, which has park-like surroundings. There is a complete system of tidal drainage, and the sanitary condition of Charleston is excellent, as is shown by the absence now of epidemics. A quarantine station has been established at old Fort Johnson. There are two street railways, operating about 35 miles of road.

Public Buildings and Institutions.—Among noteworthy public buildings are the arsenal and the citadel, market, city-hall, court-house, guard-house, and the new post-office, erected at a cost of about $400,000. There are 40 churches in the city, and 2 synagogues, some of which have edifices remarkable for architecture or historic association. Among these are the Roman Catholic cathedral, St. Michael's and St. Philip's (P. E.) churches, the former built in 1752; the Central Presbyterian church, and the Circular church (Congregational). The benevolent institutions number 15. Prominent among them are the Charleston Orphan Asylum and the Confederate Widows' Home. The public schools, not including a high school for boys, number 6, with an average attendance of 5,000. The private schools for both sexes are excellent, and include two for the higher education of girls. The College of Charleston and the Medical School of South Carolina are the leading educational institutions. The former has a fine museum and the latter a good pathological and anatomical museum. The Charleston Library, established in 1748, contains many books of great value, and the Apprentices' and Minors' Library has a good collection. Six newspapers are published.

Trade and Transportation.—The city has a large wholesale trade with the interior, and is the port through which the large inland cities of the neighboring States draw their supplies of merchandise, with the admission of large vessels to the harbor. The principal exports are cotton, rice, turpentine-casks, rosin, phosphates, fertilizers, lumber, cotton goods, fruits, and vegetables. The total value of exports and imports in 1900 was $8,276,391. The South Carolina, the Charleston and Savannah, and the Northeastern R. Rs. center in Charleston, giving the city direct connection with the large trunk lines. These roads are connected with the water-front by the East Shore Terminal R. R., which runs along the bank of the Cooper river. A similar road, to be called the West Shore Terminal, is now (1900) projected, to run along the bank of the Ashley river. The city is connected by water with New York city and Jacksonville, Fla., by the ships of the Clyde Steamship Company, and with less distant points and the neighboring islands by 12 freight and passenger steamers, owned in the city. The number of vessels arriving at this port in 1892 was 860. The total registered tonnage amounted to 880,673, which did not include vessels under 100 tons, nor steamers plying between points in the State of South Carolina.

The banks of the city are 15 in number, 3 national, 4 state, and 8 savings, with an aggregate capital of about $1,500,000. There are 13 building and loan associations in active existence, with aggregate receipts of $593,320.

Manufactures.—By the census of 1890 Charleston had 566 manufactories with a capital of $7,300,150, employing 5,283 persons; wages paid, $2,203,970; value of materials, $4,800,421, which in the finished product were valued at $8,892,860. The chief industries of the city are the manufacture of men's clothing, capital $86,310; cooperage, capital $306,420; cotton-compressing, capital $1,187,000; manufacturing of fertilizers, capital $724,900; and of flour and grist, capital $218,625.

Charleston was founded in 1680 by an English colony. During the first half century its growth was slow, but it attained commercial importance before the end of the second. It was taken by the British in 1780, after a gallant defense, and evacuated by them in 1782. It was the State capital until 1790, when the seat of government was removed to Columbia. It was the seat of the great Democratic convention of 1860, and later in the same year of the convention which passed the famous ordinance of secession. The reduction of Fort Sumter, its principal harbor defense, was the first conflict of the great civil war, and the first triumph of the Confederate arms. In Dec., 1861, nearly half of the city was destroyed by fire. During the last two years of the war it sustained a protracted siege and bombardment, and was evacuated by the Confederates Feb. 19, 1865. An earthquake destroyed a large part of the city and many lives Aug. 31, 1886, but within a few years the damage was so completely repaired that scarcely a trace of the disaster remained. The assessed valuation of property in 1890 was $21,386,539, and the municipal debt $3,972,113. Pop. (1860) 48,409; (1870) 48,956; (1880) 49,984; (1890) 54,955; (1900) 55,807. C. E. LAWRENCE.

Charleston, or **Kanawha Court-house**: capital of Kanawha County and also of West Virginia (for location of county, see map of West Virginia, ref. 9–E); on Ches. and Ohio and Kan. and Mich. RRs.; on the Kanawha river, at the confluence of the Elk river; 65 miles from its mouth and 150 miles S. S. W. of Wheeling. Steamboats navigate the Kanawha river up to this point. The city has the Kanawha and Ohio machine-shops, marble-works, ice-manufactory, woolen-mills, door, sash and blind, and furniture factories, wagon-shops, iron-fence works, foundries, engine-building works, boat

and barge building yards, dry-docks, a fine new capitol and other public buildings, excellent water-works, gas, electric light, natural gas, etc. A large trade in lumber, salt, and coal is carried on. There are a few salt-furnaces, one of which makes 2,000 bush. of salt per day. The seat of the State government was removed to Charleston in 1869, and to Wheeling in 1875. In May, 1885, Charleston became the permanent capital of the State. Pop. (1880) 4,192; (1890) 6,742; (1900) 11,099. EDITOR OF "GAZETTE."

Charleston, College of: In June, 1770, a meeting of the citizens of Charleston, S. C., was held to petition the General Assembly for the establishment of a college. In Oct., 1775, an act was passed providing for three colleges, one of which was to be located in Charlestown. In Oct., 1794, the first commencement was celebrated. In 1830 the new building (subsequently enlarged by the addition of wings) was erected. The college was nearly destroyed by the great earthquake of Aug., 1886, but academic exercises were not suspended for a day. In the face of most serious obstacles, the institution is making steady advances, maintaining the highest possible standard of scholarship in every department. The Museum of Natural History is one of the most valuable in the U. S. No college in the South is more in accord with the spirit of modern progress. It has (1900) 7 instructors, 47 students, and the library contains 14,000 volumes. HENRY E. SHEPHERD.

Charlestown: a former city of Middlesex co., Mass., but now a part of Boston; situated on a peninsula nearly inclosed by the Mystic and Charles rivers; connected with the old part of Boston and with Chelsea by five bridges. The ground rises into two eminences, Breed's and Bunker Hills, which afford delightful situations for dwellings. The city is well built, with shaded, irregular streets. Three avenues, Main, Bunker Hill, and Medford Streets, traverse the peninsula, and, converging at its neck, make the fine avenue Broadway, passing through Somerville and over Winter Hill. There is an extensive U. S. navy-yard, occupying 70 to 80 acres, extending from the Charles to the Mystic rivers, in which are three large ship-houses, the largest ropewalk in the U. S., and machine-shops for the manufacture of copper-work, machinery, and ordnance, capable of employing 2,000 men. A dry-dock connected with the navy-yard is built of granite, and cost $670,000. Charlestown has manufactures of steam-engines, boilers, and machinery, chemicals, stone-ware, brass-ware, brushes, sugar, soap, leather, mechanics' tools, gas fixtures, whips, drain-pipes, New England rum, tobacco, oils, etc. On the summit of the highest elevation stands the monument to commemorate the battle of BUNKER HILL (*q. v.*). Charlestown is supplied with water from Mystic Lake, 5 miles distant. The water-works were finished in 1864, at a cost of $1,461,259. The water flows from the lake 1 mile by gravitation, is then pumped by three engines to a reservoir on Tuft's Hill, from which it flows 4 miles, and supplies Charlestown and the neighboring towns. Charlestown was permanently settled in 1629, and is memorable from its associations with the Revolution. It was burned by the British on the day of the battle of Bunker Hill. The city was chartered in 1847, and was annexed to Boston Oct. 13, 1873. Pop. (1870) 28,323.

Charles Town: railroad junction; capital of Jefferson co., West Va. (for location of county, see map of West Virginia, ref. 6–N). It has a fine court-house and a jail. In this place John Brown was tried and executed Dec. 2, 1859. On Oct. 18, 1863, a Confederate force of 1,200 or 1,400 men under Gen. Imboden surrounded the place at daylight, and attacked the Union troops stationed there. Being surprised, they were panic-stricken, and, flying in confusion, were nearly all captured. The place was recaptured within an hour by U. S. troops under Col. George D. Wells, and the Confederates driven from the town. Pop. (1880) 2,016; (1890) 2,287; (1900) 2,392.

Charlestown: capital, chief town, and port of Nevis, West Indies; at the southwest extremity of the island (see map of West Indies, ref. 6–L). Pop. (1892) 1,600. It has a small export trade in sugar.

Charlet, shaar'lay', NICOLAS TOUSSAINT: military painter; b. in Paris, Dec. 20, 1792; d. there Dec. 19, 1845; pupil of Baron Gros; visited England in 1836 with Gericault, who was his intimate friend; was one of the first French painters to apply naturalistic treatment to pictures of battles and soldiers' life, and, besides numerous works in oil, executed a great number of lithographs. WILLIAM A. COFFIN.

Charleville, shaar'le-veel': a town of France; department of Ardennes; on the river Meuse, which separates it from Mézières (see map of France, ref. 2–G). It is well built and handsome, and has a college and a large public library; also manufactures of hardware, nails, copper, leather, etc. A suspension bridge crosses the river here. This place was formerly fortified. Pop. (1896) 17,805.

Charlevoix: village: capital of Charlevoix co., Mich. (see map of Michigan, ref. 4–I); on Chicago and West Michigan R. R. and Pine river; about a quarter of a mile from Lake Michigan; is a summer resort, and has trade in lumber and fish. Pop. (1880) 512; (1890) 1,496; (1900) 2,079.

Charlevoix, PIERRE FRANÇOIS XAVIER. de: Jesuit traveler and historian; b. at St.-Quentin, France, Oct. 29, 1682. He went as a missionary to Canada in 1720, and descended the Mississippi to its mouth. He wrote, besides other works, in French, a *History and General Description of Japan* (Paris, 1736); a *History and General Description of New France* (3 vols., 1744; Eng. trans. by John Gilmary Shea, New York, 6 vols., 1865–72); and a *History of Paraguay* (1756, 3 vols.; Eng. trans. London, 1769, 2 vols.). D. Feb. 1, 1761.

Charlotte, shaar'lot: a city and railroad junction; capital of Eaton co., Mich. (for location of county, see map of Michigan, ref. 7–I); 19 miles S. W. of Lansing. It has imposing church and school edifices, fine water-works, electric and gas lights, and several carriage and furniture factories. Pop. (1880) 2,910; (1890) 3,867; (1900) 4,092.
EDITOR OF "REPUBLICAN."

Charlotte: a city and railroad center; capital of Mecklenburg co., N. C. (for location of county, see map of North Carolina, ref. 3–E). It has Biddle University, two large public schools, other institutions of learning, and various manufactories. Gold mines have been opened in the vicinity. There is a branch of the U. S. mint in this city. The city has 4 banks, 4 local building and loan associations, 10 churches, water-works, macadamized streets, a park and library. Average temperature during the year about 60° F. Pop. (1880) 7,094; (1890) 11,557; (1900) 18,091.
SECRETARY OF CHAMBER OF COMMERCE.

Charlotte Amalie, -aa-maa'lee-*e*: a town of the Danish West Indies; capital of the island of St. Thomas (see map of West Indies, ref. 6–K). It stretches a mile along the shore, with white-walled, red-roofed houses, contrasting with the palms on the neighboring hills. It has a good harbor and an extensive trade, being a free port. It is a station for the mail-packets which ply between Southampton and the West Indies. Pop. (1887) 13,000, mostly blacks.

Charlotte Harbor: an inlet on the west coast of Florida; in De Soto County; is nearly 24 miles long, and sheltered from the sea by several islands (see map of Florida, ref. 8–I). It is shallow, its greatest depth being about 10 feet. Good oysters and fish abound here. Cattle are exported to Key West. Pop. of precinct (1890) 182; (1900) 266.

Charlot'tenburg: a town of Prussia; province of Brandenburg; on the river Spree; 3 miles W. of Berlin, at the end of the Thiergarten park (see map of German Empire, ref. 3–G). It has a palace with a fine park and a famous palmery, and a mausoleum in which are statues of Frederick William III. and Queen Louisa, by Rauch. Here are manufactures of cotton and hosiery. Pop. (1880) 30,446; (1890) 76,873; (1895) 132,377.

Char'lottesville: city and railroad junction; capital of Albemarle co., Va. (for location of county, see map of Virginia, ref. 5–G); on the Rivanna river; 97 miles by railroad W. N. W. of Richmond, 61 miles by railroad N. N. E. of Lynchburg, and 115 miles S. W. of Washington, D. C. One mile W. of this town is the University of Virginia, founded in 1819 by Thomas Jefferson, and endowed by the State. Here are cloth, agricultural implements, tobacco, hosiery, underwear, and other factories, and an excellent water-supply. The city has an academy and several schools. Monticello, the former residence of Jefferson, is 3 miles distant. Pop. (1880) 2,676; (1890) 5,591; (1900) 6,449.
EDITOR OF "JEFFERSONIAN REPUBLICAN."

Char'lottetown: capital of Prince Edward Island and of Queen's County; situated on Prince Edward Island Railway and on the north bank of East river, near the south coast (see map of Quebec, etc., ref. 1–B). It has an excellent harbor and a large export trade. The town is well laid out, and has a fine colonial building, post-office, and athenæum, a normal school and lunatic asylum, and is the seat of Prince of Wales College, St. Dunstan's (Roman Catholic) College, and a Methodist college. It has excellent public schools,

and is the see of a Roman Catholic bishop. Pop. (1891) 11,374.

Charmides, kaar'mi-dēēz (in Gr. Χαρμίδης): an Athenian philosopher; b. about 450 B. C.; uncle of Plato and a pupil of Socrates. He was one of the tyrants who obtained power by the aid of Lysander the Spartan, and was killed in battle by the army of Thrasybulus about 404 B. C.

Cha'ron (in Gr. Χάρων): in classic mythology, the ferryman who transported the souls of the dead across the rivers of the infernal regions. An obolus was placed in the mouth of the dead at burial in compensation for this service. The poets feigned that he was the son of Erebus and Nox.

Charon'das (in Gr. Χαρώνδας): an eminent Greek legislator; b. at Catania, in Sicily; flourished about 650 B. C. He composed laws in verse, which were adopted by the Athenians and other nations.

Cha'ron of Lamp'sacus: one of the early writers of history preceding Herodotus, known as LOGOGRAPHERS (*q. v.*); flourished 480–465 B. C. He wrote an *Account of the Persians* (Περσικά) and *Annals of Lampsacus*. The scant fragments are preserved in Müller's *Fragmenta Historicorum Græcorum*, vol. i., pp. 32–35. See Neumann, *De Charone Lampsaceno* (1880).

Charpentier, shaăr'pāăṅ'ti-ay', LOUIS EUGÈNE: military and genre painter; b. in Paris, June 1, 1811; d. there Dec. 16, 1890; pupil of Gérard and Léon Cogniet; third-class medal, Salons 1841 and 1857; an artist of fair ability who was Professor of Design at Versailles for a quarter of a century. One of his works, *Battle of Tchernaia* (1857), is in the Versailles Museum. W. A. C.

Charr: a beautiful fish (*Salvelinus alpinus*) of the salmon family, abounding in cold, clear brooks and ponds in Northern Europe; the same or a very similar species also in Greenland or British America. Compared with the true

The northern charr.

trout (*Salmo*), the charr (*Salvelinus*) differs in the very small scales, the presence of red spots instead of black, and in the structure of its vomer. The charr are in general more beautiful and more retiring than the trout, and more valued as game fish. Several species of charr occur in America, the best known being the so-called "brook trout," or "speckled trout," of the East, *Salvelinus fontinalis*.

D. S. JORDAN.

Charrières, shaăr'ri-ār', Madame SAINT-HYACINTHE, de: French authoress; b. in Holland in 1740; wrote several romances: *Lettres Neuchateloises* (1784) and *Caliste* (1786). She was intimate with Benjamin-Constant, and their correspondence has been published. D. Dec. 20, 1805.

Charron, shaăr'rōṅ', PIERRE: a celebrated French preacher and moralist; b. in Paris in 1541; d. Nov. 16, 1603. A friend and disciple of Montaigne, he had yet found the law intolerable and entered the Church, even desiring to become a monk. His age when this determination was adopted, or perhaps his powers as a preacher, had caused him to be refused permission, however. Curiously enough, the skeptical spirit of his master imposed itself upon him, and when his famous treatise, *De la Sagesse* (On Wisdom), appeared in 1601 (larger edition in 1604; Eng. trans. New York, 1891), it appeared in many ways to substitute natural morality for Christian faith. It was vehemently attacked, but had a great effect in its time. It should be added, however, that his earlier treatises, *Les trois Vérités* (1593) and *Discours chrétiens* (1600), are thoroughly Christian in spirit.

A. R. MARSH.

Chart: a hydrographic map for the use of navigators; the projection of some portion of the sea or coast on a plane surface. Charts are generally constructed on the principle of Mercator's projection. In the English and U. S. services, after coasts have been surveyed by the Government, charts are engraved and sold at prices below their cost in order to encourage their general use. The navigating charts, showing the dangers of the coasts with sufficient clearness to enable mariners to avoid them, are usually on a uniform scale, and the U. S. charts are generally on the polyconic projection. The preparation of charts is a part of the duty of the hydrographical department at the Admiralty in England, and in the U. S. of the coast survey and of the hydrographic office.

Charta Epispastica, kaar'ta-ep-i-spăs'ti-ka [Lat., drawing (or blistering) paper]: the pharmaceutical name for blistering paper. It is prepared by applying to one surface of smooth bibulous paper a mixture of oil, wax, spermaceti, resin, Canada balsam, water, and powdered cantharides. When applied to the skin it adheres, and after a time raises a blister as perfectly as the blistering cerate does, while it is much cleaner and more easily applied.

Various *chartæ emplasticæ*, or adherent medicated papers (*papiers emplastiques*), are employed by many French physicians instead of the less neat and convenient plasters of ordinary pharmacy.

Charte, shaart: the name applied in France (1) to the "Grand Charter" of John II., prepared by the States-General and agreed to by the king; this was the basis upon which the States-General asserted their liberties at the commencement of the Revolution; (2) that by which Louis XVIII. in 1814 acknowledged the rights of the people; (3) that of 1830, which was sworn to by Louis Philippe, recognizing the popular sovereignty. See FRANCE.

Charter [O. Fr. *chartre* < Lat. *chartula*, a small paper, deriv. of *charta*, paper]: a formally written instrument given as evidence of a grant, contract, or other transaction between man and man; an instrument executed with form and solemnity bestowing rights and privileges. In public law the term is applied to those formal deeds or instruments by which sovereigns guarantee the rights and privileges of their subjects, or by which a sovereign state guarantees those of a colony. The founders of several of the British American colonies, now States of the Union, obtained charters from the King of England for the same. In municipal law the word is principally used to designate a grant of franchises, privileges, or estates obtained from the sovereign by letters-patent under the great seal. A leading instance is found in the creation of corporations. In early times corporations were created principally in this manner. It has been doubted whether municipal corporations could at first be created in any other way than by royal charter. The better opinion is that there could be no valid charters other than royal. It is now quite frequent to originate them by act of Parliament. The act of incorporation in that case has the force of a statute. There are certain special rules appertaining to royal charters as distinguished from corporations created by act of Parliament. Thus the king can not limit the perpetuity of a corporation, while Parliament may. Accordingly, when the Bank of England was established by way of experiment, the aid of Parliament was called in to limit its duration. A general statute now confers that power upon the king to limit the time of corporate existence. So the crown can not force a new charter upon an already existing corporation. The king can not derogate from his own grant. Parliament may abolish the institution or modify it at pleasure. Nor can the king remove corporators at discretion, as each corporator is supposed to have a freehold estate. So a charter can not create exclusive right or prohibit trade, or in any way change the established law of the land. These propositions are of but little practical use in the U. S., as since the Revolution corporations are created by act of the legislature. There is a number of municipal and other charters in existence which were granted by the king prior to the Revolution, and which remain in force notwithstanding the change of government. See further under CORPORATION.

T. W. DWIGHT.

Charterhouse [a corruption of *Chartreuse*: see CARTHUSIANS]: a hospital and school in London; founded in 1611 by Sir Thomas Sutton, who endowed it with the revenues of more than twenty manors, lordships, and other estates. It was originally a Carthusian monastery founded in 1371. It is an asylum for poor brethren, the number of whom is limited to eighty, and they must be bachelors, members of the Church of England, and fifty years old. Each brother receives, besides food and lodging, an allowance of £26 a year for his clothing, etc. The school is for the benefit of "the sons of poor gentlemen to whom the

charge of education is too onerous." The number of scholars is limited to forty-four, but in 1889 there were 460 day and boarding pupils who were not charity scholars. In 1892 there were 500 pupils. Among the eminent men educated here were Addison, John Wesley, George Grote, Bishop Thirlwall, and Thackeray. The reputation of the school is high. In 1872 the school was removed to Godalming, where it occupies a large quadrangle, with a gatehouse tower 130 feet high and a chapel rich in stained glass. Headmaster, Rev. W. Haig Brown, LL. D.

Charteris, chaar'tėrz, Archibald Hamilton, D. D.: a Scotch divine; b. at Wamphray, Dumfries, Dec. 13, 1835. He graduated from the University of Edinburgh B. A. 1853, and, after pastorates in St. Quivox, New Abbey, and the Park church, Glasgow, became in 1868 Professor of Biblical Criticism in the University of Edinburgh. In 1868 he founded the Christian Life and Work Committee, of which he still remains convener. He was moderator of the General Assembly of the Church of Scotland in 1892. Besides a biography of Dr. James Robertson (Edinburgh, 1863), he published *Canonicity* (1880); *The New Testament Scriptures* (London, 1883), being the Croall lectures for 1882; and many contributions to periodicals. He was the originator and first editor of the magazine *Life and Work*.

Willis J. Beecher.

Charter Oak: a tree which, famous in colonial history, once stood in Hartford, Conn. The legend runs that when

Charter oak.

Sir Edmund Andros went to Hartford in 1687, by command of King James II., to demand the surrender of the charter of the colony, the charter was concealed by Capt. James Wadsworth in a hollow of this oak. This historic tree was blown down by a gale Aug. 21, 1856, but a sketch had been made of it in 1848.

Charter-party [Fr. *chartre-partie*—so called from such documents being at one time made in duplicate (in Fr. *parti*), and one given to each party concerned, as in the case of an indenture]: a contract in which the owner of a vessel, or (in a foreign port) the master as the agent of the owner, lets the vessel or a portion of her to a second party for the conveyance of goods from one port to another port; hence the vessel is said to be "chartered." A charter-party may be in effect a lease of a vessel, in which case the charterer has the rights and duties of a bailee for hire, furnishing his own crew, provisions, etc., or it may be a contract of affreightment, under which the owner mans and equips the vessel, incurs ordinarily the responsibilities of a Common Carrier (*q. v.*), and has a lien on the cargo for his freight. In a charter-party of affreightment it is customary to describe the ship and her location, and to specify the voyage to be performed and the terms on which the cargo is to be carried. On the part of the ship-owners it is covenanted that she shall be seaworthy and suitably equipped for the voyage; that she shall be ready to receive the cargo on a given day, wait its complete delivery for a certain period, sail for the stipulated port when laden if the weather for the time permits, continue her voyage without unnecessary deviation, and deliver the full cargo on payment of freight. The freighter's portion of the contract obliges him to load and unload at suitable periods under specified penalties, and to pay the freight as agreed. The master must not take on board any contraband goods, or otherwise act so as to render the vessel liable to seizure.

Revised by F. Sturges Allen.

Chartier, shaär'ti-ay', Alain: a French poet and prose-writer of great repute in the fifteenth century; b. at Bayeux, in Normandy, about 1392; d. not later than 1441. He studied in the University of Paris, entered the service of Charles VI., and was clerk, notary, and financial secretary to Charles VII. As a poet he is closely connected with the school of the fourteenth century—Guillaume de Machaut, Eustache Deschamps, Froissart, and Christine de Pisan—writers of *ballades, rondeaux, virelais*, and similar quaint and difficult forms. He delights also in allegorical and controversial love verse, and in moralizing poetical essays. In prose he has much the same characteristics. His style is overloaded with Latinisms, and is at times strangely contorted. At other times, however, it has a gravity and balance that presage the new prose soon to appear in the *Mémoires* of Commines; and when he is touched by the ills of his country he becomes even eloquent. His chief poetical work consists of his lyric poems, his *Bréviaire des Nobles*, his *Livre des quatre Dames*, and his *Belle Dame sans merci*, whose name and fame long endured. In prose, besides several interesting Latin letters and treatises, he wrote *Le Quadrilogue Invectif*, *Le Curial*, *Chronique de Charles VII.*, and one or two other pieces of less moment. His fame is illustrated by the apocryphal story of the kiss given him by Margaret of Scotland, Queen of France, who declared she meant not to kiss the man, "but the mouth whence had issued so many golden words." His influence upon his contemporaries was great, and even foreigners, like the English Lydgate, studied him with ardor. See Delaunay, *Thèse sur Alain Chartier* (1876), which contains full bibliographical information. The only available edition of the works of Alain Chartier is that of André Duchesne, Paris, 1617.

A. R. Marsh.

Chartism: a movement in British politics for the alleviation of the sufferings of the artisan and other laboring classes, and named for the document in which the agitators presented their demands to the world. After the reforms of Lord Grey in 1832, there remained great discontent among the workpeople of Great Britain. In 1838 six members of the House of Commons had a conference with representatives of the Workingmen's Association, and together they formulated what was known as *The People's Charter*. It demanded six specific reforms, viz.: (1) annual parliaments; (2) universal suffrage; (3) the ballot; (4) no property qualification for a seat in the House of Commons; (5) salaries for parliamentary representatives; (6) electoral districts evenly apportioned by population. The methods of agitation were those of O'Connell, who was a Chartist leader, and huge meetings were held, not wanting in intemperance of speech. The *Northern Star*, founded by Fergus O'Connor, became the newspaper organ of the movement and gained a circulation of 50,000, then an extraordinary achievement. In 1839 the National Charter Association was organized in Birmingham on the same platform, and reached a membership of 40,000. But it was not until 1848 that the magnitude and intensity of the movement was disclosed. It was a time of great depression in industry and of revolutionary excitement all over Europe. Men went out to drill in Glasgow and Manchester. Crowds assembled to listen to violent harangues; revolutionary organizations were suspected in the industrial centers of Great Britain; the governing classes were alarmed. In several northern cities the popular gatherings were dispersed by the soldiery and garrisons were maintained in them. It was announced that 500,000 people would assemble on Apr. 10, on Kennington Common, London, to present a petition signed by 6,000,000 to Parliament. The procession was forbidden by the Government, the military was posted by the Duke of Wellington to command the city, 170,000 special constables were enrolled, among whom was Louis Bonaparte (afterward Napoleon III.). The assembly was held and 50,000 attended; the procession was abandoned; the petition was presented to Parliament, scrutinized, and the signatures shrank on enumeration and verification. The Chartist movement rapidly declined, partly owing to the improving condition of labor, and partly owing to the legislative concessions to the People's Charter made in reform bills, such as the extension of suffrage, the redistribution of parliamentary seats, and the adoption of the ballot. Although the People's Charter ceased to be a platform of agitation,

the Chartist disturbances led to a larger recognition of labor interests as a factor in legislation and in British politics. See Carlyle on *Chartism*; McCarthy, *History of our own Times*; *Cooper's Life*.

Chartran, shăr'trăn', Théobald: portrait and figure painter; contemporary; b. at Besançon: pupil of Cabanel; Grand Prix de Rome 1877; second-class medal, Paris Exposition, 1889; Legion of Honor 1890. His small portraits are finely drawn and cleverly painted. At the Salon of 1892 he exhibited a masterly portrait of Pope Leo XIII. Studio in Paris. W. A. C.

Chartres, shaart'r (anc. *Autricum*): a city of France; capital of the department of Eure-et-Loir; on the river Eure, and on the railway which connects Paris with Le Mans; 49 miles S. W. of Paris (see map of France, ref. 4–E). It is built at the base and on the declivity of a steep hill. The streets are narrow and crooked. Here is a Gothic cathedral of the eleventh century, said to be the most perfect in France; it is surmounted by two towers, one of them 382 feet high, with rich ornamentation, and the other exceedingly massive. Chartres has two other remarkable churches, an episcopal palace, and a public library of about 30,700 volumes; also manufactures of hosiery, hats, leather, etc. Here is a large weekly market for grain and flour. During the Middle Ages Chartres was the capital of the district of *Chartrain*, made a duchy by Francis I., and given as an appanage to the Dukes of Orleans. Hence the title Duke of Chartres was given to the eldest son of the Duke of Orleans. More recently the same title was given to Prince Robert of Orleans, grandson of King Louis Philippe, and second son of Duke Ferdinand of Orleans. Pop. (1891) 23,108; (1896) 23,182.

Chartreuse, shăr'tröz', **La Grande**: a large and famous monastery in the French Alps; 12 miles N. N. E. of Grenoble; in the midst of wild and impressive scenery; 3,281 feet above the sea. The convent was founded by St. Bruno in 1084, somewhat higher up the mountain than the present buildings. The name of the order, Carthusians, comes from this convent, and the English Charterhouse is a corruption of its name. The buildings are extensive, but rudely built, and date from 1689. The monastery had been repeatedly burned before the present structure was built. The monks were stripped of their possessions in the French Revolution, and abandoned the convent until 1826. They have never recovered their former wealth and dignity. They manufacture a famous Liqueur (*q. v.*), which takes its name from the monastery. See Charterhouse.

Char'tulary (Late Lat. *chartularia*): literally, a record or register. This term is specially applied to certain rolls or books in which corporations, especially religious and civil corporations, keep a record of their charters and privileges granted them by the statute, and in the case of the early Latin Church a custodian of the charters, records, etc., of the Church was also so called. Some of these chartularies date back in France as far as the tenth century, but it was not until the twelfth or thirteenth century that they were generally kept by corporations. Their value lies in the fact that they frequently contained archæological and genealogical information of great historical value. Many important chartularies have been printed.

Charybdis, kā-rib'dis (in Gr. Χάρυβδις), now called **Galofaro**: an incessant undulation, rather than a whirlpool, on the Sicilian side of the Strait of Messina, opposite the rock of Scylla. It is caused by the meeting of currents, and is seldom dangerous. It was anciently much dreaded by mariners. See Rear-Admiral William Henry Smyth's monograph on the Mediterranean, p. 519, 8vo, 1854.

In Greek mythology Charybdis was a daughter of Poseidon, and was killed by Zeus with a thunderbolt and hurled into the sea, where she henceforth drew the approaching ships into the deep.

Chase, Dudley: b. in Cornish, N. H., Dec. 30, 1771; an uncle of S. P. Chase; graduated at Dartmouth in 1794; chief justice of Vermont (1817–21), and U. S. Senator from 1813 to 1817, and again from 1825 to 1831. D. in Randolph, Vt., Feb. 23, 1846.

Chase, George, LL. B.: b. in Portland, Me., Dec. 29, 1849; graduated at Yale College, Connecticut, 1870, and at Columbia College Law School, New York city, 1873. In 1875 was appointed assistant Professor of Municipal Law in the last-named institution, and in 1878 Professor of Criminal Law, Torts, and Procedure; dean of the New York Law School 1891; published an edition of Blackstone's Commentaries known as the *American Students' Blackstone* (1877), and edited *Johnson's Ready Legal Adviser* (1880); contributed many legal articles to the *Universal Cyclopædia*.

Chase, Irah, D. D.: b. at Stratton, Vt., Oct. 5., 1793; graduated at Middlebury College in 1814 and at Andover Theological Seminary 1817; in the same year was ordained to the Baptist ministry. He labored as missionary in West Virginia, and was in 1818 appointed Professor of Languages and Biblical Literature in the first Baptist Theological School, which was that year started in Philadelphia, but in 1822 removed to Washington, D. C., and incorporated with Columbian College. There he remained till 1825, in which year he became Professor of Biblical Theology, and from 1836 to 1845 of Ecclesiastical History in the Theological Institution (which he was largely instrumental in founding) at Newton Centre, Mass. He published several works, mainly controversial. D. at Newton Centre, Mass., Nov. 1, 1864.

Chase, Philander, D. D.: a Protestant Episcopal bishop; uncle of Salmon P. Chase (*q. v.*); b. in Cornish, N. H., Dec. 14, 1775; graduated at Dartmouth in 1796. He went in 1817 as a missionary to Ohio, where he planted the Episcopal Church. He became Bishop of Ohio in 1819, resigned in 1831, and after a temporary residence in Michigan was made Bishop of Illinois in 1835. He founded Kenyon College (*q. v.*), Gambier, O., and Jubilee College (1838) at Robins' Nest, Ill. Published *Reminiscences* (New York, 1848, 2 vols.). D. at Jubilee College, Robins' Nest, Ill., Sept. 20, 1852. The resignation by Bishop Chase of the see of Ohio, on account of difficulties with the faculty of the Theological School at Gambier, and his subsequent acceptance of the episcopate of Illinois, gave occasion to the enactment of the canon on Episcopal resignations still in force in the Protestant Episcopal Church.

Chase, Pliny Earle: educator; b. in Worcester, Mass., Aug. 18, 1820; graduated at Harvard College in 1839. While engaged for many years as a teacher in Philadelphia, and afterward in mercantile life, he employed his leisure in metaphysical, philological, and physical studies, producing many able and learned papers, published in the *Proceedings of the American Philosophical Society* and in various scientific journals, several of which were copied in the London, Dublin, and Edinburgh *Philosophical Magazines* and other foreign journals. These articles procured him wide distinction as a man of science. In 1871 he was appointed Professor of Physics, and later of Languages, in Haverford College. The Magellanic gold medal of the American Philosophical Society was awarded to him in 1864 for the *Numerical Relations of Gravity and Magnetism*. Among his works is *Elements of Meteorology* (1884). D. in Haverford, Dec. 17, 1886.

Chase, Salmon Portland: statesman and jurist; son of Ithamar Chase, a farmer of New Hampshire; b. in Cornish, N. H., Jan. 13, 1808. He was sixth in descent from Aquila Chase, who emigrated from England to Massachusetts in 1630. His mother was of Scotch descent. The stock to which he belonged was prolific in eminent men. His grandfather, Samuel Chase, had seven sons, five of whom received an education at Dartmouth College. During the war of 1812 Ithamar Chase engaged in the glass manufacture at Keene, N. H., but this business resulted unfortunately on the reintroduction of foreign manufactures. He died in 1817, leaving his family in straitened circumstances. Salmon's education, however, was not neglected. He was first sent to a school at Windsor, Vt., and when twelve years of age went to Ohio to live with his uncle, the bishop, who resided near Columbus. Here he divided his time between hard work on the bishop's farm and hard study in the bishop's academy, which was afterward removed to Cincinnati. In 1823 he returned to New Hampshire, and the next year entered Dartmouth College, from which he graduated in 1826. He then repaired to Washington, and supported himself by teaching a school while studying law under the direction of William Wirt. Here he obtained his license to practice law in 1829, and in the spring of 1830 went to Cincinnati to pursue his profession. During the weary hours of waiting for business he occupied himself in preparing an edition of the *Statutes of Ohio* with notes and an historical introduction. This brought him into notice, and in 1834 he was appointed solicitor for the U. S. Bank in Cincinnati. From this period he never wanted employment.

He early engaged in the controversy respecting slavery and the slave-power in the U. S., and took the then unpopular anti-slavery side. In 1837 he appeared as counsel for Matilda, a colored woman claimed as a fugitive slave, and took the ground that Congress had no right to impose on State officers the duty of assisting to render up fugitive slaves, nor to legislate on the subject at all—that the States were, by the Constitution, solely responsible for the performance of that duty, and had a right to prescribe such proceedings as they saw fit to prevent unjust arrests and detentions. These views were enforced with great eloquence and power, though unsuccessful at that time. In a subsequent case he took the broad ground that slavery was a local institution, dependent upon State laws for its existence and continuance. His great maxim was, "Slavery is sectional, freedom is national." In 1842 he was employed to defend Van Zandt, the original of Van Tromp in *Uncle Tom's Cabin*, who had been a Kentucky farmer, but from a conviction of the wrong of slavery had liberated his slaves and removed to Ohio, near Cincinnati. Here he was indicted, under the Fugitive Slave law of 1793, for harboring fugitive slaves and aiding them to escape. The cause was carried to the Supreme Court of the U. S., where it was ably argued by Mr. Chase and Hon. W. H. Seward in 1846, and became one of the *causes célèbres* of the country.

The subject had now become fully introduced into the politics of the country, and Mr. Chase was virtually the founder and leader of the Liberty party, which resulted in the formation of the Free-soil party, and ultimately of the great Republican party, which became the means of prostrating the slave-power and abolishing slavery in the U. S. A convention of this party under the guidance of Mr. Chase was held at Columbus, O., in Dec., 1841, after it became apparent that no hope was to be expected from President Tyler or the old Whig party in the direction of anti-slavery. Other conventions were held at Buffalo, Cincinnati, and Columbus in 1843, 1845, 1847, and 1848, resulting in the latter year in the nomination of Mr. Van Buren and Charles Francis Adams as the candidates of the Free-soil party for President and Vice-President. Mr. Chase was the moving spirit in these conventions. He presided over the last, and drew up the platform of principles and policy which it adopted. Most absorbing and prominent among these at this time was that of preventing the extension of slavery into the new Territories.

In Feb., 1849, he was elected a U. S. Senator from Ohio, and took his seat in the following March, where he upheld the sectional nature of slavery, opposing the compromises of 1850. In Oct., 1855, he was elected Governor of Ohio, and re-elected in 1857. In 1860 he was a prominent candidate for the presidency before the Republican convention which nominated Mr. Lincoln. In the following session of the Ohio Legislature he was again chosen Senator of the U. S., but had scarcely taken his seat in Mar., 1861, when he was nominated by President Lincoln as Secretary of the Treasury, upon the duties of which position he immediately entered.

He found the treasury empty and the Government credit below par. But he inaugurated measures which met the pressing demands of a gigantic war, amounting to six or seven hundred millions per annum, and stimulated the industrial energies of the country. These measures can not be examined in detail. They belong to the history of that struggle. A cardinal principle kept in view was to issue a sufficient amount of such securities and notes as would furnish a currency that would enable the people to meet their engagements and avoid bankruptcy. This kept them in heart, and every branch of industry in constant activity. It obviated those commercial crises which are the usual consequences of such wars. This financial policy was largely due to the recommendations of Secretary Chase, although able financiers in Congress and out gave him wise and energetic co-operation.

One of the measures resorted to, which should be noticed as exciting a difference of opinion as to the constitutional power of Congress, was the issue by the Government, in Feb., 1862, of currency notes which were made a legal tender in the payment of debts. It is due to Secretary Chase to say that while he recommended the issue of the notes, the making of them a legal tender originated in Congress, though acquiesced in by him. Another measure of permanent importance to the country was the establishment, in Feb., 1863, of a national banking system, by which all notes issued were to be based on funded bonds of the Government of equal or greater amount. This system was entirely original with Secretary Chase, and will probably be regarded as one of his greatest achievements for the benefit of his country. He hoped that it would effectually abolish a resort to State bank issues of paper currency, which it is known he latterly regarded as bills of credit within the meaning and prohibition of the Constitution.

Mr. Chase resigned the secretaryship of the Treasury in the last of June, 1864, and on Dec. 6 following he was appointed chief justice of the Supreme Court of the U. S., in place of Chief Justice Taney. The duties of his new office were no less important to the country than those which he resigned. Many of the momentous questions which arose out of the issues of the war had to be ultimately adjudicated by the high tribunal over which he was called to preside—questions affecting vast private interests and the future stability of the Government. It was the singular fortune of Chief Justice Chase that he bore a conspicuous and leading part not only in the great political movement which brought on the American civil war and abolished slavery, but in the successful conduct of that war and in the final settlement of the constitutional issues and changes to which it gave rise. The status and reconstruction of the Southern States; the rights of their citizens, personal and political; the constitutionality of acts of Congress and of the executive in various matters during the impulses and excitements of the war; the construction of those important amendments to the Constitution which were necessitated by the event of the contest—these were among the subjects upon which the Supreme Court was called to decide. As presiding officer of the court and as a constitutional judge, the chief justice fully met the duties, responsibilities, and the dignity of his high position. But his long service in political life and absence from the bar induced him to lean largely upon the experience of the other members of the bench in matters of technical law. In every case of public consequence depending upon constitutional or fundamental principles he exhibited the same largeness of mind which characterized his entire career. His opinions on some questions have been criticised as exhibiting a leaning against the Federal Government and its authority, in which as an executive officer he had taken so large a part. For example, on the question of the constitutionality of the legal-tender notes he changed his opinion and held them unconstitutional. But it is fairly due to him to accept his own explanation, that he assented to the law as a pressing necessity when passed, but subsequent reflection convinced him that he was mistaken. His opinions are characterized by great clearness and chasteness of style, and may be cited as models of juridical composition. They ever betrayed the fine scholar and the practiced writer.

In 1868 he was called upon, as chief justice, to preside over the Senate pending the impeachment and trial of President Johnson—the only instance of such a trial in the history of the Federal Government.

In June, 1870, he had a stroke of paralysis, from the effects of which he suffered more or less till his death. He attended the regular terms of court commencing in Dec., 1871, and Dec., 1872, and while his mind still remained clear and his logical powers unimpaired, his powerful frame was much enfeebled, and his general appearance indicated that his tenure of life was by a slender thread. He died in the city of New York, May 7, 1873, in the sixty-sixth year of his age. See his *Life and Public Services* by Schuckers (1874).

Chase, Samuel: jurist; b. in Somerset co., Md., Apr. 17, 1741. He was a delegate in Congress from 1774 to 1778, and signed the Declaration of Independence. In 1796 he became an associate justice of the Supreme Court of the U. S. He was impeached in 1804 for misdemeanor in the conduct of several political trials, but was acquitted by the Senate. John Randolph was one of the instigators and managers of this impeachment. D. June 19, 1811.

Chase, Thomas, LL. D.: brother of Pliny Earle Chase, noticed above; b. in Worcester, June 16, 1827; was graduated at Harvard with high honors 1848; was tutor and Latin professor at Harvard for three years; spent two years and a half in Europe; studied at the University of Berlin. On his return he was appointed (in 1855) Professor of Philology and of Classic Literature at Haverford College, and afterward accepted the presidency of that institution. He has published excellent editions of Vergil, Horace, Livy, and Juvenal; a volume entitled *Hellas*, a description of his personal observations in Greece in 1862; and also many oc-

casional addresses and papers. He was one of the company of scholars who prepared the Anglo-American revision of the translation of the New Testament. Removed late in life to Providence, R. I., where he died Oct. 5, 1892.

Chase, William Henry: b. in Massachusetts in 1798; graduated at the U. S. Military Academy in 1815; appointed brevet second lieutenant of engineers; first lieutenant 1819, captain 1825, major 1838. The events of the war of 1812 having shown the vulnerability of the ports of the Gulf coast, and especially of the key to its western territory, New Orleans, Chase was assigned to duty for their defense in 1819. Forts Pike and Macomb were his earliest works. His most important were Forts Pickens, McRee, and Barrancas (*qq. v.*), for the defense of Pensacola, regarded then as the great naval station of the Gulf. But subsequently, as senior engineer officer, all the works of fortification and of river and harbor improvement (e. g. the Mississippi mouths) came under his supervision. There was scarcely a project connected with the development of the region of his adoption in which he did not take an influential part. In 1856 he was appointed by President Pierce superintendent of the Military Academy, but resigned Oct. 31 from the army without entering on its duties. He espoused the Confederate cause, and was prominent in the seizure of the Pensacola navy-yard, but subsequently took no prominent part in the war. D. in Pensacola, Fla., Feb. 8, 1870.

Chase, William Merritt: figure, still-life, and portrait painter; b. Franklin co., Ind., Nov. 1, 1849; pupil of L. E. Wilmarth, New York, and of Wagner and Piloty, Munich; member of the Society of American Artists (1879), and of American Water-color Society; National Academician 1890; second-class medal, Munich Exposition, 1883; second-class medal, Paris Exposition, 1889. His work at first showed the influence of the Munich school, but after his return to New York in 1878 it partook more of the French methods of to-day. It is notable for admirable technical qualities, for truth to nature, and artistic arrangement. His portraits are exceedingly well painted, and often remarkable for effective composition. He is an excellent colorist and good draughtsman. President of the Society of American Artists, and one of the chief instructors in the Art Students League, New York. His *Ready for a Ride* (1879) is in the Union League Club, New York. Studio in New York. Summer studio at Southampton, L. I., where he is the head of the school of art at Shinnecock Hills. William A. Coffin.

Chas'idim [Heb., saints]: a name applied among the ancient Jews to a sect of pietists who originally aimed at strict ceremonial purity under the Mosaic law, warmly espousing the cause of the Maccabees, and opposing the Hellenizing tendencies of some of their fellow Israelites. Some writers believe that the Essenes, Pharisees, and other strict followers of the law all sprang from the Chasidim, but that the name was finally taken by a moderate party, who received the traditions as of equal authority with the law. In recent times the name is applied to a sect of Jews who sprang up in Poland in the eighteenth century, and who aim at a restoration of the ancient piety of their nation. Their ceremonial is extremely formal. Their peculiar mystical and cabalistic doctrines and customs are repudiated by the orthodox Jews. They are now chiefly found in Eastern Europe. See Jewish Sects.

Chasing [Fr. *enchâsser*, enshrine, set; deriv. of *châsse*, shrine, case < Lat. *capsa*, box]: the art of ornamenting metals by means of small steel tools, generally struck with a hammer. By these means the metal is marked with lines, patterns, etc., impressed upon its surface. The art differs from engraving in that the lines, etc., are impressed and not incised; none of the metal is cut away. It is common to ornament silver and other vessels by means of raised patterns produced from the reverse side by the snarling iron (or, as it is now more generally called, the *repoussé* process). When the projections and embossings have been made, roughly, the vessel is filled with pitch, which is allowed to harden, and the chaser works upon the outside, the thin metal being supported by the pitch. The chasing-tools then push back the relief, in parts, sharpen the edges, define and outline the pattern, and complete the design. Russell Sturgis.

Chas'ka: village and railroad junction; capital of Carver co., Minn. (for location of county, see map of Minnesota, ref. 9–E), in a township of its own name, is on the left bank of the Minnesota river, 32 miles W. S. W. of St. Paul and 20 miles S. W. of Minneapolis, and on the Minneapolis and St. Louis R. R. and the C., M. and St. Paul R. R. Chaska was founded in 1855. It has county buildings, four churches, and a weekly newspaper, and is a great brick manufacturing center. The Chicago, St. Paul, Minneapolis and Omaha R. R. passes on the opposite side of the river. Pop. (1880) 1,068; (1890) 2,210; (1900) 2,165.

Editor of "Valley Herald."

Chasles, shaal, Michel: geometer; b. at Épernon, France, Nov. 13, 1793. He became in 1846 Professor of the Higher Geometry in the Faculty of Sciences, Paris. His principal field of study was modern geometry. His most important works are *Aperçu Historique des Méthodes en Géométrie* and *Traité de Géométrie Supérieure*, the latter a very elegant presentation of the subject. D. Dec. 18, 1880.

Chasles, Victor Euphémion Philarète: journalist, author, and Professor of Foreign Literature at the College of France; b. in Mainvilliers, near Chartres, France, Oct. 8, 1798; apprenticed to a printer by his father, a prominent democratic journalist of the Revolution. He went to England, where he assisted Valpy in his editions of the classics, and afterward studied in Germany. He contributed to the *Journal des Débats*, the *Revue des Deux Mondes*, and many other journals, and made admirable translations for the *Revue Britannique*. He published books on *Charles I. and his Court*, Cromwell, Shakspeare, Mary Stuart, eighteenth century in England, the sixteenth century in France, nineteenth-century manners, and on his studies of Spain and Germany. D. in Venice, July 18, 1873. See his *Mémoires* (2 vols., 1876–78).

Chassé, David Hendrik: Dutch soldier; b. at Thiel, Guelders, Mar. 18, 1765; fought in the uprising of 1787; then entered the French service, becoming a general of division in 1813. At Waterloo he commanded the Dutch forces in the army of the allies, and in 1832 made a most heroic three weeks' defense of the citadel of Antwerp against the French and Belgians. D. at Breda, May 2, 1849.

Chassel, shăăs'sel', Charles: b. in Nancy, France, about 1612; distinguished as the first sculptor in wood of his day; was called to Paris to make toys for Louis XIV. in the boyhood of the king, and made an army of soldiers of all arms with all the implements and train of a besieging corps. He left a son devoted to the same branch of art.

Chasseloup-Laubat, shăăs'loo'lō'baa', Justin Napoléon Samuel Prosper, Comte de: a French statesman; b. in Alessandria, Piedmont, May 18, 1805; was *maître de requêtes* during the reign of Charles X.; member of the Chamber of Deputies; councilor of state under Louis Philippe. He became in 1849 member of the Legislature; in 1851 Minister of the Navy; in 1859 Minister of the Colonies; in 1862 senator; and in 1869 president of the ministry which was to carry out the liberal promises of the imperial message of July 12, 1869. D. at Versailles, Mar. 29, 1873.

Chassepot, shăăs'pō': a breech-loading rifle musket; takes its name from its inventor, Antoine Alphonse Chassepot, a French officer and inspector of arms, whose first model was brought out in 1863. Subsequently it was repeatedly improved. This musket attracted much attention in consequence of its use by the French in the war (1870–71) with Germany. It was soon displaced in the French army by the Lebel rifle. The chassepot belongs to the same class with the German needle-gun, having in its cartridge a mass of fulminating material, which is exploded by means of a needle thrust into it along the axis of the bore.

Chasseur, shăăs'sêr': a French word signifying a hunter, a sportsman; the name of certain light troops in the French army who are distinguished as good marksmen. There are chasseurs both among the infantry and cavalry. In the Austrian army are similar troops called *Jägers*. The light troops which fought under Garibaldi in 1859 and 1860 were called *Cacciatori dei Alpi*—i. e. hunters of the Alps.

Chasseurs de Vincennes, -de-văn'sen': is one of the names given to a famous corps in the French army. About the year 1835, when certain improvements had been made in the French rifle, the Duke of Orleans ordered the formation of a company of riflemen armed with the new rifle; they were garrisoned at Vincennes. They proved so efficient that in 1838 a whole battalion was organized, which was called indifferently the *tirailleurs* (sharpshooters) or *chasseurs de Vincennes*.

Chastelard, Pierre de Boscobel, de: French poet; b. in Dauphiné about 1540; as page to Marshal Danville, accompanied Queen Mary to Scotland in 1561. He fell in love with her and was encouraged in his passion; but on repeating the offense of concealing himself in her bedchamber was executed at Burntisland in 1563. See Swinburne's tragedy on this subject.

Chastellain, shaăt'lăn', Georges: a famous French chronicler and poet of the fifteenth century; b. about 1405; d. Mar. 20, 1475, at Valenciennes. Of a noble Flemish family, he became privy counselor, then historiographer, to Philip the Good. His *Chronique des ducs de Bourgogne*, in which he was aided by Molinet, covers the years from 1419 to 1470. He began work upon it in 1460. Many other works by him are in existence, among them one worth mentioning as containing a rarely fine portrait of the perfect gentleman as then conceived. It is the *Chronique du bon Chevalier messire Jacques de Lalaing.* Chastellain was also a poet, one of the *grands rhétoriqueurs*, as they are usually called, employers of a poetic style of the heaviest and most pedantic kind. Still his *Épitaphes d'Hector* furnish an interesting testimony to the passion for antiquity in the early French Renaissance, and his poetical *Récollection des choses merveilleuses arrivées de son temps* is not without value in the history of French literature. His works have been published by Baron Kervyn de Lettenhove (8 vols., Brussels, 1863–66). A. R. Marsh.

Chastellux, shaă'tē'lüks', François Jean, Marquis de: general and writer; b. in Paris in 1734. He wrote an *Essay on Public Happiness* (1772), which was highly commended by Voltaire. He became in 1775 a member of the French Academy. As major-general under Rochambeau he fought for the U. S. (1780–82). He was a friend of Washington and Jefferson. Among his works are *Travels in North America in 1780–82* (2 vols., 1786; Eng. trans. by Grieve, London, 1787) and *Advantages to Europe from the Discovery of America* (1787). D. in Paris, Oct. 28, 1788.

Chasuble [Lat. *casula*, a little house or hut, from *casa*, a house]: an ecclesiastical vestment in the Roman Catholic Church, the last to be put on by the priest before beginning the mass. It is a long sleeveless garment, hanging down in front and behind, reaching about to the knees, and put on through an aperture in the top large enough to allow the garment to fall neatly upon the shoulders. Its color varies according to the directions of the ecclesiastical calendar, but must be always one of the five liturgical colors—white, red, black, green, or violet. In most European countries the chasuble has a large cross figured on its back; in Italy the cross is on the front. It was originally no more than the pænula or outside cloak of the Romans, which in time superseded the toga, and became the usual outside garment of all Romans—rough and coarse among the slaves and the poor, elegant and rich among the nobles. The ancient liturgists loved to find traces of it, or analogies in such scriptural texts as Exodus xxviii. 32–32 and 2 Tim. iv. 13. Its common use as a strictly liturgical garment dates after the end of the sixth century, though there are reasons for believing that all clerics, of whatever rank, wore it at divine service. The chasuble in the Latin Church is hollowed out at the sides, while in the Greek Church the older form of the φελόνιον or πλανητή is yet preserved. The introduction of gold or brocaded stuffs, and the frequency of low masses, caused, it is thought, the modification of the pænula among the Latins, who have also supplanted by the cross the long scarlet strips that once ornamented the pænula, as may yet be seen in the Oranti of the Catacombs. The mass, both of the Latin bishop and priest, preserves yet traces of the time previous to the thirteenth century, when the chasuble fell down on both sides, as it now does to the front and rear. From the fifth century to the eighth this garment was usually known as *planeta*; from the ninth century the term *casula* came into use, with the signification given above (Isid., *Origines*, xix., 24). Illuminated sacramentaries, like that called after St. Gregory, and frescoes of the Catacombs, like those of SS. Cornelius and Cyprian in the crypt of the former in St. Calyxtus, show us the ancient form of the chasuble for the tenth and eighth centuries respectively.

Literature.—Ferrarius, *De re Vestiaria* (1642); Marriott, *Vestiarium Christianum* (1868); Dolby, *Church Vestments, their Use and Origin* (1868); Rock, *Hierurgia, or the Holy Sacrifice of the Mass* (3d ed. 1892); Smith, *Dictionary of Christian Antiquities*; Rensens, *Éléments d'Archæologie Chrétienne* (1890). J. J. Keane.

Chat: a name, generally used with some prefix, for various small warblers. In England it is given to some of the *Saxicolidæ*, as the whinchat, the stonechat, etc. In the

Whinchat.

U. S. the yellow-breasted chat, *Icteria virens*, is one of the *Mniotiltidæ*, a bird a little over 7 inches long, greenish above, white below, with a bright yellow breast. It is common in the Eastern U. S., ranging northward to Massachusetts, being replaced in the west by a dull colored subspecies, *Icteria virens longicauda.* During the mating season it goes through very curious evolutions on the wing, dropping through the air with upraised wings and outstretched legs, singing vigorously all the time. F. A. L.

Chateaubriand, shaă'tō'brē'ăn', Viscount François Auguste, de: author and diplomatist; the most brilliant representative of the reaction against the ideas of the French Revolution, in whose works there is an instructive transition from the classical to the romantic school in French literature; b. of a noble family at St.-Malo, Sept. 14, 1768; d. in Paris, July 4, 1848. He studied the ancient languages at Dol and Rennes, and was destined for the Church, but preferred other pursuits, and a commission in the army was procured for him in 1788. Impelled by a love of adventure, he visited the U. S. in 1791. The purpose with which he set out was to find the northwest passage to India, but, having arrived in America, he completely forgot his aim, traversed the primeval forests of the South, studied the nature and life of the aborigines, and found there the material for a new and romantic literature. He returned in 1792 to France, where he married Mademoiselle de Lavigne. The same year he joined the royalist emigrants who had taken arms to fight against the dominant party; he was wounded at Thionville, and became an exile in England. He passed nearly eight years in England, in extreme poverty, and during this period wrote several works. In 1800 he returned to France, and began to write for the *Mercure de France.* He published in 1801 *Atala*, a romance, the scene of which is laid among the American aborigines. It excited much admiration on account of its marvelous delineations of natural scenery and its great literary finish. It at once established his literary fame, and gave him the most prominent place in the literature of the First Empire. His *Genius of Christianity* followed in 1802, and actually promoted the revival of a religious spirit in French society, then recoiling from the skeptical theories of the Revolution. It appeared just as Napoleon was negotiating the concordat with the pope and laboring for the re-establishment of the Roman Catholic Church in France. The emperor showed the poet his gratitude by appointing him ambassador to Rome, afterward to the Swiss republic. But immediately after the assassination of the Prince d'Enghien, Chateaubriand resigned his office, by no means concealing his indignation. In 1806 and 1807 he traveled in Greece, Asia Minor, and Palestine. He published in 1809 a prose epic entitled *The Martyrs, or the Triumph of the Christian Religion*, and in 1811 his *Itinerary from Paris to Jerusalem.* He was admitted into the French Academy in 1811. In 1814 he expressed his implacable enmity to Napoleon in an eloquent pamphlet entitled *Bonaparte and the Bourbons.* After the restoration of 1815 he acted with the royalists, became a peer of France, and was sent as ambassador to Berlin in 1820. In 1822 he was

transferred to the court of St. James, London. He was appointed Minister of Foreign Affairs in 1823, but was removed by the intrigues of Villèle in June, 1824. He afterward acted with the liberal opposition, and wrote articles against the Villèle ministry, which were inserted in the *Journal des Débats*. In 1828 he was sent as ambassador to Rome by Martignac, but he resigned when Polignac became Prime Minister in 1829. His sympathy for the Bourbons was so strong that he refused to swear allegiance to Louis Philippe in 1830. In the latter part of his life he lived in retirement, consoled by Madame Récamier so far as so vain and egotistic a nature could be consoled. After his death appeared his autobiography, *Mémoires d'Outre-Tombe* (1849–50, 12 vols.), which by its many singular revelations again brought him conspicuously before the public. See Villemain, *Châteaubriand, sa Vie, ses Écrits et son Influence* (1858); Count de Marcellus, *Châteaubriand et son Temps* (1859); Scipion Marin, *Histoire de la Vie et des Ouvrages de Châteaubriand* (1833); Sainte-Beuve, *Châteaubriand et son Groupe Littéraire* (Paris, 1872).

Châteaudun, shăă′tō′dŭn′: a handsome town of France; department of Eure-et Loir; on the river Loir; 28 miles S. S. W. of Chartres (see map of France, ref. 4–E). It has an old castle of the tenth century, a communal college, a public library, and manufactures of blankets. Oct. 18, 1870, the town was stormed and almost entirely destroyed by the Germans. Pop. (1896) 7,460.

Chateaugay: Franklin co., N. Y. (for location of county, see map of New York, ref. 1–I); on railroad, and on the Chateaugay river; 73 miles E. by N. from Ogdensburg; has manufactures of lumber, starch, butter, cheese, etc. Pop. (1880) 680; (1890) 1,172; (1900) 973. EDITOR OF "RECORD."

Château Margaux: See MARGAUX.

Châteauroux, -roo′: a town of France; capital of the department of Indre; in an extensive plain on the river Indre; 62 miles S. E. of Tours (see map of France, ref. 5–E). It has a castle built in the tenth century; a chamber of commeree and a society of arts; also manufactures of wool, cotton, cutlery, paper, hats, and hosiery. Nearly 2,000 persons are employed here in the manufacture of strong woolen fabrics. Good iron is found in the vicinity. Pop. (1891) 23,924: (1896) 23,863.

Châteauroux, MARIE ANNE, Duchesse de: succeeded her three sisters as the mistress of Louis XV. She was grasping and arrogant, and made herself many enemies at the court. In May, 1744, she accompanied the king on his tour of inspection along the frontier. At Metz he fell ill; his life was even in danger, and at the instance of the Bishop of Soissons the Duchess of Châteauroux was sent away. In order to escape ill-treatment and violence by the rural population, she was at last compelled to travel in disguise. But the king recovered, and on his return to Paris the duchess regained her whole power over him, and prepared for revenge, when she suddenly died, Dec. 8, 1744, probably poisoned.

Château-Thierry, -tĕĕ′ăr′ree′: a town of France; department of Aisne; on the river Marne, here crossed by a bridge; about 60 miles by railway E. N. E. of Paris (see map of France, ref. 3–F). It is on the slope of a hill crowned by the ruins of a vast castle built by Charles Martel for Thierry IV. It was the native place of the great poet Lafontaine, to whom a marble monument has been here erected. Pop. (1896) 7,063.

Chatel, shăă′tel′, FERDINAND TOUSSANT FRANÇOIS: a Freneh priest; b. in Gannat, Allier, Jan. 9, 1795; became a priest 1818; left his Church in 1830, and founded in 1831 the "French Unitarian Church," the fundamental principle of which was to recognize nothing but the law of nature. The church of Chatel in Paris was closed by the police in 1842, revived in 1848, and again closed in 1850. Chatel took a position in the postal service. D. in Paris, Feb. 13, 1857.

Châtelet, shăă′tlay′. GABRIELLE EMILIE, Marquise du: b. in Paris, Dec. 17, 1706; d. at Lunéville, Aug. 10, 1749. She was a daughter of Baron de Breteuil, and received a most careful education. She understood Latin, English, and Italian, and began to translate Vergil when sixteen years old. She studied mathematics and physics and philosophy, and was one of the first in France who read and understood Newton, translating his *Principia* into French, with algebraic notes (1756). She published several dissertations on philosophy and physics, and was considered one of the great minds of the age. In 1726 the Marquis du Châtelet married her. She lived with Voltaire at Cirey, 1735–47, and later was engaged in a liaison with Saint-Lambert. See VOLTAIRE.

Châtelguyon, shăă′tel′gĕĕ′ōn′: a town of the department of Puy-de-Dome, France; the source of the celebrated Gubler waters. It is near Riom, with which it is connected by stage (see map of France, ref. 6–F). Pop. (1896) 1,617. There are twenty-seven springs, affording saline, ferruginous, and magnesian waters, with temperatures from 55° to 110 F. The Gubler spring contains the most chloride of magnesium, and is the one from which the waters are exported.

Châtellerault, shăă′tel′rō′: a town of France; department of Vienne; on the river Vienne; 18 miles N. N. E. of Poitiers (see map of France, ref. 5–D). It is near the railway from Tours to Bordeaux. It has a handsome stone bridge, an old castle, a theater, an exchange, and hospital; also important manufactures of cutlery, and a large trade in millstones, wines, etc. Here is a national manufactory of swords and bayonets. The Scottish Dukes of Hamilton derive from this place the title of Duke of Châtellerault, which was given by King Henry II. of France to James Hamilton, Earl of Arran and regent of Scotland, in 1548, and by decree of Napoleon III. was confirmed in 1864 to the Scottish Duke of Hamilton (Duke of Brandon in the English peerage). Pop. (1891) 22,522; (1896) 20,014.

Chat'field: city (incorporated in 1855) of Fillmore and Olmstead cos., Minn. (for location, see map of Minnesota, ref. 11–G); is terminus of Chatfield branch of Ch. and Nor. West. R. R.; on north branch of Root river; 50 miles W. of Winona, 26 miles N. W. of Rochester; has churches of five denominations, high school, and handsome opera-house of brick and iron. Its principal industrial establishments are 3 flouring-mills, woolen-factory, and a saw-mill, all employing water-power; 3 grain elevators and 2 grain-warehouses. The city is in a rich agricultural country, from which it has a large trade. Pop. (1880) 1,166; (1890) 1,335; (1900) 1,426.
EDITOR OF "DEMOCRAT."

Chat'ham: a fortified town, river-port, and naval arsenal of England; in the county of Kent; on the right bank of the Medway; 30 miles E. S. E. of London (see map of England, ref. 12–K). The river here begins to expand into an estuary. Chatham is defended by several forts or castles crowning the adjacent heights, by which it is flanked on the S. and E. It derives its importance from its naval and military establishments, which are separated from the town and the country by a line of fortifications which are considered the best in England, except those of Portsmouth. Here are a military hospital, barracks for infantry, marines, artillery, and engineers, and magazines, storehouses, and dépôts on a large scale. Chatham has also one of the largest royal ship-building establishments in the kingdom. The dockyard is nearly 2 miles long, and contains several building-slips and wet-docks, sufficiently capacious for the largest ships, and inclosing 67 acres. Connected with it are extensive saw-mills, forges, and a metal-mill which produces copper sheets, copper bolts, etc. Numerous brick-yards, lime-kilns, and flour-mills are found in the surrounding district, and the town carries on a large retail trade, partly on account of the presence of the garrison. Here is a large convict establishment, the prisoners being employed on Government constructions. In 1667 the Dutch admiral De Ruyter sailed up the Medway and burned some shipping at Chatham. Pop. (1891) 31,711.

Chatham: a port of entry of Northumberland co., New Brunswick; on the right bank of the Miramichi; 6 miles below Newcastle (see map of Quebec, etc., ref. 4–H); has a heavy trade in lumber and salmon, several steam-mills and foundries, is lighted with gas, and is the seat of a Roman Catholic bishop. Pop. of census sub-district in 1881, 5,762.

Chatham: a post-town of Ontario, Canada; capital of Kent County (for location, see map of Ontario, ref. 6–B); on Can. Pac., Gr. Trunk and Erie and Huron Rys.; on the river Thames; 45 miles E. of Detroit, Mich., and 11 miles N. of Lake Erie (see map of Ontario, ref. 6–B). It has a court-house, an extensive trade in lumber, wood, potash, tobacco, soap, and pork, and has large manufactures of wagons, carriages, iron castings, machinery, and woolen goods. Pop. (1881) 5,907; (1891) 9,052.
EDITOR OF "PLANET."

Chatham: town (founded in 1665, incorporated in 1712); Barnstable co., Mass. (for location of county, see map of Massachusetts, ref. 5–K); on Cape Cod Div. of Old Col. R. R., and on the Atlantic Ocean, at the "Elbow" of Cape

Cod; about 80 miles S. E. of Boston. It has a fair harbor, and is a summer resort. There are four churches, good graded schools, and a high school; its industries are commerce and fishing. It has two lighthouses, lat. 41° 40′ 15″ N., lon. 69° 56′ 30″ W. Pop. of township (1880) 2,250; (1890) 1,954; (1900) 1,749. EDITOR OF "MONITOR."

Chatham: village and railway junction; Columbia co., N. Y. (for location of county, see map of New York, ref. 6–K); 22 miles S. E. of Albany; has five churches, union school, public reading-room, manufactories of barrels, sash, doors and blinds, tissue and straw-board, wagons, thermometers, and shirts; also iron furnace and foundry, car-shops, water-works, and electric lights. There is here a large sanitarium with a very fine building. Pop. (1880) 1,765; (1890) 1,912; (1900) 2,018. EDITOR OF "COURIER."

Chatham, WILLIAM PITT, Earl of: one of the most distinguished of English statesmen; b. at Westminster, Nov. 15, 1708, of a wealthy Cornish family; educated at Eton and Oxford, but, owing to attacks of the gout which afflicted him all his life, he took no degree; was a younger son of Robert Pitt, and grandson of a governor of Madras, whose sale of the Pitt diamond for $675,000 raised his family to influence. After traveling on the Continent, William entered the army as a cornet in the Blues, and soon after, in 1735, was returned to Parliament from Old Sarum, a borough of which the grandfather had purchased the tenures and which a hundred years later became the typical "rotten borough." He had shown remarkable promise in his studies, and in the House of Commons he soon became prominent, engaging in the fierce opposition, headed by the Prince of Wales, to the Walpole government, and embittered by a quarrel between the prince and the king. After the fall of the Walpole administration, whose prosecution Pitt vindictively urged, the Duchess of Marlborough bequeathed (1744) him $50,000 for his hostility to the fallen premier. At the demand of the Pelhams, who threatened otherwise to dissolve the "Broad Bottom" government, the king, notwithstanding a strong personal dislike, saw best to accept Pitt as an officer of the Government, and in 1746 he was made vice-treasurer of Ireland, and then paymaster-general, an office lucrative from the practice of accepting interest on its balances, but a practice which Pitt refused to follow. In the Newcastle ministry Pitt openly assailed his chief and was dismissed, 1751, from office, and then became a rival in the same party of Henry Fox. In 1755, upon the breaking out of the Seven Years' war, after the resignation of Fox, he became leader of the House of Commons under the Duke of Devonshire, with the office of Secretary of State. His measures for the reorganization of the army and navy were opposed by the king, but upon Pitt's resignation in 1757 he was recalled, because the nation demanded it. A coalition was made with Newcastle, who retained the premiership, but Pitt, now known as "The Great Commoner," was virtual head of the Government. He now pursued his plans against the French vigorously, aiding Frederick the Great with subsidies and by relieving him from garrisoning Western Germany; capturing Canada through Wolfe; improving the navy to such an extent that the French were driven from the seas; and upholding with generous praise Clive's conquests in India. The prestige of France in Europe was now impaired by the loss of her colonies in the West and the East, and thus the discontent awoke which culminated in the French Revolution. After the accession of George III. in 1761, Pitt's energetic military measures to resist the Bourbon compact of Spain and France were opposed by Bute, and Pitt resigned in 1761. He accepted from the king a pension of £3,000 for three lives, and a peerage for his wife, Hester Grenville Pitt. He remained in the opposition until 1766. His health had become feeble; he nevertheless combated zealously the more obnoxious acts of the Government, especially an increased excise tax, the persecution of Wilkes, and the American Stamp Tax, the repeal of which he secured. On the fall of the Rockingham ministry (1766), which he had supported, he was desired to form a cabinet, in which he chose for himself the office of Privy Seal, with a seat in the House of Lords, which he entered as Earl of Chatham. The new ministry was weak and inefficient, its measures were taken without consultation with Chatham, who was very ill and denied himself to visitors and even to the king. It went out in 1768. Lord Chatham never again held office. When the war for American independence began, he, though sinking under the infirmities of age, called back all his great powers of eloquence to oppose the cruel and oppressive measures which were put in practice against the American colonies; but when, in 1778, the timid policy of the Duke of Richmond was gaining ground in Parliament, which favored peace with France and a recognition of the American States, Pitt, feeble, pale, and dying, arose in the House of Lords and summoned his fleeting powers to denounce this course of weakness and shame so eloquently that the measure was defeated. He sank back in a swoon at the close of his appeal, and four days afterward, May 11, 1778, died at his country seat at Hayes. He was honored with a public funeral, a monument was erected over his tomb in Westminster Abbey, and an annuity of £4,000 voted to his successors as Earls of Chatham.

Lord Chatham's character was above moral reproach. The effects of his extraordinary eloquence were enhanced by his tall and stately form and dignified bearing. His speeches, which were composed in a vigorous, eloquent, idiomatic English style, have only been partially preserved in the *Chatham Papers* (4 vols. 1838–40). See F. Thackeray, *Life of Chatham* (2 vols., 1827), and Adams's *British Orations*. Revised by C. H. THURBER.

Chatham Islands: a British group in the South Pacific Ocean; discovered by Broughton in 1791; about 400 miles E. of the Middle island of New Zealand. They are about lat. 44° S., and between lon. 177° and 179° W. Chatham island, the largest of the group, is nearly 90 miles in circumference, and contains a large lake. Area, 375 sq. miles. The others are for the greater part mere rocks. The soil and climate are good; besides the natives there are a few British colonists. Pop. 300.

Châtillon-sur-Seine, shaă′tēĕ′yōn′-sür-sayn′: a town of France; in the department of Côte-d'Or; on the Upper Seine; about 40 miles S. W. of Troyes (see map of France, ref 4–G). It stands on both sides of the river, and consisted originally of two distinct portions—Chaumont and Bourg—each with its own fortifications. It has a church, dedicated to St. Vorle and dating from the twelfth century, and a fine château, built by Marshal Marmont, who was born there in 1775. Châtillon was in olden times often the residence of the Dukes of Burgundy, but in modern times it owes its name in history chiefly to the congress which was held there in 1814, from Feb. 5 to Mar. 19, for the purpose of bringing about a peace between Napoleon and the allies. At times it looked as if the negotiations would succeed; but as Napoleon could not be brought to accept the first proposition of the allies—that the frontiers of France should be made equal to those it had before the Revolution—the congress was finally broken up without having arrived at any result. On Mar. 25 the allies marched their troops directly against Paris, and issued from Vitry a proclamation in justification of their proceedings. Pop. (1896) 4,794.

Chatoyant, shaă-toi′*a*nt [Fr., ptc. of *chatoyer*, deriv. of *chat*, cat]: a term used in mineralogy to denote the changeable or floating internal light which is reflected by certain minerals, and resembles the light reflected from the eye of a cat. Among the minerals which are chatoyant are adularia and cat's-eye.

Châtre, shaat'r, **La**: a fine old town of France; department of Indre; on the river Indre; 22 miles S. E. of Châteauroux (see map of France, ref. 5–F). It has a fine church, a ruined castle, a considerable chestnut market, and manufactures of woolen and leather. Pop. (1896) 4,850.

Chats'worth: the mansion of the Duke of Devonshire; one of the most splendid private residences in England; situated in Derbyshire, on the river Derwent, 3 miles N. E. of Bakewell (see map of England, ref. 8–H). It is surrounded by a beautiful park about 10 miles in circumference. This domain was given by William the Conqueror to his natural son, William Peveril. It was purchased by Sir William Cavendish, who built here in 1570 a mansion in which Mary Queen of Scots was confined for thirteen years. The present mansion is a structure by Palladio, begun in 1687 and finished in 1706 by the first Duke of Devonshire. It is nearly a quadrangle with an anterior court, and is ornamented with balustrades and Ionic pillars, the terraces running to 1,200 feet. The façade is 720 feet long. Chatsworth contains rich collections of paintings, statuary, basreliefs, and books. Here is a conservatory which covers nearly an acre, and is 65 feet high. The gardens and parks are 10 miles in circuit.

Chatsworth: town (founded in 1855); Livingston co., Ill. (for location of county, see map of Illinois, ref. 4–F); on

Ill. Cent. and Tol., Peoria and West. R. Rs.; 97 miles S. of Chicago; has six churches, Roman Catholic convent, excellent graded school, water-works, electric lights, and a beautiful park. It is situated in the center of a rich agricultural region. Pop. (1880) 1,054; (1890) 827; (1900) 1,038.
EDITOR OF "PLAINDEALER."

Chattahoo'chee: a river of Georgia; rises in the Blue Ridge in the northeastern part of the State. It flows southwestward, through the gold-region of Georgia, to West Point, below which it flows southward and forms the boundary between Georgia and Alabama. At the southwest extremity of Georgia it unites with the Flint river to form the Appalachicola. Its length is estimated at 550 miles. Small steamboats can ascend it to Columbus, which is about 325 miles from the Gulf of Mexico.

Chattanoo'ga: city; capital of Hamilton co., Tenn. (for location of county, see map of Tennessee, ref. 7–H). Chattanooga is the most important railroad center in the South, being the terminus of nine trunk lines of railroad. It is the leading city within a radius of 100 miles, and is situated on the Tennessee river, near the junction of the States of Alabama, Tennessee, and Georgia, at a point about central between Atlanta, Ga., Birmingham, Ala., Nashville, Tenn., and Knoxville, Tenn. The river is navigable from Chattanooga to the Mississippi. The city had by the census of 1890 a capital of $6,673,515 invested in 283 manufacturing establishments, employing 5,129 persons, and producing merchandise valued at $9,449,384. Of these, iron and steel employed $1,061,656 capital and 543 persons, and produced goods valued at $1,241,262; foundry and machine shops, $894,723 capital, 627 persons, and products $1,094,811; lumber from logs to a finished state, $1,636,884 capital, 680 persons, product $1,426,465; furniture, $396,642 capital, 627 persons, $339,375 product. Besides, it has brick and tile establishments, the only Bessemer-steel mill in the South, rolling-mills, cotton-factories, sewer-pipe works, cast-iron pipe works, car-works, and a larger variety of smaller industries than any city in the South. The city lies at the base of the historic Lookout Mountain, the view from which is very extensive and beautiful; was the scene of three of the bloodiest battles of the civil war, viz., Chickamauga, Missionary Ridge, and Lookout Mountain. The U. S. Government is (1893) laying out the Chickamauga and Chattanooga National Military Park, which, in extent, ranks next to that of Gettysburg. (See CHATTANOOGA, SIEGE AND BATTLE OF.) Pop. (1870) 6,093; (1880) 12,872; (1890) 29,100; (1900) 30,154.
EDITOR OF "TIMES."

Chattanooga, SIEGE AND BATTLE OF: Immediately after the battle of Chickamauga, Sept. 19 and 20, 1863, Gen. Rosecrans withdrew his army and placed it behind the fortifications of Chattanooga. Gen. Bragg moved up and occupied positions upon Missionary Ridge and Lookout Mountain, extending his flanks to the river above and below the city, which was thus surrounded on the south side; and the roads from Bridgeport by which it was supplied were cut. The available roads on the north (right) bank of the river were so rough and the distance so great (60 miles) that the army could not be supplied by them. The Union army was thus blockaded and in danger of starvation. Rations ran very low and many horses died from lack of forage.

In October Gen. Rosecrans was relieved and Gen. Grant took personal command, having under his orders the Army of the Cumberland, under Gen. Thomas, at Chattanooga, the Army of the Tennessee, under Gen. Sherman, between Memphis and Corinth, and the Eleventh and Twelfth Corps, who, under Gen. Hooker, were on their way from the Army of the Potomac. Sherman's army was ordered to Chattanooga.

Grant's first task was to reopen the communications by which the army might be supplied. This he accomplished by carrying out the plan already made by Gen. Rosecrans and his chief of staff, Gen. W. F. Smith, which was as follows, viz.:

Gen. Hooker, who had reached Bridgeport, was ordered to cross the river at that point and move up by Whitesides and Wauhatchie to Brown's Ferry, cutting off Bragg's pickets between Lookout Valley and the river, and uncovering the roads between Brown's and Kelly's Ferries, while Gen. W. F. Smith was to send the necessary pontons down the river to Brown's Ferry, secure the landing on the left bank, and build a bridge there, supporting the movement by two brigades of infantry, which were to march from Chattanooga across the neck of land to Brown's Ferry.

All this was successfully accomplished on Oct. 26, 27, and 28, and the army was immediately and abundantly supplied from the dépôt at Stevenson, viâ Bridgeport, boat to Kelly's Ferry, and wagon train to Brown's Ferry and across Moccasin Point to Chattanooga. This route was kept open until the close of operations at Chattanooga.

Burnside at Knoxville, owing to defective communications, was suffering from lack of supplies, and Bragg, feeling himself strong enough to hold Grant at Chattanooga with less force, detached Longstreet with 20,000 men, on Nov. 4, to capture Burnside's command.

By the night of Nov. 23 Sherman's army had arrived, and was posted on the north (right) bank of the river nearly opposite the mouth of South Chickamauga creek. Hooker was in Lookout Valley, and Thomas, during the 23d, had assaulted the Confederate line directly in front of Chattanooga, driven it back about a mile, and occupied and changed the front of the works which it had previously held. By daylight on the 24th Sherman's infantry had crossed the river, ferried over in pontons and in one steamboat, and had occupied and intrenched a position on the south (left) bank. At a little after noon the bridges across the Tennessee and the South Chickamauga were completed, and all the cavalry and artillery were also on the south side.

The troops were immediately formed for attack, and at one o'clock moved out. By 3.30 they had secured a position on the top of the ridge, which was held against the Confederate attacks and was fortified during the night. (See *Personal Memoirs of U. S. Grant.*) Early in the morning of the 24th Hooker moved out and fought his way up Lookout Mountain, and by evening had secured a position near the summit. During the night the Confederates withdrew from his front.

At daylight on the 25th the battle was opened by Sherman's attack on the left. Hooker, coming over Lookout Mountain on the right, was delayed in crossing Chattanooga creek, and did not strike the enemy until about three o'clock. To relieve Sherman from the forces concentrating upon him, Thomas, in the center, charged up Missionary Ridge before Hooker attacked the Confederate left.

His troops, under Wood and Sheridan, once started, not only drove the enemy from the rifle-trenches, but followed them up the hill, carried the works on the crest of the ridge, and routed their defenders, pursuing them until dark and capturing many prisoners. The troops in front of Sherman, now unsupported on their left, also retreated. During the night of the 25th the pursuit was organized, and measures for the relief of Burnside were taken, which were carried to a successful issue.

Grant's total strength was about 60,000 men, his losses in killed, wounded, and missing nearly 6,000. Bragg's forces were probably about 30,000. His total losses are not exactly known, but the number of prisoners taken exceeded 6,000 men, with 40 guns and 7,000 small arms. JAMES MERCUR.

Chattel [O. Fr. *chatel* < Lat. *capitale*, property]: in law. This is a word of comprehensive meaning, and, with certain exceptions, includes all property of a personal or movable nature. The common law distinguishes between hereditaments on the one hand and chattels on the other. Though this distinction is in the main founded on a difference in the nature of things, the one being in general immovable and the other movable, yet it is in part arbitrary, since there are some things which are in their nature chattels, and yet in law, in a particular case or for some special purposes, within the rules governing interests in land. No one could deny that pigeons are in general movables or chattels, yet they might become so connected with the land by their abode in a pigeon-house as to descend as land to an heir. The same remark might be made of a key of a house, which, though in its owner's pocket, might be regarded in law as part of the house or land. Mr. Austin expresses the same idea in the following words: "Things which are physically movable may be immovable by institution." So in some cases an owner's intention may impress upon a movable thing the legal qualities of an immovable, as where money is directed by a testator to be laid out in land, it is for legal purposes deemed to be land. These same doctrines may be regarded from an opposite point of view, and that which is really land may become in contemplation of law a chattel, as where land is directed by a testator to be sold and converted into money. Certain temporary interests in land are in law treated as chattels of a peculiar nature (chattels real), such as leases for a definite number of years. There is here no completeness of classification, and much time must be spent

by a legal practitioner in acquiring arbitrary distinctions, and particularly in determining when chattels attached to the land are to be deemed a part of it. The addition of machinery, buildings, trees, and shrubs to land, either by the owner or some stranger, has given rise to an important class of questions usually treated under the term "fixtures." See FIXTURES.

Chattels personal are usually subdivided by text-writers into two principal classes: such as are in possession and in action. The first term needs no special explanation. It would include the common case of a movable thing, like a watch or a domestic animal, in the possession or under the control of its owner. A so-called thing in action, or chose in action, is intangible. It is a mere right, and can only be made available or reduced into possession by a legal proceeding. An instance is a note or bond, or, according to some authorities, a right to recover damages for a wrong committed. This classification is imperfect, as it is plain that there are some rights which can not be brought within it; such as patents or copyrights, which, though derived from the state, and in the nature of monopolies, are considered as chattels. Some writers would discard this common-law distinction, and divide property of a movable nature into corporeal and incorporeal. This is not satisfactory, for, though such a distinction is prevalent in the law of real estate, it is well shown by Mr. Austin to be unphilosophical. He advocates a classification which philosophically seems to be correct between those rights which can be affirmed against all persons, and those which can only be asserted against particular persons and those who represent them. The former case is equivalent to complete ownership, such as that of a field or watch; the latter is illustrated by the rights growing out of a contract, or even a wrong, as no one could claim these except a party to the contract or one injured by the wrong. While the comprehension of these distinctions is of service to the student in tending to give him clear conceptions of his subject, the old classification can not be disregarded by the practicing lawyer, who is so bound by precedent that he can not ask a court to dismiss from its view elementary propositions concerning things in possession and things in action. We would adopt the words of Mr. Maine, who says: "The lawyers of all systems have spared no pains in striving to refer these classifications to some intelligible principle, but the reasons of the severance must ever be vainly sought for in the philosophy of law. They belong not to its philosophy, but to its history." They must be accepted as historical facts. They can only be reduced to symmetry, if at all, by legislation. See PROPERTY and TITLE and consult Austin, *On Jurisprudence*; Williams, *On Personal Property*; Schouler, on the same; and Kent's *Commentaries*.

T. W. DWIGHT.

Chattel Mortgage: See MORTGAGES.

Chat'terer: any one of a small group of oscine birds forming the family *Ampelidæ*. (See WAXWING.) The best-known species is the cedar bird (*Ampelis cedrorum*), which is found throughout the greater part of North America. The Bohemian waxwing (*Ampelis garrulus*) is a larger, more richly colored bird, occurring in the northern portions of Europe and North America. It is remarkable for its erratic wanderings, and may be abundant at a given locality one year, and rare, or absent, the next. The term chatterer is a misnomer, as these birds are very quiet, and is probably due to a misinterpretation of the specific name *garrulus* applied to the European species from its resemblance in color to the European jay.

F. A. LUCAS.

Chat'terton, THOMAS: an English poet; b. at Bristol, Nov. 20, 1752. He was a precocious youth, but received only a very meager education in Colson's charity-school in his native city. He was fond of solitude and reverie, devoured books, especially on antiquities, began to write verses at the age of twelve, and was apprenticed to an attorney of Bristol in 1767. Soon after this date he exhibited to his friends manuscript copies of poems which he said were composed by Rowley, a monk of the fifteenth century, and found by him in the archives of St. Mary Redcliffe, where his uncle had been sexton; even Horace Walpole was for a moment taken in. Disgusted with the drudgery of legal studies and business, he removed to London in Apr., 1770, and adopted the profession of author. He produced with great rapidity songs, satiric poems, letters in the style of Junius, and other works, some of which were inserted in the public journals, but brought him little remuneration. He was reduced to extreme destitution, took poison, and was found dead in his lodging-room Aug. 24, 1770; at that time, however, his death attracted very little attention. Among his poems are *The Ballade of Chartie*, *The Tragedy of Ælla*, *The Battle of Hastings*, and the *Tournament*. See W. W. Skeat, *Chatterton's Poetical Works* (2 vols., 1875).

Revised by H. A. BEERS.

Chau'cer, GEOFFREY: English poet; son of John Chaucer, vintner, of London. It is probable that London was the place of his birth, but the date is unknown; 1328, which was long accepted, has no authority, and is even impossible, since John Chaucer was unmarried at that time. In the record of a trial at which the poet gave evidence, in 1386, Geoffrey Chaucer is described as of the age of forty and more, and as having borne arms for twenty-seven years; but it has been shown that the age of several other witnesses is put sixteen or twenty years too low, and consequently this plausible document can not be trusted for Chaucer's. A Geoffrey Chaucer was in the service of the wife of Lionel, third son of Edward III., in 1357. The poet was engaged in Edward III.'s invasion of France in 1359. 1340, which has of late been assumed as an approximate date for his birth, suits fairly well with the known facts of his life, but he may well have been born earlier. It appears from public records that he was a valet of the king's chamber—a place always filled by gentlemen—in 1367, and that in June of the same year the king granted him a salary for life, or till he was otherwise provided for, in consideration of services past and to be rendered. At various times, from 1370 to 1378, or perhaps 1380, Chaucer was employed on royal missions in Italy, Flanders, and France, and for somewhat more than ten years from 1374 he held offices in the customs. He was elected to Parliament for Kent in the year 1386, but toward the end of that year was dismissed, for reasons unknown, from his place in the customs; and although he received other public appointments in 1389, he lost them again, and remained in comparative poverty until the accession of Henry IV., whose favor he immediately received, but lived only a year to enjoy.

A Philippa Chaucer received in 1366 a pension as one of the ladies of the chamber of Queen Philippa. After the queen's death, in 1369, Philippa Chaucer appears to have passed into the service of the second wife of John of Gaunt, Duke of Lancaster; for before 1372 the duke had granted her a pension of £10, "which grant seems to have been commuted in June, 1374, for an annuity of the same amount to her and her husband, for life, in consideration of the good services which they had rendered to the duke, to his duchess, and to the late queen, his mother." Geoffrey Chaucer is named as the husband of this Philippa in the Issue Rolls as early as 1381 (and probably earlier). Philippa Chaucer died in 1387. She has been held (but the evidence is not convincing) to have been the daughter of Sir Payne Roet, and sister to Katherine Swynford, who became the third wife of John of Gaunt. It is not even certain that Chaucer was not her maiden name. She left a son Lewis, for whom, when he was ten years old, possibly in 1391, the father compiled a treatise on the astrolabe. Thomas Chaucer, a person of great wealth and consideration, has been maintained to have been a son of Geoffrey and Philippa, upon the ground that Philippa was of the Roet family.

The chief work of Chaucer, and one which has secured him an immortal and still brightening fame, is *The Canterbury Tales*, a series of about twenty stories narrated by pilgrims to the shrine of St. Thomas. The persons and characters of the pilgrims are sketched with marvelous spirit in an introductory prologue, and both here and in the tales there is displayed a dramatic power of the comic sort second only, and scarcely second, to that of Shakspeare. *Troilus and Cresside*, *The Parliament of Fowls*, and *The Legend of Good Women* are also admirable poems. *The Canterbury Tales* were excellently edited by Thomas Tyrwhitt in 1775, in four volumes, to which a glossary was added in 1778. Of late years Chaucer has received particular attention in England, America, and also in Germany. The Chaucer Society, founded in 1868, has printed seven texts of *The Canterbury Tales*, four of *Troilus*, and all, or nearly all, of the extant texts of the minor poems. The minor poems and *The Legend of Good Women* have for the first time been critically edited (Oxford, 1888–89) by the Rev. W. W. Skeat, preceding an edition of *The Canterbury Tales* and of *Troilus*. The three small volumes of selections from *The Canterbury Tales*, published in the Clarendon Press Series (edited by Skeat and Morris), have given an intelligent introduction to Chau-

cer to many thousands of young people. For biography, *The Life of Chaucer* by Sir Harris Nicolas made great additions to our knowledge. Prof. T. R. Lounsbury's *Studies in Chaucer*, 3 vols. (New York, 1892), embracing papers on Chaucer's life, historical and legendary, his text, the genuine and the spurious works, his learning, genius, etc., is a work of capital importance. F. J. Child.

Chaudes-Aigues, shōd'zayg': an old town of Upper Auvergne, in France; department of Cantal (see map of France, ref. 7–F); celebrated for its hot mineral springs, which were well known to the Romans and are mentioned by Sidonius Apollinaris. The water, whose temperature varies from 135° to 195° F., is slightly alkaline, and is used not only for medical purposes, but also furnishes a cheap means of heating the houses of the town. Pop. about 1,650.

Chaudet, shō'day', Antoine Denis: b. in Paris, Mar. 31, 1763; d. in Paris, Apr. 19, 1810; sculptor and painter; left many works in sculpture of high importance, and portraits of Napoleon I., and many of his contemporaries.

Chaudière, shō'di-ār': a river of the Dominion of Canada; rises in the south part of the province of Quebec, flows northward, and enters the St. Lawrence about 7 miles above Quebec. Length, 120 miles. Two and a half miles from its mouth is a remarkable cataract, called the Falls of the Chaudière, which is about 100 feet high.

Chaudière: a lake of Canada; about 15 miles W. of the city of Ottawa; is an expansion of the Ottawa river.

Chaumonot, shō'mō'nō', Pierre Marie Joseph: a Jesuit and missionary to the North American Indians. He was born in France in 1611, went to Canada in 1639, and after many labors and hardships died near Quebec in 1693. He wrote a grammar of the Huron language, which was published in 1835.

Chaumont, shō'mōñ': a town of France; capital of the department of Haute-Marne; on an eminence near the river Marne; about 141 miles E. S. E. of Paris (see map of France, ref. 4–H). It is connected by railways with Paris, Troyes, and Vesoul. It has a triumphal arch commenced by Napoleon, and a public library of 35,000 volumes; also manufactures of drugget, hosiery, cotton yarn, and gloves. On Mar. 1, 1814, the allied powers here concluded a treaty against Napoleon. Pop. (1896) 13,428.

Chaun'cey, Isaac: a commodore in the U. S. navy; b. at Black Rock, Fairfield co., Conn., Feb. 20, 1772. At an early age he manifested a love for the sea, and entered the merchant service about 1785; obtained command of a ship when he was nineteen years old. On the organization of the navy in 1798, Chauncey was appointed a lieutenant; promoted commandant in 1802; captain in 1806. He served with distinction in the war with Tripoli, and for his services there received the thanks of Congress, which body also voted him a sword, but the resolution was never carried into effect. He was in command of the Navy-yard at Brooklyn, N. Y., from 1808 till the outbreak of the war with Great Britain, when he was placed in the command of the lakes, which position he retained till the close of the war, and won for himself the highest honors for gallantry and skill as a naval commander. He subsequently commanded the Mediterranean squadron (1816–18), was in command of the Navy-yard at Brooklyn, and was president of the navy commission at the time of his death, which occurred in Washington, Jan. 27, 1840.

Chauncey, John S.: commodore U. S. navy; son of Isaac, mentioned above; b. in New York about 1800; entered the U. S. navy as midshipman in Jan., 1812. In 1822 Chauncey commanded the sloop Peacock, and was engaged in the capture of a fleet of armed pirate vessels off Bahia Honda, Cuba; from 1838 to 1843 and from 1843 to 1847 he was assistant inspector of ordnance; in 1861 he commanded the Susquehanna, and was second in command in the engagements of Forts Hatteras and Clark; subsequently in command of blockade on coasts of Virginia and North Carolina. D. in Brooklyn, Apr. 10, 1871.

C. H. Thurber.

Chauncy, Charles: second president of Harvard University; b. in Yardleybury, Hertfordshire, England, in 1592 (baptized Nov. 5); educated at Cambridge, where he was a Professor of Greek and Hebrew. He left the university in 1627, and from then till leaving England was a clergyman in parochial duty in the Church of England. His Puritan principles brought him into trouble, and he emigrated to New England in 1638. He became president of Harvard in 1654, succeeding the first president, Henry Dunster, and d. Feb. 19, 1672.

Chautauqua, sha-taw'kwa: a widely known summer educational center on Chautauqua Lake, Chautauqua co., N. Y. (for location, see map of New York, ref. 6–B). The grounds, formerly known as Fair Point, were purchased, in 1874 by the Chautauqua Assembly, originated jointly by Lewis Miller, of Akron, O., and Dr. (now Bishop) John H. Vincent, of New York. The town, containing more than 500 cottages, a large hotel, and 25 public buildings, lecture-halls, recitation-rooms, a museum, gymnasium, etc., is built upon heavily wooded terraces, sloping gradually to the lake shore. There are complete water and sewerage systems, fire department, electric-light plant, and other municipal features. The average summer population is about 10,000. See Chautauqua System of Education.

Chautauqua Lake: in Chautauqua co., N. Y.; a beautiful sheet of water about 20 miles long, and from 1 to 2 miles wide. It is 726 feet higher than Lake Erie. The surplus water flows through an outlet into Conewango creek. Steamboats ply between Mayville, which is at the N. W. end of the lake, and Jamestown, a flourishing commercial city at the S. E. extremity.

Chautauqua System of Education: The plan of applying scientific principles to Bible study and the training of Sunday-school teachers begun at Chautauqua in 1874 naturally expanded to include classes in literature, language, science, art, etc. In 1878 the establishment of the *Chautauqua Literary and Scientific Circle* paved the way for a system of home reading and study, which has since been widely extended. To Dr. W. R. Harper, now president of the Chicago University, who has been connected with Chautauqua since 1880, much credit is due for the development of the educational work. The combined agencies now employed are known as "The Chautauqua System of Education." Two divisions are made: (1) Summer Work. *The College* offers courses in college studies under instructors from leading institutions. *The Schools of Sacred Literature* and the *S. S. Normal Department* give biblical instruction and pedagogical training. *The Teachers' Retreat* deals with psychology, pedagogics, and practical methods for secular teachers. *The Schools of Music* and *Physical Education* offer exceptional opportunities under teachers of the first rank. There are also classes in art, decoration, oratory, manual training, etc. The number in these schools varies from 1,000 to 1,500 each summer. A schedule of daily lectures, concerts, readings and entertainments, affords instruction and recreation to all. (2) Home Reading and Study. The college conducts correspondence-instruction in all regular college subjects. The instructors are professors in well-known colleges. Each course equals the work expected of a resident student in one subject in a year, and requires about ten hours per week for ten months. Lesson sheets are sent frequently to the student, who returns them for correction. The examinations are conducted by the University of the State of New York. The Chautauqua Literary and Scientific Circle has enrolled over 210,000 readers since 1878. The average number of readers at one time is about 40,000. The essentials of the plan are: A definite four-year course in history, literature, science, etc. Specified books are approved by a council of six. The reading is apportioned by the week. A magazine, *The Chautauquan*, contains additional readings, notes, and general literature. A membership book gives suggestions for reading and review outlines. Isolated readers may have all the privileges. Local circles may be formed by three or more members for mutual aid. The time required is about an hour a day for nine months a year. Certificates are granted to all who complete the course. There are advanced courses for continued reading in special lines, a pedagogical course for secular teachers, and a course to encourage the reading of good literature by the young.

John H. Vincent.

Chauveau, Pierre Joseph Olivier, D. C. L.: Canadian author; b. at Quebec, May 30, 1820; educated at the seminary of Quebec. He was admitted to the bar in 1841; entered Parliament in 1844, and held portfolios of Solicitor-General in 1851, Provincial Secretary in 1853, Premier of province of Quebec in 1867, and Speaker of the Senate in 1873. In 1878 he was appointed Professor of Roman Law in Laval University, and has been president of the Royal Society of

Canada. D. in Quebec, Apr. 4, 1890. In addition to poems, he published *Charles Guérin*, *Roman de Mœurs Canadiennes* (Quebec, 1852); *Voyage de le Prince de Galles* (1861); *Souvenirs et Légendes* (1877); *François Xavier Garneau, sa vie et ses œuvres* (1883). NEIL MACDONALD.

Chauvenet, shō-ve-nay', WILLIAM, LL. D.: mathematician; b. in Milford, Pa., May 24, 1820; graduated at Yale in 1840. He was Professor of Mathematics and Astronomy at the U. S. Naval Academy at Annapolis, Md. (1845–59), an institution he promoted from its beginning. He was chancellor of Washington University 1859–69, and for many years general secretary of the American Association for the Advancement of Science. His mathematical treatises were adopted as text-books in many schools and colleges. D. in St. Paul, Minn., Dec. 13, 1870.

Chauve-souris: the common name in France for the BAT (*q. v.*).

Chauvin, shō'văñ, ÉTIENNE: b. at Nîmes, France, Apr. 18, 1640; d. in Berlin, Apr. 6, 1725. He was a pastor of the Reformed Church in France, but after the revocation of the Ediet of Nantes he fled to Rotterdam, where for several years he officiated in the Walloon Church. In 1695 he was called to Berlin as Professor of Philosophy. He enjoyed great reputation there as a representative of Cartesianism, and he studied physics with great zeal in order to fill up the gaps which the Cartesian system presents in that department. His principal work is his *Lexicon rationale sive thesaurus philosophicus*, which may be considered as a dictionary of Cartesian philosophy. It is very comprehensive.

Chauvinism, shō'vin-izm (in Fr. *chauvinisme*): a term derived from Chauvin, a character in a popular comedy which was performed at the time of the restoration of the Bourbons, 1815. Chauvin was a bragging veteran of Napoleon's army, who talked much of Austerlitz and Jena, and vowed to take revenge for the battle of Waterloo. A Chauvinist may be defined as one who has exaggerated and ridiculous sentiments of patriotism, and is excessively warlike or quarrelsome.

Chaux-de-Fonds, shō'de-fōñ': a town of Switzerland; canton of Neufchâtel; situated in a narrow gorge of the Jura Mountains; 9 miles N. W. of Neufchâtel (see map of Switzerland, ref. 4–C). It is 3,070 feet above the level of the sea. It has extensive manufactures of clocks and watches. Above 160,000 watches are manufactured annually. Pop. (1897) 31,157.

Chay-root, Choya, or **Indian Madder** [*chay* is from Tamil *chaya*]: the *Oldenlandia umbellata*; a herb of the family *Rubiaceæ*, a native both of India and of Mexico. The dye made in India from the outer bark of the roots is well known as the source of the durable red color of Indian chintzes. The leaves are used as an expectorant. Several plants of this genus abound in the U. S.

Chazars: a Tartar people, originally inhabiting the land between the Caucasus and the Caspian Sea. Beginning with the seventh century they spread north between the Dnieper and the Volga, establishing their capital at Astrachan. In 1016 they were subdued by the Russians and Greeks.

Chazy (shăă-zee') **Limestone**: a geological formation occurring on both sides of the Champlain basin and in Canada. It belongs to the Trenton epoch of the Silurian period.

Cheat [M. Eng. *chete*, abbrev. of *eschete* = O. Fr. *eschete* (cf. *escheat*), rent, what falls to one, partic. of *escheoir* < Med. Lat. *excadere* (Lat. *excidere*), fall from; *ex*, from + *cadere*, fall]: in law this topic may be considered under two principal divisions: 1, at common law; 2, by statute, then termed "false pretenses."

1. The common law regarded a "cheat" as a crime when one person defrauded another not by mere words, but by some outward and visible means, such as a false token or sign. A mere lie was not in this sense a cheat, though in a civil sense and as a basis for a civil action it may amount to a fraud. (See FRAUD.) Thus the act of marking false brands upon articles sold, calculated to deceive and defraud persons in general, would come within the scope of the criminal offense. This view led to fine-spun and artificial distinctions. For example, if a man in purchasing goods gave his own check on a bank in which he knew that he had no funds, it would be a mere lie reduced to writing, and thus not a cheat; while if he gave another man's check under the same circumstances the act would be cheating, as the paper was then a token or symbol. Under these rules false personation may be a common-law cheat, particularly where the personator by dress or tokens represents himself to be another person, and thus causes injury to others. Some have even maintained that the defrauder might himself be a symbol or token, as where, knowing that he held a relation (such as apprenticeship) which prevented him from entering into a public engagement (enlisting as a soldier), he professed to be able to, and did in fact, enter into it.

The crime of forgery, though usually, from its magnitude as an offense, discussed separately from the various classes of cheats, is in reality comprised within the same category. The "false token or sign" necessary to constitute cheating at common law must be of such a nature that its tendency in general would be to deceive, though in fact it may be used only to injure particular individuals; as e. g. the use of false dice in games of chance. Moreover, it is essential that any injury sustained be properly attributable to some confidence or belief which the use of the token, etc., inspired. If other considerations than the device influence a person's action, there is merely an attempt to cheat. This is, however, also indictable. Cheating belongs to the lower grade of criminal offenses, termed "misdemeanors."

2. *False Pretenses* constitute a very reprehensible mode of fraudulent deception. The failure of the common law to provide a remedy where no symbol was employed made statutory provisions necessary for wrongs thus occasioned. Reference can here be made only to such regulations as the various States have generally agreed in establishing. False pretenses may be defined as false representations, with intent to defraud, by words or acts concerning past or present facts and events. Statements of a promissory nature in regard to any future transaction, and perhaps all representations as to the future, are insufficient to afford a ground for prosecution. The false representation may be made by acts without words, as if one purports by his peculiar dress to belong to a particular institution of learning, such as Cambridge University. A false sample may also be referred to. Mere expressions of opinion, however, or mere exaggerations of language, by which no reasonable man would be influenced, can not be considered false pretenses within the statutes. It is a further rule that the deception practiced must be the efficient operative cause of the injury sustained. The criterion always is whether, if there had been no such deceit practiced, the transaction between the parties would have been consummated. There has been much discussion upon the point whether the representation must be calculated to deceive a person of ordinary prudence, or whether it will be sufficient, though the party was weak, that he was actually defrauded. The question is still open. The false pretense may be made by an agent in such a way as to make his principal criminally liable.

Property acquired under false pretenses is held by the wrongful possessor under a voidable title as regards the true owner, but if transferred to an honest purchaser, who acts in good faith, without knowledge of the fraud, the latter's claim is indefeasible. On the other hand, when goods are stolen the thief can, with but few exceptions, give no better title than he himself possesses. The reason for the difference is that in the one case the wrong-doer acts with the owner's consent, even though it be procured fraudulently, while in the other his will is in no way exerted. According to general principles this offense would be a misdemeanor, though the statutes of some of the States make it a felony. T. W. DWIGHT.

Cheatham, cheet'am, BENJAMIN FRANKLIN: a general in the Confederate army; b. in Nashville, Oct. 22, 1821; served during the Mexican war as captain of Tennessee volunteers and as colonel Third Tennessee Voltigeurs to July, 1848. During the civil war he espoused the Confederate cause, became major-general, and bore a conspicuous part at Chickamauga, Missionary Ridge, Franklin, Nashville, etc. D. in Nashville, Sept. 4, 1886.

Cheat River: West Virginia; formed by the junction of several branches which rise among the Alleghanies in Randolph County, and unite in Tucker County. It flows nearly northward, and enters the Monongahela in Fayette co., Pa. Its length without the branches is about 75 miles. It takes its name from the extremely variable volume of its waters; for while it is sometimes a large stream, it often becomes in a few hours quite insignificant.

Chebanse: town; Iroquois and Kankakee cos., Ill. (for location of county, see map of Illinois, ref. 4–G); on Ill. Cent. and Tol., Peoria and Western R. Rs.; 65 miles S. S. W. of Chicago. It has a very extensive trade in grain. Pop. (1880) 728; (1890) 616; (1900) 555. EDITOR OF "HERALD."

Cheboygan: city; capital of Cheboygan co., Mich. (for location of county, see map of Michigan, ref. 3–I); on railway and on Lake Huron; has large lumbering and farming industries. Pop. (1880) 2,269; (1890) 6,235; (1900) 6,489.

Check, or **Cheque** [O. Fr. *eschec*: Ital. *scacco*, from Arab. Pers. *shāh*, king, as a term used in game of chess]: a bill of exchange drawn upon a bank or banker, or person holding a position similar to that of a banker. It has some peculiarities which distinguish it from an ordinary bill of exchange, particularly when it is payable without any specific mention of time. It is then, in point of law, payable on demand and without days of grace. If payable a fixed number of days after date, it varies but slightly from a bill of exchange, and will follow the ordinary rules as to days of grace. It is usually said in the lawbooks that a check is not accepted as a bill is. Acceptance, however, as will be seen hereafter, has recently become quite common, and is perfectly lawful. A check may be considered under the following heads: 1. Its form and requisites; 2. The duty of the holder as to demand of payment (*a*) toward the drawer, (*b*) toward the indorser, and herein of crossed checks; 3. The effect of the check upon the banker, and, under this, of acceptance; 4. A check considered as payment of a debt or as cash; 5. The civil and criminal liability of drawers having no funds.

1. A check in its ordinary form is simply an order addressed to the banker to pay a person named or his order or bearer, or the equivalent of a bearer (such as a mere numeral), a sum of money. A check may preserve this form and be post-dated. This class of checks is not used in England, owing to the provisions of the Stamp Acts. It is quite common at the present time to make a check payable to order, as the indorsement of the name of the payee operates as a receipt. In some instances a note may amount to a check. Thus if a customer makes a note payable at his bank, he implicitly requests its payment in the same general manner as if he had drawn his check. In filling up a check care should be taken to so draw it that additional words, which might increase its amount, can not be inserted in blank spaces. Thus if the drawer had written the words "fifty dollars," and had left sufficient space between the word "fifty" and that which preceded it to insert "one hundred and," and such words had been fradulently inserted, and the bank had paid the check in good faith, supposing it to be drawn for $150, the drawer would be the loser. When, on the other hand, due caution has been exercised, the loss from forgeries will fall on the bank, rather than on the drawer, though the former may in some instances recover from the holder. The drawer may simply sign his name to a blank printed form of check, or even to a blank sheet of paper, at the same time authorizing it to be subsequently filled up by some person acting in his behalf. If so filled he will be bound. Even should the agent acting fraudulently fill it up for a larger sum than was directed, the drawer would still be bound to a person who took the check in good faith. This would not be strictly a case of forgery, but that of an agent defrauding his principal, and yet acting within his apparent authority.

2. *The Duty of the Holder as to Demand and Notice*: (*a*) *As to the Drawer.*—The drawer has a right to expect that the holder will demand payment with promptitude, as, if the banker fails to pay, recourse may be had to him. Presentment should be made, in general, as early as the next day, and if payment is not made, due notice given. However, a failure to present is not necessarily fatal to the holder's claim. Whether it is or not depends on the fact whether an injury is caused to the drawer. If, for example, he had no funds in the bank, want of presentment is unimportant, as it is plain that he sustains no harm; so, if after giving the check, he withdraws his funds. If, however, the banker should become insolvent with sufficient funds of the drawer in his possession, want of presentment would be a sufficient defense. (*b*) *Demand as to Indorsers.*—Indorsements upon checks are common. An indorsement is necessary when the instrument is payable to order; it is admissible when payable to bearer. The legal effect of indorsement, as in the case of a bill of exchange, is to make the indorser liable, provided that the steps necessary to charge him are taken. These are substantially the same as in bills of exchange. There are cases in which no presentment is necessary to bind the indorser, as where he indorses and puts in circulation a void or forged check, even though he does this innocently. In some cases custom enlarges the time for presentment. Thus if there be a custom to pay checks through the "clearing-house" (see CLEARING-HOUSE), the time required for them to pass through the system of exchanges there adopted will be allowed. In England a practice of *crossing* checks is resorted to. A check is said to be "crossed" when it is marked by the drawer in such a way that, instead of being presented through an ordinary holder, it must come to the paying bank through a banker. This practice has given rise to a number of perplexing questions recently settled by statute (21 and 22 Vict. ch. 79). The additional time necessary to present the check in this manner must of course be allowed there to the holder. It is believed that crossing checks is not practiced in the U. S. A practice has grown up in some of the large cities to pay drafts drawn on bankers by checks drawn by such bankers, in turn, upon some regularly organized bank, instead of cash. This practice has an important effect upon the subject of demand. Though the check is not payment of the draft, yet it must be presented on the *same day* that it is received, or the drawers of the draft may be discharged. The holder of the draft might have insisted on the money instead of taking the check, and if not paid might have protested the draft.

3. *Effect of the Check on the Banker on whom it is Drawn, and herein of Acceptance.*—According to the better opinion, a check gives no right of action to the holder against the banker. Of course the latter should, in general, pay it, but the holder has no means of enforcing this obligation if the banker refuses to perform it. This rule grows out of the nature of a deposit in a bank, in respect to which there is much popular misconception. This fact is perhaps partly due to the ambiguity lurking in the word "deposit." This is sometimes and properly used to mean the act of intrusting a specific chattel to a person who is bound to return the identical thing delivered to him. That, however, is not the nature of an ordinary bank account against which checks are drawn. The banker is not bound to render the specific money delivered, but only engages to pay an equivalent amount. The relation of *debtor* and *creditor* is created by the transaction. Although the banker is bound to pay checks when he is in funds, it is a duty between him and the depositor or creditor. It can not be enforced by the payee of the check, who is no party to the contract. Nor can the check be treated as an assignment by the depositor of so much money as it represents. These rules have led to a very important practice of certifying checks. An officer of a bank—e. g. a teller or cashier—has by custom acquired an authority to mark such checks as are presented to him as good. This act is treated in law as an acceptance, and the bank becomes liable. The practice is attended with danger, as it practically gives to a teller power to establish without limit fictitious claims against the bank, as he may certify checks for persons who have overdrawn their accounts, or even who have closed their accounts, or have had no dealings with the bank, which will still be binding upon it on general principles of law. (See AGENT, ESTOPPEL, and BILL OF EXCHANGE.) A cashier or teller, however, can not, where he has no funds, validly certify his own check. On the other hand, certification of a check is attended with some hazard to the holder, as he may thereby release the drawer should the bank fail even on the same day and between the time of certification and of presentment for payment. (*National Bank of Jersey City agt. Leach*, New York Court of Appeals, 1873.) In the financial crisis of 1873 in New York, certified bank-checks by general consent played an important part in monetary transactions, and became for a considerable time, through the association of a number of national banks, a substitute for currency. It may be added that banks sometimes pay checks for customers who have no balance due them. These are called "overdrafts." The bank in such a case has a claim upon the dealer for the sum overdrawn.

4. *A Check Considered as Payment or as Cash.*—The general presumption of law is that a check is issued by a drawer to a payee in payment of debt, and not as a means of making a loan. The intention, however, may be shown by affirmative proof. Considered as payment, it is not in general absolute. It is rather a means of obtaining payment, whether it be the debtor's own check or that of a third person. Accordingly, if the check is not paid, the creditor

may resort to his original claim, though if there be an agreement to receive the check as full payment, it must be followed. In other words, a check is not money, but a means of obtaining money, and debts can not be paid in anything but money, unless there be an agreement for some substitute. The gift of one's own check, unless it be certified, is a mere naked promise, and may be countermanded at any time before payment. The death of a drawer in such a case before payment would be a revocation of the authority. It is common for a bank to receive on deposit not only cash, but checks drawn either on itself or on some other bank, payable to the depositor. Such a deposit is not to be treated as cash in case the check is drawn on another bank. It is rather received conditionally, in case it turns out to be good, and the depositor will be liable on his indorsement, which is usually required. Where, however, the check is given by another dealer, the receiving bank is absolutely bound by the credit which it gives the depositor as if it had paid the check.

5. *Civil and Criminal Liability of Drawers of Checks Having no Funds with the Bank*: (*a*) *Civil Liability.*—It is a general rule that a man who draws a check with knowledge that he has no funds commits a fraud toward the payee. If he should purchase goods under such circumstances the seller could rescind the sale as fraudulent. It will not be enough to sustain the sale that he has reasonable grounds to expect funds, but they must be *actually on hand* to pay the check. This view proceeds upon the theory that a check is in the nature of a representation that the money is immediately available; and where a drawer has notice to the contrary he makes a representation known to be false which avoids the contract as between him and the seller, though it would be otherwise should the rights of innocent purchasers intervene. (*b*) *Criminal Liability.*—It was not a crime at common law to give one's own check for goods bought with knowledge that it was worthless, since this was only an affirmation or a base lie reduced to writing, and there was no token or symbol of falsehood on which the common law lays stress. It might accordingly be a criminal cheat (see CHEAT) knowingly to pass off the worthless check of another. Under the statutory offense of false pretenses it is criminal to give one's own check on such a sale, knowing that the drawer had no funds nor any reasonable grounds of expecting them. There might be cases, such as that of *Loughran against Barry*, above cited, where the contract would be rescinded on account of a representation known to be false, and yet the drawer would not be guilty of crime, by reason of the absence of a true criminal intent. See Shaw, *On the Law of Bankers' Checks* (London, 1871); also Parsons, *On Bills and Notes*; and other text-writers on same subject, as Chitty, Byles, Story, etc.

T. W. DWIGHT.

Checkerberry: See PARTRIDGEBERRY.

Checkers, or Draughts: game for two persons played on a square board divided into sixty-four equal squares of alternate colors, each player having twelve like pieces or *men*, distinguished by their color from those of his opponent. Only the thirty-two squares of one color are employed in the game (in America usually the darker ones), and the board is so placed between the players that each has one of them at the corner to his left. The men of each player are placed before him on the first three rows of these squares; the play then alternates between the two players until the end. A play is made by *moving* or *jumping*. A player *moves* by advancing one of his men from the square it occupies diagonally to an adjacent unoccupied square. A man can move or jump only forward until it reaches the last row on the opposite side of the board, when it must be crowned by placing upon it another piece; it then becomes a *king*, and can thereafter move or jump either forward or backward. A player *jumps* one of his opponent's men when it occupies a square adjacent to that occupied by one of his own and there is an unoccupied square next beyond it in the same line. The play is made by the player advancing his man to this unoccupied square, and removing the opponent's piece from the board. Should his man from its new position be able to jump again, it does so in the same play as many times as possible, with the single exception that if it be not a king the play must end on its becoming one. The person to play should jump if possible; if he moves instead, his opponent may at his option either remove from the board the man which should have jumped, and then play, or require the player to take back his move and to jump, or simply proceed as if the play had been correctly made. The first of these three methods is rarely employed. The game is won by a player capturing all his opponent's pieces, or so hemming them in that his opponent can not move or jump when it is his turn to play. The game is drawn when neither player can win; if a player claims to have any advantage, his opponent may require him to win the game or show a decided advantage within forty of his plays, and if he fails, may declare the game drawn.

The game is supposed to have originated before 2000 B. C., and to have preceded chess. It was introduced into Europe from Egypt several centuries ago. Variations from the form described above are quite frequent in the Old World, but are little played in America. The *losing game* is played by the same rules, save that a player wins by losing all his pieces, or by having them so hemmed in by those of his opponent that he can not move or jump when it is his turn to play.

Cheddar Cheese: See CHEESE.

Chedu'ba: an East Indian island in the Bay of Bengal; about 10 miles from Aracan, to which province it belongs. Area about 250 sq. miles. Nearly all of the island has a rich and productive soil, and the interior is much more free from jungle than that of any other island on this coast. The staple productions are cotton, sugar, rice, indigo, and petroleum, which is extensively used in the composition of paint, as it is found to protect wood against the ravages of insects. This island was captured from the Burmese by the British in 1824, and actually ceded to Great Britain in 1826. It afterward proved a valuable possession. Pop. about 20,000.

Cheese (in Lat. *ca'seus*, Ger. *Käse*, Fr. *fromage*): a variety of food prepared by coagulating or solidifying milk, separating the curd from the liquid portion which is called whey, adding some salt, putting it in molds or hoops, and permitting it to undergo a curing or ripening process through slow fermentation.

Cheese is a wholesome and nourishing food. It is comparatively cheap, convenient for use, and, when good, is promotive of digestion rather than antagonistic to it. The chief service of a diet is to furnish those elements or materials which are required for the nutrition of the tissues of the body, and to supply heat or energy for the activities of life. These tissues have the power of appropriating, from food which has been swallowed, the elements which they require, and also of changing them into their own substance. The serviceability of a food depends upon its adaptation to maintain in these tissues an even balance between the processes of waste and reparation. The main substances required have been termed *nitrogenous*, *non-nitrogenous* or *carbo-hydrates* and *salts* or *mineral matter*. The proper proportion in which these can be taken with most advantage in food is 1 part of "nitrogenous" matter to 3½ or 4 parts by weight of "non-nitrogenous" matter. The following table from Letheby shows the relative quantities of these that are to be found in a few articles of diet, and which are cited for comparison with cheese:

SUBSTANCES.	Nitrogenous.	NON-NITROGENOUS.			Salts.
		Starch.	Sugar.	Fat.	
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Lean beef	19·3	....	....	3·6	5·1
Fat beef	14·8	....	....	29·8	4·4
Cheese	34·59	....	4·0	29·75	4·25
Milk	4·1	....	4·4	3·3	0·7
Bread	8·1	47·4	3·6	1·6	2·3
Potatoes	2·1	18·8	3·2	0·2	0·7

It may be calculated that cheese can give at least one and a half times as much nutrition per pound as ordinary beef. The sense of taste has power to stimulate the secretion of digestive fluids; and the pungent, agreeable flavor of well-cured cheese renders it a food easy of digestion, even to the extent of promoting the digestion of other foods that may have been consumed.

COMPOSITION OF CHEESE.—The composition varies according to the process of manufacture and the constitution and condition of the milk from which it is made. Cheese may be made from the milk of any animal, but nearly all the cheeses of commerce are made from that of cows. Milk is a very complex compound, and the milk of cows, as the cheese-maker needs to know it, is composed of substances partly in solution and partly in suspension. It may be described

as a thin emulsion of fat, in a serum of albuminous matter, sugar, and mineral matters. When obtained from a healthy cow in its normal state it has a constant tendency toward acidity. It will change the color of litmus paper before lactic acid has been developed. A small quantity of carbonic acid is generated soon after it is drawn, if left warm; but that can be taken out by agitation and aëration. The true sourness of milk is caused by the development of lactic acid. The specific gravity of milk varies between 1,029 and 1.035 at 60° F.; that is to say, a quantity of milk equal in bulk to as much water as will weigh 1,000 lb. at 60° F. will weigh from 1,029 to 1,035 lb. at the same temperature. The effect of each per cent. of fat is to decrease the specific gravity, because the fat of milk is lighter than its other parts. The effect of each per cent. of solids other than fat is to increase the specific gravity. The total solids of ordinary milk vary between 12 and 16 per cent. In some unusual instances the range of variation has been known to be between 11 per cent. and 20 per cent. of total solids, and between 2 per cent. and 10 per cent. of fat. The solids of milk are its only constituents that have any real or ratable value. The water that is put into the milk by the cow, while the process of elaboration is proceeding in her udder, is worth no more per pound or per gallon than the water that may be put in by a man when it has come into his hands for use or sale. The limits of variation of the solids other than fat are usually within one-half of 1 per cent. in the same cow at different periods in her milking season. Different cows of the same breed rarely show a variation of more than 1 per cent. in the solids other than fat contained in their milk. The greatest difference exists between cows of different breeds; it will sometimes reach as much as 2½ per cent. as between the milk of cows giving extra rich milk and those yielding a very poor quality. The solids other than fat, or the solids in the serum of the milk, also increase slightly during the milking season; the rate is about ·04 per cent. of solids not fat per month.

Composition of Milk.—The average composition of milk from cows may be stated as

COMPONENTS.	Colostrum.	Normal milk.
	Per cent.	Per cent.
Water	75·8	87·2
Fat	2·6	3·60
Casein, Albumen	15·0	3·50
Sugar	3·6	5·0
Ash	3·0	0·70

A great many varieties of cheese are now made. Many of them take their distinctive names from a particular place or locality from which they come. All may be said to belong to one of the classes "soft cheese," "medium or firm cheese" or "hard cheese." Soft cheeses are seldom pressed, and therefore contain a larger per cent. of water than the others. In most cases soft cheeses contain from 60 to 40 per cent. of water, with an average of about 50 per cent. Medium or hard cheeses contain from 40 per cent. to 15 per cent. of water, with an average of about 32 per cent. The following table shows the composition of the varieties of cheeses commonly found in the markets of America and Europe:

MAKE OF CHEESE.	Water.	Fat.	Casein.	Sugar.	Ash.
Stilton, average	30·35	35·39	28·85	....	3·82
Cheddar, six months	31·17	33·68	26·31	4·91	3·93
English, Canadian, and American Cheddar, average	34·38	32·71	26·38	....	3·58
Double Gloucester	35·96	26·83	21·74	....	4·07
New Cheshire	36·96	29·34	24·08	5·17	4·45
Old Cheshire	32·59	26·06	32·51	4·53	4·31
Derby	31·68	35·20	24·50	4·38	4·24
Cream, average	30·65	62·99	4·94	....	1·15
Gouda (flat Dutch)	21·90	24·81	46·95	....	6·32
Edam (round Dutch)	36·28	30·26	24·06	....	4·90
Gorgonzola	24·96	43·46	26·10	0·26	5·22
Parmesan, average	31·34	19·22	41·99	....	6·25
Camembert, average (first prize, dairy show)	40·3	29·9	29·8	....	....
Roquefort, average	31·20	33·16	27·63	...	6·01
Brie, average	50·35	25·12	17·18	....	5·41
Gervais, cream	52·94	29·75	11·80	2·58	2·93
Gruyère, average	34·87	28·91	25·87	....	3·84

CONSTITUENTS OF CHEESE.—The percentage of fat contained in different individual cheeses of the make which is known as Cheddar, and which is practically the cheese of the American continent, may vary from 23 to 44 per cent. The percentage of casein and albumen may vary from 17 to 28 per cent.; the per cent. of ash from 2·5 to 5 per cent.; and the per cent. of water from 22 to 42 per cent.

The milk fat is held to consist of a mixture of several compounds, each of which contains glycerine with some acid. The more prominent and important of these compounds are *olein*, *palmitin*, *stearin*, and *butyrin*. The composition of the milk fat seems to be changed very shortly after the milk is drawn from the cow, and its exact character at any time is therefore quite uncertain. Fresh milk does not appear to contain any butyrin, caprylin, or caproin, while these appear shortly after it is drawn from the cow, and are doubtless the products of a degree of fermentation. The fat in the milk is in a condition of minute globules, which are held in a state of permanent emulsion. Cream has no definite or unvarying composition. It is a word used to define that part of the milk into which a large per cent. of its fat has been gathered by the influence of gravity or by centrifugal force. It is composed of the same constituents as milk, but they are not in the same nor in any constant relative proportion. Cream cheese implies the use of a quantity of cream added to the normal milk.

The Casein.—The casein is the portion of milk which is coagulated by the action of rennet in the process of cheese-making. It appears that the casein does not exist in the milk in a state of complete solution. Some of it appears to be in actual solution, while the greater portion of it is in a state of suspension in the form of minute granules. When milk is filtered through porcelain, the casein, together with the fat, is filtered out, and a clear liquid, which is commonly known as the serum of the milk, is obtained through the filter. Casein and albumen together are known as nitrogenous compounds, and have also been called albuminoids. In composition they closely resemble the albumen or white of an egg. Albumen may be seen as a thin white scum on milk which has been scalded or boiled. The albumen is not coagulated by the action of rennet, and in the process of cheese-making mainly all passes into the whey. To distinguish the casein from the curd, it has been called caseinogen.

Milk-sugar.—Milk-sugar is essentially of the same composition as cane-sugar, but is less soluble and not so sweet as the latter. When it is acted upon by certain micro-organisms or ferments it is changed, yielding as its main product lactic acid. The presence of lactic acid gives the milk or cheese that quality which is termed sour. In the process of cheese-making most of the sugar passes into the whey. A small quantity of it and also of lactic acid is retained in the cheese. These are usually in tables of analyses classed under the head of extractives.

The ash of milk is mainly made up of such elements as calcium, phosphorus, potassium, sodium, magnesium, oxygen, sulphur, chlorine, and iron. It has been demonstrated that the calcium or lime compounds in milk are of particular importance in connection with the process of cheese-making, since the rennet will not coagulate the casein of the milk unless some soluble calcium compound is present. At the present time our knowledge of the changes which occur in these constituents of milk and cheese during the whole process is quite meager.

The quantity of milk required to yield 1 lb. of merchantable Cheddar cheese (which is again taken as typical of the ordinary cheese of commerce) varies according to the source and quality of the milk, and also according to the process and manner of manufacturing adopted. It will range from 9 lb. to 11 lb. of milk per pound of cured cheese.

The proper care and preparation of milk exercises a far-reaching influence on the quality of the cheese which is made from it. Many of the various forms of fermentation which are manifested in milk and cheese are sources of trouble and loss. All the forms of fermentation of milk or its products which have yet been studied and described—from the common souring to the pungent flavor of old cheese—are due to contamination of the milk by some micro-organisms which have reached it from an external source after the milk is drawn from the cow. These organisms of various sorts are so numerous and widespread that no practical method has yet been devised or adopted for keeping them entirely out of milk. Seeing that their presence appears to be inevitable, the dairyman must devote his efforts to preventing undesirable sorts from finding a place in the product which he handles, and toward keeping the action of others within such bounds as to promote the development of flavors which he will find valuable in food products. The best means to attain this end are per-

fect cleanliness and a regulation of the temperature at which the milk or its products are kept. Carelessness or untidiness in the milking of cows will introduce taints into the milk which no degree of subsequent care can eliminate or hide. All the vessels and utensils which are used in the dairy should be scalded with boiling water as frequently as is necessary to keep them perfectly sweet and clean. Filthy floors and proximity to any source of foul air are frequent causes of contamination. Milk should always be strained immediately after it is drawn from the cow, to remove leaves, straws, hairs, or any other impurities which have fallen into it, and some of which might be dissolved to the injury of the whole product.

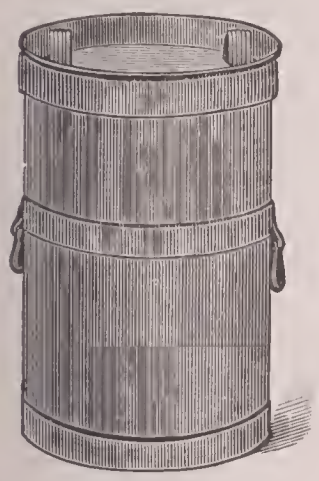


FIG. 1.—Cheese-factory milk-can.

Aëration.—After the straining is attended to, the milk should be aërated. Too often it is poured into one large can and left there just as the cows have given it. That neglect implies three things that are injurious to its quality for cheese-making: (1) The peculiar odor which the cow imparts to the milk will be left in it until it becomes fixed in its flavor. (2) The undesirable germs of fermentation that come in the milk and from the air have the best conditions for growth and action when the milk is left undisturbed. (3) The milk will become in a degree unfit for perfect coagulation by rennet. Hence it is needful and advantageous to aërate it for three reasons:

First, because by pouring, stirring, dipping, or trickling it over an exposed surface, there is eliminated from the milk by evaporation any objectionable volatile element that may be in it. Secondly, because, as has already been stated, the milk contains germs of fermentation. A peculiarity about some of these microbes is that they become active only in the absence of free oxygen. When warm new milk is left undisturbed carbonic acid gas is generated, and that furnishes the best condition for the commencement of action by these almost invisible creatures. After they get started, they can keep up their decomposing work, even in the presence of oxygen. It is impracticable to perfectly coagulate such milk so as to yield a fine quality of keeping cheese. *Neglect of aëration will increase the quantity of milk required to make a pound of fine cheese.* Thirdly, because the airing seems to increase the number and give vigor to the germs of fermentation that will bring about an acid condition of the milk, without producing the acid. So much is this so that *it has been found impracticable to make strictly first-class Cheddar cheese from milk that has not been aërated.*

Cooling.—The subsequent cooling of milk retards the process by which it becomes sour. Certain germs of fermentation exist in milk which in the act of their multiplication split molecules of sugar of milk into molecules of lactic acid. By delaying the operation of these germs the milk is kept sweet for a longer period. The cooling of the milk should never precede the aëration. A temperature of from 60° to 70° F. will be found cold enough for the keeping of milk over night when it has been previously aired.

Taints.—Milk is a liquid of absorbent proclivities. It should be protected against injury that would result from exposure to impure air. Any taints which may be present in the milk from the odor or flavor of feed which has been consumed by the cow will be strongest when the milk is newly drawn from the animal. Taints giving off bad odors and imparting unpleasant flavors from the action of bacteria become stronger the longer the milk is kept. The colostrum, or first portion of milk given by cows after the birth of the calf, is not fit for use in the manufacture of cheese. That condition of the milk usually lasts until after the fourth day.

PROCESS OF MANUFACTURE.—The task of the cheese-maker is to preserve as much as possible of the nourishing constituents of milk in a condition at its best for human food, and conveniently prepared for transportation. The first essential treatment in the process is to reduce the bulk of the milk by the separation of a part of the water which it contains. The degree to which this separation of water is effected very largely accounts for the difference between cheeses which are called "soft," "medium," or "hard." A brief description of the process which is followed in the manufacture of Cheddar cheese will suffice to illustrate the process which is adopted for the manufacture of cheese of the various sorts and which go under different names.

The Cheddar cheese takes its name from a small parish in Somersetshire, in England, where, under the shelter of the Mendip hills, English dairymen have manufactured cheese for some two or three centuries. Their method was first improved and raised into a definite system by Mr. Joseph Harding, of Marksbury.

The process of manufacture may be subdivided into the following operations: The ripening of the milk; the coloring of the milk; the coagulating or solidifying of the curd; the cutting of the curd; the heating, scalding, or cooking of the curd; the separating of the whey; the ripening of the curd; the grinding or cutting of the curd; the salting of the curd; the hooping of the curd, or pressing of the cheese; the bandaging of the cheese; and the curing or ripening of the cheese.

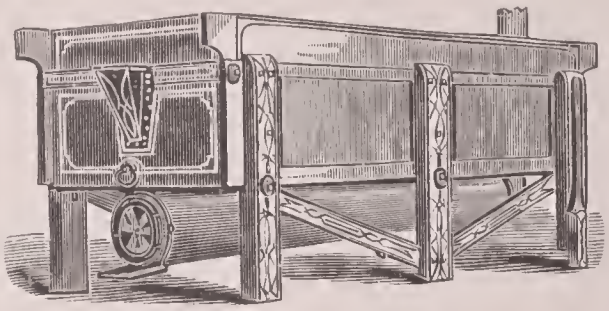


FIG. 2.—Milk vat and heater.

1. *Ripening of the Milk.*—The ripening of the milk is a term used by cheese-makers to express such treatment of the milk as will bring it to that condition when the rennet will coagulate the casein more quickly than when put into fresh or new milk. This is brought about by the action of various ferments in the milk when held at a temperature suitable for their development. A temperature of from 85° to 90° F. seems best adapted to facilitate the change which is desired. The exact degree of ripeness which gives the best result in cheese is difficult to determine. The rennet test (or, as it is commonly called, the cup test) is the most practical test for the average cheese-maker. It is used to ascertain the degree of acidity of the milk or its ripeness for cheese-making. The test may be described as follows: After the vat of milk has been heated to the desired temperature, take 8 oz. of milk from the vat (a teacup is the best vessel to manipulate the test in), add 1 drachm of rennet extract of known strength. Just before adding the rennet take a watch in the left hand and a teaspoon holding the extract of rennet in the right hand. When the seconds hand of the watch touches at some figure, drop the rennet into the milk in the cup and give the milk a sharp stirring for about ten seconds to mix the rennet thoroughly with the milk. If the milk thickens in the cup in twenty-five seconds it is not ripe enough for setting, and should be allowed to mature longer. From twenty seconds down to fifteen seconds by the test indicate the condition of milk most desirable for adding the rennet to the milk in the vat. The most accurate way of telling when the milk in the cup has been coagulated is to put a small piece of burnt match or any small black speck in the cup before the rennet is added. By stirring the black speck is put in motion, and when this stops moving it is a sure sign that the milk is coagulated. After the operator has practiced the test a few times he will be able to manipulate it with accuracy.

Bond's phenol-phthallein acid test is also used in some factories. A small quantity of the phenol-phthallein is put into the milk. While the milk is acidy no change from the white is evident. A standard solution of alkali is prepared for the test. This is added to a small portion of the milk which is being tested, drop by drop, and when a sufficient number of drops have been added to render the milk alkaline, the phenol-phthallein at once changes the whole of the liquid to a magenta color. The number of drops of the alkaline solution which are required to correct the acidity in the milk indicates the acidity or degree of ripeness which the milk has attained.

To the ordinary competent cheese-maker a sense examination seems adequate to give a knowledge of when the milk has reached the proper degree of ripeness.

2. *Coloring of the Milk.*—An extract of annatto, which is

obtained from a plant (bixa orellana), is the common substance which is used for this purpose. It is added to the milk in a liquid form, usually at the rate of from ¾ to 1¼ fluid oz. per 1,000 lb. of milk. The extract of annatto is usually diluted with water to the extent of ½ gal. per 1,000 lb. of milk before it is stirred into it.

3. *Coagulating the Curd.*—The coagulation or solidifying of the curd may be effected by the addition of rennet or the development or use of acids. In most cases rennet is employed. It is a preparation made from the stomach of a calf, which has the power of precipitating the casein of milk. It acts most effectively and rapidly at temperatures from 94° to 98° F. The curdling or coagulation of milk by rennet is the only fermentation of milk which is known to be produced by an unorganized ferment. As far as known, all other fermentations of milk resulting in coagulation are effected by the agency of micro-organisms. Rennet, or *yirning*, is a name also given to the fourth stomach of a young calf. In parts of Central Europe the rennet is prepared by being blown like a bladder until the membranes are distended and very thin, when it is dried. In other places the fresh rennets or *yirnings* are rubbed with salt and left to dry, when they may be kept for an indefinite period. In preparing it for use in cheese-making the dry rennet is soaked in brine, sometimes cut in strips, and always rubbed frequently to cause the mucus to pass into the liquid. The strength of the liquid rennet which is obtained depends upon the quantity of brine which has been used for the soaking of each rennet. Ordinarily each rennet has enough virtue to coagulate from 3,000 to 5,000 lb. of milk into the best condition of curd for the manufacture of cheese. Several brands of commercial extracts of rennet are now prepared by secret processes. A somewhat similar process is described as follows: Wilkins (*Landwirthschaftl. Centralb. f. Deutschland*, 1874) prepares *rennet essence* by rubbing fresh calves' stomachs with salt, treating with water for two days at 100° F. (or a mixture of equal parts of water and Rhine wine), adding to this solution alcohol (90 per cent.) containing a little hydrochloric acid, and allowing the whole to stand eight days. The liquid is then filtered, and will keep for years. His proportions are 6 oz. fresh rennet, 1 oz. salt, 17 oz. water (or wine and water), 2 oz. alcohol, 12 grains acid. One pint of the essence will curdle 250 gal. of milk in thirty to forty minutes. Schatzmann (*Wiener Landschaftl. Zeit.*, 1873) investigated the action of artificial preparations of rennet, and found them to be very permanent, their action to be reliable and accurate to the minute, and the cheese to separate better, with a higher yield. Hansen (*Landwirthschaftl. Centralb. f. Deutschland*) is said to have prepared rennet from hog stomachs after they had been used for making pepsin, using acid, and obtaining rennet in solution and in the solid form.

The action of rennet is not yet well understood or explained. It was Hammersten, a Swedish scientist, who first undertook the study of rennet in such a way as to present clear information on what the substance is.

"His researches lasted several years, and he gave an account of this ferment which has been but little changed up to the present day. In his first paper (1872) he demonstrated at the outset that the action of rennet is entirely independent of the formation of an acid. The reaction does not change during the curdling, although the curd is usually acid from the action of micro-organisms. He proved, secondly, that the action is entirely independent of milk sugar and affects the casein alone. He found that solutions of casein which had been entirely freed from sugar would curdle readily by means of the ferment. Now since, as had already been shown, the action of micro-organisms in souring milk is on the milk sugar rather than the casein, these conclusions proved that the two processes were entirely different, the one acting on the milk sugar and the other on the casein, the one curdling the milk by the formation of an acid and the other not affecting its reaction. Hammersten also succeeded in separating the active principle of rennet from the other ferments associated with it in the gastric secretion."

H. W. Conn gives this explanation, which seems to be the best that has yet appeared, on the action of rennet:

"This caseinogen appears to be kept in the condition of semi-solution by the alkaline condition of the milk, for it is easily precipitated from the solution by the presence of a small quantity of acid. When thus precipitated it seems to be simply thrown from its solution without being altered in its nature. But the active principle of rennet has a very different effect upon it. Under the action of rennet the caseinogen is chemically changed. It is broken into two different proteids, one of which is easily coagulated, while the other is coagulated only with great difficulty. The former is readily thrown from its solution by calcium salts, and, since these are always present in the milk, the result of rennet action is always to throw down the casein. This portion of the original caseinogen is then manufactured into the cheese, while the other portion, being soluble, goes into the whey and is lost to the cheese-maker. The amount of protein thus lost may be still further increased through the action of bacteria, which have the power of digesting even the curdled casein, and this fact teaches the advisability of using rennet in a manner which will produce the coagulation as quickly as possible. The rapidity of the action will depend upon the relative amount of rennet and the temperature, while it is delayed by alkalies and hastened by various salts."

The active principle of rennet is a chemical ferment or enzyme, which is distinct from the other digestive ferments in the stomach juices. It has been variously called rennet, lab, chymosin, and pixine. It seems to be somewhat widely distributed in nature among animals and plants, and it is a common product of bacteria growth. It is killed by a temperature of 70° C. (158° F.), and it acts best at about 35° C. (95° F.). It is undoubtedly to be regarded as one of the digestive ferments.

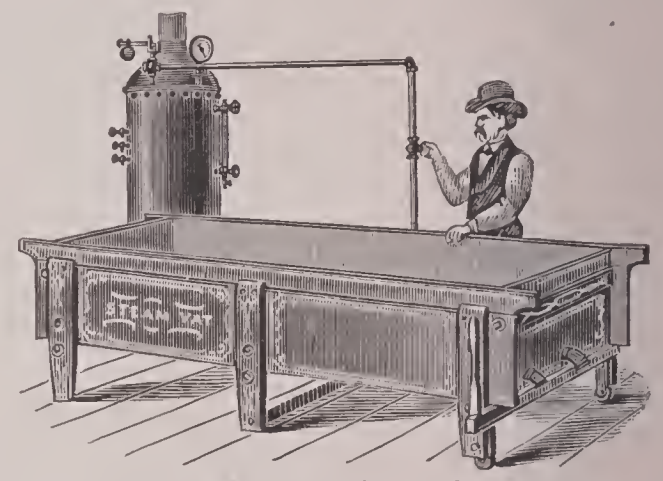
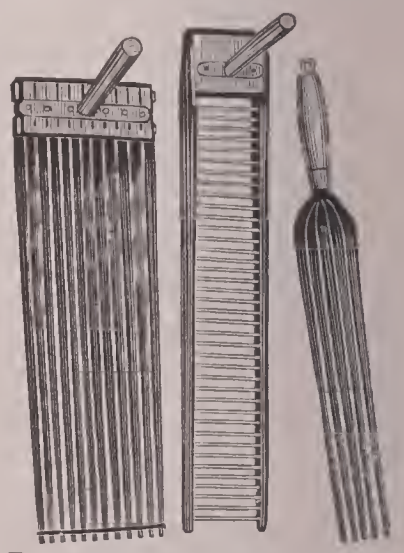


Fig. 3.—Milk vat and steam-heater.

Temperature of Milk.—In the making of cheese the milk is gradually brought to a temperature of about 86° F.; a slightly higher or lower temperature does not appear to make any appreciable difference in the quality or quantity of the cheese which result from the process. In mixing the extract of rennet with the milk it is usually diluted to the extent of at least 1 gal. to every 200 gal. of milk. This permits of a thorough distribution of the fermenting principle of rennet, in order that it may coagulate the caseinogen uniformly throughout the mass. During the coagulation the casein of the milk entangles and encases mechanically most of the fat globules which are held in suspension in the milk. The quantity of rennet which may be used varies very greatly. In milk which is almost sour a larger proportion of rennet should be used than in the coagulation of milk which is comparatively sweet. The quantity of rennet which is employed does not appear to affect the quantity of cheese which can be obtained nor its keeping qualities, except in one respect. The use of a larger quantity of rennet extract in coagulating milk is likely to result in the retention of an abnormally large percentage of water in the cheese. Cheeses containing a large percentage of water cure more rapidly and spoil more quickly than cheeses from which more of the water has been expelled.



Figs. 4, 5, and 6.—Gang-knives for cutting the curd.

4. *Cutting the Curd.*—When the curd has become firm enough to split open before any dull instrument or the

finger of the operator, it is considered as sufficiently firm for the process of cutting to be commenced. The time required to attain this condition after the addition of the rennet may range from ten to sixty minutes, with the milk at a temperature of 86° F. For the cutting of the curd, knives containing several blades from ⅜ of an inch to ½ an inch apart are used. These knives are of two sorts. One cuts the curd into horizontal lines, and the other—the perpendicular knife—cuts these into cubes. In small dairies, and formerly in all dairies, the cutting was effected by means of single knives or machines constructed of wire stretched on a frame which was lowered into and again lifted through the soft curd. The degree of fineness or coarseness to which the curd is cut at this stage of the making has some influence on the quantity of moisture or water which is retained in the cheese. The larger the size of the cubes which are left, the greater is the quantity of water which will be retained. A natural shrinkage of the cubes of curd occurs from the time the cutting is effected. On the surface of each piece of curd a film is formed. This is spoken of as the healing of the curd.

5. *The Heating, Scalding, or Cooking of the Curd.*—The whole mass of whey, with the curd in it, is usually raised to a temperature of from 96° to 100° F. The heating may be effected by the introduction of steam under or around the tin-pan or vat in which the curd is held. In private dairies the common practice is to remove a portion of the whey and scald it to a temperature of 115° or 120°, after which it is poured back on the other portion of the whey which contains the curd. Fig. 3 illustrates the form of a modern cheese-vat.

During the whole process of heating the curd it is kept in a state of gentle agitation by the hands of the cheese-maker or by the use of a rake or some other stirring device. A common test to discern the approach or degree of acidity in the curd is called *the hot-iron test.* A small portion of curd is pressed in the hand until most of the free moisture is expelled. It is then touched lightly against a hot iron. When it is withdrawn from contact with the hot iron, if there be any development of lactic acid, a large number of very slender filaments, like the finest of threads, will be stretched between it and the iron to which it had adhered. The longer these filaments or threads can be stretched before they break, the greater is the degree of the development of acid which is revealed.

6. *The Separating of the Whey.*—The heating and stirring of the curd will cause the particles to shrink to about one-sixth of their first size. When they have become sufficiently firm and dry, they are allowed to settle to the bottom of the pan or vat in which the making is being carried on, when the whey is drawn off. To know precisely the proper stage at which to remove the whey requires care and experience on the part of the cheese-maker. When the threads or filaments by the hot-iron test draw to the length of about ¼ of an inch the curd has usually reached the stage when the whey should be removed immediately. The whey from curd which has been carefully cut and properly handled is bright and clear, with a slightly yellowish-green shade of color. When the curd has been cut roughly or handled violently during any of the stages of the process, considerable quantities of the casein or fat will be lost into the whey. Whey is sometimes drunk as a beverage and is sometimes evaporated for the extraction of milk-sugar. It is usually fed to swine, and is a valuable food for them. There are about 7 lb. of solids in every 100 lb. of whey. Its composition when slightly sour may be given as follows:

	Per cent.
Water	93·00
Nitrogenous substances	1·00
Fat	0·50
Milk-sugar	4·25
Lactic acid	0·50
Ash	0·75
Total	100·00

One hundred pounds of whey fed in the most judicious manner should produce 2 lb. of increase in the live weight in swine.

7. *The Ripening of the Curd.*—After the whey has been drawn from the curd it is usually stirred, in order to keep the particles from packing or matting together until the particles are dry enough to bear pressing together without adhering immediately. After this the curd is allowed to pack or mat into a uniform mass. It is afterward cut into pieces of from 4 to 12 inches square, for convenience in handling. These pieces are turned over from time to time, to facilitate the separation of the remainder of the whey from it. These pieces are doubled and packed on top of each other until the whole forms a compact pile, when the curd is held at a temperature of from 90° to 94° F., until it reaches a condition of ripeness, such as is discerned by the experienced maker. The degree of ripeness or development of acid can be determined by the hot-iron test; but that is

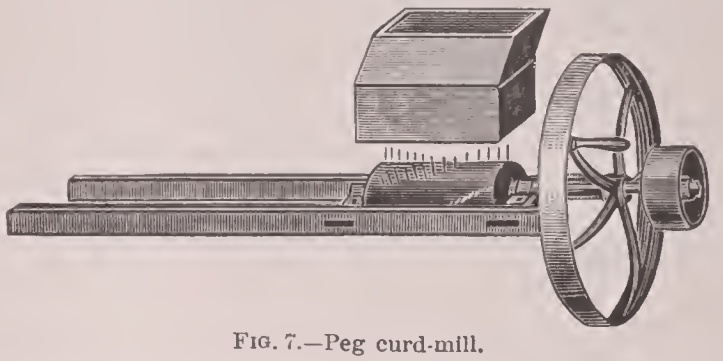


Fig. 7.—Peg curd-mill.

not so sure a guide at this stage as it is for examination of the curd to discover when it is ripe enough for the removal of the whey. The acid development, as revealed by the hot-iron test, will permit the thread-like processes to be drawn to a length of from 1 to 2½ inches from the hot iron. The ap-

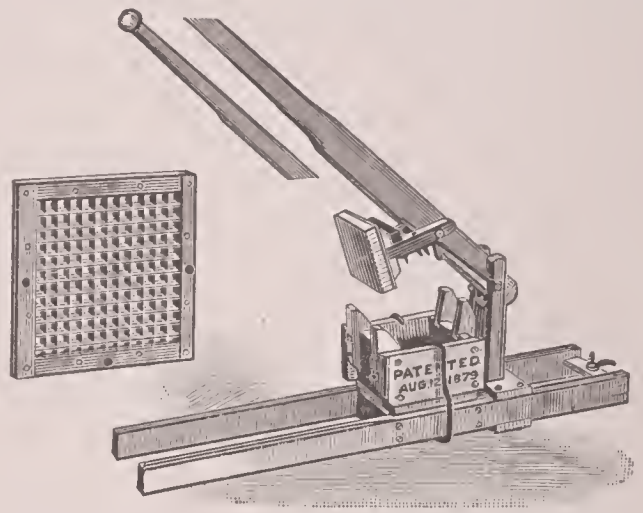


Fig. 8.—Harris curd-cutter. The above cut shows the machine taken apart and the shape of the knife-board.

pearance and texture of the curd also indicate its condition as to ripeness. When it acquires an oily quality and exhibits a fibrous texture when torn, almost similar to the muscles in a piece of boiled beef, it is counted to be ready for cutting and salting.

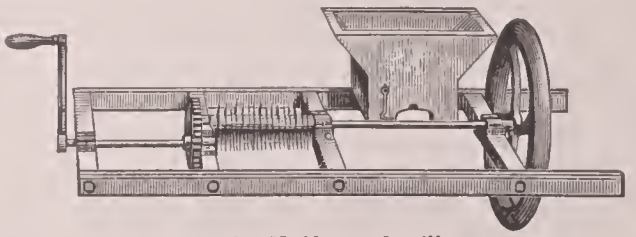


Fig. 9.—Knife curd-mill.

8. *The Grinding or Cutting the Curd.*—There are several different mechanical devices for the grinding or cutting of the curd. Some of these effect a division of the curd into pieces from ½-inch cubes to a larger size by means of cutting-knives. Others tear the curd apart by means of pegs attached to a roller. In both cases the curd is fed into a hopper-like receptacle.

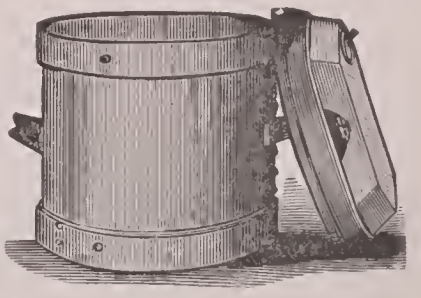


Fig. 10.—Cheese hoop and follower.

9. *The Salting of the Curd.*—Pure salt is added to the curd at the rate of from 1½ lb. to 3 lb. per 1,000 lb. of milk. Salt acts on the particles of curd in such a way as to expel a part of the remaining moisture. It gives an agreeable fla-

vor to the curd and cheese, and also acts as a preservative. Consequently the larger the quantity of salt which is used the drier will be the body of the cheese and the longer it will keep without deterioration. The process of ripening is also retarded in proportion to the quantity of salt which is used.

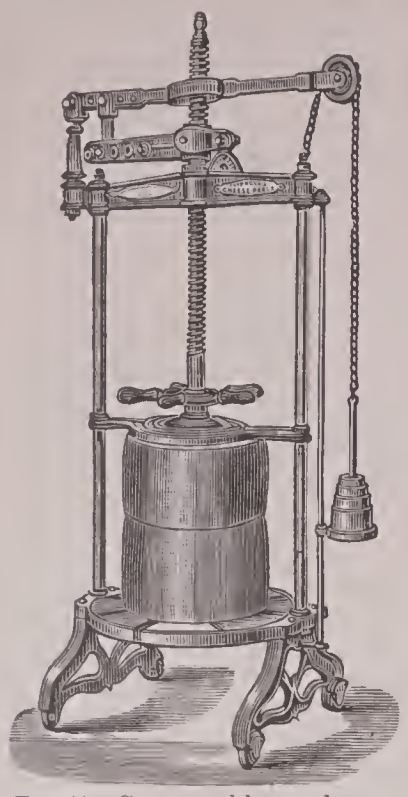


Fig. 11.—Compound-lever cheese-press.

10. *The Hooping or Pressing of the Curd.*—The pressing of the curd is effected not only to get rid of the superfluous whey, but to give to the mass a desirable shape and sufficient consistency to render it suitable for handling and transportation. The hoops are usually cylindrical, from 12 to 16 inches high, and from 7 to 16 inches in diameter. They are made of heavy tin or galvanized iron, or of wooden staves held in place by iron hoops. In some presses the hoops stand on tables. Over each one is an upright screw, which is used to exert sufficient pressure on the cheese. In other cases gang-presses are used, in which the hoops lie in a horizontal row. The pressure is exerted from one end of the row by means of a screw, and presses all the cheese in the several hoops at the same time.

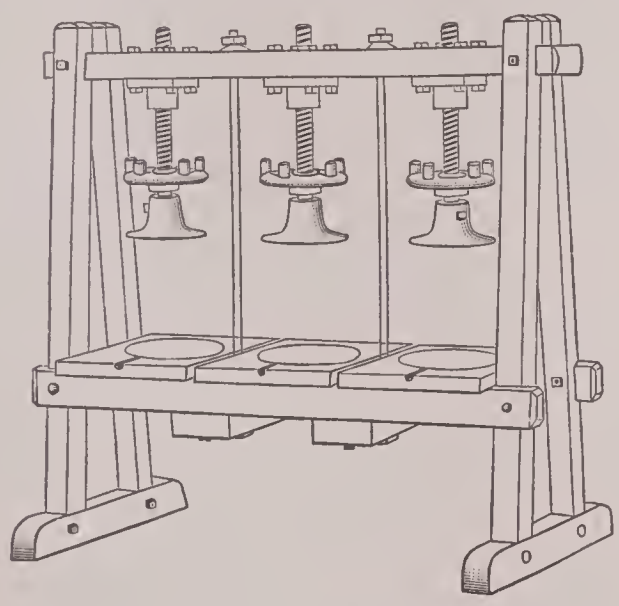


Fig. 12.—Upright screw cheese-press.

Devices have recently been applied whereby a coil spring at one end, or the action of a small water-wheel at the other, causes a continuous pressure to be kept up, even after the cheeses yield to the pressure of the screw and shrink somewhat in size.

11. *Bandaging the Cheese.*—The bandaging of the cheese consists in putting a covering of fine cheese-cloth in position in the hoop before the curd is filled into it. After the mass has been pressed to give it sufficient consistency to permit of the new cheese being handled, the hoop is removed and the bandage of cloth carefully adjusted, so as to cover the sides and turn over the edges of the ends of the cheese. The cheeses are also turned upside down in the hoops during the process of pressing. The usual time given to pressing cheese in cheese-factories is from eighteen to twenty hours. Cloths are sometimes left on the ends of the cheese, to prevent a cracking of the rind. In other cases when the cheese is taken from the hoop the end-cloths are removed, after which the rinds are rubbed with hot butter or whey oil.

12. *The Curing or Ripening.*—When the cheeses are taken from the presses they are only compressed quantities of curd. The curd is quite insipid, not palatable to most people, and rather indigestible. To give it the true characteristics of cheese it must be kept for a length of time varying from a few weeks to several months, to undergo a process of fermentation, which is commonly called curing. The proper flavor is thus developed, which grows stronger the longer

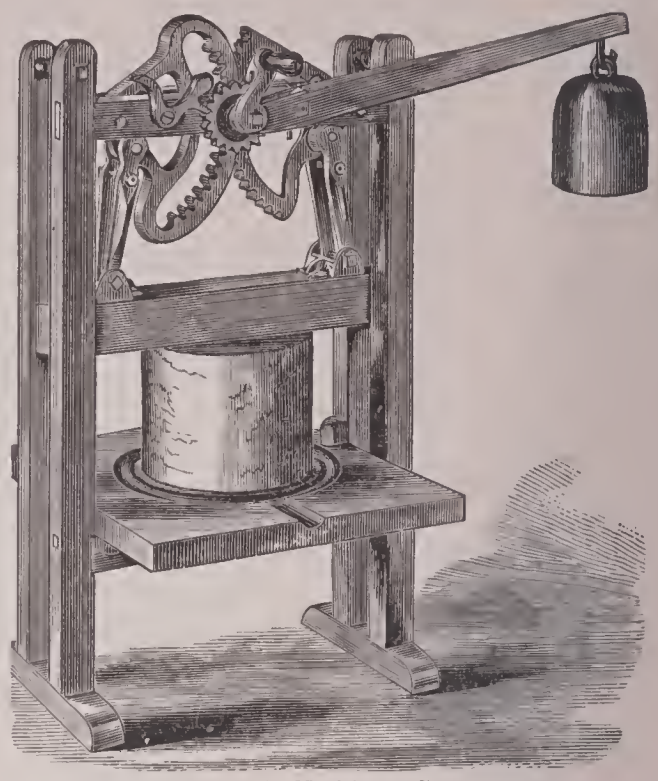


Fig. 13.—Oyston's Herkimer County press.

the cheeses are kept. During that process the casein again becomes soluble, and the various fermentations, which proceed simultaneously in the cheese, give rise to the distinctive flavors which often give different cheeses their names. The acidity of the curd diminishes as the cheese becomes older and riper, and in most cases entirely disappears. There is

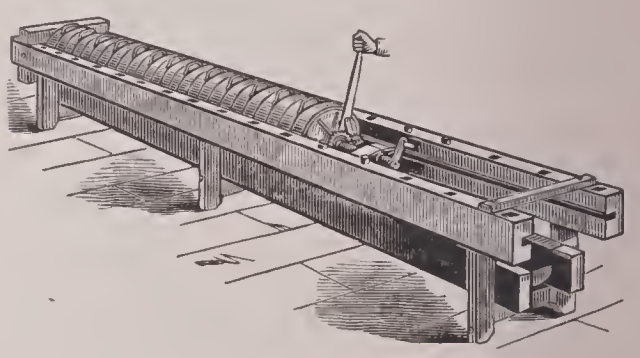


Fig. 14.—Gang-press and hoops.

also considerable loss of weight in the curing process. That may be from 1½ to 3 per cent. during the first seven days up to 5 or 6 per cent. during the following seventy days. The shrinkage in weight depends in some measure upon the quantity of water retained in the curd and the degree of moisture in and the temperature of the atmosphere where the curing goes on. In some cases the shrinkage has been known to reach 10 per cent. within five weeks after the cheeses have been made.

The following extracts from Experimental Station Bulletin No. 9, of the U. S. Department of Agriculture (H. W. Conn), present the most reliable scientific information which is available at this date on the ripening of cheese:

"The ripening of cheese has been conclusively proved to be a matter of the action of micro-organisms. Cohn (1875) first found bacteria in cheese, stating that *Bacterium lactis* was especially abundant. But it was Duclaux who first connected the ripening with the growth of these organisms. His first paper (1877) gave the results of a chemical study of the ripening process, and showed that it consisted chiefly in the transformation of insoluble casein into soluble albuminoids and that the process was associated with the production of several ferments. Three years later (1880) he made a study of the bacteria in such cheese, and determined that they were very numerous and comprised several species. Some of them were aërobic, while others were anaërobic. During the ripening there were produced several gases—carbonic acid, hydrogen, and sulphuretted hydrogen, and a large number of decomposition products, such as alcohol, oxalic acid, carbonate of ammonium, leucin, tyrosin, etc. In

general the process was quite similar to the digestion by the digestive fluids of the stomach and alimentary canal. At this time Duclaux first suggested that certain of the bacteria produced as the result of their growth ferments similar in their characters to the digestive ferments, a discovery which we have seen to be so well established by later work.

"The ripening of cheese was now studied by others, Schaffer, Bondzynski, and Benecke all confirming Duclaux. Schaffer prevented the growth of bacteria by subjecting the cheese to a stream of carbonic acid, and found that under these conditions the cheese would not ripen. Benecke (1887) concluded that the species *Bacillus subtilis* was the chief organism concerned in the ripening process, although others were found with it. In a later work Duclaux (1887) applied modern methods of bacteriological study to the subject, and found seven species of aërobic organisms and three species of anaërobic organisms present in the cheese. He regarded them all as concerned in the process. The ripening, he said, concerned chiefly the casein, and was due to the combined effect of all of the bacteria present, each aiding the others, and each having a share in the decomposition of the casein. The aërobic organisms acted at the surface and the anaërobic organisms acted in the interior, and thus the whole cheese becomes thoroughly ripened.

"The most systematic work was done, however, by Adametz (1889). This observer proved that the ripening was due to bacteria growth by treating fresh cheese with a disinfecting agent, which would prevent bacteria growth without affecting the chemical condition of the cheese. Under these conditions the cheese did not ripen. He also made quantitative estimates of the number of organisms present, finding from 850,000 to 5,600,000 per gramme, and this number was found to increase slowly during the ripening process. He also tried to determine whether the ripening was due to the combined action of many species of organisms or to a single species. For this purpose he studied many specimens, and studied the cheese at intervals during the ripening. He found many species of bacteria present, but as the ripening went on one species was found to increase at the expense of the others, and was much more abundant at the close of the ripening than any of the others. This species he always found, while the others were more variable, and hence he concluded that this species was the cause of the ripening. The organism in question was not *Bacillus subtilis*, as had been supposed by Benecke, but a species to which no name has been given.

"Shortly after this Freudenreich (1890) carried on a set of experiments of a similar import to those of Adametz, confirming his results. He obtained rather large numbers of organisms in his cheese, but agreed with Adametz that the ripening was due to a single species of organism rather than to the combined action of a large number.

"At this point the knowledge of the normal ripening of cheese rests at the present time. But few observations have been made in regard to abnormal ripening. The greatest difficulty that the cheese manufacturer has to contend with lies in this direction. He can not be sure of a uniform product. In spite of all precautions his cheese will sometimes undergo abnormal troubles and become worthless by changes taking place during the ripening process. These troubles have been attributed to every sort of difficulty, including health and condition of the cow, the condition of the barn, the food of the cow, etc. In some cases they have actually been traced to filth connected with the management of the cows. Recent experiments have indicated that the direct result is in all cases to be attributed to the action of abnormal species of micro-organisms which get into the milk, and hence have a share in the ripening of the cheese. Certain it is that black cheese, bitter cheese, and cheese flecked with red spots are all thus caused, and several other troublesome infections have with certainty been traced to micro-organisms. Freudenreich (1890) has experimentally shown that if milk is inoculated with certain species of bacteria which should not be present, and the milk is then made into cheese, the cheese will ripen in an abnormal manner and become worthless, while the control cheese is perfectly good. According to Adametz (1891), either bacteria, yeasts, or moulds may be the cause of the abnormal ripening of cheese under different conditions. But while abnormal ripening is undoubtedly due to growth of improper species of organisms, we can not at present determine how far the variations in the ripening are due to different species of organisms planted in the curd and how far to different conditions of the ripening. Each doubtless has its effect, and much further study is needed in this direction.

"It is evident that the presence of bacteria in cheese is inevitable. The milk from which it was made always contains them, and when made into cheese part of the bacteria at least will be inclosed in the cheese. Here they find proper conditions for growth. The conditions are not very favorable, it is true, for the density of the cheese prevents ready access of air, and the aërobic organisms suffer in consequence, except at the surface. The lack of moisture is also doubtless a disadvantage. But in spite of these disadvantages the bacteria grow slowly, and soon produce profound chemical changes. They give rise to the peptonizing ferment, which acts upon the casein, rendering it partly soluble. Besides this, they induce numerous other decomposition changes, the total result of which is the production of the rich, delicately flavored cheese for the market. The cheese-maker thus forces the bacteria to give him products for which he obtains a high price. Of course, so far as the food value of cheese is concerned, it is the casein and the fat which render cheese valuable, but its market price depends not upon the quantity of casein, but upon the flavor, and this flavor is supplied by micro-organisms. To a certain extent also it is true that the different flavors of different cheeses are due to the action of different species of organisms in the ripening, although we know little in regard to this matter at the present time."

The terms which are used in the trade, and some of the qualities of cheese which have particular commercial value, may be defined as: (1) rich, clean, creamy *flavor*; (2) solid, firm, buttery *body*; (3) fine, close, flaky *texture*; (4) bright, uniform *color*; (5) attractive, neat, symmetrical appearance.

For the judging of cheese at competitions, and for the making of records for comparison, the following scale of points has been devised and is serviceable:

POINTS.	Perfection.	Points awarded.
Flavor	35	..
Body	25	..
Texture	15	..
Color	15	..
Finish	10	..

Some experiments have been made recently—mostly in the experimental dairy stations of Canada and New York—to discover the relation which exists between the percentage of fat in the milk and the quantity and quality of cheese which may be obtained from it. The results of the investigations indicate that, from milk containing between 3 and 4 per cent. of fat, for every two-tenths of 1 per cent. of fat contained in the milk, three-tenths of 1 per cent. of cheese may be obtained, additional to the quantity obtained from normal milk containing 3 per cent. of fat.

Co-operative Factories.—On the continent of North America the great bulk of the cheese which is produced is made in co-operative factories. Probably 95 per cent. of it is manufactured in cheese-factories and not, as in Great Britain and other parts of Europe, in private dairies. The first cheese-factory in the U. S. was erected and operated by Mr. Jesse Williams, near Rome, N. Y., in 1851. Mr. James Burnett, of Dunham, Que., and Mr. Harvey Farrington, of Norwich, Ont., divide the honor of introducing the cheese-factory system into Canada.

The bases upon which a cheese-factory may be established and the business carried on are usually:

I. A private enterprise, whereby some individual or firm undertakes to provide buildings and to conduct the business; or

II. The formation of a joint-stock company or co-operative association.

In the case of private enterprise one of four plans may be followed:

(1) The individual or business firm, called the "manufacturer," may charge such a rate per pound of cheese as may be agreed upon with the patrons who furnish the milk, in consideration of which the manufacturer will undertake and agree to manufacture cheese of first-class merchantable quality, and to provide all furnishings required in the manufacture and boxing or packing of the same.

The collecting of the milk is sometimes done at the expense of the manufacturer and sometimes it is delivered at the factory by the patrons. A different rate is charged by the manufacturer in the two cases.

Where the milk is collected by the manufacturer for

cheese-making, the usual charge ranges from 2 cents to 2¾ cents per pound of cheese, according to the quantity of the output, the distances to be traveled collecting the milk, and other local and particular circumstances.

(2) The manufacturer may carry on the business and meet all expenses incident thereto, in the providing of furnishings, etc., for a stated per cent. of the product.

The disposal of the whey is a matter for mutual agreement between the manufacturer and patrons.

(3) The manufacturer may purchase the milk from the patrons at such a price as may be agreed upon. The price may be uniform per 100 lb. of milk for the whole season, or it may vary for different months.

(4) A price for milk may be fixed on a sliding scale, according to some recognized market quotation for milk or cheese from time to time during the season.

In the case of co-operative companies and associations each may be formed to conduct business as a manufacturer, in a similar capacity and on similar lines to those mentioned under the heading of "private enterprise"; or it may conduct business in a special way for the benefit of its shareholders who furnish milk to the factory which it controls. In the latter case one or other of the subjoined sets of arrangements may be followed.

(5) A certain rate per pound of product may be charged by the company, or association, called hereafter the manufacturer, similar to the plan mentioned in (1). The balance between the receipts and the expenditures of the company or association, in its manufacturing capacity, may be distributed as a dividend among the shareholders according to the amounts of stock which they hold, or it may be disposed of otherwise as they may direct.

(6) Each shareholder may be entitled to furnish to the factory a stated quantity of milk for every share which he holds in the company or association. The product from such quantities of milk may be manufactured at a fixed rate per pound, sufficient to cover the actual running expenses of the concern; and a slight additional charge (say ¼ cent per pound for cheese) may be made for all the quantities of milk furnished in excess.

A rate equal to or higher than the shareholder's excess-rate may be charged for manufacturing the product of the milk supplied by all non-shareholders.

According to this arrangement $12 of shares in cheese-factory stock might entitle the holder to furnish 9,000 lb. of milk annually at the lowest rate for manufacturing.

(7) Under the arrangements set forth in (1), (2), (5), and (6), a general meeting of the patrons, called for that purpose, designates some individual as salesman for the disposal of the products of the factory. The plan of appointing one salesman has been found more satisfactory than the appointment of two or three with equal powers. The salesman may have an advisory committee associated with him.

Statistics.—No accurate statistics are available showing the quantities of cheese which are manufactured in different countries. An English authority (Henry F. Moore) estimates that the total quantity of cheese made in Great Britain reaches 300,000,000 lb. per annum. It has been calculated by a U. S. statistician (J. R. Dodge) that the net requirements of Great Britain in cheese to be imported amount to about 200,000,000 lb. annually. France imports about 25,000,000 lb. per year and Italy imports about 20,000,000 lb. The U. S. export about 104,000,000 lb. annually; the yearly exportation from Canada, which is steadily increasing, has reached 106,000,000 lb.; Holland exports about 60,000,000 lb., and Switzerland about 50,000,000 lb. annually. All other European countries have as great imports as exports.

Varieties of Cheese.—The varieties of cheeses which go under different names are well-nigh innumerable. Most of them take their distinctive designation from the place or locality where they were first made. Counties, districts, towns, villages, and parishes have all lent their names to different varieties. The cheeses themselves often differ: (1) according to the source of the milk from which they are made; (2) as they are made from cream, whole milk, skimmed milk, or mixtures of these; (3) according to the agent used to effect coagulation of the milk; (4) according to the method of manipulating the curd and the temperatures to which it is raised; (5) according to the shape and size of the cheese; (6) according to the manner of the curing or ripening; (7) and according to the results which come from the milk, curd, or cheese being inoculated by certain ferments or forms of micro-organisms which appear to prevail in different places.

Some of the cheeses are pressed and others are left to drain dry for periods of several days or even weeks. The *Cheddar* cheese may be taken as typical of *hard* or *firm cheeses*; the *Gruyère* or *Stilton* as types of *medium cheeses*; and cream cheese, as *Neufchâtel* or *Brie*, as representative of *soft cheeses*.

The following list of the cheeses which are best known is taken almost entirely from Prof. James Long's pamphlet on *Trade in Dairy Produce*:

British Cheese.—Pressed: Cheddar, Cheshire, Gloucester, Leicester, Dunlop, Derby, Wiltshire Loaf, Blue Dorset, Liberton, Caerphilly. Unpressed: Stilton, Wensleydale, Cotherstone, Colwick, Slipcote, York (curd), New Forest.

French Cheese.—Pressed: Cantal, Port-du-Salut, Septmoncel, Gex, Sassenage, Gruyère. Unpressed: Gérome, Void, Olivet, Rollot, Brie, Camembert, Coulommiers, Livarot, Neufchâtel, Mont d'Or, Troyes, Gournay, Gervais, Bondon, Mignot, Pont l'Évêque.

Swiss Cheese.—Pressed: Gruyère, Emmenthaler, Backstein, Spalen, Gessanay, Vacherin, Jura. Unpressed: Bellelay.

Italian Cheese.—Pressed: Parmesan, Gorgonzola, Cacio Cavallo, Pecorino, Bellunese, Rubiole.

German Cheese.—Pressed: Hartz. Unpressed: Münster, Limburg.

Holland Cheese.—Pressed: Edam, Gouda.

Swedish Cheese.—Pressed: Herrgaardsost.

United States Cheese.—Pressed: Cheddar, Brick, Young Americas, Ohio Flats, Skim.

Canadian Cheese.—Pressed: Cheddar, Loaf or Truckle, Stilton, Cream, prepared cheese in stone and glass pots. Unpressed: Stilton.

Emmenthal cheeses are the variety which are produced most plentifully in Switzerland. Each cheese is round, 80 to 100 cm. in diameter, 10 to 15 cm. thick, and weighing from 50 to 100 kilog. or more. Like all the rich cheeses (*fromage gras*), which retain nearly all the elements of the milk, its nutritive value is high. It was first made in the valley of the Emme in the canton of Berne, whence it followed the Bernese emigration into the neighboring cantons, where it is now made in large quantities, and into Bavaria, Russia, North Germany, and North and South America. The exportation began in the seventeenth century to Germany and Italy, and now it is sent everywhere, the principal markets being Germany, Russia, Italy, and the U. S., where it is known as *Schweizer Kase*. In winter a good deal of Emmenthal *mi-gras* is made, mostly for France, where it takes the place of butter.

Next in importance is the *Gruyère*, called after the village of that name in Fribourg, another round cheese 60 to 70 cm. in diameter, 9 to 12 cm. thick, and weighing 30 to 45 kilog. It has come into great repute since the formation of a wealthy society for its manufacture in Fribourg. It is also made in large quantities in Vaud and Neufchâtel, and the French provinces of the Jura and the Doubs, where, according to some writers, it originated about 1750. It is manufactured in much the same way as the Emmenthal, except that a third or more of the cream is removed, whence it is classed as *mi-gras*. The exportation is mostly to France and Italy, and recently to South America.

Still more remarkable is the *Schabzieger*, or green cheese (*fromage vert*), known in the U. S. under the corrupt name of sago or sapsago, and which some writers hesitate to class as a cheese. Its manufacture dates back to the ninth or tenth century, and it is still the most famous product of the canton of Glaris, which turns out a great many other varieties, mostly *mi-gras* and *maigre*. The peculiarity of the *Schabzieger* is due partly to the method of coagulation by azi instead of rennet, and partly to treatment by the *zigerlee* (melilotus cœrulea), a plant grown for the purpose in Schwyz. In 1869 the exportation amounted to 1,250,000 kilog., valued at 750,000 francs. It is sent all over the world.

The *Gorgonzola* cheeses are made mostly in Italy. *Stracchino*, of Gorgonzola, is made of milk containing the buttery parts. When the mountain pasture is exhausted the Bergamese herdsmen drive, for wintering, their herds to the plains. Gorgonzola is their favorite halting-spot, for there they first find the luxuriant vegetation of the Lombardian plateau. These herds, reveling on the rich grasses of Gorgonzola, are, from the middle of September to the end of October, very lactiferous.

Cheese is made during these months in small rooms devoted to it in the homes of the Gorgonzolese, who buy the milk of the herdsmen. The autumn temperature, being

moderate, is best for cheese-making, as too much heat, by hastening the separation of the whey, makes it too dry and friable, while excessive cold produces a wheyey acid and easily spoiled cheese. The milk while warm from the cow is curdled with well preserved and prepared calf rennet. The quality of the cheese depends much upon that of the rennet, and experience guides as to the quantity required. In fifteen or twenty minutes, when the milk is coagulated and the whey separated, the curd is hung in hemp-cloth bags to drain. As cows are milked twice daily the foregoing is twice done, viz., mornings and evenings.

The morning-drained curd, inclosed in light, flexible, wooden bands, covered on their inside surface with hemp-cloth, is placed on an inclined board strewn with rye chaff. Being of two milkings the curd is partly warm, partly cold, and, though mixed, care is taken to form the upper and lower strata of the warm, because it is cementitious. As hot and cold curd never perfectly unite, minute interstices remain in the cheese, in which, while maturing, green mould, known as "parsley," forms and gives the *stracchino* the delicious taste for which it is famous. The curd is further drained during the first day of the process by two or three turnings. On the following morning, when of some consistency, the cloth being removed, its value is determined by weighing. After three or four days fermentation begins, and the wooden bands are removed. It is then, once daily for eight or ten days, alternately salted on its upper and lower side, 4 oz. of pulverized salt being, on an average, used per form of 33 lb. The Gorgonzolese adopted some years ago the process of quickly turning and pressing the cheese against a salt-covered surface, thus insuring more uniformity and a better crust. The color changes in a month to pinkish white if good, to black if bad. When black, the crust is soft and the cheeses perishable in summer. If the crust is sufficiently hard, the shade is improved by one or two dippings in salt water.

French Cream Cheese.—This variety of cheese is similar to most of the soft cheeses which must be eaten fresh. In making it, enough rennet is added to the morning mess of milk to coagulate it in two or three hours at a temperature of 70° F. It is then left for twenty or twenty-four hours. After the whey which has collected on top of the curd is poured off, the curd is cut in slices and laid on a sieve to drain. After this is done, cream from as much milk as was first coagulated is added and mixed with the curd by means of a wooden pestle until it is uniform in consistency. The whole is placed in wicker molds—generally heart-shaped—and is ready for use. It can be kept good for several days if placed in a refrigerator or on ice.

Limburg is a soft cheese formed at a low temperature and slightly pressed. The curing process is usually allowed to proceed to the putrefactive stage before it is eaten. Its odor is extremely offensive to persons with an acute sense of smell, who have not acquired a taste for it.

Parmesan cheese is used extensively for soups in Italy, and is to be found upon the dinner-tables commonly grated into a powder.

The Roquefort cheese was originally, and it is at the present time to some extent, made from ewe's milk; but in some instances cow's milk is added. It is highly flavored, blue-moulded, and is ripened in curing-cellars in mountain caves in that part of France where it is produced. The caves are constantly cool at a temperature of 41° or 42° F.

Stilton cheese takes its name from the village or parish of Stilton in England. It is popularly believed to be made from milk with cream added. The milk is coagulated at a low temperature, the curd is dipped out by bowls on a strainer usually made of cloth, it is moved gently to facilitate the separation of the whey, and while still in a moist and comparatively soft and plastic condition is filled into hoops or molds of cylindrical shape and about 7 inches in diameter. These molds or hoops are turned upside down frequently for several days. Sometimes the curd is inoculated with the mould and flavor which are characteristic of Stiltons, by grating a small quantity of an old Stilton cheese between the layers as it is filled into the hoops. Sometimes the cheeses are inoculated by the insertion into their sides of wooden skewers which have been stuck into an old Stilton cheese for a few days.

Full-cream cheese is a term now used to designate cheese made from whole milk, from which no cream has been removed, and from which strippings have not been kept back.

Skim-milk cheese is also extensively manufactured in many countries, and sold often under the name of whole-milk cheese. It is generally harder and more translucent than other cheese. Sometimes the milk is skimmed three times, and yields a cheese which becomes so hard in a short time that a pickaxe must be used to break it. By allowing the curd of skim-milk to ferment somewhat, and by leaving considerable whey in it, softer cheese is obtained. Such is the offensive German hand-cheese.

Oleomargarine, or *filled cheese*, devised by H. O. Freeman, of Sherburne, N. Y., is made by replacing the fat removed in the cream with oleomargarine made from beef suet. The oleomargarine is melted and added to the skim-milk, which has been previously heated to 94° F., and colored with annatto. Rennet enough is then added to curdle in eight or ten minutes. About 1½ lb. of oleomargarine are retained by 100 lb. of milk. When skillfully made this cheese appears rich and well-flavored, and passes for fair whole-milk cheese, but spoils very quickly and badly.

Lard cheese has recently been manufactured in New York and other States. It is somewhat similar to oleomargarine cheese, being made from skimmed milk and lard.

Butter-filled cheese is also made from skim-milk and rancid or other cheap butter, which is partly purified by melting before it is mixed into the milk.

The mould on and in old cheese consists of a few common species of green, blue, and red fungi, such as *Penicillium glaucum*, *P. globulosum*, *Torula viridis*, *T. auriantiaca*, etc. See articles Fungi, Mildew, and Mould.

Cheese-mites, which appear on some kinds of old cheese as a light buff dust, are known as *Acarus domesticus* or *A. siro*. They are of the same genus of the *Arachnidæ* as the sugar-mites. They are harmless.

Skippers, called also *hoppers* and *jumpers*, are the larvæ or maggots of the cheese-fly, *Piophila casei*, which lays its eggs in the cracks or on the surface of the cheese. This fly is about half as large as the ordinary house-fly. Care and cleanliness are the only means for preventing its inroads; frequent turning, rubbing, brushing, etc.

Tyrotoxicon.—Dr. Victor C. Vaughan has separated from long-kept acid milk, from cheese which caused poisonous symptoms, and from an ice-cream which similarly had caused illness, a very poisonous substance, of the nature of a ptomaine, which he has named tyrotoxicon. The method of separation is exceedingly simple; the acid-coagulated milk is filtered, and the filtrate, thus freed from fat and casein, is shaken up with ether after being first faintly alkalized with potash. On filtering and evaporating the ether, a crystalline substance is left, extremely small doses of which cause vomiting and diarrhœa in man, and kill small animals with cholera-like symptoms. There has been recently adduced evidence that this crystalline substance is probably diazobenzine.

Literature.—F. D. Curtis, *Hints on Cheese-making* (Utica, 1871); X. A. Willard, *Practical Dairy-husbandry* (New York, 1872); C. L. Flint, *Milch-cows and Dairy-farming* (Boston, 1874); X. A. Willard, *The Practical Butter-book* (New York, 1875); L. B. Arnold, *American Dairying* (Rochester, 1876); Benno Martiny, *Die Milch* (Dantzic, 1871); C. Husson, *Le Lait* (Paris, 1878); I. J. Ellerbrock, *Die Holländische Rindviehsucht und Milchwirthschaft* (Brunswick); W. Fleischmann, *Das Molkereiwesen* (Brunswick, 1877); Johnston's *Chemistry of Common Life* (New York, 1870); Knapp, Ronalds, and Richardson, *Chemical Technology* (vol. iii., London, 1851); Payen, *Précis des Substances alimentaires* (4th ed. Paris, 1865); Ure's *Dictionary* (London, 1867); Bolley, *Handbuch der Chem. Tech.* (Bd. iv., 1867); Mnspratt's *Chemistry* (London, 1850); Muspratt's *Chemie* (3te Auf. Bd. iii., Brunswick, 1876); Hassall, *Food and its Adulteration* (London, 1876); *The Milk Journal* (London, monthly); *Milch Zeitung* (Bremen, weekly); *Annual Reports of the Department of Agriculture*; *Transactions New York State Ag. Soc.*; *An. Reports Am. Dairymen's Association*; *An. Reports Butter and Cheese Exchange of New York*; *An. Reports New York Produce Exchange*; *Jour. Roy. Ag. Soc. England*; Wagner's *Jahresb. Tech. Chem.*; Hoffmann's *Jahresb. Ag. Chem.*; *Cattle and Dairy-farming, United States Consular Report* (Washington, 1887); A. W. Blyth, *Foods: Composition and Analysis* (London, 1888); H. W. Conn, *The Fermentations of Milk, United States Dept. Ag. Bulletin No. 9* (1892); H. F. Moore, *The Cheddar Cheese of the World* (Bristol, 1887); *New York State Dairymen's Association's Reports* (1888); *Ontario Dairymen's Association's Reports* (Toronto, Ontario, 1886–91); *Dairy Commissioner's Report for Canada* (Ottawa, 1890–91); James Long, *Our Trade in Dairy Produce* (Man-

chester, 1892); L. L. Van Slyke, *New York Ag. Experiment Station, Bulletins Nos. 37 and 43*; W. A. Henry and S. M. Babcock, *Wisconsin Ag. Experiment Station, Bulletins Nos. 18 and 27*; I. H. Monrad, *The A B C of Cheese-making* (Winnetka, Ill.); P. Schützenberger, *Fermentation* (New York, 1876); *Hoard's Dairyman* (Fort Atkinson, Wis., weekly); *Ontario Ag. College Reports* (Guelph, Ontario, 1886–89).

JAS. W. ROBERTSON.

Cheese-maggot: See CHEESE.

Chee'tah, or **Hunting Leopard**: the *Guepardа jubata* or *Cynælurus jubatus*, a carnivorous mammal of the cat family, distinguished by its slender build, long legs, and non-retractile claws. The general color is pale yellow, marked with numerous small black spots, which, unlike those of the leopard, are not arranged in rosettes. The hair on the neck and shoulders is long, the fur coarser and crisper than that of most cats. It is found throughout Africa, and in Asia nearly as far N. as Siberia. Its intelligence, docility, and fidelity are so great that in India and Persia it is trained for the chase of antelopes and deer. The cheetah is kept leashed and hooded until the game is found near, when it is let loose and, drawing stealthily near its victim, it rushes suddenly upon it, and can with difficulty be made to let go its hold. This animal is readily domesticated. Little is known of its habits while in a state of nature. In Ceylon the true leopard is called *cheetah*.

Cheetham, HENRY, D. D.: b. in Nottingham, England, Apr. 27, 1827; educated at Christ's College, Cambridge; ordained in 1856 to the curacy of Saffron Walden, Essex; held the vicarage of Quarndon, Derbyshire, from 1858 to Sept., 1870. He was then nominated to the bishopric of Sierra Leone, and was consecrated Nov. 30, 1870, in St. Paul's Cathedral. He resigned his see in 1882, and became vicar of Rotherham. He is the author of *Ministerial Fruit Proportionate to Ministerial Faith*; *Sermons*, etc.

Cheetham, SAMUEL, D. D.: Archdeacon of Rochester since 1882; b. in Hambleton, Rutland, Mar. 3, 1827; educated at Cambridge, where he graduated in the first class both in classics and mathematics in 1850; was Professor of Pastoral Theology in King's College, London, 1863–82. He edited with Dr. William Smith the *Dictionary of Christian Antiquities* (London, 1875–80, 2 vols.).

Chee'ver, EZEKIEL: a New England school-teacher; b. in London, England, Jan. 25, 1615 (N. S.). He received an excellent classical education, and emigrated to America in June, 1637, to enjoy Christian worship in its purity. He was one of the founders of the colony of New Haven, where he taught school for twelve years; was chosen deacon soon after the organization of a church there, and occasionally served as a preacher. He represented the town in the General Assembly in 1646: was afterward master of the grammar school at Ipswich, Mass., for eleven years, and subsequently taught school in Charlestown, Mass., nine years; removed to Boston Jan. 6, 1671, and had charge of the Boston Latin School for many years. During the time he was teaching at New Haven he prepared the *Accidence, a Short Introduction to the Latin Tongue*, of which in 1785 twenty editions had been published, and it was in use for over 100 years by the Latin teachers of New England. He also wrote *Scripture Prophecies Explained, in Three Short Essays*. D. in Boston, Mass., Aug. 21, 1708.

Cheever, GEORGE BARRELL, D. D.: Congregational divine; b. at Hallowell, Me., Apr. 17, 1807; graduated at Bowdoin College in 1825, and at Andover Theological Seminary in 1830. In 1833 he became minister of a Congregational church in Salem, Mass. He published, in 1835, a satirical allegory called *Deacon Giles's Distillery*, for which he was prosecuted by a certain distiller, and was condemned to imprisonment for thirty days. He was distinguished as a zealous advocate of temperance and as an opponent of slavery. He resigned his pastorate 1836, went to Europe, and contributed letters to the New York *Observer*, and in 1839, on his return, took charge of the Allen Street Presbyterian church, New York city, and held it till 1844; he was corresponding editor of the New York *Evangelist* in 1844 while in Europe, and was its principal editor for a year after his return in 1845. His contributions to the New York *Independent* and the *Bibliotheca Sacra* were numerous and extensive. From 1846 to 1870 he was pastor of the Church of the Puritans in New York city. Among his works are *Studies in Poetry* (1830); *Lectures on Pilgrim's Progress* (1843); *Wanderings of a Pilgrim in the Shadow of Mont Blanc* (1846); *Journal of the Pilgrims at Plymouth in 1620* (1848); and *God against Slavery* (1857). D. at Englewood, N. J., Oct. 1, 1890.

Cheever, HENRY THEODORE: See the Appendix.

Cheffontaines, shef'fŏn'tān', CHRISTOPHE, de: a French theologian; b. about 1532 in Brittany; became Archbishop of Cæsarea about 1586, and exercised episcopal functions in the diocese of Sens in the absence of Cardinal Pellevé. Cheffontaines wrote, among other works, a *Defense of the Faith of our Ancestors* (1570) and a *Treatise against Certain Dogmas of Scholastic Theology* (1586). D. May 26, 1595.

Chefoo, or **Chifu**: a seaport of China, called by the natives *Yen-t'ai* (Smoke Terrace); in the hien or district of Foo-shan, the foo or department of Tŭng-chow, and the province of Shantung. It is situated in lat. 37° 35′ 56″ N., and lon. 124° 22′ 33″ E., on the north shore of the promontory of Shantung, in the southeast angle of a small bay formed by the peninsula of Chefoo, the sandy spit which connects this peninsula with the mainland, and the hill Yen-t'ai, from which the town takes its name (see map of China, ref. 4–K). Chefoo is one of the ports opened to foreign residence and trade by the treaty of 1858, taking the place of Tŭng-Chow-foo (55 miles to the W. N. W.), the city designated in the treaty, but which possessed no suitable harbor. Steamers plying between Shanghai and Tientsin touch here, and there is considerable trade by sailing ships with the other ports of China. The chief imports are woolens, cotton goods, opium, and sugar. The chief exports are pulse, bean oil, bean-cake, medicines, and strawbraid. In 1891 the total imports amounted to $10,234,720, and the exports to $5,125,848. In the same year 1,217 vessels, with a tonnage of 982,759 tons, entered the port, and 1,215, with a tonnage of 981,805 tons, cleared. The climate of Chifu is the most salubrious of all the treaty-ports of China, and the place is consequently much resorted to by foreigners from other parts of China in the summer months. Pop. (1890) 32,500.

R. LILLEY.

Chehab-Eddin, better **Shehâb-Eddin**, ABDEL RAHMAN: b. at Damascus in 1203; d. there in 1267. He wrote *Kitâb-ar-raudhatain*, or *The Book of the Two Gardens*, which means the history of Nureddin and Saladin. This work appeared also in an abridged form as *Azhar-ar-raudhatain*, or *The Flowers of the Two Gardens*.

Cheha'lis: a river of the State of Washington; rises in Lewis County, on the east side of the Coast Range; flows in a W. N. W. direction through Chehalis County; enters Gray's Harbor, and is about a quarter of a mile wide at its mouth. It is navigable for steamboats, and its valley is extensive and fertile, producing oats, wheat, and potatoes. The inclosing hills are covered with dense forests of fir, cedar, spruce, maple, and ash. Total length about 125 miles.

Chehalis: city; capital of Lewis co., Wash. (for location of county, see map of Washington, ref. 6–C); on Northern Pacific R. R. and Chehalis and South Bend R. R., and at the confluence of the Chehalis and Newaukum rivers; 54 miles S. of Tacoma. It has five churches and excellent graded schools; its industries are manufacturing and agriculture. It was founded in 1881. Pop. (1890) 1,309; (1900) 1,775.

EDITOR "BEE."

Cheh-kiang, or **Che-kiang**, chā-kyaang' (i. e. Crooked River, from the old name of the river which waters the province, called the Ts'ien-T'ang river since the eleventh century): the smallest of the eighteen provinces of China; bounded S. by Fuh-kien, W. by Kiang-si and Ngan-hwei, N. by Kiang-su, and E. by the Yellow Sea; 11,588,692 inhabitants in 1882; area, 39,150 sq. miles. The southwestern part of the province is hilly, and produces great quantities of excellent tea; the northern and eastern parts belong to the great delta plain, and produce silks. The principal towns are the capital, Hang-Chow-Foo, and the treaty-port of Ning-po. The Chusan islands, lying opposite Ning-po at a distance of about 50 miles, belong to this province.

Cheirolepis, kī-rol'ĕe-pis [Gr. χειρ, a hand + λεπίς, scale, in allusion to the scale-covered pectoral fins]: a genus of fossil fishes belonging to the family *Palæoniscidæ*, found in the Devonian of Europe and Canada. The vertebral column was cartilaginous although the neural arches were ossified, head large, teeth small, pointed, or cylindrical, body slender, and covered with small rhomboid scales. The fins, particularly the pectorals, are large, and the first ray of each is developed as a spine.

F. A. L.

Cheiromancy [from Gr. χειρόμαντις, diviner by palmistry; χείρ, hand + μάντις, diviner]: divination by inspection of the

lines in the palm of the hand; also called *palmistry*. Cheiromaney comes from India, and is of great antiquity. It was practiced at Rome and much in vogue at the time of Juvenal. It was cultivated by philosophers and celebrated schoolmen like Plato, Aristotle, Galien, Albertus Magnus, and Ptolemy. Aristotle having found on an altar dedicated to Apollo a book on cheiromancy, written in letters of gold, sent it to Alexander as a work worthy of the attention of an investigating and lofty spirit. Cheiromancy played a very important part among the Chaldeans, Assyrians, and Egyptians. The Jewish people possessed thousands of cheiromancers. Solomon speaks of the art as having been perfected among the Hebrews. The Emperor Augustus was considered a distinguished practitioner. Cardanus, the author of a work on cheiromancy which is considered one of the best, declares and proves that there are from the point of view of this art 170 kinds of hands. Tricassus recognizes only 80; Kenker will allow but 70, and Belot puts the number at 40. This art was in great repute in Europe in the Middle Ages. The basis of the so-called science is the three large, principal lines which are at once recognized in the palm of the hand. The first, the one nearest the fingers, is called the line of the heart; the second, in the middle of the hand, the line of the head; and the third, at the base of the thumb, the line of life. These represent the trinity of human existence: the heart, sensation; the head, intelligence; life, action. There exist outside of these three main lines other important lines, all of which have a particular significance. Moreover, the palm of the hand is divided into different quarters, and the slight elevations beneath the base of each finger are called mountains, each one having its particular name. The line of the heart when it is very well defined signifies strong and happy affection; if the line is broken, it denotes inconstancy. The line of the head in the same way denotes strong or weak mental faculties. The line of life, the most important of all, determines by its distinctness and clearness the length of life and liability to diseases, etc. Each one of the mountains mentioned above is named after the various planets, from which they receive, according to their greater or less development, favorable or unfavorable influences. It need hardly be added that the whole subject is placed in the realm of charlatanism or of innocent amusement, according to the way in which it is practiced.

C. H. Thurber.

Cheiron, kī'ron (in Gr. Χείρων): one of the Centaurs; the noblest specimen of a combination of the human and animal forms created by the Greek imagination. Generally the centaur expresses the sensual and savage features of a man combined with the strength and swiftness of a horse; but to these qualities Cheiron added justness, wisdom, and kindness. Having been instructed by Artemis and Apollo in hunting, gymnastics, music, and medicine, he in his turn became the instructor of many heroes—Achilles, Heracles, and others—in these arts. Together with the other Centaurs, he was expelled by the Lapithæ from Mt. Pelion, but sacrifices continued to be offered to him even after his expulsion by the Magnesians; and the family of the Cheironidæ, living in that neighborhood and distinguished for knowledge in medicine, was said to descend from him.

Cheironectes, kī-rō-nek'tēez [Gr. χειρ, hand + νήχειν swim]: the yapock, or water-opossum (*Cheironectes variegatus*), a small marsupial of the family *Didelphyidæ*, found from Guatemala to Southern Brazil. It is about 2 feet in total length, clothed in soft, dense, woolly fur, white below, gray above, marked with large patches of sooty black, ears large and bare, tail long and naked, except at the base where it is covered with fur. The hind feet are large and webbed, and the animal, which is aquatic in its habits, frequenting small streams, feeds on crustacea, insects, and fishes. Owing to its peculiar appearance and mode of life it was for a long time placed with the otters. F. A. L.

Cheironectes.

Cheiroptera, kī-rop'te-ra [from Gr. χείρ, hand + πτερόν, wing]: an order of mammals consisting of the Bats (*q. v.*).

Cheke, Sir John: scholar and Hellenist; b. in Cambridge, June 14, 1514. He became in 1540 first Professor of Greek in the university of that place, and distinguished himself as a reviver of classical learning. In 1544 he was appointed Latin tutor to Prince Edward. He was Secretary of State in 1553, but on the accession of Queen Mary he was deprived of his office because he was a Protestant, and he went into exile. He was seized in Flanders in 1556 by the agents of Philip II. of Spain, and taken to England. Compelled to choose between death by fire and a profession of the Catholic religion, he accepted the latter. D. Sept. 13, 1557. Of his numerous writings, *The Hurt of Sedition* (1549) and the translation of the *Gospel of Matthew* are especially noteworthy. See Strype, *Life of Cheke* (1705).

Che-Kiang: See Cheh-kiang.

Chelidonium: See Celandine.

Chelido'nius: See Schwalber.

Chelifer, kel'i-fer [from Gr. χηλή, claw + Lat. *fer're*, bear]: a genus of small arachnids belonging to the order *Pseudoscorpii*, and commonly called false scorpions. They have two large pincers in front, like the true scorpions, but they lack the long abdomen and the poison sting of the latter. They live in moss, under the bark of trees and the wall-paper in houses. They feed on small mites and insects.

Chelmon'ski, Joseph: figure and landscape painter; b. in Varsovia, Russia; contemporary; pupil of Gerson, Paris; honorable mention, Paris Salon, 1882; medal of honor, Paris Exposition, 1889. He paints horses well, and his pictures of life in Russia and Poland are spirited. W. A. C.

Chelmsford, chemz'fŭrd: a town of England; capital of the county of Essex; at the confluence of the Chelmer and Cann rivers; on the Eastern Union Railway; 29 miles N. E. of London (see map of England, ref. 11–K). Two fine bridges cross the river here. The town is well built, has an old church, a handsome county-hall, a theater, and assembly-rooms. Pop. (1891) 11,008.

Chelmsford, Lord Frederic Augustus Thesiger: British general; b. May 31, 1827. Educated at Eton; served in the Crimean war; commanded the British troops in the Zulu war of 1879; made general 1888; lieutenant of the Tower of London 1884–89.

Chelmsford, Sir Frederick Thesiger, Baron, Lord Chancellor: b. in London in 1794. He became solicitor-general in 1844 and attorney-general in 1845, but he resigned in 1846. He was reappointed in 1852. On the formation of a Conservative ministry in 1858 he was appointed Lord Chancellor, and received the title of Lord Chelmsford. He resigned with his colleagues in June, 1859, and was again Lord Chancellor from July, 1866, to Feb., 1868. D. Oct. 5, 1878.

Chelonia, kĕe-lō'ni-a [from Gr. χελώνη, tortoise]: that order of reptiles which contains the turtles and tortoises. In this sense the term is antedated by Testudinata (*q. v.*). *Chelonia* is also the name of the genus of sea-turtles containing the Green Turtle (*q. v.*).

Chel'sea: a populous southwestern suburb of London; in Middlesex; on the left (north) bank of the Thames; 4½ miles W. S. W. of St. Paul's (see map of England, ref. 12–J). The Thames is here crossed by three fine bridges, the Chelsea, Albert, and Battersea. Among the principal edifices are the great Chelsea Hospital for pensioners from the British army, the Royal Military Asylum, founded by Frederick, Duke of York, for the maintenance and education of soldiers' children, and a training-college for schoolmasters for the army. A noted place of public amusement formerly was Cremorne Gardens, now built upon. A fine embankment skirts the river-front. The original name was not Chelsea, but Cealscythe, and in the *Doomsday-book* it appears as Cercehede or Chelched. The present form first appeared in the sixteenth century. The manor of Chelsea was presented

by Henry VIII. to Catharine Parr, afterward passing into the hands of the Duke of Northumberland, Lord Cheyne, and Sir Hans Sloane. The names Cheyne and Sloane are still perpetuated in the borough, as it was in Cheyne Walk that Carlyle lived for many years. During the eighteenth century many famous men resided here, among them Arbuthnot, Atterbury, Guy, Swift, Smollett, Steele, and Count Zinzendorf. Chelsea was the first place in England in which the Italian style of gardening was introduced by Sir John Danvers. The borough returns one member to Parliament. Pop. (1891) 96,272; (1901) 73,856.

Chelsea: a city of Suffolk co., Mass. (for location of county, see map of Massachusetts, ref. 2-I); is a northeastern suburb of Boston; is 3 or 4 miles N. E. of Boston Common. It is separated from Charlestown by the Mystic river, which is here crossed by the Chelsea bridge. It is bounded on the S. and S. E. by an inlet of the sea called Chelsea creek, which separates it from East Boston. Chelsea has a U. S. marine hospital and a U. S. naval powder-magazine, an academy, and large factories for making elastic rubber, sewing-machines, brass-ware, linseed-oil, iron safes, woolens, brushes, machinery, tools, etc. The U. S. census of 1890 shows 334 manufacturing establishments, with a capital of $7,068,111, employing 3,421 persons at the aggregate annual wages of $1,879,663. The cost of materials consumed yearly is given as $4,655,432, and the value of the product $8,072,048. Chelsea is connected with Boston by the Eastern R. R. and by a ferry 1½ miles across. Pop. (1880) 21,782; (1890) 27,909; (1900) 34,072.

EDITOR OF "RECORD."

Chelsea: village (incorporated 1869), Washtenaw co., Mich. (for location of county, see map of Michigan, ref. 8-J); on Michigan Central R. R.; 22 miles E. by N. of Jackson; has excellent graded school and five churches; is the best produce-market in Southern Michigan. Pop. (1880) 1,160; (1890) 1,356; (1900) 1,635.

EDITOR OF "HERALD."

Chelsea: shire town, Orange co., Vt. (for location of county, see map of Vermont, ref. 5-C); 22 miles S. E. from Montpelier. Chelsea has an academy, 2 churches, and county buildings; has manufactories of shoes, lumber, and milk products. There are here excellent water privileges, and valuable granite formations (as yet unquarried). Manufacturing industries which locate here are exempted from taxation for a period of ten years. Pop. (1880) 1,462; (1890) 1,230; (1900) 1,070.

EDITOR OF "HERALD."

Chelsea Hospital: an asylum at Chelsea, England, for disabled or superannuated soldiers. The College for Religious Controversy, founded by James I. in 1610, was torn down to make room for this hospital in 1682. It has accommodations for about 660 persons, and is governed by a board of commissioners, comprising, *ex-officio*, the Lord President of the Council and the First Lord of the Treasury. It supports about 500 in-pensioners, who receive board, lodging, and clothing. All pensions granted to soldiers by the British Government are awarded by the commissioners of Chelsea Hospital, who are appointed by the crown. Out-pensioners may become inmates when there are vacancies, by surrendering their out-allowances, and inmates may become out-pensioners at will. The institution is supported by Parliamentary appropriations. In 1892 the expenditures for the hospital were £26,633, and for out-pensioners £1,821,700. In 1892 there were 84,011 out-pensioners paid at the hospital.

Cheltenham, chelt'nŭm: a parliamentary borough and fashionable watering-place of Gloucestershire, England; on the Bristol and Birmingham Railway; 96 miles by the road or 121 by railway W. N. W. of London (see map of England, ref. 11-G). It is pleasantly situated in a picturesque valley on the Chelt, a small tributary of the Severn, and is sheltered on the E. and S. E. by a semicircle of the Cotswold Hills. It derives its prosperity and importance from its mineral springs, which contain sulphates of soda and magnesia, with iodine, iron, and carbonic acid. It has elegant squares, terraces, and crescents, and numerous villas, interspersed with gardens and shrubberies. The public promenades are among the finest in England. It has ten or more churches, besides chapels of Dissenters, a general hospital, a theater, a zoölogical garden, and a well-endowed grammar school founded in 1574. Cheltenham is famous for its colleges and schools, among which is the proprietary college for the sons of gentlemen. The borough returns one member to the House of Commons. Pop. (1891) 42,914.

Chemakum: See CHIMAKUAN INDIANS.

Chemical Affinity: See AFFINITY.

Chemical Analysis: See ANALYSIS, CHEMICAL.

Chemical Equivalents: See CHEMISTRY and also ATOMIC WEIGHTS.

Chemical Nomenclature and **Notation**: See CHEMISTRY.

Chemistry, kem'is-tri [Eng. deriv. (seventeenth century) of *chemist*, Fr. *chimiste*, Mod. Lat. *chimista* for earlier *alchimista* with omission of the Arab. article *al*. The mediæv. name of the science was Span. *alquimia*, Ital. *alchimia*, O. Fr. *alquimie*, Lat. *alchimia*, all forms of Arab. *al-kīmīa* = *al*, the + *kīmīa*, prob. representing Late Gr. χημεία, Egyptian art, from *Khem*, an old name of Egypt. The word may be merely a folk-etymological modification of Gr. χυμεία, pouring, infusion, adapting it to a supposed connection with *Khem*. It was, at any rate, a supposed connection with χυμεία, etc., which in the Renaissance produced the spellings *alchymia*, *chymistry*, *chymist*, etc.]: the science which deals with the composition of the various forms of matter of which the universe is made up, and with the changes in composition which these forms of matter undergo. The name applied about the fourth century of the Christian era to the art which had for its object the transformation of the baser metals into the noble ones, as, for example, of silver into gold, was *chemia* (χημεία). This, in turn, is said to be derived either from the Egyptian word Khem, or chêmi, the name of Egypt (see the etymology), or from a word meaning black. Whether, therefore, *chemia* first signified the Egyptian art, or the occupation with a black substance of importance to the alchemists, is uncertain. Certain it is that the earliest chemical work recorded is that done by the alchemists (see ALCHEMY), and for a long period the principal chemical work was done by them. Gradually other objects were sought for, and a body of workers came to be engaged in earnest efforts to learn more of the composition of the things of the earth, and then the science of chemistry as we know it to-day took shape and grew rapidly. Looking at anything, the chemist first asks, "What does this consist of?" An example will illustrate the kind of answer he will get. Suppose the thing is a piece of granite. He can see with the naked eye that the granite is made up of at least three different things, and by breaking it up and working carefully the three things can be separated from one another. He will discover that they are the three minerals quartz, feldspar, and mica. By treating each of these substances in turn in the proper way, each one can be shown to be made of simple things. Thus the quartz consists of silicon and oxygen; the feldspar, of silicon, oxygen, aluminium, and either potassium or sodium; and the mica, of silicon, oxygen, aluminium, and potassium or sodium, with one or two other substances. Now the question presents itself, Can the substances just named, i. e. silicon, oxygen, aluminium, potassium, and sodium, be further decomposed? And the answer is that although chemists have been working with these things since their discovery, and have subjected them to all the influences at their command, they have not been able to get any simpler things from them. Hence these simple substances are called *chemical elements*. By work similar to that above referred to in connection with granite, all things within reach of the chemist have been found to be made up of not more than seventy elements. Most of these elements are, however, quite rare, most things with which we have to deal being made up of about a dozen elements; and most of the chemical changes that are taking place around us involving only this small number of elements. It has been calculated that the solid crust of the earth is made up approximately as represented in the subjoined table:

	Per cent.		Per cent.
Oxygen	44·0 to 48·7	Calcium	6·6 to 0·9
Silicon	22·8 " 36·2	Magnesium	2·7 " 0·1
Aluminium	9·9 " 6·1	Sodium	2·4 " 2·5
Iron	9·9 " 2·4	Potassium	1·7 " 3·1

While oxygen forms a large proportion of the solid crust of the earth, it forms a still larger proportion (eight-ninths) of water by weight, and about one-fifth of the bulk of the air. Carbon is the principal element entering into the structure of living things; while hydrogen, oxygen, and nitrogen, also are essential constituents of animals and plants. Nitrogen forms four-fifths of the bulk of the air.

The first object of chemistry is to determine what elements enter into the composition of things. But, starting with this object in view, the chemist soon finds that many substances

that occur in nature contain the same elements. Thus there are many compounds known that contain only the elements carbon, hydrogen, and oxygen. Gradually he recognizes the importance of determining not only what elements are in the substance under examination, but *in what proportions by weight they are present*. Work of the first kind is called *qualitative analysis*, while work of the second kind is called *quantitative analysis*. By means of these two kinds of work much of the knowledge included in the science of chemistry has been gained.

There is a third kind of work which has also contributed very largely to the development of chemistry. This is the opposite of analysis. It is *synthesis*. Finding that by various methods they were able to tear things apart or to decompose them, chemists naturally tried to make more complex from simpler things. In this way they succeeded in making artificially in the chemical laboratory not only many of the things that occur in nature, but many more that do not occur in nature, and for years past chemists have been working with things of their own making much more than with things furnished by nature.

Valuable as is a knowledge of the composition of things, both qualitative and quantitative, whether this knowledge be gained by analysis or synthesis, chemistry would never have been what it now is without the aid of guiding thoughts that stimulate to work. In dealing with the problems of analysis and synthesis the chemist has impressed upon his mind the great fact that two or more elements combine with each other and form new things, and that the act of combination is a very wonderful and interesting one. He brings together the elements oxygen and hydrogen, and finds that they can be left in contact with each other for any length of time in a closed vessel without change, but that if the smallest spark be applied to the mixture, a fearful explosion ensues, the gases disappear for the most part, and a few drops of water are formed. He will naturally ask what has happened. He will be interested in the phenomenon for its own sake, but he will not be satisfied when he has learned that the explosion accompanied the act of combination between the elements hydrogen and oxygen; and that the water is the product of the combination of the two elements; and that the elements combine in the proportion of one part by weight of hydrogen to eight parts by weight of oxygen. Can he not learn anything more concerning the act? He can learn that when the gases combine there is a great elevation of temperature; that there is a simple relation between the volumes of the combining gases; that when the act of combination is started in any part of a mixture of the two gases it proceeds with enormous rapidity throughout the mass; that the volume of the water, in the form of gas or vapor, bears a simple relation to the volumes of the combining gases; and, indeed, he can learn much more. In such an investigation he would constantly be brought face to face with the great question: What is the cause of the combination? What holds the hydrogen and oxygen together in the compound, water? What is the condition of things in the mass of the gas hydrogen, and in that of the gas oxygen? What change in the condition takes place when the two combine? In this stage of his inquiry he will necessarily call in his imagination. He has learned certain facts in regard to which there can be no question. He has found that a fact to-day is a fact to-morrow. He gains confidence in facts, and recognizes that in his speculations as to causes he must always be guided by the facts. He strives to imagine a condition of things that would lead to the results he is familiar with. If he succeeds, he proposes his *hypothesis*, which is a guess as to the cause, and if the hypothesis be a good one it sets others to thinking, and from thinking they go to work to see whether their thoughts are or are not well founded. Thus a study of facts leads to hypotheses, and hypotheses in turn lead to further study of the facts, and chemistry grows.

A systematic study of chemical phenomena has been carried on for centuries, and the science of chemistry now includes (1) a knowledge of an enormous number of *facts*; (2) *laws* governing these facts; (3) *hypotheses* as to the causes of the regularities which we call laws; and (4) *theories*, which are hypotheses that have been thoroughly tested and found to hold good. When a subject is spoken of as a science it may be inferred that it has been developed to such an extent as to include all the parts mentioned. Facts alone do not constitute a science, nor do facts and laws alone; there must be hypotheses, and some of these must have become theories before the subject they deal with is entitled to rank as a science.

Hand in hand with the development of a science the application of the truths of the science advances. Mankind is ever ready to make use of new discoveries for its own improvement, and much of the progress of the world from barbarism to civilization is intimately connected with the applications of the treasures of science. Chemistry has been particularly helpful in this respect. It has furnished the world with innumerable substances which are of fundamental importance, and without which it is difficult to see how the world could get along. Take, for example, the substance sulphuric acid. This is not furnished by nature, but is manufactured in all civilized countries by a process devised by chemists. This substance is used in the manufacture of the important compound, soda, which is needed in the manufacture of glass and soap; it is used further in the refining of petroleum, and in the preparation of valuable fertilizers. Its importance can not be overestimated. And so with many other substances. It is clear from what has been said then that we might have the science of chemistry in all its fullness without applying it directly to the material welfare of man. On the other hand, it would be possible to have many of the great chemical industries without the aid of the science, but, as a matter of fact, the growth of chemical industries does to a very large extent to-day depend upon the growth of the science, while science also often profits by the growth of the industries.

In this cyclopædia some of the principal facts of chemistry and the principal chemical industries are presented in independent articles arranged alphabetically; but in order that an idea of the connection between the facts may be more clearly discerned and some conception of the science gained, a brief account of the history of the subject is given, together with a general account of the present condition and object of the science.

Historical.—The old philosophers were much given to speculation and but little to experiment. Indeed, the time is not far distant when working with the hands was considered beneath learned men. In the early ages there was much thinking without a sufficient basis of facts. Many theories were put forward that have since been found to be at variance with the facts. Among the first chemical theories was that of Aristotle regarding the composition of all forms of matter. According to this theory all things are made up of four elements, called earth, air, fire, and water, and the properties of a thing depend upon the proportion in which these elements enter into it. This theory is profound, and is evidently the result of a contemplation of the facts of nature. It would be interesting to discuss it, but this would lead too far, and it must suffice to note that the theory suggests the possibility of converting one substance into another by varying the proportion of the constituent elements. The alchemists were engaged in chemical work with this object in view. Their highest object was the conversion of base metals like lead, copper, and mercury into the noble metals silver and gold. For fifteen hundred years this object was pursued with great industry by many earnest men. What was the result? They found that what they were striving to accomplish could not be accomplished. They found that the metals can not be converted one into the other; that they can enter into combination with other things and form new compounds, and that they can be recovered from these compounds without loss. This work laid the foundation of our present conception of *chemical elements*, which is plainly entirely different from that first held by the alchemists. Now, we consider that substance a chemical element which can not be decomposed by us into simpler substances, and we hold that, so far as our powers go, these elements are quite independent of one another. Further, while engaged upon their chief problem, the alchemists became acquainted with a host of chemical facts, and laid the foundations of the science of chemistry.

In the first half of the sixteenth century, through the influence of Paracelsus, some of those who were engaged in work on chemical substances were seeking another object. The value of some chemical substances as remedies for disease had long been recognized. Now, the importance of the chemical processes constantly taking place in the human body was also recognized, and it appeared that by the introduction of the proper substances into the diseased body the normal chemical condition could probably be restored. The study of chemistry took therefore a medical direction. This period is known as that of *iatro-chemistry*. It was

fruitful in the discovery of new substances, especially such as produced changes in the condition of the human body. Paracelsus, the father of iatro-chemistry, said: "The true object of chemistry is not to make gold, but to prepare medicines."

Toward the end of the seventeenth century much attention began to be given to the phenomena of combustion, and for a period of over a hundred years the leading chemists were engaged in work in this line, guided by a theory that was put forward by Stahl. Before him Boyle and others had added much to the knowledge of the chemistry of combustion, but it remained for Stahl to gather all the knowledge upon the subject together and propose the theory that was destined to exert such a powerful influence on the thoughts of chemists. This is the phlogiston theory. According to this all combustible substances contain a common ingredient called *phlogiston*, which escapes in the process of combustion. The act of combustion consists in the escape of this ingredient. Some substances contain much phlogiston, and therefore burn easily; others contain little and burn with difficulty. Combustion being one of the most common chemical phenomena, it is not surprising that this simple and comprehensive theory at once attracted attention and directed the thoughts of chemists. It held sway until the end of the eighteenth century, when Lavoisier succeeded in furnishing the true explanation of combustion, and, by so doing, in giving chemistry the direction which it has been following ever since. The phlogiston theory was the controlling theory for about 120 years. During most of that time the question as to the weight of substances was not regarded as an important one. True, balances came into use, but their use did not lead to valuable results for some time. It was pointed out from time to time that some things increase in weight by burning, as, for example, tin, lead, zinc, etc., and that this is plainly not in accordance with the phlogiston theory. If something escapes in the act of burning, then that which is left should always weigh less than the original substance. By way of reply it was said by the upholders of the theory that the phlogiston might weigh less than nothing, and thus make the substance in which it was lighter by its presence. It was not, however, until Lavoisier took up the subject that the theory was found to be incompetent to explain the facts, and that a much simpler and much more satisfactory explanation of combustion was presented.

Lavoisier began his studies a believer in the theory of phlogiston, but the facts established by him, taken together with the discovery of oxygen made by Priestley at the same time, showed clearly that the cause of combustion is oxygen. Briefly stated, Lavoisier proved that when a certain weight of a substance is burned in the air, a certain weight of the air disappears as such, and the substance increases in weight just as much as the air loses. He also showed that the part of the air that is used up is identical with the oxygen discovered by Priestley and by Scheele, which they had made by heating red oxide of mercury. His results are summed up thus: When a substance burns it combines with oxygen, and the weight of the product formed is equal to the sum of the weights of the substance burned and of the oxygen used up. There was no room for phlogiston. Nothing escapes when combustion takes place. Combustion is an act of combination with oxygen. The explanation thus given is the one we give to-day.

As Lavoisier reached his great results by the aid of the balance, this instrument came at once to be the chief instrument of chemistry. The quantitative period of chemistry was thus introduced, and very soon new results of fundamental importance were achieved. Before speaking of these, however, one generalization should be noted, as it lies at the basis of all chemistry. This is the law of *the indestructibility of matter*, or the law of *the conservation of mass*, which may be stated thus:

Whenever a change in the composition of substances takes place the amount of matter after the change is the same as before the change.

Assuming that this law has always held good, it follows that the amount of matter in the universe is the same to-day as it was at the beginning. Transformations are constantly taking place, but these involve no increase nor decrease in the total amount of matter. The evidence upon which this law rests is furnished by the innumerable quantitative analyses that have been made since the balance came into general use. Every fact known points to its truth. It is the first great law of chemistry. In the early part of the nineteenth century Dalton discovered two other important laws the truth of which has been verified by all subsequent work. These are (1) *the law of definite proportions*, and (2) *the law of multiple proportions*. The former is thus expressed:

Any given chemical compound always contains the same elements in exactly the same proportion by weight.

The second thus:

If two elements form several compounds with each other, the different weights of one that combine with a fixed weight of the other bear a simple ratio to each other.

The three laws mentioned are simply expressions of what has been found to hold true in all cases thus far examined. As the number of these is very great, it is fair to assume that the laws hold good also in cases not actually examined. These laws bear the same relation to the facts that every other law of nature does. They go beyond the facts and are an expression of facts known. It is, however, one thing to know a general fact or to know a law, and quite another thing to know the reason why the law holds good. We know that all bodies are attracted by the earth, and that they fall when thrown in the air. This is a very remarkable fact, and one of immense importance. We know that it is true, as we have evidence of its truth every day. But yet we do not know why it is so. We say that the earth attracts other bodies by virtue of gravitation, but this does not tell us anything whatever about the cause of the phenomenon. We might verify the law of universal attraction over and over again without getting any nearer to the explanation. So, too, we might verify the important laws of definite and multiple proportions over and over again without being able to give an answer to the question why do substances combine according to these laws. Here comes in the hypothesis.

Dalton not only discovered the laws, but he proposed an hypothesis which has since developed into a theory, the most important and most fruitful theory of chemistry. This is the *atomic theory*. If we consider any simple form of matter or element, such as iron, it is clear that there are two views which we may hold regarding the way the substance is made up. We know we can subdivide every piece of iron we can see, no matter how small it may be; and though after a time the particles would become so small that we could no longer subdivide them, still we can imagine that by more refined methods the process of subdivision might be continued forever. If we believe that such infinite subdivision is possible, we hold the hypothesis that matter is infinitely divisible. We can not prove this—we can only speculate in regard to it. But we may also conceive that after the process of subdivision has been carried on for a time until extremely minute particles have been reached, a limit will be found beyond which the process of subdivision can not be carried. If we believe this, we hold the hypothesis that matter is not infinitely divisible, and this carries with it the belief that matter consists of *indivisible particles*, that is, of particles that can not be made smaller by any means known to us. These particles may be called *atoms* (from the Greek ἄτομος, indivisible). Both of these hypotheses have been held for ages. But the discussion in regard to the relative merits of the two was not profitable, because the facts known did not make either hypothesis necessary.

When, however, the laws of definite and multiple proportion were discovered, Dalton saw that the conception of atoms might furnish an explanation of the laws. If each element is made up of atoms, the most probable view is that every atom of a particular element is like every other atom of that element. Among the properties possessed by these atoms must be weight. It is probable that the atoms of different elements have different weights. Let us suppose now that when two elements combine chemically the action takes place between the atoms, so that one atom of the one element combines with one of the other, and so on throughout the mass. If in the mass of the one element there were exactly as many atoms as in the mass of the other element, both substances would enter into combination completely. But if there were a larger number of atoms of one element than of the other, then of the element of which the larger number of atoms is present some would be left uncombined. Suppose, further, that the weights of the atoms of the two elements are to each other as one to ten. Then if when these two elements are brought together they combine in the proportion of one atom of one to one atom of the other, the resulting compound will contain the elements in the propor-

tion of one part by weight of one to ten parts by weight of the other. Or if on analyzing a compound of two elements we find that it contains one part by weight of one to ten parts by weight of the other, we should conclude that the weights of the atoms of the two elements bear to each other the ratio one to ten. The atomic theory thus furnishes an explanation of the facts summed up in the law of definite proportions. As the atoms are indivisible, if two elements combine in more than one proportion they must do so in the proportion of one atom of one to two atoms of the other, or one to three, or two to three, or in some other way that does not involve a breaking down of single atoms. If, for example, two elements, the weights of whose atoms are as one to ten, combine in the proportion of one atom of one to one atom of the other, the resulting compound will contain the elements in the proportion of one part by weight of one to ten parts by weight of the other element. If the same elements combine in the proportion of one atom of the first to two of the second, then the resulting compound will contain the elements in the proportion of one part by weight of one to twenty parts by weight of the other, and so on. It will thus be seen that the law of multiple proportions, as well as that of definite proportions, finds a satisfactory explanation in the atomic theory. All experience in the field of chemistry tends to show that the atomic theory is well founded. It has been the guide of chemists for nearly a hundred years, and it has led them into most interesting fields where they have made important discoveries.

The atomic theory being accepted, the determination of atomic weights becomes one of the principal problems of chemistry. So many difficulties have been encountered in this that some of the leaders have entirely abandoned the use of the word atom, and speak of *equivalents*. An equivalent of an element was that relative weight of the element that combined with one part by weight of hydrogen. Thus 8 parts of oxygen, 35·4 parts of chlorine, 80 parts of bromine, and 16 parts of sulphur combine respectively with 1 part by weight of hydrogen, and therefore 8, 35·4, 80, and 16 are said to be the equivalents of these elements. But, unfortunately, there are many elements that do not combine with hydrogen, and some combine with it in more than one proportion, so that the difficulty of determining equivalents is as great as that of determining atomic weights. Then it was proposed to call these important weights *combining numbers* and *combining weights*, but the old difficulties remained in spite of the new names. Meantime, through the aid of a large number of observations, chemists gradually came to recognize the truth of a generalization that was made by Avogadro in Italy at about the same time that Dalton proposed the atomic theory. This same generalization was also made a little later by Ampère, of France. Avogadro's law, as it is commonly called, is this: *Under the same conditions of pressure and temperature, equal volumes of all gaseous substances, whether elementary or compound, contain the same number of molecules.*

Although this law was distinctly stated in 1811, it did not exert much influence on chemistry for nearly half a century. Then it came to be recognized as a firm foundation for speculations on the subject of atomic weights, and its truth is now generally acknowledged by chemists and physicists. According to this law it is an easy matter to determine the relative weights of the molecules of all gaseous substances. But the molecule is not the atom. It is, however, not difficult, knowing the molecular weights of a number of compounds of an element, to determine the atomic weight from these. As regards the distinction between atoms and molecules, an example or two will make this clear. Common salt or sodium chloride is a compound of the elements sodium and chlorine. According to the theory, the smallest particle of sodium chloride is a molecule. But each molecule must be made up of at least one atom of sodium and one atom of chlorine. So, too, with an element such as hydrogen. The gas as we know it—that is, free hydrogen—is conceived as made up of molecules, and these molecules in turn of atoms. It may be, however, that the molecule of an element is identical with its atom, or the molecule may consist of two, three, or more atoms. In the latter case the atoms are believed to be held in combination in the same way as in the molecule of a compound. The molecule of a compound is therefore made up of atoms of different kinds, while that of an element is made up of atoms of the same kind. These conceptions of molecules and atoms based upon the law of Avogadro form the foundation of what is frequently called "modern chemistry." With the adoption of these conceptions came a definite and consistent system of atomic weights, upon which the great majority of chemists were agreed. These are the atomic weights at present in use, and they are based not only upon Avogadro's law, but upon a large mass of other evidence.

Another law that is of value in connection with the problem of the determination of atomic weights is the law of Dulong and Petit, discovered in 1819. This is expressed as follows: *The specific heat of an element multiplied by its atomic weight is a constant* (*about 6·25*).

According to this, it is only necessary to determine the specific heat of an element, and divide this into the constant 6·25 to get the atomic weight. What is meant by specific heat will appear from the following: It is known that when equal weights of different substances are exposed to heat from the same source, they have different temperatures at the end of the same period of time. From this it is clear that to raise equal weights of different substances the same number of degrees different quantities of heat are necessary. Given exactly the same heating-power, it takes about thirty-two times as long to raise the temperature of a pound of water 10, 20, or 30 degrees as it takes to raise the temperature of a pound of mercury the same number of degrees; or it takes thirty-two *times as much heat* to raise the temperature of a pound of water 10, 20, or 30 degrees as it takes to raise the temperature of a pound of mercury the same number of degrees. The quantity of heat required to raise the temperature of a given weight of any substance a given number of degrees, as compared with the quantity of heat required to raise the temperature of the same weight of water the same number of degrees, is called the specific heat of the substance. The specific heat of water being taken as the standard, that of mercury is $\frac{1}{32}$ or 0·03332; that of gold is 0·03244, etc.

While the adoption of the system of atomic weights now in use has led to clearer views in regard to many chemical phenomena, and has been of great service to chemistry in many other ways, there is one special result that demands attention even in this brief account. It has been shown by Mendeléeff, Lothar Meyer, and previously in a less satisfactory way by Newlands, that the properties of the elements are most remarkably connected with their atomic weights. Hydrogen, the lightest element, with lowest atomic weight, does not fit into the system. Beginning with that one which comes next in the order of increasing atomic weights, and arranging it with the following thirteen elements simply with reference to the increasing atomic weights, we have this table:

Lithium, 7; Glucinum, 9; Boron, 11; Carbon, 12;
Sodium, 23; Magnesium, 24; Aluminium, 27; Silicon, 28;

Nitrogen, 14; Oxygen, 16; Fluorine, 19;
Phosphorus, 31; Sulphur, 32; Chlorine, 35·5.

In these two series elements which we recognize as similar come to stand in the same vertical line, as lithium and sodium, glucinum and magnesium, carbon and silicon, fluorine and chlorine, etc. But this is only the beginning. Further examination showed that all the elements can be arranged in series similar to the above, and thus a very intimate connection between the atomic weights and the properties of the elements is known to exist. It will be noticed that the changes in the properties of the elements are *periodic*. Hence the law governing the relations between the atomic weights and properties of the elements is known as *the periodic law*. The relations can be expressed in different ways. The subjoined table, proposed by Mendeléeff, is the one most commonly used. In order to aid in its interpretation a list of all the elements, with their symbols and atomic weights, is given first. In this list the names of the most common elements are printed in SMALL CAPITALS and those of the rarest elements in *italics*.

LIST OF THE ELEMENTS, THEIR SYMBOLS AND ATOMIC WEIGHTS.

ALUMINIUM	Al	27·04	Columbium	Cb	93·7
Antimony	Sb	119·6	Copper	Cu	63·18
Arsenic	As	74·9	*Didymium*	Di	142·1
Barium	Ba	136·9	*Erbium*	E	166
Bismuth	Bi	207·3	Fluorine	F	19·06
Boron	B	10·9	*Gallium*	Ga	69·9
Bromine	Br	79·76	*Germanium*	Ge	73·32
Cadmium	Cd	111·7	Glucinum	Gl	9·08
Cæsium	Cs	132·7	Gold	Au	196·7
CALCIUM	Ca	39·91	HYDROGEN	H	1
CARBON	C	11·97	Indium	In	113·4
Cerium	Ce	141·2	Iodine	I	126·54
CHLORINE	Cl	35·37	Iridium	Ir	192·5
Chromium	Cr	52·45	IRON	Fe	55·88
Cobalt	Co	58·74	*Lanthanum*	La	138·5

LIST OF THE ELEMENTS, THEIR SYMBOLS AND ATOMIC WEIGHTS.

Lead	Pb	206·4	Silicon	Si	28
Lithium	Li	7·01	Silver	Ag	107·66
Magnesium	Mg	23·94	Sodium	Na	23
Manganese	Mn	54·8	Strontium	Sr	87·3
Mercury	Hg	199·8	Sulphur	S	31·98
Molybdenum	Mo	95·9	*Tantalum*	Ta	182
Nickel	Ni	58·56	*Tellurium*	Te	125
Nitrogen	N	14·01	*Thallium*	Tl	203·7
Osmium	Os	191	*Thorium*	Th	232
Oxygen	O	15·96	Tin	Sn	117·4
Palladium	Pd	106·2	Titanium	Ti	48
Phosphorus	P	30·96	Tungsten	W	183·6
Platinum	Pt	194·3	Uranium	U	239·8
Potassium	K	39·03	Vanadium	V	51·1
Rhodium	Rh	104·1	*Ytterbium*	Yb	172·6
Rubidium	Rb	85·2	*Yttrium*	Y	88·9
Ruthenium	Ru	103·5	Zinc	Zn	65·1
Scandium	Sc	43·97	Zirconium	Zr	90·4
Selenium	Se	78·87			

In this table the atomic weights are given as in the original. Many of them differ slightly from the figures determined by the most accurate work.

family; its properties are the result of that particular weight. Further, it seems to follow that the elements are not entirely independent forms of matter, but that they are in all probability compounds of a small number of simple elements at present unknown to us. Of this, however, we have no evidence, and until some one succeeds in isolating one or more of these ultimate elements it is almost useless to speculate in regard to them. See Argon and Spectrum (*Helium*).

From the earliest times chemists have speculated upon the constitution of matter, and some of the most prominent views that have been held have been briefly referred to in the foregoing. The general acceptance of the atomic theory and of the notions of chemical combination presented by Lavoisier led to new ideas in regard to chemical constitution. In Lavoisier's system oxygen was the controlling element. Oxygen formed acids and oxygen formed bases, and acids and bases formed salts with one another. Then early in this century the idea that electricity was the cause of chemical combination was held by many, and was earnestly advo-

Series.	Group I. — R_2O.	Group II. — RO.	Group III. — R_2O_3.	Group IV. RH_4, RO_2.	Group V. RH_3, R_2O_5.	Group VI. RH_2, RO_3.	Group VII. RH, R_2O_7.	Group VIII. — RO_4.
1	H = 1							
2	Li = 7	Gl = 9·1	B = 11	C = 12	N = 14	O = 16	F = 19	
3	Na = 23	Mg = 24·4	Al = 27	Si = 28	P = 31	S = 32	Cl = 35·5	
4	K = 39·1	Ca = 40	Sc = 44	Ti = 48·1	V = 51·2	Cr = 52·3	Mn = 55	Fe=56, Ni=58·5, Co=59·1, Cu=63·3.
5	(Cu) = 63·3	Zn = 65·4	Ga = 69·9	Ge = 72	As = 75	Se = 79	Br = 80	
6	Rb = 85·4	Sr = 87·5	Y = 89	Zr = 90·7	Nb = 94·2	Mo = 95·9	— = 100	Rh=103, Ru=103·8, Pd=108, Ag=107·9.
7	(Ag) = 107·9	Cd = 112	In = 113·7	Sn = 118	Sb = 120·3	Te = 125·2	I = 126·9	
8	Cs = 132·9	Ba = 137	La = 138·5	Ce = 141·5	Di = 145	—	—	— — —
9	(—)	—	—	—	—	—	—	
10	—	—	Yb = 173·2	—	Ta = 182·8	W = 184	—	Ir=193·1, Pt=194·8, Os=200, Au=196·7.
11	(Au) = 196·7	Hg = 200·4	Tl = 204·1	Pb = 206·9	Bi = 208	—	—	
12	—	—	—	Th = 233·4	—	U = 239	—	— — —

It will be seen that in Group I. are the metals of the alkalies; in Group II. calcium, strontium, and barium, magnesium, zinc, and cadmium; in Group III. boron, aluminium, scandium, etc.; in Group IV. carbon, silicon, tin, lead; in Group V. nitrogen, phosphorus, arsenic, etc.; in Group VI. sulphur, selenium, tellurium; in Group VII. fluorine, chlorine, bromine, and iodine. Between the fourth series, ending with manganese, and the next one, beginning with copper, there are three similar elements, iron, cobalt, and nickel. So, too, a similar group of three elements—ruthenium, rhodium, and palladium—comes between the sixth and seventh series; and another, consisting of osmium, iridium, and platinum, between the eleventh and twelfth. If we know the atomic weight of an element, we can tell approximately where it belongs in the table, and from its position we can determine its properties with considerable accuracy. When the table was first constructed three elements now included in it were not known. These are scandium, gallium, and germanium. It was seen, however, that the gaps existed, and it was predicted by Mendeléeff that elements would be found with atomic weights approximately 44, 69, and 72, and that these elements would have certain properties which were clearly stated at the time. The predictions were confirmed by the subsequent discovery of all three of these elements, and their properties were found to agree very closely with the descriptions given long before the elements were known. Unquestionably the properties of the elements are determined by their atomic weights. An element whose atom weighs one hundred times as much as that of hydrogen must have certain properties. It must combine with hydrogen and with oxygen in certain proportions; it must be allied to the members of the chlorine

cated by Sir Humphry Davy and by Berzelius. According to the electro-chemical theories, every compound, however complex it may be, consists of two parts, one of which is electro-positive and the other electro-negative. In order that we may know the constitution of a compound according to this theory, we must know what elements enter into it, the relative weights of the elements contained in the compound. This is expressed in the terms of the atomic theory by saying that it contains certain atoms. Thus sodium sulphate is said to consist of two atoms of sodium, four atoms of oxygen, and one atom of sulphur, and this is expressed by the formula Na_2SO_4. But now, according to the electro-chemical theory, this is made up of an electro-positive and an electro-negative part, and it ought to be possible to determine what these are by passing an electric current through the compound in solution, and noting what part goes to the positive pole and what to the negative. It is found that the part containing the sodium goes to the negative pole, and is itself, therefore, positive, while the part containing the sulphur goes to the positive pole, and is therefore negative. This was expressed thus, $\overset{+}{Na_2}O.\overset{-}{SO_3}$. All formulas then came to be written in a similar way. But the electro-chemical theory was found to lead to inconsistencies, and was finally abandoned. The so-called *binary theory* was an outgrowth of the electro-chemical theory. It was not of broad application, having to deal mainly with salts. According to it every salt consists of two parts. At one time these two parts were held to be an acid and a base. Later they were a metal and an acid radical.

After the electro-chemical was given up, it was recognized that while the number of compounds is enormous they fall

into a comparatively few classes, the members of each of which resemble some simple compound which is the type of the class. The four *types* to which compounds were referred are hydrochloric acid, ClH, water, H_2O, ammonia, NH_3, and marsh gas CH_4. Or the formulas of these typical compounds may be written thus:

$$ClH \qquad O\begin{cases} H \\ H \end{cases} \qquad N\begin{cases} H \\ H \\ H \end{cases} \qquad C\begin{cases} H \\ H \\ H \\ H \end{cases}$$

By substituting other elements or groups of elements for the hydrogen, the composition of each type may be changed in a great variety of ways, but the general plan of the compound will be the same as that of the simple type. This so-called type theory served a valuable purpose, and led gradually to the views at present held regarding the constitution of chemical compounds. These views resulted from the efforts of many, among whom may be mentioned Frankland, Würtz, Hofmann, Williamson, and Kekulé. It was, however, largely due to Kekulé's clear and comprehensive treatment of the subject of constitution that chemists came to accept the views now generally held. In an important article published in 1858 he said: "I consider it necessary, and in the present state of our knowledge I consider it possible, in many cases to go back to the elements themselves which make up the compound." At the present time the expression constitution of a compound means the arrangement of the atoms composing the molecule of the compound. It is believed that these atoms are connected or linked together in definite ways, and that by studying the decompositions and syntheses of a compound it is possible to draw conclusions as to the order in which the atoms are linked together. It is easily seen that different kinds of atoms have different linking powers. Thus hydrogen and chlorine have this power in its simplest form. An atom of hydrogen can hold in combination but a single atom of chlorine, and an atom of chlorine can hold but a single atom of hydrogen. An atom of oxygen can, however, hold two atoms of hydrogen, an atom of nitrogen can hold three atoms of hydrogen, and an atom of carbon can hold four atoms of hydrogen. This power of an atom to hold a certain number of other atoms in combination is called *valence*, and sometimes *atomicity*; and, according to differences like those referred to, the elements are divided into *univalent*, *bivalent*, *trivalent*, *quadrivalent*, according as they are like chlorine, oxygen, nitrogen, or carbon. The determination of the constitution of a chemical compound involves then the following steps:

(1) The analysis, qualitative and quantitative;

(2) The determination of the molecular weight by the aid of Avogadro's law or some similar law;

(3) The determination of the molecular formula from the results obtained in steps 1 and 2;

(3) The determination of the way in which the atoms are linked together by a study of the decompositions and syntheses of the compound.

The formula $H-\overset{H}{\underset{H}{C}}-\overset{O}{\overset{\|}{C}}-O-H$ represents the constitution of ordinary acetic acid as determined by the methods referred to. It is a condensed statement of a great many facts that have been established by much work, and the facts are expressed in the terms of the theory of atoms, the theory of molecules, the hypothesis of the linking of atoms, and the hypothesis of valence. Constitution, in the sense in which that word has been used, has no reference to the arrangement of atoms in space. It refers simply to connections, not to directions. Quite recently, however, the study of certain phenomena has led to a conception of constitution which does involve the consideration of space-relations, and a new branch of chemistry has sprung up, known as STEREO-CHEMISTRY (*q. v.*). It would lead too far to discuss this subject here. Suffice it to say that most chemists at present believe that there are good grounds for believing that conclusions can be drawn in many cases as to the shape of the molecules, and more particularly as to the space-relations of the atoms in certain molecules, and this fascinating subject is now under active investigation in a number of the leading laboratories of the world. The results already obtained are such as to give promise of brilliant successes in the future.

Up to the present most chemists have been engaged in the study of questions pertaining directly to composition and constitution, and work of this kind promises to yield rich rewards for years to come. Most of the work is of such a kind as to be practically incomprehensible, except to one who has a thorough knowledge of chemistry, and so the world at large hears very little of it. It is only when the results are of such a character that they can be utilized by mankind that they come to be known at all. Let a chemist discover a dyestuff or a medicine or a very sweet, or a very pleasant-smelling substance, and the world feels that he has done something. The discovery of the aniline dyes, of the artificial preparation of alizarin or Turkey red, of the sweet substance known as saccharin, of antipyrine, of sulphonal, of choral, of nitroglycerin, etc., of these the world hears. But of the countless thousands of long-named substances which are constantly being described in the chemical journals, the world hears nothing and cares nothing. It does not follow from this, however, that these things are of no importance. They may be of the very highest importance, and yet absolutely incomprehensible to the world. Anything that advances the science of chemistry, even to a very slight extent, is of importance, for, leaving all other thoughts out of consideration, it is only through advancement of the science that further applications of the science become possible. But there is a higher argument. Anything that gives a clearer insight into the secrets of nature is of value to man, whether it be capable of direct application to his material wants or not.

There is another side of chemistry of which no mention has been made thus far, and this side has been coming into greater prominence within the last few years. A complete study of chemistry involves not only the subject of constitution, but that of the nature of chemical action. Some chemists are no longer satisfied with studying chemical elements and chemical compounds as such, but they have sought to make observations during the progress of chemical action, and thus to get an insight into the nature of the act. For various reasons there are serious difficulties in the way of such observations, but, notwithstanding these, some progress has been made in this kind of study. This branch of chemistry is generally called *physical* or *general chemistry*. It has been shown that the extent to which two or more substances act upon one another is determined by the mass of the substances as well as by something which is called the affinity, and methods have been devised for determining the affinity of certain classes of substances. The amount of heat evolved or absorbed in chemical reactions has been carefully measured in a large number of cases, and some conclusions of general application have been reached. This special branch of physical chemistry is called *thermo-chemistry*. Finally, the study of solutions has led to some very curious results. Prominent among these is the conception that many substances, particularly the common acids, bases, and salts, are broken down when dissolved in water, and that in the solutions these decomposition products or *ions* are present. Thus when sodium chloride or common salt is dissolved in water, it is believed by many that it is broken down into the ions chlorine and sodium, and that these exist as such in the solution. It is not meant by this that the substances we know as chlorine and sodium are present as such, but the atoms of these elements highly charged with electricity. In the article on SOLUTION (*q. v.*) this subject will be presented somewhat more fully, though it should be said that this hypothesis has not yet taken its final place in chemistry.

Chemistry is taught very generally in schools, colleges, and universities. It touches a good many subjects, and it is taught, further, for the most part for the purpose of giving some insight into the methods of natural science. Chemical laboratories were the first into which students were admitted for instruction. The first chemical laboratory built for instruction and investigation was that of Liebig at the University of Giessen. Now hundreds of better equipped laboratories are found in every civilized country, though there is hardly a laboratory that can point to richer results than those obtained in the old laboratory at Giessen. There are now not only chemical laboratories, but physical, biological, pathological, psychological, and other laboratories in which the scientific work of the world is carried on. It would be difficult to overestimate the value of the work done in them year by year.

After this general account, it will be easier to give a definition of chemistry than it was at the outset. It was then stated that "chemistry is that science which has to deal with the composition of the various forms of matter of which the universe is made up, and with the changes in

composition which these forms of matter undergo." If rightly understood, this definition is satisfactory; but from what has been said, it is clear that the chemist's task is not done when he has determined the composition of substances. He must go further, and determine the constitution, and further still and strive to learn what the chemical reactions are that give rise to the compounds he deals with. He must investigate everything that is likely to help him in his effort to discover what takes place when substances act upon one another chemically. His field is boundless, and new visions are appearing to him at every advance.

Bibliography.—Remsen, *Theoretical Chemistry* (1892); Remsen, *Inorganic Chemistry* (1892); Remsen, *Organic Chemistry* (1891); Ostwald, *Outlines of General Chemistry* (1890); Lothar Meyer, *Outlines of Theoretical Chemistry* (1892); Richter's *Inorganic Chemistry* (1891); Richter's *Organic Chemistry* (1891); E. von Meyer, *History of Chemistry* (1891). Ira Remsen.

Chemmis, kem'mis (in Gr. Χέμμις): a city of ancient Egypt; the modern Ekhmim. See Egypt, Ancient; Panopolis.

Chemnitz, chem'nits: a town of the kingdom of Saxony, Germany; in the circle of Zwiekau; on the Chemnitz river; 44 miles W. S. W. of Dresden (see map of German Empire, ref. 5–G). Chemnitz is the most important manufacturing town in the kingdom, but ranks next to Leipzig and Dresden in population. It produces largely cheap cotton goods for the European and American markets. It is also engaged in the manufacture of silks and woolens, and in calico-printing, and the construction of machinery, steam-engines, etc. It has several handsome buildings, a gymnasium, an industrial school of great repute, technical schools, etc. It was formerly fortified, but its walls have been converted into promenades. Chemnitz was an imperial city from the thirteenth century to the seventeenth. Its prosperity was originally due to the linen-weaving of the Wends. Cotton-weaving was introduced in 1799, and developed greatly after 1834 when the kingdom joined the customs union. Pop. (1895) 161,017.

Chemnitz (Lat. *Chemnitius*), Martin: Lutheran theologian; b. at Treuenbrietzen, in Brandenburg, Nov. 9, 1522. Owing to straitened means his university course at Wittenberg was brief, and was confined mainly to the study of mathematics. Under the advice of Melanchthon his theological studies were pursued privately, especially from 1550–52, while librarian of the Duke of Prussia. He became lecturer on Melanchthon's *Loci* at Wittenberg in 1552. From 1554 to 1567 he was preacher in Brunswick, and delivered weekly theological lectures. He became superintendent in 1567, and showed great organizing ability. His chief works were *Examen Concilii Tridentini* (1565–73), one of the ablest defenses of Protestantism; *De Duabus Naturis*, an epoch-making treatise on the Incarnation; and the posthumous *Loci Theologici* (1591), being a commentary on Melanchthon's system. He also began a *Harmony of the Gospels*, and was one of the authors of the *Formula of Concord*. D. Apr. 8, 1586. Bossuet said that Luther, Chemnitz, and Gerhard were three in a series of Lutheran theologians in which there was no fourth. Henry E. Jacobs.

Chemosh: the national deity of the Moabites (*q. v.*); essentially the same as the Moloch of the Ammonites or the Canaanitic Baal. His worship was introduced into Jerusalem by Solomon.

Chemsian: See Chimmesyan Indians.

Che'mulpo': an open or treaty port on the west coast of Korea; 27 miles from Seoul, the capital, with which it is connected by a good road; lat. 37° 10′ N., lon. 126° 40′ E. (see map of China, ref. 4–L). There were only three foreign firms there in 1892, and the trade is mostly in the hands of Japanese. The chief exports are hides and beans, valued in 1887 at $260,000: the imports were mostly cotton and woolen goods, and were valued at $1,200,000.

Chemung, shĕĕ-mŭng': a river of New York; formed in Steuben County by the union of the Conhocton and Tioga rivers. It flows in an E. S. E. direction through Chemung County, and enters the North Branch of the Susquehanna about a mile below Athens, in Bradford co., Pa.

Chemung Group: in U. S. geology, a prominent division of the Devonian system of rocks, characterized by the upper marine fauna of the Devonian. The rocks are typically irregular alternations of shaly sandstones, coarse shales, and flaggy sandstones, characteristically brownish gray in color, named for Chemung County, river, or town in Southern New York, and outcropping over the southern half of the western counties of New York State, as well as in the Appalachian region. Other rocks in Iowa in the Western States, and in Maine, are referred to the Chemung group. Palæontologically the Chemung group is equivalent to the Upper Devonian of the British and European classifications. See Geology and Palæontology. H. S. Williams.

Chenango River: rises in Oneida co., N. Y.; flows S. S. W. through Madison and Chenango Counties; enters the Susquehanna at Binghamton. Length, 90 miles.

Cheney, Charles Edward, D. D.: clergyman; b. at Canandaigua, Ontario co., N. Y., Feb. 12, 1836. He graduated at Hobart College, Geneva, N. Y., in 1857, and studied at the Theological Seminary of Virginia. Nov. 21, 1858, he was ordained deacon and became assistant rector of St. Luke's church, Rochester, N. Y. Subsequently he took charge of St. Paul's church at Havana, N. Y. (1859), and in Mar., 1860, he was ordained a presbyter, and took charge of Christ church mission in Chicago. In consequence of his refusal to use the word "regenerate" in the baptismal offices, he incurred the displeasure of his diocesan, Bishop Whitehouse, and his trial for this offense has become historic. During this trial by an ecclesiastical court an injunction from the Superior Court was obtained by Melville W. Fuller (now Chief Justice of the U. S.), Mr. Cheney's counsel, on the ground that his client could not have justice at the hands of the ecclesiastical tribunal as constituted. On a hearing the injunction was dissolved, and the trial proceeded. Mr. Cheney was found guilty and was suspended from the exercise of his sacerdotal functions for a stated time. Refusing to obey the decision of the court, a new trial for contumacy followed, and on this ground—that of contumacy—he was finally deposed from the priesthood of the Protestant Episcopal Church. He received consecration as a bishop (Dec. 14, 1873), from the hands of the Rt. Rev. Dr. Cummins, late assistant Bishop of Kentucky, who had left the church of which he was a bishop with the view of founding an organization more in sympathy with the evangelical bodies who have not the episcopate. Dr. Cheney still remains in charge of Christ church, Chicago, the parishioners of which followed him into the Reformed Episcopal Church.

Cheney, John Vance: poet; b. at Groveland, N. Y., Dec. 29, 1848; practiced law in New York till 1876, when he removed to San Francisco; librarian of the public library there 1887–94, and of the Newberry Library, Chicago, since 1894. Among his poems are *Thistle Drift* (1887) and *Wood Blooms* (1888).

Chénier, shā'ni-ā', André Marie, de: poet; b. in Constantinople, Oct. 30, 1762, his father being consul-general of France, his mother a beautiful and cultivated Greek named Santi-l'Homaka before her marriage. He was educated in Paris, and early conceived a profound enthusiasm for Greek poetry and art. At sixteen he proposed to translate Sappho. He was, however, a serious student and, on the whole, had the intellectual sympathies of the eighteenth century rather than the romantic passions of the nineteenth, of which he has so often been called an early representative. In 1787 he went as secretary of legation to London, where he lived somewhat gloomily for a time, deriving little from England except an admiration for the English Constitution, which subsequently led him to oppose and denounce the tendencies toward anarchy which appeared in the French Revolutionary movement. At the first outbreak of the Revolution, however, he hailed it with gladness. He returned to France and threw himself into the political whirl. But before long he found himself vehemently opposing the men into whose hands the direction of things had fallen. He was arrested and after a time in prison guillotined July 25, 1794.

The enduring portion of Chénier's poetry is that which conveys his love of beauty, his passion for antique art, his reflection upon the universe, rather than that which conveys his political loves and hates. His early death, however, left his work in a very unfinished and even fragmentary condition. Of his three longer poems, *l'Invention*, *Hermes*, and *Susanne*, only the first is completed. The *Hermes*, in which the poet attempts a new version of the theme of Lucretius, *De Rerum Natura*, is the most interesting. Of his shorter poems, idyllic in form, several are among the masterpieces of the French tongue: *l'Aveugle*, *la Liberté*, *le Mendiant*, *le Jeune Malade*. His ode to Charlotte Corday and that to *la Jeune Captive* are equally famous. See H. de Latouche, *Notice sur André Chénier* (1826); Sainte-Beuve, *Critiques et Portraits* (t. ii.), and his *Causeries de Lundi* (t iv.): B. de Fouquières, *Poésies d'André Chénier, avec une étude* (1872);

id., *Œuvres en prose d'A. C.* (1872); id., *Documents nouveaux sur A. C.* (1875); *Œuvres de A. Chénier*, ed. by L. Moland (1882). A. R. Marsh.

Chénier, Marie Joseph Blaise, de: French poet and dramatist; younger brother of André Chénier; b. Feb. 11, 1764, at Constantinople. After several discouraging failures he produeed at the Théâtre Français, Nov. 4, 1789, his tragedy *Charles IX.*, which proved to be a politieal event of the first importance. From this moment the poet was famous as the representative on the stage of the impulses which led to the Freneh Revolution. Danton said of *Charles IX.*: "Si *Figaro* a tué la noblesse, *Charles IX.* tuera la royauté." The poet's next great success was his *Caius Gracchus* (1792), full of lofty republican sentiment and patriotie pride. The famous phrase, *Des lois, et non du sang*, however, brought it and the poet into suspicion during the dark days of the Terror. In 1794 *Timoléon*, a play full of protests against violenee and tyranny, was not allowed to be played, and indeed would have been destroyed completely had not Mme. Vestris secretly kept a copy of the MS. These three plays constitute Marie Joseph Chénier's main literary achievement. They had great political signifieanee, and they also did much to prepare the way for the romantie drama of our century. The poet wrote besides many patriotic songs and odes, among them the famous *Chant du départ* whieh was almost as popular among the Freneh soldiers as the *Marseillaise*. Chénier had also for a time an important political *rôle* as a moderate republiean. His last years were embittered by a baseless ealumny to the effect that he had a hand in the death of his brother André. D. Jan. 10, 1811. See *Œuvres de Marie-Joseph de Chénier* (ed. Arnault, 8 vols., 1823–26); Ch. Labitte, *Marie-Joseph Chénier*, in his *Études littéraires* (t. ii.). A. R. Marsh.

Chenoa: town (settled 1856, incorporated 1872); McLean co., Ill. (for loeation of eounty, see map of Illinois, ref. 5–E); at junetion of Chieago and Alton and Toledo, Peoria and Western R. Rs.; 102 miles S. of Chicago, 48 miles E. of Peoria. It has a graded sehool, seven ehureh organizations, tile-works, kiln-factory, canning-faetory, ereamery, and coal mines. Agrieulture is an important industry. Pop. (1880) 1,063; (1890) 1,226; (1900) 1,512.

Editor of "Chenoa Gazette."

Chenopodium, kĕ-nō-pō'di-ŭm [from Gr. χηνόπους, goose-foot: χήν, goose + πούς, ποδός, foot]: a genus of herbaeeous plants of the family *Chenopodiaceæ*; natives of America, Europe, and Asia. They are weeds, growing in gardens and waste plaees, and often covered with a white mealiness. Several speeies are naturalized in the U. S., and are known by the names of goosefoot, pigweed, and lamb's quarter. The *Chenopodium anthelminticum* (wormseed) is a native of the U. S. An oil whieh is obtained from the seeds of this plant is administered as a remedy for worms. Among the more important plants of this genus is Quinoa (*q. v.*).

Chenopods, ken'o-podz (see Chenopodium): a family of dieotyledonous plants (*Chenopodiaceæ*) with small, greenish, apetalous flowers, each with a one-eelled and one-seeded ovary; seed with a long, curved embryo in eopious endosperm. The beet (*Beta vulgaris*), spinach (*Spinacia oleracea*), and many weed plants belonging to many genera (e. g. *Cycloloma*, *Chenopodium*, *Atriplex*, *Corispermum*, *Salsoli*, etc.), are well-known ehenopods. There are 520 species known, of which a few in the tropics are small trees.

Charles E. Bessey.

Cheops, kee'ops (in Gr. Χέοψ): the name given by Herodotus to the despotic builder of the great pyramid in Egypt, now identified with Suphis I. (or Shufu) of the monuments. He was the second king of the fourth dynasty, whieh was established at Memphis about 2500 B. C., aeeording to the more sober Egyptologists. See Suphis.

Cheper: See Kheper.

Chep'stow: a town and river-port of England; county of Monmouth; on the river Wye; 2½ miles from its entranee into the estuary of the Severn, and 141 miles by rail W. of London (see map of England, ref. 12–F). At Chepstow occurs the highest tidal bore in Europe, rising suddenly often 50 feet and sometimes more than 65. Pop. (1891) 3,378.

Cher, shăr: a river of Central France; rising in the department of Creuse. It flows in a general N. W. direetion through the departments of Allier, Cher, and Loir-et-Cher, and enters the Loire immediately below Tours. Total length 207 miles. It becomes navigable when it receives the rivers Arnon and Yévre.

Cher: a central department of France; area, 2,780 sq. miles. It is bounded E. by the river Loire, and is intersected by the Cher. The surface is nearly level, and extensively covered with forests; the soil is variable; the staple products are wine, hemp, flax, and wool. It has mines of eoal and iron, and manufaetures of woolen fabrics. Capital, Bourges. Pop. (1891) 359,276; (1896) 347,725.

Cheraw': railroad junetion: Chesterfield co., S. C. (for loeation of county, see map of South Carolina, ref. 5–F); on Pedee river, at the head of navigation; 140 miles N. of Charleston. It has two academies, several other sehools, and a public library. During the civil war this plaee, whieh was a dépôt of supplies for the Confederates, was eaptured Mar. 3, 1865, by the Federal forees under Gen. Sherman. Pop. (1880) 918; (1890) 976; (1900) 1,151.

Cherbourg, sher'bŭrg, or (Fr. pron.) shăr'boor' (in Lat. *Caroburgus*): a fortified seaport-town and important naval station of Franee; department of Manche; on the English Channel; and at the N. end of the peninsula of Cotentin; 229¾ miles by rail W. N. W. of Paris; lat. 49° 38′ N., lon. 1° 37′ W. (see map of Franee, ref. 2–C). Its climate is mild. The streets are narrow, and there are but a few public buildings of any importanee. Among these are the ancient tower and the Church of La Trinité, in front of whieh is a colossal statue of Napoleon I. It eontains a eommunal eollege, a public library, a museum, and a theater; also manufaetures of hosiery, ehemieals, laee, and leather, but the industry of the inhabitants is ehiefly employed in the arsenal and dockyards. Vast sums of money have been expended here in fortifications, and in public works for the improvement of the harbor. The latter is sheltered by land on three sides, but is open to heavy seas and storms on the N. To proteet it from these the eonstruction of a breakwater, or *digue*, was eommeneed in the reign of Louis XVI. and eompleted under Napoleon III. Cherbourg breakwater is the most gigantic work eonstructed for such a purpose in ancient or modern times, and is a noble monument of the skill and perseveranee of the Freneh engineers. (See the article Breakwater.) At the meeting of the two branches of the breakwater there is an important eentral fort. The town is also defended by a number of other batteries faeing the sea, besides two important forts on the land side. The naval port eonsists of a harbor 776 feet long by 663 feet wide, whieh eommunicates with two large wet doeks. The eommereial harbor at the mouth of the Divette, half a mile distant, is conneeted with the sea by a eanal 650 feet long and 54 feet in width. Outside these harbors is the bay, whieh is of a triangular shape. William the Conqueror founded a hospital and a ehureh here. Cherbourg was besieged by the English in 1378, 1418, 1450, and 1758. Pop. (1881) 35,691; (1891) 38,554; (1896) 40,783.

Cherbuliez, shăr'bü'li-ay', Victor: novelist; nephew of Antoine Elysée, and son of André Cherbuliez. Professor of Hebrew at Geneva; b. July 19, 1829. His *À propos d'un Cheval*, a reverie on ancient art, appeared in 1860, and was followed by the romances *Comte Kostia* (1863); *Paule Meré*; *Le Roman d'une honnête femme* (1866); *Le grand œuvre* (1867); *Ladislas Bolski* (1869); *Samuel Brohl et Cie.* (1877), *La vocation du Comte Ghislain* (1888); a work on *Men and Things of the Present Time* (1883); *Le secret du Précepteur* (1893), etc. He was elected to the French Aeademy in 1882. D. in Paris, July 1, 1899.

Cherea, or **Chærea**, Cassius: the murderer of Caligula; first mentioned during the revolt of the German legions after the death of Augustus, when he eseaped the general massacre of the eenturions by his brilliant valor and intrepidity. As tribune of the prætorian guard he afterward beeame one of the prineipal members of the eonspiraey against Caligula, and when the emperor, on Jan. 24, 41 A. D., returned from the theater, where he had been present at the games eelebrated in honor of Augustus, it was Cherea who in the long gallery of the palaee gave Caligula the first blow. He supported the senate in its attempt to establish the republie, but meanwhile the prætorian guard had declared Claudius emperor, and next day Cherea was exeeuted.

Cheres: See Egypt, Ancient.

Cheribon, sher'i-bon, or **Sheribon**: a seaport town on the north coast of Java; capital of the resideney of Cheribon; at the head of a bay: 128 miles E. S. E. of Batavia. It was formerly of importanee, but suffered severely from a plague in the earlier part of the nineteenth century. It exports eoffee, indigo, pepper, etc. Pop. 11,000.

Cherimoy'er, or **Chirimoy'a**: the fruit of a species of Anona (*q. v.*), of the Custard Apple family (*Anonaceæ*). It grows upon a spreading tree (*A. cherimolia*), 20 to 25 feet high, which is native of tropical America including the West Indies. It is related to the pawpaw of the U. S. (*Asimina triloba*), and bears ovate-lanceolate leaves which are silky underneath, solitary, brown, fragrant flowers, and globose or oblong, greenish or purplish fruits which are from 2 to 5 or 6 inches in diameter. These fruits have a white flesh containing a few dark-colored seeds, and are regarded as among the finest in the world. This and some related species have been long in cultivation as ornamental plants in conservatories. C. E. B.

Chernigoff': a government (and city) of Little Russia. The government is on the east bank of the Upper Dnieper, S. of Smolensk, and between Orel and Kursk on the E. and Poltava on the W. Area, 20,233 sq. miles. It is an undulating plain, deeply grooved with ravines, wooded and marshy in the north, dry and steppe-like in the south. The Disna river passes through the province, and is navigable. Corn, timber, linseed, brandy, and hemp are produced. Sugar is also extensively grown and manufactured. Pop. (1883) 1,996,250; (1897) 2,322,007. The people are mostly (86 per cent.) of Little Russian stock. Jews are numerous, and there are a few Germans and Greeks. Chief towns, Nyezhin (50,000), Starodub (25,000), Chernigoff (20,000) (see map of Russia, ref. 8-C). The last is the capital, and is situated on the right bank of the Desna, 476 miles S. W. of Moscow. It is an ancient city, and was formerly of much greater importance than now. M. W. Harrington.

Cherokee': town; capital of Cherokee co., Ia. (for location of county, see map of Iowa, ref. 3-D); on Ill. Cent. R. R., and on the Little Sioux river; 59 miles E. N. E. of Sioux City. Cherokee has a number of flourishing industries, electric lights, water-works, and mineral springs. Pop. (1880) 1,523; (1890) 3,441; (1900) 3,865.
Editor of "Times."

Cherokee: city; Crawford co., Kan. (for location of county, see map of Kansas, ref. 8-K); on Mo., Pac. and Kan. City, F. S. and M. R. Rs.; 136 miles S. of Kansas City; has a high school, churches, large hay-press manufactory, mills, round-house, machine-shop, coal-shafts, etc. Pop. (1880) 556; (1890) 1,087; (1900) 1,326.
Editors of "Sentinel."

Cherokees: See Iroquoian Indians.

Chéron, shăy' rōn', Élise Sophie, also known as **M. Le Hay**: painter; b. 1648; pupil of her father, Henri Chéron; she painted in various mediums, oil, water-color, enamel, etc., and was made member of the academies of Paris and Padua. D. 1711. W. J. S.

Cherry: a name applied to various species of the genus *Prunus* (family *Rosaceæ*), which are characterized by small, smooth fruits with a smooth stone, which is globular or approximately so. There are numerous species of cherries in various parts of the world, falling into two groups designated by the inflorescence. In one group, to which garden cherries belong, the flowers are borne in umbel-like, nearly sessile clusters; and in the other, to which belong the choke cherry and wild black cherry, they are disposed in true racemes. The natural history of the common cherries is not well understood, but most botanists agree in referring them to two species—*Prunus cerasus*, comprising the Morello type, and *Prunus avium*, comprising all the sweet cherries and the class known as Dukes. Pomologists divide the offspring of *Prunus avium* into several classes, but most American writers make but three divisions—the "hearts," characterized by heart-shaped fruit with sweet, tender flesh; the "bigarreaus," with a firmer or more meaty flesh; and the Dukes, with acid, juicy fruit. The Dukes are sometimes classed with the Morellos, and some writers regard them as a distinct species; among the heart cherries, leading varieties are Black Eagle, Black Tartarian, Downer, Elton, Governor Wood, Ohio Beauty; among the bigarreaus, Napoleon Bigarreau, Yellow Spanish (known also as Bigarreau), Windsor, Roekport Bigarreau; among Dukes, May Duke, Late Duke, Royal Duke, Reine Hortense, Belle de Choisy, Belle Magnifique; among Morellos, English Morello, Montmoreney, Early Richmond, Ostheim, Louis Philippe. Cherries require a dry and moderately strong soil. The Mazzard is a half-wild type of *Prunus avium*, which is used for stocks upon which to bud and graft all the common cherries. The Mahaleb stock (*Prunus mahaleb*) is used as a stock when dwarf trees are required. The Sand or Dwarf cherry (*Prunus pumila*), native to the U. S., is now coming into cultivation as a fruit-plant. In Japan cherries are popular as ornamental plants, the common species there being *Prunus pseudocerasus*. L. H. Bailey.

Cherry-bird: See Cedar-bird.

Cherry Laurel: a name given to the evergreen cherry-trees, such as the bay laurel, *Prunus laurocerasus*, a native of Asia; the Portugal laurel, *Prunus lusitanica*, a native of Southern Europe; and the "mock orange" of the Southern U. S., *Prunus caroliniana*. They are all prized as ornamental shrubs or trees, and all abound in poisonous hydrocyanic acid, especially in the kernels and leaves. They have also an essential oil, resembling that of bitter almonds. The leaves of the first-mentioned species are used in flavoring sauces, etc., and in preparing cherry-laurel water; sometimes employed in medicine as a sedative, but its strength is variable, and it should not be used.

Cherryvale: city (founded in 1870); Montgomery co., Kan. (for location of county, see map of Kansas, ref. 8-I); on Atch., Top. and S. Fé, Kan. City, Fort S. and M., and St. L. and San. F. R. Rs.; 156 miles S. W. of Kansas City; has 2 fine schools, 6 churches, and natural gas, which supplies light and heat to the entire city. The city is situated in a farming district. Pop. (1880) 690; (1890) 2,104; (1900) 3,472.
Editor of "Republic."

Cherry Valley: village; Otsego co., N. Y. (for location of county, see map of New York, ref. 5-H); 68 miles W. of Albany. It has an academy. Cherry Valley was the scene of a massacre by the Tories and Indians in the British service Oct. 11, 1778. Thirty-two inhabitants, nearly all women and children, were murdered, besides sixteen soldiers of the Continental army. The rest of the citizens were made prisoners and taken away, and all the buildings were burned. The village is 6 miles from Sharon Springs, and is a place of summer resort. Pop. (1880) 856; (1890) 685; (1900) 772.
Editor of "Gazette."

Chersiphron, kĕr'si-fron (in Gr. Χερσίφρων): an eminent Cretan architect who flourished about 600 B. C. He designed the temple of Diana at Ephesus, one of the Seven Wonders of the world, but he died before it was finished. It was adorned with 127 Ionic columns of marble 60 feet high, and was 425 Roman feet in length.

Chersou: See Kherson.

Chersonesus, kĕr-sō-nee'sŭs (in Gr. Χερσόνησος): the ancient name of several peninsulas of Europe and Asia, as Chersonesus Aurea (Malacca), Chersonesus Cimbrica (Jutland), Chersonesus Thracia (Gallipoli), and Chersonesus Taurica (Crimea).

Chert, or **Hornstone**: a siliceous mineral; a variety of quartz with many of the characters of flint, but differing from it in being of a tougher nature, and breaking with a splintery instead of a conchoidal fracture. It is always massive, and is of various colors—white, red, yellow, gray, and brown. It is common in the mountain limestone, oölite, and greensand formations; it sometimes forms rocks, and often contains petrifactions. The term chert is often applied to the siliceous concretions which occur as nodules in limestone rocks. The limestone is said to be "cherty" when it contains so much of these concretions as to render it unfit for building and conversion into lime.

Cherub (plu. **Cherubim** or **Cherubs**): a kind of winged being mentioned in the Scriptures. Cherubim guarded Paradise (Gen. iii. 24) and prevented the return of fallen man, and cherubim were placed over the mercy-seat in the Holy of Holies (Ex. xxxvii. 8), and were wrought into the hangings of the temple (Ex. xxvi. 1, 31; xxxvi. 8, 35); so in Solomon's temple (1 Kings vi. 23, *sqq.*) they overshadowed the ark, and carved upon the doors and elsewhere were used as ornaments (1 Kings vii. 29, 36). They symbolized the nearness and at the same time the inaccessibility of God. They appear as four-winged beings of a generally human form in Christian art. Most writers regard them as angels, but many critics believe that they are symbols rather than real existences. According to the simple, primitive angelology, cherubim carried God when he appeared in his glory on the earth (Ps. xviii. 10); cf. Ezekiel's visions (Ezek. i. 19; x. 16; xi. 22). So also they are called "the wings of the wind," bearing God to the world (Ps. civ. 3; Is. xix. 1).

Cherubini, kăy-roo-bee'nĕe, Maria Luigi Carlo Zenobio Salvador: musician; b. in Florence, Italy, Sept. 14, 1760;

d. in Paris, May 15, 1842. Most of his life was spent in France. First taught by his father, an orchestral player in the Pergola theater of his native city, he early attracted the attention of the Grand Duke of Tuscany. Through his liberality he was enabled to study at Bologna under Sarti for four years. Here he gained the wonderful proficiency in the polyphonic style which ever distinguished him.

Both his earlier and latest works were in the line of church music, as masses, motetts, and offertories, mostly of large dimensions, with full orchestral accompaniments. A middle period of his art-life made him also famous as an operatic composer. Among his numerous operas *Lodoiska* (1791), *Medée* (1797), and *Les deux Journées* (1800) were the most renowned of their time. The latter is still occasionally given in Germany under the title of *Der Wasserträger* (The Water-carrier). The overtures to many of his operas are still found upon many European concert programmes. Among his sacred compositions his requiem in C minor is considered his greatest work. Beethoven is known to have esteemed Cherubini very highly, ranking him above all the then living writers for the stage. Napoleon I., though personally disliking him, made him chevalier of the Legion of Honor.

DUDLEY BUCK.

Cherusci, kĕĕ-rŭs'si: an ancient and celebrated German tribe mentioned by Cæsar; inhabited a country on the north side of the Silva Bacenis (Hartz Forest). The famous Hermann (Arminius) was a chief of the Cherusci. Having formed a league with other German tribes, he defeated the Roman general Varus near the Lippe in 9 A. D. According to Tacitus, the Cherusci were conquered by the Catti or Chatti after the death of Arminius.

Cher'vil [Fr. *cerfeuil*, from the Lat. *caerefolium* = Gr. *χαιρέφυλλον*]: a garden plant, *Anthriscus cerefolium*, of the order *Umbelliferæ*, used as a pot-herb and in soups. The leaves have a peculiar, somewhat sweetish and aromatic smell and taste. It is a native of Europe.

Chesaning: village; Saginaw co., Mich. (for location of county, see map of Michigan, ref. 6–J); on Mich. Cent. R. R. and on Shiawassee river; 20 miles S. of Saginaw; has seven churches, fine union school, stave and lumber mills, grain elevator, grist-mill, and fair-grounds and race-course. The village is situated in a fine agricultural region, and derives water-power from the river. Pop. (1880) 889; (1890) 1,056; (1900) 1,244.

EDITOR OF "ARGUS."

Chesapeake Bay [*Chesapeake* is from an Indian word meaning mother of waters]: a large inlet of the Atlantic coast of the U. S.; extends from Capes Charles and Henry northward along Virginia and two parts of Maryland to the mouth of the Susquehanna river. It is about 200 miles long, and varies in width from 4 to 40 miles. The distance from Cape Charles to Cape Henry is nearly 12 miles. The coasts on each side are deeply indented by numerous inlets and estuaries, which are navigable. The Chesapeake is so deep that the largest ships can ascend from the ocean nearly to the northern extremity. It contains numerous islands. The largest rivers which flow into it are the Susquehanna, the Potomac, and the James.

Ches'brough, ELLIS SYLVESTER: civil engineer; b. in Baltimore, Md., July 6, 1813, and at the age of thirteen began the work of his profession as a chainman on the Baltimore and Ohio Railroad. From 1846 to 1855 he was engineer of the Boston water-works, having also charge of streets and harbor improvements. He planned the sewerage system for Chicago and also the water tunnels, and he was engaged as consulting engineer on sewerage work in many cities. During 1878 he was president of the American Society of Civil Engineers. D. Aug. 18, 1886.

Ches'elden, WILLIAM, F. R. S.: anatomist and surgeon; b. near Melton Mowbray, Leicestershire, England, in 1688. He began to lecture on anatomy in London about 1711, and published in 1713 *The Anatomy of the Human Body*, which was long used as a text-book. He was afterward chief surgeon of St. Thomas's and Westminster Hospitals, and acquired a high reputation as an operator. Among his works is *The Anatomy of the Bones* (1733). D. in Bath, Apr. 10, 1752.

Cheshire, England: See CHESTER.

Chesh'ire, JOSEPH BLOUNT, Jr., D. D.: b. in Tarborough, N. C., Mar. 27, 1850; son of a clergyman of the same name; educated at Trinity College, Hartford, Conn.; is the official historiographer of the diocese of North Carolina; author of *The Early Conventions of the Episcopal Church in North Carolina, with Introduction and Notes* (1882). In 1892 he edited *Sketches of Church History in North Carolina*, one-third of which was his contribution. Before his ordination in 1878 Dr. Cheshire was admitted to the bar Jan. 1, 1872, and practiced law for six years.

W. S. PERRY.

Ches'ney, CHARLES CORNWALLIS: b. in England, Sept. 29, 1826; entered the British army as second lieutenant in the corps of royal engineers; became lieutenant-colonel in 1868 and brevet colonel 1873. Although he bore an excellent reputation as an officer of engineers, it is by his contributions to military literature that his name is best known. He was for many years Professor of Military Art and History at the Staff College, Sandhurst. In 1863 he published his *Campaigns in Virginia*; in 1868 his *Waterloo Lectures*. In 1870 his *Military Biographies*, contributed mainly to the *Edinburgh Review*, including essays on Gens. Grant, Lee, and others, were published in 1 vol. D. Mar. 19, 1876.

Chesney, FRANCIS RAWDON: an officer noted as an explorer; b. in County Down, Ireland, in 1789. Aided by the British Government, he explored a route from Europe to India by way of the Red Sea, and in 1836 descended the Euphrates in a steamer from Beer (Bîr) to its mouth. He published *The Expedition for the Survey of the Euphrates and Tigris* (4 vols., 1850). In 1855 he obtained the rank of major-general. D. at Mourne, Jan. 30, 1872.

Chess, or **Cheat**: common names in the U. S. of several species of *Bromus*, of the Grass family, especially *Bromus secalinus*. It resembles oats in appearance, and commonly occurs in wheat-fields as a troublesome weed.

Chess [O. Fr. *eschès*, *eschecs*, plur. of *eschec*, whence Engl. *check*; Ital. *scacco*, Lat. *scaccus*, ultim. from Pers. *shāh*, king. Adopted into Germ. as *Schach*]: a scientific pastime of a most entertaining character, which concentrates and exercises the logical faculties and affords a test of mental skill free from the elements of chance. It has been called "the art of human reason." The influence of the cultivation of this game on the highest qualities of mind bears essential resemblance to the effect of gymnastics on the growth, increase and conservation of the physical powers. The players begin with exactly even forces and the different pieces on either side correspondingly possess equal properties. The results are obtained by purely logical processes of reasoning, which engage to an enormous extent simultaneously the memory, creative imagination, and concrete calculation. Among general amateurs who only enjoy the pleasures of the game as a recreation the average duration of life has been computed to be higher than that of men devoted to other pursuits, and of the comparatively few chess experts who have attained eminence as practical masters or authors an exceptionally large proportion have remained in the fullest possession of their mental faculties up to a very old age.

A great number of the most famous men in history have been attracted by the beauties of the game, and greatly favored it as a pastime. Sir Walter Raleigh said that he would not care to survive for one day the loss of his capacity for playing chess. Benjamin Franklin paid it the highest encomium as an intellectual exercise. Goethe, in an adaptation from Diderot, described it as the "touchstone of the human brain." Prince Bismarck once taunted an eloquent opponent in the Reichstag with the remark that "great orators can play neither chess nor whist well," which evidently showed that this eminent statesman had a higher opinion of the logical requirements of intellectual games of skill than of the faculty of oratory. Prince Eugène of Savoy, Frederick the Great, Napoleon I., Emperor William I., von Moltke, Leibnitz, Lessing, Mendelssohn, Voltaire, Rousseau, Alfred de Musset, the two Lyttons, Buckle, Tennyson, Ruskin, and other great celebrities are known to have been warm devotees of chess.

Early History of the Game.—Little is known of the early history of the game and of the time of its introduction into Europe, but all authorities agree that it is of ancient Oriental origin. The Egyptians played two or more games on chequered boards with pieces of different powers, but they were not strictly chess. In the funeral pageants of Queen Isy em Kheb (a contemporary of Solomon) and of Queen Taiti (consort of Amanoph, 1430 B. C.), the squares of the ornamentation are alternately pink and green. Similar relics that might be brought into connection with the invention of the game are referred to in Wilkinson's *Ancient Egyptians*, and in H. Villiers Stewart's *The Tent of an*

Egyptian Queen (London, 1882). Dr. Forbes is of opinion that the Byzantines received the game of chess from the Persians about the beginning of the seventh century of the Christian era, and that it was communicated to some central parts of Europe from Constantinople and from Spain in the next century.

The First Printed Book.—The development and progress of chess has been closely connected with the earliest budding of literature in different languages. A short treatise by Jacobus de Cessolis, entitled *Liber de moribus hominum et officiis nobilium super ludo Scacorum*, written about the year 1300 A. D., was translated into English from a French version of Jehan de Vignay by William Caxton, and brought out in type in 1479 at Cologne, under the title *The Game and Playe of the Chesse*. A second edition was printed by the translator in 1479 in London, and this is undoubtedly one of the first books issued in metal type in England, some writers indeed claiming it to be absolutely the first.

Chess Libraries.—The literary elucidation of the game, with the branches that have developed in different countries, fills, in special chess libraries which have been collected by many amateurs and public institutions, several thousands of volumes, consisting of theoretical works, collections of actually played games, books on endings and problems, chess periodicals, etc. The largest of the well-known chess libraries are those of J. G. White, of Cleveland, O.; Baron von Heydebrand und der Lasa, Wiesbaden, Germany; Charles A. Gilberg, Brooklyn, N. Y.; and Eugene B. Cook, Hoboken, N. J.

Theoretical Works.—Of the most prominent theoretical chess works that have appeared within about forty-five years may be mentioned Bilguer's *Handbuch des Schachspiels*, by Baron von Heydebrand und der Lasa (Leipzig, 1843); *The Chessplayer's Handbook*, by Howard Staunton (London, 1847); *Das grosse Schachhandbuch*, by Zukertort and Dufresne (Berlin, 1871); *Teoria e Pratica del Giuoco degli Schacchi*, by C. Salvioli (Venice, 1885); and *The Modern Chess Instructor*, part i., by W. Steinitz (New York, 1889).

Collections of Games.—Separate collections of games played by masters, with reliable annotations, are most instructive and entertaining to amateurs, and since the inauguration of great public matches between two selected players, or tournaments consisting of short encounters between a large number of competitors, the publication of the games thus played forms a large portion of current chess literature. The most noteworthy books of that description are *Chess Studies, comprising 1,000 Games* (without annotations), edited by George Walker (London, 1844); *Staunton's Chess Tournament* (London, 1852); *Book of the First American Chess Congress*, by G. W. Fiske (New York, 1859), which is especially remarkable as it records the first public exploits of the American chess genius, Paul Morphy; *Morphy's Game of Chess*, by Lowenthal (London, 1860); *The Chess Congress of 1862*, by Lowenthal and Medley (London, 1864); *Transactions of the British Chess Association*, by Lowenthal and Medley (London, 1868); *Congrès International des Échecs*, by Alphonse Féry d'Esclands, with notes by G. R. Neumann and J. A. de Rivière (Paris, 1868); *Der erste Wiener Internationale Schachkongress*, by H. Lehner and C. Schwede (Leipzig, 1874); *London International Chess Tournament*, by J. I. Minchin (London, 1883), with notes by Zukertort, Steinitz, Mason, and Bird; *Sixth American Chess Congress*, by W. Steinitz (New York, 1891); and various books of German chess congresses, by E. Schallopp and other authors (Leipzig).

Chess Problems.—Compositions of problems, which are imaginary end positions leading to mate in a required number of moves, are almost dissociated from the practical game to the formation of a separate art, which has been called the poetry of chess. Philip Stamma, a native of Aleppo, Syria, who was interpreter of Oriental languages to the King of England, is regarded as the father of this modern branch of chess science, which he inaugurated with a collection of 100 artificial end positions, published in 1737, and the same author is the inventor of an ingenious chess notation which has since been adopted all through Germany, and also by writers in other languages, notably by the Italian C. Salvioli. It consists in marking the horizontal squares of the board from left to right with letters from a to h, and the vertical ones, starting from the white side, with figures from 1 to 8. The combination of a letter and figure thus denotes each square precisely.

Problem Tournaments and Composers.—Shortly after the institution of tournaments for players, public competitions, mostly of an international character, were also organized for problem composers in connection with chess congresses or by journals which publish a regular chess column. There are now so many problem composers in different countries, who are recognized to be of the first rank, that it is too difficult to class and enumerate them. But it will perhaps be only fair to distinguish by name problem authors who have won high prizes in international competitions, and who at the same time have been the leaders of problem taste in their published works. They are Ph. Klett and Kohtz and Kockelkorn (joint authors) in Germany; J. Berger, Austria; F. Healy and B. G. Laws, England; S. Loyd, America; E. Pradignat, France; and B. G. Valle, Italy.

Chess Masters, Champions, and Blindfold Players.—For the purposes of comparison between mental operations and physical exercises, it is very remarkable that in chess as well as in sports the relative difference of strength between the highest experts is extremely difficult to determine, and is generally almost imperceptible. The established tests of skill have often produced close results, and it is specially notable that in team matches of players selected by rival clubs or associations, which sometimes number as many as one hundred a side, occasional ties, i. e. equalities in the score of each party, have occurred.

Up to the early part of the nineteenth century chess celebrity was generally assigned only to authors on the game, and of the very few previous public trials of strength between reputed experts which are on record that of the Italian Leonardo, called "El Puttino," who defeated the Spanish chess author, Ruy Lopez, at the court of Philip II., is noteworthy. The distinguished French musical composer, Danican, better known under the name of Philidor, was the greatest chess player and writer on the game of the last century, and he added to his fame, after having frequently played single games from memory without sight of board or men, by successfully conducting in that manner two games a short time before his death in 1795. This has been held to have been the first achievement of the kind until recently, when Prince Dadian of Mingrelia, a distinguished Russian amateur, discovered in the *Histoire Universelle*, by G. Villani, 1559, an earlier record of a blindfold exhibition by a Saracen of the name of Buccca, who about that time played two games without board or men, and one game over the board simultaneously. But this performance, which was at the time considered quite astounding, has been since greatly excelled by various masters. Zukertort played in that way the greatest number of games, i. e. 16, Louis Paulsen 14, Blackburne 12, Tschigorin 10, Morphy and others 8.

Philidor's successor in holding the chess supremacy was De la Bourdonnais, also a Frenchman, whose match games with the best English player of the time, Alexander Macdonnell, were the first to be preserved in a collected form. De la Bourdonnais died in London in 1840, and three years later a great match was organized at Paris between his pupil Saint-Amant and Howard Staunton, of England, which was regarded as of an international character, and involving at least the European championship. The winner of that match, Staunton, after having defeated some players of considerable strength, among them the rising master Harrwitz, at large odds, became the chief promoter of the first international tournament, which was held in connection with the first World's Exhibition of 1851 in London, and was ostensibly intended to settle the championship of the world. But in that tournament, as well as in the numerous subsequent ones which have since been organized, it was found impossible to frame satisfactory rules for the purpose of establishing an undisputed superiority, and such general contests are regarded by the best judges merely as excellent training for aspiring champions, and a personal encounter in a large number of games between two selected players is held to be the superior test. In the first international tournament Prof. Anderssen, of Breslau, was the chief victor, and Staunton took only the fourth prize. The latter had also been defeated by the former in the personal round, but nevertheless Staunton was still distinctly termed in 1858 the "*acknowledged European champion*" in a challenge from Paul Morphy, of New Orleans, the most precocious genius that has ever appeared in the chess arena.

Morphy's famous tour to Europe took place in the same year, at the end of which he had defeated Lowenthal, Harrwitz, and Anderssen in matches, as well as other foremost players in off-hand games, so decisively that the title of champion of the world was assigned to him, though his

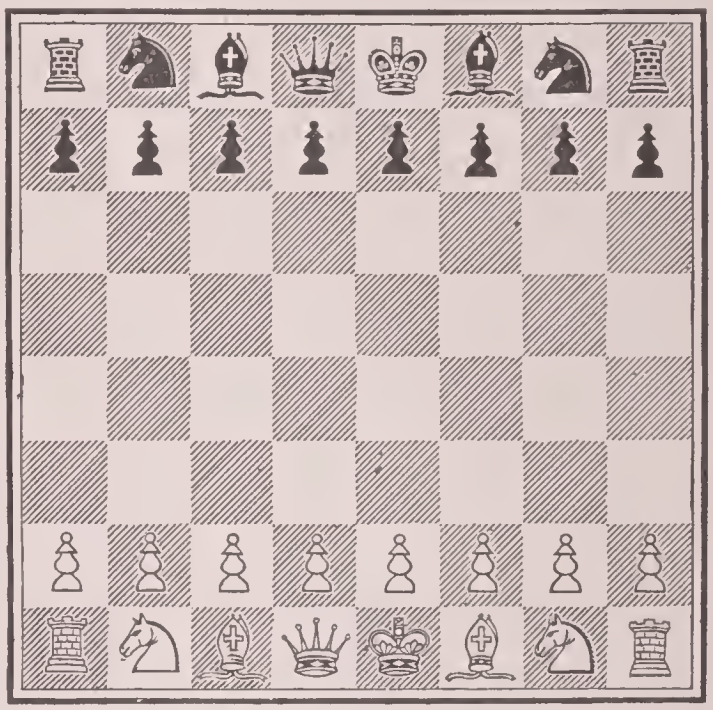
desired match with Staunton did not come off, owing to the latter's unwillingness to play. After his return to his native city the young master retired from chess practice, chiefly on account of a nervous disorder which was due to private misfortunes, and perhaps in some measure to mental overwork at an early age. He died in July, 1884. Staunton also retired in 1858, and he died in 1874.

In 1866 Steinitz, an Austrian born, but resident in the U. S. since 1883, won the championship of the world in a match in London against Prof. Anderssen, and successfully defended the title until 1894 in various great matches, of which the most notable were those against Zukertort in London, 1872; Blackburne in London, 1876; Zukertort again in New York, St. Louis, and New Orleans, 1886; Tschigorin in Havana, 1889; Gunsberg in New York, 1891; and Tschigorin again in Havana, 1892. In 1894 he was beaten by Lasker. Though he has not competed in any tournament since 1883, Steinitz held the best average record in tournaments according to the last computation published in 1891 by W. Sonneborn, the inventor of an ingenious and recognized mathematical system for the purpose. Steinitz has also won the greatest number of consecutive games in any single tournament.

The chief rivals of these champions, besides their respective opponents already named, who either had no opportunity of showing their fullest force or else fell short of the highest success, were, in chronological order, Baron von Heydebrand und der Lasa, Buckle, Hamppe, Neumann, Winawer, Englisch, Burn, Mackenzie, and Weiss. At the present time two most remarkable young players are in the field, both natives of Germany—Dr. Tarrasch, of Nuremburg, and E. Lasker, formerly of Berlin, but now resident in England. The former won in succession the three tournaments of Breslau in 1889, Manchester in 1890, and Dresden in 1892. Each of those tournaments consisted only of one round, and they were also inferior as public tests to the double-round tournaments of London, 1883, and New York, 1889, in reference to strength of competitors. But the succession of victories on the part of the German master is an astounding one, and is much enhanced by the fact that he only lost one single game in the last tournament, but otherwise won or drew all other games in the three competitions. He has, however, never played a match against any first-class player. Lasker has made a record which ranks him among the greatest masters of the day. He has beaten such players as Mieses, Englisch, and von Bardeleben, has won two tournaments in England without losing more than one game, and has defeated Blackburne and Bird in matches without a single game being scored against him. In 1894 he defeated Steinitz in a match for the championship of the world.

Inexhaustibility of Chess.—The infinite variety of possible combinations in playing the game affords opportunities for the exercise of the highest ingenuity. Starting on the basis that the first player has twenty different moves at his disposal, for which, however, only the pawns and the two knights are available, while the other pieces are blocked according to the laws of the game, and that the opponent has twenty different replies, under the same restrictions for each one, it is clear that the first move on each side, without going any farther, can be made in 400 different ways! This number is therefore the unit in the arithmetical progression for calculating the total of possible combinations that may arise in playing the game. Mathematicians have been unable to arrive at an exact figure, but Edwyn Anthony, of Hereford, in an article published in the *Chess Players' Chronicle*, 1878, has computed approximately that the number of ways of playing only the first ten moves on each side is 169,518,829,100,544,000,000,000,000,000,000.

Hints for Learners.—From such an appalling product of reckoning, which after all only applies to the opening portion of the game, the difficulties in mastering its intricacies would seem to be insurmountable. But experience has proved that this practically illimitable number of combinations presents no more serious general difficulty to the acquirement of proficiency in the game of chess than it does in the art of music, which theoretically is also of infinite variety. By adopting a reasonable method of training, it requires in reality no greater effort of mind or expenditure of time to learn the game sufficiently for the purpose of thorough enjoyment and appreciation of its attractions as a foundation for further improvement than a similar qualification for other accomplishments. Our advice on the subject must of necessity be very brief, and we shall confine ourselves to the most important points. After having obtained the necessary elementary knowledge in reference to the movements of the pieces and the laws of the game, the learner should alternate practice and study with the greatest regularity. Tuition under competent instructors and actual play with superiors will be of the greatest assistance. The study should consist chiefly in learning the openings and in playing over attentively selected games of first-class masters, with analytical comments by annotators of the highest repute. But the solving of real or artificial game endings and problems will also be found of great service. In practicing over the board the learner should very early begin to play on even terms against the strongest opponents available, without in the least minding even the certainty of defeat for a long time. The play with full forces is of an entirely different character, most notably in the openings on both sides, to that at odds, and a much better training is afforded to the student in competing on equal terms than by habituating himself to start with an exceptional advantage. By adopting these methods systematically a player will soon acquire knowledge and judgment of position that will fit him to attain a high stage of excellence.



Elementary Description of the Game.—The above diagram shows the board and men arranged for starting play between two parties. It should be specially noticed that each side has a white square on his right hand corner, and that the white queen is placed on a white square and the black queen on a black square.

Notation.—The abbreviated signs for the pieces and pawns in recording the scores of games or in print are K for king, Q for queen, R for rook, B for bishop, Kt for knight, and P for pawn. In the opening of the game and sometimes throughout it is necessary to distinguish specially the pieces on each side, thus, KR for king's rook, QR for queen's rook, KKt for king's knight, etc. In designating the pawns the letter P is added to the name of the piece which he fronts. For instance, QRP for queen's rook's pawn, KKtP for king's knight's pawn, KP for king's pawn.

The squares are described by adding sq to the initial letters of the piece placed at starting on the front row, the figure 2 for the second row, the figure 3 for the third row, and so on up to the figure 8, each party counting from his own first or front row to the top. Thus, for instance, the square on which the king's bishop stands would be marked KB sq if white places any man on that square, and KB8 when black plays a man to that square. (The figure 1 is also sometimes used instead of sq, or either is left out altogether when a square on the first or front row is alluded to.) The fourth square on white's fifth row, counting from left to right, would be called K4.

The object of the game is to "checkmate" the adverse king, which means to attack him in such a manner that he can not effect his escape. If the king and all other pieces are blocked in a position in which the said king is not attacked or "in check," it is a "stalemate," and the game is drawn.

Movements of Men and Captures.—The men move to vacant squares, and, with the exception of the knight, can pass

over only unoccupied squares. A capture is effected by removing the adversary's man and replacing it with the capturing man. All captures are optional, excepting when checkmate can not otherwise be avoided. The king is of paramount importance, but his powers in play are limited, and he is weaker for the purposes of co-operation than queen or rook, but stronger than bishop or knight. He is the only piece that is not allowed to "place himself in check," which means to expose himself to capture. The king moves to any adjoining square only, and captures in the same way unprotected pieces. Once during the game the king may "castle." This is effected with either rook when no piece intervenes, the king not being in check, nor moving into check, nor passing any square commanded (attacked) by an adverse piece, by placing the rook on the square next to the king, and then crossing over with the king to the square next to the rook. Either the king first or simultaneously king and rook should be touched in carrying out that process. Castling with the queen's rook is described in the notation by 0–0–0 (adopted from the German), or "Castles QR" or "Castles Q side"; the sign for castling with the KR is 0–0, "Castles KR" or "Castles K side."

The queen is the most powerful piece on the board. She moves straight in all directions, horizontally, vertically, and diagonally, as long as she passes on unoccupied squares, or until she replaces an adverse man by capturing it.

The rooks move and capture horizontally and vertically, but not diagonally.

The bishops, which are slightly superior to the knights, move or capture diagonally in any direction, and in consequence a bishop always remains on squares of his original color.

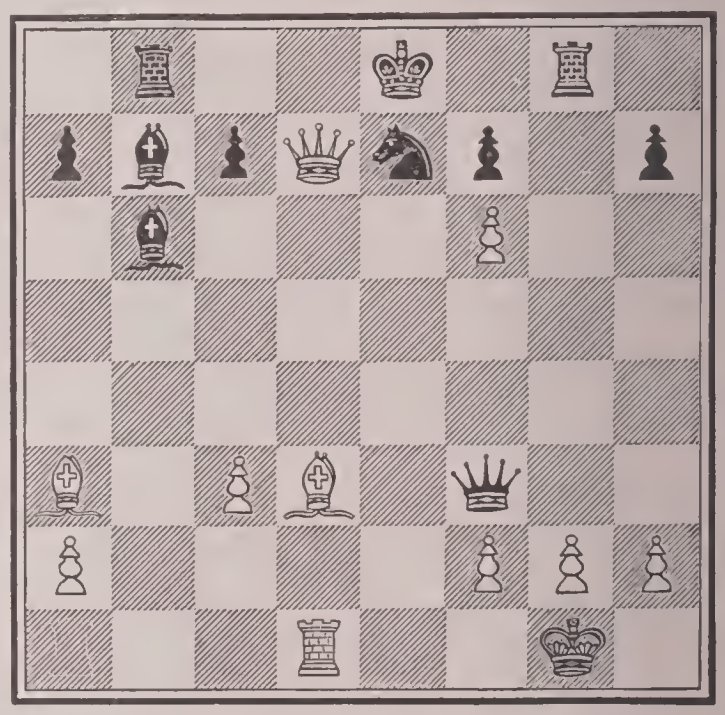
The movement of the knight, or its method of capturing, combines one move square and one oblique, landing the piece on any third square of opposite color from the starting-point, with power of overleaping men of either side. In the position in the above diagram either knight may move to B3 or R3 on the corresponding side; in the middle of a free board a knight has eight moves.

The pawn moves, if for the first time, one or two squares forward at the option of the player, but afterward only one square at a time forward. He captures, however, only on one of the two diagonal squares in front. Exceptionally, when a pawn stands on a fifth square, and the opponent, in accordance with his option, plays one of the adjoining pawns two squares, the former *may* capture the same as if the hostile man had only been moved one square. This is called "taking a pawn in passing," or "*en passant*," for which the abbreviation is e. p. The privilege of capturing *en passant* and the respective liability to being captured in that way is absolutely confined to pawns. A pawn on reaching the eighth square, counting from the front row of the same color, may be promoted into any piece of the same color, excepting the king. A player may therefore have two or more queens, three or more rooks, knights, or bishops, simultaneously on the board in the course of the game. . According to the code of laws of the British Chess Association of 1862 a player has the option of allowing such a pawn to remain unmovable, but liable to capture. The practical utility of such a case is hardly likely to arise in actual play, and this law is only of importance in reference to construction of problems.

Modern Style and an Old Masterpiece.—It is now established beyond any doubt, chiefly through the best practical examples of modern masters and the more recent researches of theorists, that scientifically correct play must be based on steady development and circumspection with the view of holding the balance of position at all points without sacrificing any material, and that the first move or the attack is only sufficient to secure a draw, which by best play on both sides should be the legitimate result. It is also now generally accepted that the king is a strong piece both for attack and defense, and early aggressions in his direction are mostly premature. Yet the slightest strategical fault will often justify brilliant sacrifices of heavy material that will result in the recovery of more valuable force, or even in checkmating the opponent. Theoretical analyses and practical expositions of masters have often produced charming complications of that description, which will always prove most entertaining to the student. One of the finest specimens of that character is the subjoined game, which was played between Prof. Anderssen, one of the world's champions about forty years ago, and Herr Dufresne, one of the strongest players of that time and a distinguished chess author. The opening, an "Evans gambit," is named after its inventor, Capt. Evans, the word gambit meaning the early sacrifice of a pawn for the attack.

(– represents the word "to," ch "check," dbl ch "double check," dis ch "discovered check," and × "takes.")

A. Anderssen.	J. Dufresne.
WHITE.	BLACK.
1. P–K4	1. P–K4
2. KKt–B3	2. QKt–B3
3. B–B4	3. B–B4
4. P–QKt4 (*a*)	4. B × KtP (*b*)
5. P–B3	5. B–R4
6. P–Q4 (*c*)	6. P × P
7. Castles	7. P–Q6 (*d*)
8. Q–Kt3	8. Q–B3
9. P–K5	9. Q–Kt3 (*e*)
10. R–K sq	10. KKt–K2
11. B–R3	11. P–Kt4 (*f*)
12. Q × P	12. QR–Kt sq
13. Q–R4	13. B–Kt3 (*g*)
14. QKt–Q2	14. B–Kt2
15. Kt–K4	15. Q–B4 (*h*)
16. B × QP	16. Q–R4 (*i*)
17. Kt–B6 ch (*j*)	17. P × Kt
18. P × P	18. R–Kt sq
19. QR–Q sq (*k*)	19. Q × Kt
20. R × Kt ch	20. Kt × R (*l*)
21. Q × QP ch	21. K × Q
22. B–B5 dbl ch	22. K–K sq
23. B–Q7 ch	
and mates next move (*m*).	



NOTES.

(*a*) This move constitutes the gambit named above, and it leads to a variety of most interesting combinations in theory and in practice.

(*b*) Some authorities hold that the gambit ought to be refused by B–Kt3, and no doubt black obtains at least an equal game by that retreat.

(*c*) The Russian master, Tschigorin, prefers castling at this juncture to the present more hazardous attacking line, which gives up another pawn. The latter was, however, in general favor among experts at the time this game was played.

(*d*) Herr Dufresne's favorite defense, but P × P has been since established as superior, though it still leaves white with a very strong attack.

(*e*) 9 . . . Kt × P would at least lose a piece by 10 R–K sq, 10 P–Q3; 11 Kt × Kt (the attack might also be continued with 11 B–KKt5); 11 . . . P × Kt; 12 Q–R4 ch and wins.

(*f*) Castling was undoubtedly preferable. The counter-attack is premature.

(*g*) He could not castle now on account of the reply B × Kt, winning a piece.

(*h*) Loss of time, which was of great importance in this precarious position; 15 . . . Kt–Q5; 16 KKt–Kt5, 16 Kt–K3; 17 B × P, 17 Q–R4 was probably his best resource.

(*i*) The queen was now in danger by Kt–B6 ch.

(*j*) The initiation of a most elegant and profound combination.

(*k*) The key-move to one of the most beautiful problems that has ever been constructed in actual play.

(*l*) Even if he had divined white's magnificent plan, which more clearly reveals itself on the next move, he could not have saved the game, for if 20 . . . K–Q sq, 21 R × QP ch, 21 K–B sq (best, or if 21 . . . K × R white soon forces mate by B–B5 dbl ch), 22 R–Q8 ch, and if

22 . . , Kt × R ; 23 Q–Q7 ch and mates in two more moves, while if 22 . . . K × R ; 23 B–B5 dis ch and wins.

(*m*) Wherever the king moves to the reply B × Kt effects mate.

W. Steinitz.

Chest, or **Tho'rax**: the part of the body between the neck and the abdomen. It is a conical casement formed of bones and cartilages joined together by muscles and other soft tissues. It contains the heart and the great blood-vessels, the lungs, œsophagus, various nerves, and other less important structures. The windpipe and the venous trunks of the head, neck, and arms enter the upper portion, which is bounded by the top of the sternum in front, by the first rib at the sides, and by the first thoracic vertebra behind. In the expanded part of the chest are the lungs, one to either side, and in the space between the lungs, more toward the front than the back, is the heart and the great vessels leading to and leaving it. This portion of the chest is bounded by the sternum and costal cartilages and the ribs in front, by the ribs at the side, and by the thoracic portion of the spine behind. The lower opening of the thorax is closed by the diaphragm, a musculo-membranous structure attached to the end of the sternum in front, the ribs at the sides, and the spine behind. The diaphragm arches upward into the thorax, but moves up and down with the respirations.

The thorax, as a whole, is broader from side to side than from before backward. It changes its shape with the breathing, becoming expanded by the elevation of the sternum and ribs during inspiration, and contracted and depressed during expiration. In pure abdominal breathing the external shape of the thorax changes but little, while internally the capacity is increased and decreased by the descent and ascent of the arching diaphragm.

Deformities of the thorax are very common, and usually result from disease affecting the bones in early childhood, such as rickets. A marked form of rachitic or rickety deformity is that known as "chicken-breast," in which the chest is compressed laterally, and the sternum and anterior margins of the ribs may be made to protrude. With persons who suffer with very long abdominal disease during childhood, the lower part of the chest is frequently much expanded; in individuals of phthisical tendency the chest is prone to be flattened and elongated. The potent cause of deformity of the chest, which has frequently been overlooked, is the "mouth-breathing," resulting from chronic nasal disease in childhood. The insufficient chest expansion leads to gradual deformity of the chest, resembling "chicken-breast." In spinal disease, particularly in kyphosis or hunchback, marked deformities occur. Emphysema and asthma lead to a barrel-like deformation of the chest. Chest deformities while they are found resulting from disease may also contribute to the occurrence of disease by interfering with proper breathing and circulation. Such effects may be obviated, and the deformities themselves may be removed by systemic exercise and by general care of the health.

William Pepper.

Ches'ter, or **Chesh'ire**: a maritime county of England; bounded N. by Lancashire, from which it is separated by the Mersey, N. E. by Yorkshire, E. by Derbyshire and Staffordshire, S. by Shropshire and Denbighshire, W. by Flintshire, and N. W. by the Irish Sea. It has a coast on the Irish Sea and the estuaries of the Dee and Mersey. Area, 1,027 sq. miles. The surface is mostly level and well wooded; the soil is a fertile clayey or sandy loam adapted to grazing and dairy farming. The surface-rock is new red sandstone. The chief rivers besides the Mersey are the Dee and Weaver. Coal, copper, and lead are found in the county. Salt is mined in large quantities. Here are many extensive dairies; the quantity of cheese made annually is estimated at about 15,000 tons. Chester has a good system of canals and is traversed by several railways. Capital, Chester. The other chief towns are Macclesfield, Stockport, and Birkenhead. In 828 A. D. Egbert annexed Chester to his kingdom. William the Conqueror erected it into a county palatine. Pop. (1891) 535,944; (1901) 601,042.

Chester: an episcopal city of England; capital of the county of Cheshire; on the right bank of the Dee; 22 miles from the sea and 16 miles S. S. E. of Liverpool (see map of England, ref. 8–F). It has a large railway station at which several lines of railways converge. The town is built on a rocky sandstone elevation, and is entirely inclosed within ancient and massive walls, nearly 2 miles in length. In the four principal streets are to be seen the most striking feature of the town. The space in front of the second stories of the houses, which are used for shops, forms a covered way for foot-passengers called the "rows." Chester has an old and massive sandstone cathedral 375 feet long, with a tower 127 feet high. Among its other edifices are a castle and St. John's church, the latter supposed to have been founded in 698 A. D., and now partially in ruins. Here is a stone bridge across the Dee with a single arch 200 feet in span. Chester has a public library, a museum, and a theater. It returns a member to Parliament. There are lead and iron works, and shoes are manufactured. Cheese, coal, copper, and cast iron are exported from this point by the river, which is navigable for small vessels. Chester occupies the site of an important Roman station called *Deva* (or *Devana*) *Castra*. Pop. (1891) 37,105; (1901) 36,281.

Chester: a port of entry; post-village and township of Lunenburg co., Nova Scotia; 45 miles W. by S. of Halifax; on Chester Basin, which is studded with numerous islands (see map of Quebec, etc., ref. 3–B). Its manufactures and fisheries are important. The village of Chester Basin, 5 miles distant, is also celebrated for its beauty. Pop. 3,000.

Chester: city; capital of Randolph co., Ill. (for location of county, see map of Illinois, ref. 10–D); on Wab., Chest. and West. R. R., and on the Mississippi river; 76 miles below St. Louis. It is the shipping-point for the Chester coal-fields. It has rolling-mills, foundries, flour-mills, and an elevator. Pop. (1880) 2,580; (1890) 2,708; (1900) 2,832.

Chester: a city (incorporated in 1866); Delaware co., Pa. (for location of county, see map of Pennsylvania, ref. 6–J); on B. and O., Phil. and Read., and Phil., W. and B. R. Rs., and on the Delaware river; 15 miles W. S. W. of Philadelphia. It was settled by the Swedes in 1643, and is the oldest town in the State. In Chester are fine schools, 16 churches, large ship-yards, and manufactures of woolen and cotton goods, metals, etc. The Pennsylvania Military Academy is in the city, Crozer Theological Seminary (Baptist) in Upland, and Swarthmore College (Friends) a short distance outside the city. Adjacent are the boroughs of Upland and South Chester, which have considerable manufactories. Pop. (1880) 14,997; (1890) 20,226; (1900) 33,988. Editor of "Times."

Chester: town; capital of Chester co., S. C. (for location of county, see map of South Carolina, ref. 4–E); 65 miles N. N. W. of Columbia, the State capital; is in a cotton-raising region. Pop. (1880) 1,899; (1890) 2,703; (1900) 4,075.

Chester: town; Windsor co., Vt.; on the Williams river, and the Rutland Division of the Central Vermont Railway; 39 miles S. E. of Rutland (see map of Vermont, ref. 7–C). Here are manufactures of chair stock, lumber, soapstone finish, and a fine soapstone quarry. Pop. of township (1880) 1,901; (1890) 1,787; (1900) 1,775; village, 950.

Chester, Colby M.: captain U. S. navy; b. in Connecticut in 1845; graduated at the Naval Academy as ensign in 1863. He served in the steamer Richmond at the battle of Mobile Bay Aug. 5, 1864, and was commended "for coolness and courage" by the commanding officer of that vessel, Capt. Thornton A. Jenkins, in his official report to Rear-Admiral Farragut of the part taken by the Richmond in the battle. Was hydrographic inspector of the coast survey 1881–85; captain June 12, 1896.

Chester, Joseph Lemuel: antiquary; b. in Norwich, Conn., Apr. 30, 1821. He has published *Greenwood Cemetery, and other Poems* (1843); a treatise on *The Law of Repulsion* (1853); *Educational Laws of Virginia*, etc. (1854), and other works. He was afterward engaged in the publication of all the marriage, burial, and baptismal registers of Westminster Abbey, with annotations. D. in London, May 28, 1882.

Chester Court-house, S. C.: See Chester.

Ches'terfield: a town of Derbyshire, England; 24 miles by railway N. N. E. of Derby (see map of England, ref. 8–H). It has a church built in the thirteenth century, with a remarkable twisted spire 230 feet high. Here are manufactures of silk and cotton stuffs, laces, hosiery, earthenware, and machinery. Mines of coal, lead, and iron are worked in the vicinity. Pop. (1891) 13,242.

Chesterfield Inlet: a long and narrow inlet of British America; extends westward from the northern part of Hudson's Bay. It is about 250 miles long, and 25 miles wide at the broadest part. It incloses many islands.

Chesterfield, Philip Dormer Stanhope, Fourth Earl of: an English author and courtier distinguished for his wit and politeness; b. in London, Sept. 22, 1694. He was the eldest son of Philip the third earl and Elizabeth Saville, who was a daughter of the Marquis of Halifax. He studied

at Cambridge, made a tour on the Continent in 1714, and was elected a member of Parliament in 1715. In 1726 he inherited the earldom and passed into the House of Lords. He became an eloquent debater, and gained distinction by his graceful manners and fine taste. In 1733 he married Melusina Schulemburg, Countess of Walsingham. He was a strenuous opponent of Sir Robert Walpole about 1734–40, was appointed Lord-Lieutenant of Ireland in 1745, and one of the principal Secretaries of State in 1746. He resigned office in 1748. He was intimate with Pope, Swift, Voltaire, and Bolingbroke. His reputation as a writer is founded chiefly on his *Letters to his Son* (1774), the style of which is much admired. "Take out the immorality," said Dr. Johnson, "and it should be put into the hands of every gentleman." D. Mar. 24, 1773.

Chestertown: seaport; capital of Kent co., Md. (for location of county, see map of Maryland, ref. 2–G); on Balt. and Del. Bay, and on the right (west) bank of Chester river; about 30 miles E. of Baltimore. It is the seat of Washington College. Pop. (1880) 2,359; (1890) 2,632; (1900) 3,008.

Chestnut, ches'nŭt (in Lat. *castanea*; Fr. *châtaigne*): a forest-tree of the family *Cupuliferæ*. The genus *Castanea* is distinguished by having sterile flowers interruptedly clustered in long and naked cylindrical catkins, and coriaceous and farinaceous ovoid nuts inclosed in a hard and prickly four-valved involucre. The *Castanea sativa* is a large tree growing wild in Europe, while its variety *americana* grows in the U. S. from Maine to Michigan and Alabama. It prefers a dry, light soil, and usually grows in hilly districts. It has oblong-lanceolate and pointed leaves, serrate with coarse pointed teeth, and smooth and green on both sides. Each involucre (called the bur) contains from one to three edible nuts, often compressed and flattened on one or both sides. The wood is light and coarse-grained, but durable, is a valuable material for fences, and is much prized for finishing rooms. The chestnut is an ornamental and stately tree, and in Europe attains a great age. A chestnut-tree on Mt. Etna was celebrated for its longevity, and is said to have measured 200 feet in circumference. The fruit of the Spanish chestnut is larger than that which grows in the U. S. Chestnuts form an important article of food in France and other countries of Southern Europe, where they are cultivated and used either roasted or boiled. The best variety of French chestnuts is called *marron*. The chinquapin (*Castanea pumila*) is a small tree indigenous in the Southern U. S. from Pennsylvania to Florida, Indian Territory, and Texas. The nuts are good to eat, but are not so large as chestnuts. The genus *castanopsis* includes fourteen species of chestnut-like Asiatic and West American trees, of which *C. chrysophylla*, an evergreen Californian species, and *C. argentea* of Java are good representatives.

Chetimach'es Lake, or **Grand Lake**: in the southern part of Louisiana, between the parishes of St. Mary's and St. Martin's. It is about 40 miles long; too shallow for navigation. It is an expansion of the Atchafalaya Bayou.

Cheto'pa: a city; Labette co., Kan. (for location of county, see map of Kansas, ref. 8–J); $2\frac{1}{4}$ miles N. of the Indian Territory line; on Mo., Kan. and Tex. and Mo. and Pac. R. Rs., and on the Neosho river. It has flour-mills, a foundry, 2 fine school-buildings, 4 churches, and electric lights, etc. A fine building-stone is found immediately S. of the city. Pop. (1880) 1,305; (1890) 2,265; (1900) 2,019.

EDITOR OF "ADVANCE."

Chevalier, she-vă'li-ay', MICHEL: political economist; b. at Limoges, France, Jan. 13, 1806. He was sent to the U. S. in 1832 to examine the American railroads, and published in 1836 *Letters on North America*. Among his important works is one entitled *On the Material Interests of France* (1838). He became an advocate of free trade. In 1840 he was appointed Professor of Political Economy in the College of France, and in 1841 chief engineer of mines. He was deprived of these places by the republicans in 1848, but was reinstated by Napoleon in 1852; wrote on the organization of labor against socialism. In 1851 he was admitted into the Institute. He was the author of *History and Description of the Ways of Communication in the United States* (2 vols., 1840–42); *Mexico, Ancient and Modern* (1863), and other works. D. in Montpellier, Nov. 28, 1879.

Chevaux-de-Frise, she-vō'de-frēz': a French military term used also in English; applied to large and strong pieces of timber, from which wooden or iron spikes project in various directions. They are employed to impede the advance of cavalry or of a storming-party in a fortified place. Sometimes the cheval-de-frise consists of an iron tube, 6 feet long, in which there are twelve holes. The same number of spears are kept in the tube, and when required for use are inserted in the holes.

Chevaux-legers, -lā'zhā' (i. e. light horse): a company of light cavalry created by Henry IV., and used by him as a kind of household troops. The company consisted originally only of 240 men, all noblemen, and ranked next the *garde du corps*. Afterward several other companies were added, and the name became very celebrated until, in 1779, it disappeared from the French army-rolls, the companies having been incorporated with the regular regiments of dragoons. Meanwhile the name had crossed the Rhine, and not only the minor princes of Germany but even Austria created companies of chevaux-legers. The name is frequently met with in accounts of the Napoleonic wars, and was much used in Germany, but has now disappeared there too.

Cheverus, shev'*e*-rŭs, or (Fr. pron.) shev'rüs', JEAN LOUIS ANNE MADELEINE LEFEBVRE, D. D.: a French cardinal and philanthropist; b. at Mayenne, Jan. 28, 1768. Imprisoned by the revolutionists, he fled to England on his release in 1792; surrendered his fortune to his relatives and migrated to Boston in 1796 as a missionary. Here he endeared himself to the people by his kindly relations to Protestants, who aided him in building churches, by his humane work among the poor and those stricken by pestilence, by his self-impoverishing generosity, and by his support of educational institutions. He was one of the founders of the Boston Athenæum; was appointed Bishop of Boston, Mass., in 1808; returned to France in 1823 on account of his health; was made Bishop of Montauban; Archbishop of Bordeaux in 1826, and a cardinal in 1835. D. in Bordeaux, July 19, 1836. See his *Life* by J. Huen-Dubourg (Paris, 1837; 3d ed. 1842; Eng. trans. Boston, 1839).

Cheves, cheevz, LANGDON, LL. D.: statesman and lawyer; b. in Abbeville district, S. C., Sept. 17, 1776. He was a member of Congress from 1811 to 1816, and was Speaker of the House of Representatives during one session (1814–15). In this position he voted against the bill to recharter the U. S. Bank in 1815, but he was afterward president of that bank (1819–22); also a supporter of nullification in South Carolina. D. in Columbia, June 25, 1857.

Chev'iot Hills: a mountain-range extending along the border between England and Scotland. The range is about 35 miles long. Its direction is nearly N. E. and S. W. The highest point is Cheviot Peak, which rises 2,676 feet above the level of the sea. The rocks of which the range is formed are porphyry, trap, and mountain limestone. Grouse abound on these hills, which afford good pasture, and are grazed by sheep, called Cheviots, which are famed for their wool. Their name is connected with the ballad of Chevy Chase and many incidents of border warfare.

Chevreul, she-vröl', MICHEL EUGÈNE, LL. D.: chemist; b. at Angers, France, Aug. 31, 1786; published in 1823 *Chemical Researches on Fat Substances of Animal Origin*, which did much to promote industries, and became director of the dyeworks at Gobelin in 1824. He succeeded Vauquelin as Professor of Applied Chemistry in the Museum of Natural History in 1829. He published in 1839 an important work *On the Law of the Simultaneous Contrast of Colors and the Distribution of Colored Objects*. Among his other works is *Lectures on Chemistry Applied to the Art of Dyeing* (1831). D. Apr. 10, 1889.

Chevron, shev'rŭn [Fr., rafter, from a deriv. of Lat. *caper*, goat, i. e. leap of a goat]: an ornament and badge of rank of gold or silver lace, or of braid, worn on the sleeve, deriving its name from its resemblance in form to a pair of rafters. It is of French origin, and has been used to denote periods of service in the ranks (*chevrons d'ancienneté*) or the rank of non-commissioned officers. The corporals and the various grades of sergeant have from one to four chevrons, of different colors in different branches of the service.

CHEVRON, in heraldry, an ordinary representing the rafters of a house, and generally denoting the foundation of his own family by the bearer. The chevron is formed of two lines, joined at the top, and descending to the extremity of the field in the form of a pair of rafters.

CHEVRON, or ZIGZAG MOLDING, in architecture, a molding in the form of a succession of chevrons. In general it

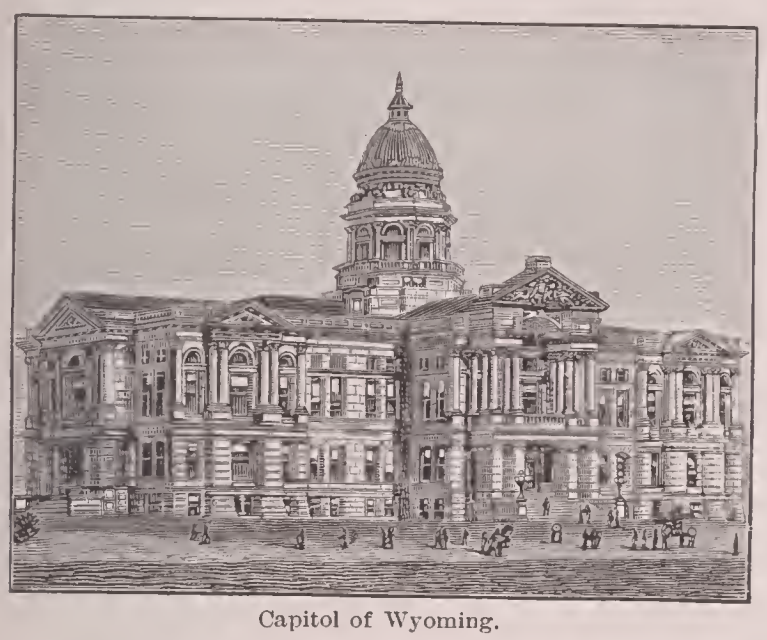
is characteristic of Norman architecture, but is also found during the transition period from Norman to Early English.

Chev'y Chase: one of the most famous of British ballads, recounting an affray between the Douglas and the Percy on the Scottish border. In its present form the piece does not seem to be older than the beginning of the seventeenth century. But a much earlier version exists under the title *The Hunting of the Cheviot*. See Skeat, *Specimens of Early English Literature*, part iii.

Revised by H. A. Beers.

Chewink', Ground Finch, or **Tow'hee Bun'ting** (*Pipilo erythropthalmus*): a very common passerine bird of the U. S. and Canada; glossy black, with breast and abdomen white, and with the sides and lower tail-coverts rufous. It nests on the ground, and flies with a peculiar jerking motion.

Cheyenne, shī-en': city and railroad center; capital of State of Wyoming and of Laramie County (for location of county, see map of Wyoming, ref. 12–L); situated 106 miles N. of Denver and 516 miles W. of Omaha. Elevation,



Capitol of Wyoming.

6,075 feet. It has the main railroad-shops of the Union Pac. R. R. system (employing 600 mechanics), a fine capitol building, water-works, a beautiful park, three artificial lakes, a public library, and a $40,000 high-school building. This is the great beef-growing center, the shipping-point for beef-cattle to Eastern markets, and the supply dépôt for the trade of the Rocky Mountain region. Pop. (1880) 3,456; (1890) 11,690; (1900) 14,087. Editor of "Sun."

Cheyennes: See Algonquian Indians.

Cheyne, Thomas Kelly, D. D.: exegetical scholar and author; b. in London, Sept. 18, 1841; educated at Merchant Taylors' School and at Worcester College, Oxford; Kennicott Hebrew scholarship 1863; Pusey and Ellerton Hebrew scholarship 1864; member of the Old Testament Revision Committee; ordained 1864; Oriel Professor of Interpretation at Oxford, with canonry of Rochester attached, 1886; fellow of Balliol College 1868; Bampton lecturer 1889. Author of *Notes and Criticisms on the Hebrew Text of Isaiah* (1868); *The Book of Isaiah Chronologically Arranged* (1870); joint editor of *The Holy Bible* (Authorized Version) *with various Renderings and Readings from the Best Authorities* (1876); *The Prophecies of Isaiah, a new Translation with Commentaries and Appendices* (1880–81; 3d ed. 1884); *Micah and Hosea*, in *The Cambridge Bible for Schools* (1882–84); *Exposition of Jeremiah in Pulpit Commentary* (1883–84); *The Book of Psalms*, translated in *The Parchment Library* (1884); *Job and Solomon* (1887); *The Book of Psalms*, a new translation with commentary (1888); *The Hallowing of Criticism* (1888); *Jeremiah, his Life and Times* (1888); *Aids to the Devout Study of Criticism* (1892). Prof. Cheyne has contributed numerous articles to the *Encyctopædia Britannica*, and has been prominently known as one of the English representatives of Ewald's school of criticism and exegesis. In 1889 he delivered the Bampton Lectures on *The Historical Origin and Religious Ideas of the Psalter*, which were published in 1890. W. S. Perry.

Chézy, shăy'zee', Antoine Léonard, de: b. at Neuilly, France, Jan. 15, 1773; educated in the Polytechnic School of Paris; studied Arabic, Persian, and other Oriental languages under de Sacy and Langlès; was appointed to accompany Napoleon to Egypt in 1799, but fell sick in Toulon, and was compelled to return home; became conservator of the Oriental manuscripts in the National Library in 1799, and Professor of Sanskrit in the Collège de France in 1814. He made a translation of *Medschnun and Leila* in 1807, and an edition and translation of *Sacuntala* in 1830. D. in Paris, Aug. 31, 1832. C. R. Lanman.

Chhatisgarh': the easternmost of the four districts of the Central Provinces, British India; between lats. 17° 50′ and 23° 10′ N., and lons. 83° 30′ and 85° E. Area, 25,013 sq. miles. It consists of three districts, Raipur, Bilaspur, and Sambalpur, and thirteen feudatory states, the latter comprising about one-third of the area. Pop. (1891) 3,537,350, of whom about 62 per cent. are Hindus.

Chhindwa'ra: a district of Nerbudda, Central Provinces, British India; between 21° 25′ and 22° 50′ N. lat., and 78° and 79° 30′ E. lon.; on the southern slopes of the Salpura Mountains. Area, 3,915 sq. miles. There are very extensive forests in the district, and coal has been discovered in great abundance. The climate of the upper part is temperate and healthy, and ice frequently forms in the tanks. The average annual rainfall is about 36 inches. Pop. about 400,000, of whom two-thirds are Hindus. The principal town and administrative center is Chhindwara, situated in the wooded district and among the hills at an elevation of 2,200 feet. It is a favorite European health resort. Pop. 10,000.

Chiabrera, kĕĕ-ăă-brā'răă, Gabriello: an Italian lyric poet; b. at Savona, June 8, 1552. Reaching maturity at a time when the creative force in Italian literature had nearly spent itself, he endeavored to find new inspiration in the Greek lyric poets, especially Pindar and Anacreon. He strove to imitate the grandeur of the one, the grace of the other. His contemporaries thought him to have succeeded, and esteemed him the discoverer of new poetic worlds. In fact, however, his verse is mainly rhetoric, and one may read far in it without finding a single touch of true imagination. His greatest success was in his numerous odes and canzoni, above all in his *canzonette*. His attempts at epic poetry, in imitation of Vergil and Homer, *La Gotiade*, *La Firenze*, *l'Amadeide*, *Il Ruggiero*, had comparatively little effect even in his own time, and are now almost unreadable. His twenty-two *poemetti* on profane subjects and fourteen on sacred subjects are equally impossible. D. Oct. 14, 1637. See *Vita de G. Chiabrera*, by himself (Milan, 1821). His works are to be found in the series *Ctassici Itatiani* (Milan, 3 vols., 1807–08). A. R. Marsh.

Chiapanecs: See Indians of Central America.

Chiapas, chĕĕ-aa'păăs: a state in the southeast part of the Mexican confederation. Area, 27,222 sq. miles. It is bounded N. by Tabasco, E. by Guatemala, and W. by Tehuantepec. It exports cocoa and vanilla. Extensive and remarkable ruins of an ancient city are visible at Palenque in this state. Pop. (1895) 315,120. Capital, San Cristóbal.

Chiari, kĕĕ-aa'rĕĕ: a town of Italy; province of Brescia; on the railway from Milan to Brescia; 11 miles W. of the latter; was formerly fortified (see map of Italy, ref. 2–C). It has several churches and manufactures of silk fabrics. Pop. 10,507.

Chiari, Giuseppe: painter; b. in Rome in 1654; pupil of Galliani and M. Maratta; worked in the church of Montesanto, Marcaioni chapel, S. Maria del Suffragio, where his *Adoration of the Magi* is, and in S. John Lateran. D. 1727.

Chiarini, kĕĕ-ăă-ree'nĕĕ, Bartolomeo: Italian sculptor who lived about 1560. In company with Benvenuto Torelli he carved the wood bas-reliefs in the choir of S. Severino at Naples.

Chiarini, Marc Antonio: Bolognese painter; b. 1652; pupil of Fra Quaino and Domenico Santi. Painted at Modena, Milan, Lucca, and Vienna, with a great reputation for perspectives, architectural subjects, arabesques, and ceilings. D. 1730.

Chiaroscuro, kĕĕ-aa'rō-skoo'rō [Ital., from a union of the two words meaning *light* and *dark*]: a combination of light and dark in a painting; a drawing; a print from wood-cut or metal, and the like. The term is especially used for the design in light and dark of a painting, as distinguished from its color-design and from its merit as a piece of accurate drawing. Thus a picture may be said to be poor

and cold in color, but valuable as a piece of *chiaroscuro*—that is to say, the combination of light and dark parts and of different degrees of light and dark is praised. It is sometimes said that the chiaroscuro is not truthful or not accurate, meaning that the system of light and dark in the picture is not that of nature; but probably this is an erroneous use of the term, as chiaroscuro is an exclusively artistical expression. It might be better to say that the chiaroscuro is fine, but not taken from the light and shade of nature.

RUSSELL STURGIS.

Chiaroscuro Prints: prints in two or more colors made from wood-cuts by the use of two or more blocks, each with a different-colored ink. These were common in Italy in the sixteenth century, and the use of them was revived in the eighteenth century in England.

Chiasma: See DECUSSATION.

Chiavari, kĕĕ-aa′vaă-rĕĕ: a town of Italy; province of Genoa; on the Gulf of Rapallo, at the mouth of the Sturla; 24 miles E. S. E. of Genoa (see map of Italy, ref. 4–C). The streets are bordered with arcades and well-built houses. The town is inclosed by cultivated hills, and has many handsome villas in the environs. Here are several palaces and three churches; also manufactures of silk, lace, furniture. Fishing is carried on and marble is quarried in the neighborhood. Pop. 12,066.

Chiavistelli, kĕĕ-aă-vĕĕs-tel′lĕĕ, JACOPO: b. 1621; d. 1698; Florentine painter; pupil Fab. Boschi and Baccio del Bianco; work of his is in the prefecture and in various churches in Florence.

Chibchas and **Chibchan Antiquities**: The ancient nation of the Chibchas occupied the territory about the headwaters of the Magdalena river in New Granada (see INDIANS OF SOUTH AMERICA); but more or less remote branches of the stock occupied a large part of the present republic of Colombia, and remains attributable to them are found scattered over a great part of this area.

Buildings.—Both the domestic and public edifices of the Chibchas were usually of perishable materials, as wood and plaster, so that in their territory remnants of stone structures are rare. A few sites, however, are mentioned where such have been found. Perhaps the most characteristic is in the valley of San Augustin. Here the ruins of various small temples or *adoratorios* have been discovered. They are constructed partly underground, walls and roof being of large slabs of a compact ferruginous sandstone, carefully dressed, and bearing figures carved in relief. The interior chamber is rectangular, about 7 feet in height, and 12 feet by 10 in area. In the vicinity many large and curious stone images have been met with, carved with considerable expression and with a marked and varied individuality. They have a family likeness, being short and thick, about 4 feet high, and with an expression of countenance apparently intended to strike terror into the observer.

Sepulchers.—In most of the fertile valleys of the upper Magdalena and its branches burial-mounds from 5 to 30 feet in height were numerous. They attracted the attention of the European settlers at an early date, as they were found to contain an abundance of precious metal—gold and silver—which had been buried with the dead. Gold was especially frequent, the forms into which it had been worked being figurines, cups and vases, personal ornaments, and utensils. There have been instances reported where $50,000 worth of this metal have been extracted from a single tumulus. The consequence is that but few of them have escaped the attention of the treasure-seekers, who cared for nothing but the objects in metal, and for those only for their money value.

Rock Inscriptions.—Although it is not positively known that the Chibchas possessed a method of writing, there is some evidence to that effect, and the paintings and carvings on rocks still to be seen in their territory prove that at least they understood a developed form of symbolic script. A number of such have been mentioned in various parts of their territory, the two best known being the "painted rock" at Saboya and a pyramidal inscribed rock at Gameza, on the river Chicamocha. Both of these contain figures of men and of animals, especially the frog, which seems to have played an important part in Chibchan mythology as the symbol of the god of the waters. The monolithic pyramid of Gameza is believed to have been artificially carved into its present shape to serve as a memorial of some important event in tribal history. Unfortunately, an accurate copy of the inscription has not been published.

Calendar Stones.—Another and peculiar class of Chibchan antiquities includes what have perhaps erroneously been called "calendar stones." These are small, hard stones, 6 or 7 inches in length, or less, carved into curious shapes, with flat surfaces, on which are chiseled in low relief figures of various objects. The local archæologist Duquesne, and following him Alexander von Humboldt, explained these as calendars, and the figures upon them as day and month signs. This explanation has been rejected by later antiquaries, who prefer to regard them as molds on which thin plates of gold were hammered so as to present in the metal the figure in relief on the stone. To this it may be objected that the figures are always in series of fives on the stones, and that they are not varied, but are repetitions of the same, a frog, a fish, a drum, a quiver, etc., which would scarcely be the case were they simply molds for gold-beating. Their real purpose has therefore not been decided.

Metal-work.—The Chibchas were not acquainted with copper or bronze, and their tools and weapons were of stone or wood. The rivers of their country are, however, rich in gold, and this they acquired unusual skill in working. They had learned the art of smelting and chasing, and of decoration in both low and high relief. Their eye for symmetry of form was excellent, and the gold vases probably showing the most correct form and finest workmanship of any on the American continent have been disinterred from their ancient sepulchers. They were one of the few American tribes who had a metallic currency, for which they used flat pieces of gold valued by measure and not weight.

Pottery.—The ceramic art had been cultivated by the Chibchas to almost as great an extent as by the Peruvians. The jars and vases taken from the ancient mounds are usually in a grayish clay, finely tempered, symmetrical in contour, and of varied designs, all, however, presenting an easily recognizable family likeness. They rarely imitate animal forms, and in this respect these products differ from the ware brought from Peru.

AUTHORITIES.—J. Acosta, *Compendio Historico de Nueva Granada*; P. Perez, *Geografía de Bogotá*; E. Uricoechea, *Antiguedades Neo-grenadinas.* D. G. BRINTON.

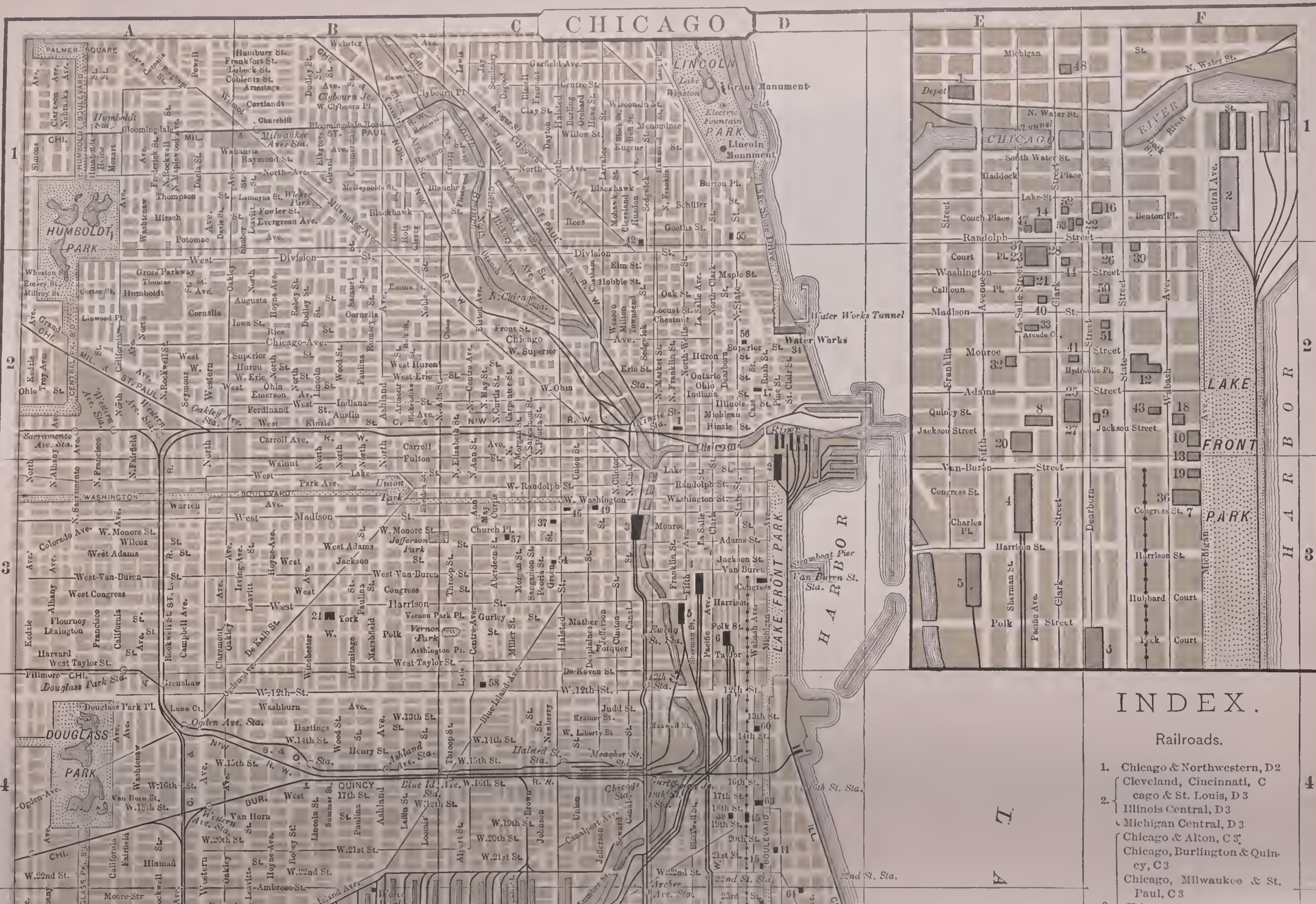
Chica, chee′ka: a resinous dyestuff used to give an orange-red color to cotton. It is obtained by boiling the leaves of the *Bignonia chica*, a plant which grows on the banks of the Orinoco. This plant is a climber with bipinnate leaves, heart-shaped leaflets, and flowers in drooping clusters.

Chica, or **Pito**: a fermented liquor made from Indian corn in some parts of South America, and similar to ordinary beer; but the Indians sometimes prepare it by chewing the grains, and that which is so prepared is most highly esteemed. To make this liquor particularly strong and well flavored, they pour it into an earthen jar which contains beef; and having made the jar air-tight, they bury it in the ground, where it is left for years. On the birth of a child it is their custom thus to bury a jar of chica, to be drunk at the same child's wedding. Chica has an agreeable flavor, and is very intoxicating.

Chicago: city; capital of Cook co., Ill. (for location, see map of Illinois, ref. 2–G); the largest city on the Great Lakes, also the second city in size and the largest interior city in the U. S.; on Lake Michigan and both sides of the Chicago river; lat. 41° 53′ 6″ N., lon. 87° 36′ W. from Greenwich; 911 miles from New York, 811 from Washington, 915 from New Orleans, and 2,450 from San Francisco. The area of the original town in 1830 was 2·55 sq. miles; in 1847, it was 14·03 sq. miles; in 1864, 35·76 sq. miles; in Dec., 1887, 43·91 sq. miles; in 1900, 190·66 sq. miles.

Site and Plan.—Its original site was a narrow sand ridge extending along the lake, and a low flat prairie, many miles in extent, adjoining it on the W. only 3 feet higher than the river. The prairie has since been raised to a uniform grade of 10 feet above the lake, an elevation ample for perfect sewerage. The highest part of the city is in the neighborhood of Humboldt Park. Within the city limits the west shore of Lake Michigan extends nearly N. and S. The city stretches along the lake for a distance of 26 miles, touching the State line of Indiana on the S. E. It varies in width from E. to W. from 6 to 14 miles. The river and its branches divide the city into what are called the north, west, and south sides, of which the west division contains 762,219 inhabitants, the south 645,318, and the north 291,048 (school census of 1900). That part of the city touching the Indiana State line is drained by Calumet river. The principal branch of this stream flows northward and empties into Lake Michi-

Fine Arts Building, World's Columbian Exposition.



INDEX.

Railroads.

1. Chicago & Northwestern, D 2
2. Cleveland, Cincinnati, Chicago & St. Louis, D 3; Illinois Central, D 3; Michigan Central, D 3
   Chicago & Alton, C 3; Chicago, Burlington & Quincy, C 3; Chicago, Milwaukee & St. Paul, C 3
3. Chicago, St. Louis & Pitts-

INDEX.

Hotels.

7. Auditorium, F 3
8. Grand Pacific, E 2
9. Great Northern, F 2
10. Leland, F 2
11. Hotel Woodruff, D 4
12. Palmer House, F 2
13. Richelieu, F 3
14. Sherman House, E 1
15. Southern, D 4
16. Tremont, F 1
17. Virginia, D 2
18. Wellington, F 2

Public Buildings, Etc.

19. Art Institute, F 3
20. Board of Trade, E 2
21. Chamber of Commerce, E 2
22. Chicago Athenæum, E 1
23. City Hall and County Court House, E 2
24. Cook County Hospital, B 3
25. Custom House, E 2
26. Masonic Temple, F 2
27. Post Office, E 2
28. Public Library, E 2
29. Stock Exchange, E 2
30. Union Stock Yards, C 6
31. University of Chicago, E 8
32. W. C. T. U. Temple, E 2
33. Y. M. C. A., E 2
34. Water Works, D 2
35. World's Columbian Exposition, F 8.

Theatres.

36. Auditorium Theatre, F 3
37. Academy of Music, C 3
38. Alhambra Theatre, D 4
39. Central Music Hall, F 2
40. Chicago Opera House, E 2
41. Columbia Theatre, E 2
42. Criterion Theatre, C 1
43. Eden Musee and Casino F 2
44. Grand Opera House E 2
45. Havlin's Theatre, D 4
46. Haymarket Theatre, C 3
47. Hooley's Theatre, E 1
48. Jacobs' Clark St. Theatre, E 1
49. Lyceum Theatre, C 3
50. Madison Street Theatre, F 2
51. McVicker's Theatre, F 2
52. Olympic Theatre, E 1
53. Schiller Theatre, E 1
54. Standard Theatre, C 3
55. Windsor Theatre, D 1

Churches.

56. Cathedral of the Holy Name, R. C., D 2
57. Centenary M. E., C 3
58. Church of the Holy Family, R. C., C 4
59. Church of the Messiah, Unit., D 5
60. Grace P. E., D 4
61. Immanuel Bapt., D 5
62. Plymouth Congregational, D 5
63. Second Presbyterian, D 4
64. St. Paul's Universalist, D 5
65. Trinity P. E., D 5

University of Chicago, principal building.

gan. Here also are found the only large bodies of water within the city limits—Calumet Lake, a little more than 3 miles in length, and Hyde Lake. Both are connected with Calumet river, and Hyde Lake is connected with Wolf Lake, which lies partly in Chicago and partly in Indiana.

The streets of the city, averaging in width 66 feet, are, with but few exceptions, laid out at right angles, running with the four points of the compass. Of these streets 1,248 miles are paved and 1,412 partly improved, making in all 2,660 miles of streets. The streets are lined with 5,890 miles of sidewalk (including parks) averaging 17 feet in width, of which 4,490½ are of wood, 286 stone, and 1,076 concrete. There are 1,481 miles of sewers, 53,490 catch-basins, and 154,951 manholes, which, with the cost of repairing and cleaning, have cost the city $20,059,389.

The business center is comparatively small, occupying an area less than a mile square, bounded on the E. by the lake and N. and W. by Chicago river. Here are situated most of the great railway dépôts, the post-office, the court-house, the board of trade building and custom-house, the Art Institute, the principal stores, banks, theaters, and hotels, the lofty structures that are the chief architectural features of the city. The chief business thoroughfares within this area are Michigan, Wabash, and Fifth Avenues, State, Dearborn, Clark, La Salle, Franklin, and Market Streets, all running N. and S., and Lake, Randolph, Washington, Madison, Monroe, Adams, and Jackson Streets, extending E. and W. The shipping business is transacted along the river and the canal, the former having a frontage, including docks, of 41 miles. Many of the manufactories are situated on Canal and Clinton Streets W. of the river, also in the angle formed by the Chicago river and its northern branch, and in the south-western part of the city. The live-stock and meat industry is carried on at the Union stock-yards, extending from Thirty-ninth Street to Forty-seventh Street, in the geographical center of the city.

Grand, Michigan, Drexel, and Washington Boulevards, Wabash, Calumet, and Prairie Avenues, La Salle, Rush, Pine, and Cass Streets, and the lake shore drive contain many of the most attractive and costly residences. There is great variety in the architecture and in the building material; brick and sandstone are used extensively, but large houses constructed entirely of wood are found, and those of all descriptions in the strictly residence quarters are detached, as a rule. The great boulevards, stretching as far as the eye can reach, are admirably planned to meet the needs of the future as well as the present, and, with their roadways separated by stretches of turf and brilliant flower-beds, and their palatial dwellings surrounded by well-kept lawns, present a strong contrast to the business streets, which are overcrowded, and show the effects of the almost universal use of soft coal for manufacturing and other purposes. The fact that the city is modern is everywhere apparent; a large part of it retains its suburban character, and in the more recently annexed districts there are farms, groves, and even bits of unbroken prairie, but in the older parts enterprise, good taste, and a lavish outlay of money have combined to produce effects that almost compensate for the lack of picturesqueness obtained only by age.

Parks and Boulevards.—The park system, including boulevards, covers an area of 2,605 acres. The principal parks are under the management of three distinct boards of commissioners, those for Lincoln Park, on the north side, for the west parks, and for the south parks. Lincoln Park, on Lake Michigan, including boulevards, contains 308 acres. The ground is undulating and beautifully laid out in drives, lawns, and avenues, bordered by trees, shrubs, and flowers. It has two artificial lakes and a lagoon for boating. It contains many fine specimens of the sculptor's art, among which the most striking is the statue by St. Gaudens of Abraham Lincoln, which cost $50,000. There are also an equestrian statue of Gen. Grant, bronze statues of Franklin, Hans Christian Andersen, Schiller, Linné, and La Salle, a reclining statue of Shakespeare, and a group of Indians. The west parks are separately distinguished as follows: Douglas, 180 acres; Garfield, 186 acres; and Humboldt, 200 acres; there are also the lesser parks of Union, Vernon, Wickes, and Jefferson. The south park system includes the famous Jackson Park, where the World's Columbian Exposition was held, containing 533 acres; Washington Park, 371 acres; Gage Park, 20 acres; and the celebrated Midway Plaisance, 80 acres. Only one of the buildings in Jackson Park erected for the World's Fair remains permanently, the Art Building, which has become the Field Columbian Museum. The above system of parks is connected with a chain of boulevards, from 100 to 200 feet in width, which with the lake shore drive circles the entire city with one of the most beautiful driveways in the world, over 65 miles in length. Besides the parks under the management of the boards, the following small parks, containing from 1 to 5 acres, scattered through the city, are controlled by the commissioner of public works; Irving, Oak, Ellis, Green Bay, Shedd's, Jefferson (town), Holstein, East End, and Congress parks; and Douglas Monument, Aldine, Biekerdike, and Washington squares. The Lake Front Park, 20 acres, is also controlled by the city.

Drainage Channel and Waterway.—The Illinois and Michigan Canal was deepened in 1868–71 at the cost of $3,300,000 for drainage purposes, the Chicago river having become greatly contaminated by the city sewage; but the canal was not made sufficiently large to carry off the water, and resort was had to pumping, which has only partly answered the purpose. After several years' agitation and discussion a plan for the construction of a new waterway, 160 feet wide and at least 16 feet deep, from the Chicago river to the Desplaines, and so on to Joliet, was adopted, and the work was begun in 1891. On Jan. 2, 1900, this great canal was opened, the cost to that date having been $33,525,700.

Water-works.—The city is supplied with water from Lake Michigan. Pure water is obtained at "cribs" located from 2 to 4 miles from the shore, and is conveyed thence to the city through five tunnels under the lake. It is distributed by ten pumping works capable of supplying the city with 532,000,000 gals. daily. The cost of the system to Jan. 1, 1901, including lands, buildings, water-pipe, tunnels, cribs, and machinery, was more than $30,000,000.

Bridges and Track Elevation.—The Chicago river is spanned by fifty-four swinging bridges, of from 200 to 250 feet in length, operated by steam. By the elevation of 260 miles of railway tracks and the construction of 254 subways, dangerous grade crossings have been eliminated. Three brick tunnels under the river connect the north and south and south and west divisions of the city, and are used by cable-cars and pedestrians.

Lighting.—The city has 29,500 street lamps, of which 25,000 are gas and 4,500 gasoline. It has also an electric plant with four power stations, supplying 4,300 lights. The cost of lighting is nearly $913,000 per year.

Public Buildings.—The U. S. Government building, occupying an entire block, and erected in 1880–84 at the cost of nearly $6,000,000, was so badly constructed that it had to be torn down and a new one is being erected in its place. The Board of Trade building, at the foot of La Salle Street, covers an area of 200 by 174 feet, and is built of gray granite. The great Exchange Hall, the largest in the country, is 174 by 155 feet, and is elegantly embellished with decorations. The court-house and city-hall combined was erected in 1879–81 at a cost of over $4,000,000. It is a handsome and imposing structure 340 by 210 feet, three stories in height, with basement and attic, in the Romanesque and Venetian style of architecture. The interior is finely decorated and finished, the floors being tiled with black and white marble. The east half is used as a county building, with court and office rooms, and the west half as a city-hall.

The high-building period began in 1883–84, the first one being the Home Insurance building, ten stories high. It is called the "Chicago construction," and consists of a skeleton construction of metal, fire-proofed by masonry, all loads being carried story by story on the columns. They are claimed to be fire-proof, wind-proof, and earthquake-proof. Among the "sky-scrapers" the Masonic Temple is the highest, being twenty stories in height, and cost over $2,000,000. It contains 800 offices and desk-room for 5,000 people. Other tall buildings are the W. C. T. U. Temple, which cost $1,100,000, thirteen stories high, the new Chamber of Commerce building, the Unity, Monadnock, Fisher, and Old Colony buildings, and the Leiter building, 404 by 140 feet. The Auditorium building includes an opera-house, with a seating capacity for 4,000 people, which can be extended to accommodate 7,000, a recital hall, stores, 136 offices, a tower observatory, and a hotel with accommodations for 400 guests. It has a total frontage on Wabash and Michigan Avenues and Congress Street of 710 feet, and the main building is ten stories in height.

Means of Communication.—Chicago, being the terminus of all the great trunk lines of railway of the U. S., Canada, and Mexico, is practically the greatest railway center in the world. The number of these lines, controlled by thirty-five

different corporations, is twenty-one, and they bring into the city the products, merchandise, and passengers from 111,000 miles of contributing lines. These lines have a trackage of 1,439 miles in the city; the six principal dépôts are the Union, Grand Central, Rock Island, Illinois Central (costing over $1,000,000), Dearborn or Polk Street, and the Northwestern. From these stations 275 through trains, 750 local, suburban, or accommodation trains, and over 500 freight trains arrive and depart daily.

Besides the railways, the carrying trade of Chicago is largely shared by the merchant marine service, the average number of vessels arriving and departing each year being a little over 16,000, with a tonnage of 12,600,000. These include many passenger steamers, which connect the city through Lake Michigan with Lakes Huron, Superior, and Erie; through the Erie and Welland Canals with the ocean; and through the Illinois and Michigan Canal with the Mississippi river. There are 432 miles of street-railways, 40 of which are operated by cable, 5 by horses, and 347 by electricity, while 40 are elevated.

Churches.—There are 852 churches, divided denominationally as follows: Methodist Episcopal, 148; Lutheran, 149; Roman Catholic, 121; Congregational, 96; Baptist, 76; Presbyterian, 62; Protestant Episcopal, 47; Jewish, 20; Reformed Episcopal, 7; and all others, 126.

Educational Institutions.—The common schools are supported by taxation, and are free to all. The expenditures for 1900 were $7,273,787. The system is under the management of a board of education and city superintendent, appointed by the mayor. In 1900 there were 252 school houses, 5,350 teachers, to whom were paid salaries amounting to $4,847,192, and an enrollment of 211,897 pupils. There are primary, grammar, and high-school departments, and English high and manual-training school, and evening schools. A compulsory education law is in force. There is also a normal school for the education of public-school graduates desirous of becoming teachers, and in addition to the public or free schools there are numerous kindergartens, parochial schools, and private and sectarian schools. The oldest college is the NORTHWESTERN UNIVERSITY (*q. v.*) The Armour Institute, a training school for the promotion of industrial education, was established in 1891 by Philip D. Armour and his family, who endowed it with $1,700,000. A spacious and substantial building has been erected, 175 by 65 feet, five stories in height, with rooms for library, chemical and physical laboratories, lectures, and recitations. The Chicago Athenæum, called "The People's College," was established in 1873. It is opened daily and five evenings each week for nine months each year, and has a corps of thirty-three teachers. Young men and women are entered at any time without examination.

The oldest of the theological colleges is the Chicago Theological Seminary (Congregational), which was established in 1854. The McCormick Theological Seminary is a Presbyterian institution which was organized and the first buildings erected in 1863. The Western Theological Seminary is a new institution, established under the control of the Protestant Episcopal Church. The Baptist Union Theological Seminary is now a part of the University of Chicago (see CHICAGO, UNIVERSITY OF). St. Ignatius College is a Roman Catholic institution, established in 1869. It is conducted by the Fathers of the Society of Jesus. St. Xavier's Academy is a Catholic institution for the education of females. It was established in 1846, and is conducted by the Sisters of Mercy. The leading medical colleges are the Bennet Homœopathic, College of Physicians and Surgeons, Hahnemann, and Rush. There are also several colleges of dental surgery.

Art has found a home in the Art Institute, a magnificent structure located on Michigan Avenue and costing $500,000. It contains a splendid collection of pictures, casts, and works of art, together valued at $500,000.

The Academy of Sciences was founded in 1869. In 1890 Matthew Laflin made it a donation of $75,000, which, with other aid, enabled it to erect a fine building in Lincoln Park.

Libraries.—The Chicago Historical Society possesses the oldest public library in the city, begun when the society was organized in 1857. It is not large, containing only 65,000 volumes, bound and unbound, but is rich in Americana, original documents, records, and manuscripts. The Public Library is the largest in the Northwest, containing over 260,000 volumes. It was established in 1873, and is supported by city taxation. It is housed in a magnificent fireproof building on Michigan Avenue. It is a free circulating library, with reading and reference rooms. The Newberry Library is named after its founder, Walter L. Newberry, who left in his will for its establishment property from which has been realized over $2,500,000. It occupies a handsome building facing Washington Place, on the north side. The library is for reference only, and over 200,000 volumes, many of them rare and costly, have been collected. The Chicago Law Institute has a fine law library in the county building. The Crerar Library, with an endowment of over $2,000,000 from John Crerar, is to be located on the south side, and, in accordance with the founder's will, must be kept free from sensational and skeptical works.

Charitable Institutions.—These comprise 11 asylums for children, 2 diet kitchens, 6 homes for the aged, 6 homes for women, 7 industrial schools, 7 day nurseries, 12 relief societies, 4 reformatories, 7 dispensaries, 8 training-schools for nurses, County and City Infirmary, and Insane Hospital. Besides these there are the following hospitals: Alexian Brothers, Augustana, Baptist, Emergency, German, Marine, Porter Memorial, Mercy, Michael Reece, Presbyterian, Provident, St. Elizabeth, St. Joseph, St. Luke's, Temperance, Wesley, Woman's, and the Women's and Children's.

Government.—The city is governed by a mayor, elected biennially, who receives a salary of $7,000; and a common council, composed (1900) of sixty-eight aldermen, whose terms are also two years, each of the thirty-four wards into which the city is divided electing one each year. The other elective officers are a city clerk, treasurer, and attorney. The following are the officers appointed by the mayor and confirmed by the council: City comptroller, commissioner of public works, corporation counsel, city collector, prosecuting attorney, engineer, superintendents of the police department, public buildings, water office, streets, and schools, fire marshal and other subordinate officers. The receipts of the city for 1900 were $33,341,720, and the expenditures $30,141,134. The bonded debt in 1900 was $16,000,000.

Police and Fire Departments.—The police force of the city, including a superintendent and assistant, secretary, chief inspector and 5 division inspectors, 15 captains, 60 lieutenants, 104 patrol sergeants, and 104 desk sergeants, numbers 2,475; with 42 police stations, 39 patrol barns, 42 patrol wagons, 8 ambulances, and 245 horses in use. Connected with the department is a bureau of identification, with the portraits of over 12,000 criminals and measurements and descriptions of over 4,000. It has also a detective department, 30 matrons to look after women and children arrested, and an efficient patrol-wagon system. The cost of maintaining the force in 1900 was $3,383,092.

The fire department consists of 1,150 officers and men, 101 steam engines, 27 chemical engines, 33 hook and ladder trucks, 5 fire-boats and 503 horses. The organization is directed by a fire marshal, a first and second assistant, secretary, a fire inspector, and 13 chiefs of battalions. Connected with the department is an insurance patrol, established in 1871. Firemen are retired on half pay after a continuous service of twenty years. The cost to the city of the department in 1900 was $1,678,410.

Banks.—There are 15 national banks with an aggregate capital of $17,450,000, and 17 State banks with an aggregate capital of $11,622,000. The total bank clearances for 1900 were $6,799,535,598, as against $6,612,313,611 in 1899.

Manufactures.—The manufacturing industries of Chicago are second in magnitude only to those of New York city and are growing rapidly. The total value of manufactures for 1900 was $741,097,000, as against $673,725,000 for 1899. Slaughtering and meat packing and closely allied industries lead in value of products, aggregating $154,000,000. Smelting and refining come next with $42,000,000. Then follow wagons and implements, $40,000,000; clothing, $35,000,000; printing and publishing, $31,000,000; rolling mills, $30,000,000; foundries, $27,000,000; furniture, $26,000,000; machinery, $21,000,000; cars, bridges, and elevators, $21,000,000; boots and shoes, $16,250,000; breweries, $15,000,000; cloaks and furs, $15,000,000; tobacco, snuff, and cigars, $12,000,000; tanneries, $11,000,000; coffee and spice mills, $11,000,000; electric supplies, $10,500,000; bakeries, $10,500,000; soap, $10,500,000; sash, door, and box manufacture, $10,500,000; jewelry and optical goods, $10,000,000; pianos and organs, $10,000,000; millinery, $10,000,000.

Trade and Commerce.—The receipts of grain, and flour in its grain equivalent, in 1900 aggregated 349,631,000 bush., more than in any previous year; the shipments for the year aggregated 265,546,000 bush. Corn showed receipts of 134,663,456 bush.; shipments, 111,099,653. Oats, receipts, 105,226,761 bush.; shipments, 77,554,695. There are 27 grain

elevators, with a combined capacity of 32,800,000 bush. The volume of the speculative grain trade of Chicago for 1900, as indicated by the board of trade clearing-house, amounted to $62,227,165. The live-stock receipts during 1900 were 8,698,478 hogs, 2,728,134 cattle, 3,540,643 sheep, 136,370 calves, 91,756 horses, valued in all at $271,217,000. The number of hogs packed in that year was 7,241,881; of cattle, 1,794,397. During the year Chicago received 216,455,042 lb. of dressed beef, and shipped 1,178,950,898 lb. Of meats other than barreled pork there were received during the year 197,203,914 lb., and shipped 791,021,932 lb. Of lard, 60,632,245 lb. were received, and 479,773,491 lb. shipped.

The great pine forests of Michigan, Wisconsin, and Western Canada, easily accessible by lake vessels, and the vast region tributary to Chicago and dependent upon this market for lumber, have made the figures in this department of trade almost fabulous. Chicago is the largest lumber-market in the world, the receipts for 1900 aggregating 1,671,563,000 feet. Of shingles, 345,000,000 feet were received. The coal receipts were 2,125,063 tons of anthracite and 4,627,167 tons of bituminous, which, with the coke received, amounted in value to about $20,470,885. The value of foreign merchandise imported into Chicago in 1893 was $15,441,320, paying a duty of $8,177,735.

Hotels and Theaters.—The demands of the World's Fair stimulated the erection of more hotels than can be well sustained. The principal hotels in the heart of the city are the Auditorium and its Annex, the Great Northern, the Palmer House, the Grand Pacific, the Wellington, the Leland, Victoria, Sherman, and the Tremont House, and farther out the Virginia, the Metropole, and the Lexington. The "downtown" theaters, with the Auditorium and Central Music Hall, are McVicker's, the Illinois, Chicago Opera-house, the Grand Opera-house, Powers's, the Dearborn, the Great Northern, the Studebaker, the Olympic, and Hopkins's.

The Press.—The first newspaper, the *Weekly Chicago Democrat*, was founded in 1833, and began with 145 subscribers. The second, *The American*, now called *The Evening Journal*, was founded in 1835. In 1894 the number of publications of all kinds was a little over 500. Of this number, 24 were dailies, 195 weeklies, and 280 monthlies; 53 were devoted to religion, 11 to music and the drama, 16 to commerce and finance; 25 were printed in German, 2 in French, 24 in Scandinavian (chiefly Swedish), 5 in Bohemian, and 7 in Polish.

History.—The territory included within the limits of Chicago belonged to France by right of discovery, as claimed by La Salle in 1682; to Great Britain, by conquest and treaty with France in 1761; to Virginia, by right of conquest under Col. George Rogers Clark in 1778, under whose jurisdiction it remained until 1784; and to the U. S., by deeds of cession from Virginia and New York, which claimed the territory under a treaty with the Six Nations of Indians. It became a part of "the Northwest Territory," but there being no white inhabitants it was not included in any county until 1796, when it was embraced within the county of Wayne, the third one organized in the Territory, in which Detroit also was situated. When the Indiana Territory was created, in 1802, it was included within its boundary until the Territory of Illinois was separated therefrom and organized in 1809. It thereafter was included in Illinois counties as follows: Madison in 1812, Edwards in 1814, Crawford in 1816, in Clark after the Territory of Illinois was admitted as a State in 1819, Pike in 1821, Fulton in 1823, Peoria 1825, under whose jurisdiction it remained until the formation of Cook County in 1831.

The site of the city was a place of resort and rendezvous for the Indians ever since it was first discovered by the whites; and for many years before any civilized settlements were made it was the favorite rallying-point for hundreds of voyagers and fur-traders. So important was this spot regarded by the Government that in the treaty of Greenville (Aug. 3, 1795)—the first made with the aborigines for Western lands—"six miles square at the mouth of the Chikago river," covering the present site of the city, was ceded to the U. S. Fort Dearborn was established in 1803–04, around which slowly grew the white settlement which formed the village of Chicago. This was plotted and laid out Aug. 4, 1830; it was incorporated as a town in 1833, and as a city May 4, 1837.

The building of the Illinois and Michigan Canal, which did much to promote the growth of the city, was begun in 1836 and completed in 1848. The first appropriation for the improvement of the harbor of Chicago by Congress, $25,000, was made Mar. 2, 1833. The first drawbridge across the Chicago river was constructed in 1834. The first fire company was organized in 1835. The first vessel, the *Clarissa*, was built and launched May 4, 1836. Chicago became a port of entry July 16, 1846.

The first railway constructed was a ten-mile stretch of the Chicago and Galena Union Railroad, and the first train of cars was run thereon Dec. 15, 1848. It required nearly four years to complete the line to Freeport, a distance of 120 miles. The first roads leading to the East, the Michigan Southern and the Michigan Central, did not enter the city until 1852.

Chicago, having neither barriers of hills nor forests, is exposed to sweeping winds on every side. Under conditions most favorable for a disastrous fire, one broke out in the evening of Oct. 8, 1871, in a barn on De Koven Street. The wind was blowing strong from the S., and soon veering to the S. W. assumed the proportions of a fierce and unrelenting gale. In two hours and a half the entire heart of the city was burned out. On the morning of the 9th the north side was attacked; at 3.20 the water-works were destroyed, and thenceforth there was no help. The fire raged on the south side until 10 o'clock, A. M., and on the north side all day. On the west side, where the fire began, 194 acres were burned over, destroying 500 buildings. On the south side the area was 460 acres, and the number of buildings burned 3,650, including 1,600 stores, 28 hotels, 60 manufactories, and all the public buildings, banks, and offices. The area of destruction on the north side comprised 1,470 acres, and the number of buildings destroyed was 13,300, including 600 stores and warehouses, 100 manufactories, and all the finest residences in the city. Out of a population of 77,000, only 7,000 were left with a roof to cover their heads. The loss of property, according to the best revised estimates, was: Buildings and improvements, $50,000,000; produce, lumber, and provisions, $5,000,000; dry goods and manufactures, $75,000,000; household property, libraries, etc., $57,000,000—total, $187,000,000. The loss of the city in public buildings, bridges, pavements, etc., was $2,500,000.

The hard times of 1876–77 culminated in rioting on July 23, 1877, and continued three days, the militia being called out, and many of the rioters killed and wounded.

In May, 1886, labor difficulties led to the Haymarket riots, which, by the hurling of a bomb during an anarchists' meeting into the ranks of the police, resulted in the death or severe wounding of twenty persons. The leaders were arrested, tried, and four of them, Spies, Parsons, Fischer, and Engel, executed for their crime.

The strike of 1894 was the most extensive that has occurred in Chicago, requiring the calling out not only of the State militia, but of U. S. troops as well. Property to the amount of over a million dollars was destroyed, and many lives were lost.

For an account of the World's Fair of 1893, see COLUMBIAN EXPOSITION, WORLD'S.

Population.—(1837) 4,180; (1845) 12,088; (1850) 29,963; (1860) 109,206; (1870) 298,977; (1880) 503,185; (1890) 1,099,850; (1900) 1,698,575. The foreign-born population in 1890 was 809,850. The nationalities of the population at the school census of 1894 were as follows: American-born, 949,092; of foreign birth, 618,565. Of those of foreign birth, 216,324 were from Germany, 111,037 from Ireland, 90,922 from Scandinavia, 34,960 from Bohemia, 47,881 from Poland, 36,895 from Great Britain, 7,413 from France, and 14,194 from Italy. Of the voters in 1892, the native born numbered 131,335, those naturalized or of foreign birth, 128,812.

See Moses and Kirkland, *History of Chicago* (2 vols., 1894); Andreas, *The History of Chicago* (3 vols., Chicago, 1885); Schick, *Chicago and its Environs* (Chicago, 1891).

JOHN MOSES.

Chicago, University of: The first University of Chicago was chartered by the Legislature of Illinois in 1857, and began the work of instruction in 1858; but in 1886, when its last class was graduated, it succumbed to the financial difficulties which had attended the greater part of its history. In May, 1888, the American Baptist Education Society was formed in Washington, and the Rev. F. T. Gates elected corresponding secretary. He decided that the first great work of the society should be the founding of a strong institution in Chicago. In Dec., 1888, the board of the society instructed its secretary to use every means in his power to originate and encourage such a movement. In 1889 Drs. William R. Harper, E. Benjamin Andrews, Alvah Hovey,

Henry G. Weston, J. F. Elder, Samuel W. Duncan, Henry L. Morehouse, James M. Taylor, and Hon. Charles L. Colby were appointed a committee to report on the scope, location, funds, etc., of the institution. In May, 1889, the board took financial action in a series of resolutions, immediately after the adoption of which Mr. Gates announced a subscription of $600,000 by Mr. John D. Rockefeller, of New York, providing $400,000 more should be pledged on or before June 1, 1890. Not only was the $400,000 secured, but also books, apparatus, and a site for the institution valued at $125,000. The site lies between Washington and Jackson Parks, and fronts south on the Midway Plaisance. Mr. Marshall Field contributed a block and a half of land and two and a half blocks more were purchased for $282,500, thus providing a tract of four blocks, or some 25 acres. The university was incorporated in June, 1890, the corporate name being "The University of Chicago." Two-thirds of the members of the board of trustees and the president of the university must belong to the Baptist denomination. At the first meeting of the board of trustees after its incorporation, Prof. William Rainey Harper, of Yale University, was elected president. He entered upon the duties of his office July 1, 1891. Before he accepted the presidency, the scope of the institution had been greatly enlarged. At first the establishment of a college only had been contemplated. President Harper felt that the institution should be a university from the outset. Mr. Rockefeller, agreeing with this view, in Sept., 1890, added $1,000,000 to his former subscription, of which $800,000 was designated for non-professional graduate instruction. Mr. Rockefeller further increased his endowment Feb. 23, 1892, by $1,000,000, and Dec. 27, 1892, by $1,000,000 more, making the total of his endowment $3,600,000. The general plan of the entire group of buildings was prepared before the work of construction was commenced. The central features of the plan are a university hall, scientific laboratories, museum, library, chapel, science hall, and gymnasium. Dormitories intended to accommodate over 2,000 students are arranged in quadrangles on the four corners of the site. The erection of buildings was begun Nov. 26, 1891. The first buildings to be erected were the recitation building and a group of dormitories for the divinity school and university. In 1892 S. A. Kent, of Chicago, contributed $150,000 for the erection and equipment of a chemical laboratory. The entire group of buildings will be of blue Bedford stone. The university begins its work with a great and valuable library, comprising numerous private libraries, but mainly consisting of a large collection purchased in Berlin, popularly known as the Calvary Library, which includes many rare manuscripts and the most complete collection of dissertations from the universities of Europe in existence. The library now contains over 300,000 volumes. In 1891 the executors and trustees of the estate of William B. Ogden, the first mayor of Chicago, assigned to the university 70 per cent. of that portion of the estate devoted by the will of Mr. Ogden to benevolent purposes, to establish "The Ogden Scientific School of the University of Chicago." It is expected that at least $300,000 will be realized by the university from this source. The entire property of the university was valued in 1900 at more than $8,000,000. The university academy occupies the buildings formerly used by the Theological Seminary at Morgan Park, and also those occupied by the Illinois Military Academy. The Baptist Union Theological Seminary, in accordance with Mr. Rockefeller's wishes, became the divinity school of the university, and now occupies quarters on the university site. The organization of the university embraces many novel features. The university work is divided into the university proper and the department of university extension. The university proper includes (1) academies which may be either directly under the control of the university or affiliated with it; (2) colleges either in Chicago or at other points, the latter being also affiliated with the university upon certain definite terms; (3) graduate schools, either non-professional or professional. The college year is divided into four quarters, beginning respectively on the first day of October, January, April, and July, and continuing twelve weeks. The university is thus in session the entire year. Students and professors may take as their vacation any one of the four quarters: the students may take two vacations of six weeks each at two periods of the year as best suits their needs and convenience. The courses of instruction are classified as majors and minors; majors calling for ten hours and the minors five hours each per week. Courses continue six weeks. Candidates for a degree must have finished satisfactorily 24 majors and 24 minors, or the equivalent of 36 majors, and each student is required to take 1 major and 1 minor during each term of the quarter. Students may be graduated at any time when they have completed the required work. Non-resident work is accepted under certain specific regulations. Instruction in the university began Oct., 1892, with 111 instructors in its various faculties, and an attendance of 589 students. It had at the close of 1900 240 instructors and 3,183 students. C. H. THURBER.

Chicasaw Confederacy: See NATCHESAN INDIANS; also MUSKHOGEAN INDIANS.

Chiccory, or **Succory**: an herb of the family *Compositæ*, sub-family *Ligulifloræ*. The common chiccory or succory (*Cichorium intybus*) is a perennial plant found wild in most parts of Europe and naturalized in the U. S., growing in waysides, borders of fields, etc. It has a long carrot-like root of a brownish-yellow color, and white within. The stem rises 2 to 5 feet, the leaves resembling those of the dandelion; the flowers rather large, beautiful, and generally blue. Chiccory is extensively cultivated in Europe for its roots and for feeding cattle with its leaves; and its cultivation has attracted some attention in America. The blanched leaves are sometimes used as a salad. To this genus belongs also the endive. The dried and powdered roots of chiccory are much used as a substitute for coffee; also in the adulteration of that article.

Chichen', or **Chichen Itza**: a town of Mexico, in Yucatan; 18 miles S. W. of Valladolid (see map of Mexico, ref. 7–L). Here are the remains of an ancient town, comprising a vast ruined building 450 feet long, a pyramid, the base of which is 550 feet square, and a remarkable domed edifice.

Chich'ester (anc. *Regnum*): an episcopal city of England; capital of Sussex; on the London, Brighton, and South Coast Railway; 17 miles E. N. E. of Portsmouth (see map of England, ref. 14–I). It stands on a plain between an arm of the sea and the South Downs. It is well built, and has clean wide streets. Here is a cathedral built in 1199, which is 410 feet long by 227 wide. The town is connected by a canal with the sea, which is 2 miles distant. It was formerly the capital of the kingdom of Sussex. Chichester district sends a member to Parliament. Pop. (1891) 7,842.

Chickadee [a name derived from its note]: the popular name of the black cap titmouse (*Parus atricapillus*) and other American passerine birds of the same genus and of

Chickadee.

nearly related genera. The common chickadee is frequent all the year round throughout a great part of Eastern North America, and is one of the bravest and most cheerful of winter birds. It shares with several others the name snow-bird, and its familiar cry and sprightly manners render it a great favorite with children. It nests in a hollow tree, and feeds on insects in their season and on seeds in winter.

Chickahom'iny: a river in the east part of Virginia; rises about 20 miles N. W. of Richmond; flows southeastward, and after a course of about 75 miles enters the James river. It forms the boundary between Henrico and Charles City Counties on the right, and Hanover, New Kent, and James City on the left. The margins of the Chickahominy were the theater of the operations of Gen. McClellan operating against Richmond during May and June, 1862. In close proximity to this river occurred the battles of Seven Pines and Fair Oaks, May 31–June 1, 1862; Mechanicsville, June 26; Gaines's Mill, June 27; Savage's Station, June 29;

White Oak Swamp, June 30, 1862; and Cold Harbor, June 3, 1864. See CONFEDERATE STATES.

Chickamau'ga: a creek which rises in Walker co., Ga.; flows northeastward and northward, and enters the Tennessee river about 6 miles above Chattanooga.

Chickamauga, Battle of: battle fought near Chickamauga creek, about 12 miles E. of Chattanooga, between the forces of the U. S., under command of Gen. W. S. Rosecrans, and those of the Confederates, under Gen. Braxton Bragg; commenced on the morning of Sept. 19, 1863, at nine o'clock. Of Rosecrans's army Gen. McCook commanded the right wing, Thomas the left, and Crittenden the center, while Gen. Polk held chief command of the Confederate right and Hood of the left. The Confederates first attacked the extreme left of the U. S. army with heavy masses, the endeavor being to turn it, and thus gain possession of the roads to Chattanooga. A desperate conflict was continued during the day, but Thomas maintained his position. On the right the conflict had been severe at times, but, on the whole, the day closed with the advantage on the Union side. During the night Thomas was re-enforced from the other wings of the army, and had strengthened his position by hastily thrown up breastworks. The attack was renewed by the Confederates on the morning of the 20th against the left and center, and the tide of battle here ebbed and flowed throughout the day with heavy losses on both sides, but without material advantage to either; but Bragg was unable to turn Thomas's flank and occupy the coveted passage to Chattanooga. The fight along the left center had been equally desperate, bloody, and indecisive. But on the right a fearful disaster had fallen. In answer to Thomas's call for aid, Rosecrans had dispatched Negley's and Van Cleve's divisions from the right and center. Wood was directed to close up on Reynolds on the right center, and Davis to close up on Wood. According to Rosecrans's report, Wood overlooked this direction, but supposed that he was to *support* Reynolds, and attempted to do so by withdrawing from the line and passing in the rear of Brannan, thus opening a gap in the line of battle, which being quickly perceived by Longstreet, a decisive charge was made, striking Davis in flank and rear, and throwing the whole division into confusion. Pouring in through this gap, the Confederates cut off the Federal right and center, and attacking Sheridan's division, which was advancing to the support of the left, compelled it, after a gallant struggle, to give way. It was afterward rallied, however, and by a circuitous route joined Thomas, who was now left to breast the tide of battle against the whole army of Bragg. The right and part of the center had been broken and sent flying in disorder toward Chattanooga with terrible loss. Rosecrans, McCook, and numerous subordinate commanders were carried along in the whirl. Sheridan and Davis rallied and reformed their decimated and scattered commands on the way, and halted at Rossville. Rosecrans, being unable to join Thomas, hastened to Chattanooga to prepare that place for defense in case of a total rout of his army, which now seemed imminent. But Gen. Thomas still remained immovable in his position. His line had now assumed a crescent shape, with its flank supported by the lower spurs of the mountain; and here he repulsed the furious onsets of the Confederates. About 3.30 P. M. the Confederates discovered a gap in the hills in rear of his right flank, through which Longstreet poured his massive columns. At this critical moment Gen. Gordon Granger, who had been posted with his reserves to cover the left and rear, arrived in the field. He had heard the sound of the cannon and marched his force there without orders. Gen. Thomas pointed out to him the gap through which the Confederates were debouching, and he at once threw in Steedman's brigade of cavalry. The conflict was terrible, but the gap was taken. Two divisions of Longstreet's corps repeatedly assaulted the position, but a battery of six guns placed in the gorge repelled them with fearful slaughter. About sunset they made their last charge, when they were met and driven back at the point of the bayonet, and returned no more. In the meantime Thomas had repulsed the repeated attacks on his left and front, and at nightfall the Confederate army retired beyond range of his artillery, leaving Thomas in possession of his hard-fought field. Considering the extreme labor of his troops, the scarcity of ammunition, food, and water, Gen. Thomas determined to retire on Rossville, where they arrived and took post before morning of the 21st, receiving supplies from Chattanooga, and offering battle during the day, but the attack was not seriously renewed. On the night of the 21st he withdrew within the defenses of Chattanooga.

The result of the battle was a nominal victory to the Confederates on the field, though Chattanooga and the possession of East Tennessee, the prize for which the battle was fought, still remained in the possession of the Union forces. The Union loss was reported at 16,000, killed, wounded, and missing; the Confederate loss, 18,000; they captured 36 guns, 8,500 small-arms, and large quantities of accoutrements.

Chickamauga and Chattanooga National Park: By an act of Congress approved Aug. 19, 1890, the establishment of a park embracing the battle-fields of Chickamauga and of the actions about Chattanooga was authorized. Under it and subsequent legislation a national commission was appointed to carry out this intention. Georgia ceded to the U. S. jurisdiction over the field purchased by the commission and over the roads approaching it, and Tennessee over the roads from Hooker's position on Lookout Creek to Rossville and thence along the summit of Missionary Ridge to Sherman's works at the northern end. Nearly all the ground occupied in the Chickamauga battle has been acquired, and negotiations are carried on to embrace the scenes of the actions at Brown's Ferry, Wauhatchie, Orchard Knob, Lookout Mountain, and Missionary Ridge. The roads, buildings, and conditions as existing at each engagement are to be restored. A new road runs for 20 miles along the crest of Missionary Ridge, on which are threaded the scenes of the heaviest actions. The Government marks with tablets suitably inscribed the headquarters of general officers, the position of organizations down to batteries, regiments and detached forces for both armies, while monuments commemorative of the lesser organizations are left to the States and the voluntary efforts of veterans' societies. The park was dedicated in the presence of a large concourse of spectators, Sept. 19, 1895.

Chickaree Indians: See SIOUAN INDIANS.

Chickasaw Bluffs, Battle of: before Vicksburg, Miss. The U. S. forces under Gen. W. T. Sherman assaulted this strongly fortified position Dec. 29, 1862, but, though the head of the assaulting column reached the works, the severe fire from the rifle-pits and batteries caused them to fall back to the point of starting, leaving many dead, wounded, and prisoners on the field. The Confederate loss in killed and wounded was but light.

Chickasaws, or **Chicasaws**: See MUSKHOGEAN INDIANS.

Chicken-pox: a contagious febrile disease, chiefly of children: bearing some resemblance to a very mild form of smallpox. Chicken-pox is distinguished by an eruption of vesicles or blebs, which rarely become pustular or yellow, and leave only a very slight incrustation, which falls off in a few days, without any such permanent mark or pit as in smallpox. It is a disease of little or no danger, the fever being often hardly perceptible, and never lasting long. It usually occurs but once in any one patient.

Chick's Springs: Greenville co., S. C. (for location of county, see map of South Carolina, ref. 4–C); about 9 miles N. E. of Greenville. Here are two mineral springs—one alterative and slightly sulphurous, the other a tonic iron spring. Pop. of township (1890) 2,595; (1900) 3,136.

Chick-pea: a plant of the genus *Cicer* and family *Leguminosæ*; having pinnate leaves and two-seeded pods, inflated like bladders. The common chick-pea (*Cicer arietinum*) grows wild in the countries around the Mediterranean. It is an annual, of a stiff upright habit. The seeds abound in farina, and have a slightly bitterish taste. They are about the size of common peas, and curiously wrinkled. They are used as food, either boiled or roasted; are the common pulse of the East; are an important article in French and Spanish cookery; have been in general use from the earliest times; and the plant is now extensively cultivated in Egypt, Syria, India, Europe, Mexico, etc. The herbage affords nutritious food for cattle. Drops exude from this plant, which, on drying, leave crystals of almost pure oxalic acid. In France, in India, and in Mexico the free use of the chick-pea as food is said sometimes to lead to paralysis.

Chicla'na: a town of Spain; province of Cadiz; 12 miles S. E. of Cadiz (see map of Spain, ref. 20–C). The houses are built of white stone. It has a fine hospital, and manufactures of linen, earthenware, and brandy. Here are mineral springs which are much frequented. Pop. 11,627.

Chicla'yo: a city of Peru; capital of the department of Lambayeque; 10 miles N. E. of the port of Pimentel and 18 miles N. of that of Eten, with both of which it is connected by rail (see map of South America, ref. 4–B). Pop. 14,000.

Chico, chee'cō: city; former capital of Butte co., Cal. (for location of county, see map of California, ref. 5–C): on railroad and on Chico creek; 96 miles N. of Sacramento and 6 miles E. of the Sacramento river; has 7 churches, State normal school, 2 public schools, flour-mills, lumber and planing mills, marble-works, a foundry, and machine-shops. Pop. (1880) 3,300; (1890) 2,894; (1900) 2,640.

EDITOR OF "ENTERPRISE."

Chic'opee: a river of Massachusetts: rises in Worcester County: flows nearly westward, and enters the Connecticut 4 miles above Springfield. It affords abundant water-power.

Chicopee: city; Hampden co., Mass. (for location of county, see map of Massachusetts, ref. 3–D); on Conn. Riv. Div. of Boston and Maine R. R., and on Connecticut river at the mouth of the Chicopee river, 4 miles N. of Springfield, of which it was formerly a part. It was incorporated as a town in 1848 and as a city in 1890, and contains the villages of Chicopee, Chicopee Falls, Fairview, and Willimansett. There are here 15 public schools, 4 parochial schools, 15 churches, and a free public library of 20,000 volumes. The taxable valuation of Chicopee has increased from $3,301,000 in 1848 to $9,250,830 in 1900. It has a system of sewers, an electric-lighting plant, and a public water-supply owned by the city. Water-power for manufacturing purposes is furnished by the Chicopee river, which is crossed by five dams within the city limits. At Chicopee Centre are located extensive cotton-mills, manufactures of machine-tools and bicycles, an extensive foundry for casting bronze statuary, and the largest manufactory of swords in the U. S. The village of Chicopee Falls is on the Chicopee river, 1½ miles E. of Chicopee Centre, with which it is connected by a branch railroad and an electric street-car line. Here are mills with 70,000 spindles producing cotton flannel, dress-goods, and blankets; extensive manufactures of agricultural tools, knitting-machines, knit goods, rifles, shotguns, pistols, and mechanics' tools; also a bleachery. Pop. of city (1890) 14,050; (1900) 19,167—including Chicopee, Chicopee Falls, Willimansett, etc.

JOHN D. WHITE, CITY CLERK OF CHICOPEE.

Chicoutimi, shĕĕ'koo'tĕĕ'mee': a post-village; capital of Chicoutimi co., Quebec, Canada, on the south side of the river Saguenay; 75 miles from its mouth (see map of Quebec, ref. 2–D). It has a court-house, jail, a convent of the Good Shepherd, and an important trade in lumber, which is shipped direct to Great Britain and other regions. Pop. about 2,000.

Chief Justice: the title of the highest in rank of the judges of a court. The chief justice of the U. S. is an officer who presides over the Supreme Court, controlling its docket, regulating the order of business, and assigning to the associate justices the cases in which they are to prepare opinions. He reads decisions in practice cases; administers the oath to the President and Vice-President at their inauguration; presides when the President is on trial upon articles of impeachment; and nominates persons to be appointed registers in bankruptcy by the district judges. Like his associates, he is required to attend at least one term of the circuit court in his circuit during each period of two years. He ranks next to the President in official dignity. His salary is $10,500.

Chiem-See, chēem'say': a lake of Bavaria; 42 miles S. E. of Munich; is at an elevation of 1,726 feet above the sea. It is 12 miles long, about 7 miles wide, and a little over 500 feet deep. It contains many fish. Its outlet is by the Alz and then the Inn into the Danube.

Chieri, kĕĕ-ay'rĕĕ (anc. *Carrea Potentia*): a town of Italy; province of Turin; on the slope of a hill 8 miles S. E. of Turin (see map of Italy, ref. 3–B). It had manufactures of fustians, etc., in 1422. Here is the Church of St. Domenico, built in 1260, and the Church of Santa Maria della Scala, which was founded in 1405, the largest Gothic structure in Piedmont. Chieri has manufactures of silk, cotton, and linen fabrics. Pop. 13,260.

Chieti, -ay'tĕĕ, formerly **Abruzzo Citeriore**: a province of Central Italy; a mountainous region. The chief products are corn, oil, fruits, rice, and wine. Area, 1,105 sq. miles. Pop. (1881) 339,986; (1890) 348,318.

Chieti (anc. *Teate*): an episcopal city of Italy; capital of the province of Chieti or Abruzzo Citeriore; on a hill near the Pescara; 40 miles E. of Aquila, 115 miles N. of Naples, and 6 miles from the Adriatic (see map of Italy, ref. 5–F). It is the see of an archbishop, and has a cathedral, a college, and a fine theater. Here are some manufactures of silk and woolen goods. Chieti occupies the site of the ancient *Teate*, a large and important city, the remains of which are still visible. Among these are the ruins of a theater and several temples. Pop. 22,432.

Chignecto (shig-nek'tō) **Bay**: an inlet in British North America; is the northern part of the Bay of Fundy, and extends between New Brunswick and Nova Scotia. It is about 30 miles long.

Chigoe, chig'ō, or **Jigger**: a small species of flea (*Sarcopsylla penetrans*) occurring in tropical and semitropical America. In length it is but a twenty-fifth of an inch. It lives a free life, especially in the sand. The fertilized female bores into the skin of the foot of man and of other animals. At first there is but a slight irritation and scarcely noticeable itching, but soon the eggs begin to grow and these distend the abdomen of the mother to the size of a pea. As a result, inflammation and ulceration follows, which should be attended to at once, for if the young jiggers be set free from the parent they can continue the trouble, and death has resulted from neglect. They are usually extracted with the knife, but care must be taken to remove all the eggs. In the Southern States the term jigger and chigoe are often given to certain of the TICKS (*q. v.*) which attack man and other animals, but which belong to another zoölogical group. J. S. K.

Chi- (or **Shi-**) **Hwang-Ti** (i. e. First August Ruler): a ruler of China, who at the age of thirteen succeeded his father, Prince Chwang Siang, 246 B. C., and who, having completed the subjugation of the feudatory kingdoms of the Chow Dynasty, begun by his ancestors of the house of Ts'in, proclaimed himself First Universal Emperor (221 B. C.). He divided his empire into thirty-six provinces, and displayed great ability in consolidating it, constructing roads and canals and many fine public buildings. Among other things he drove out the Hiung Nû, or Huns, and other northern barbarians who threatened to overrun his empire, and built the great wall to prevent their return. (See GREAT WALL OF CHINA.) His name and memory, however, have for ever been rendered infamous by his destruction by fire of all the records of the past, and of all writings except those on medicine, divination, and husbandry, in order, first, that he might appear to succeeding ages as the first great emperor, and, second, that he might not be confronted by the literati with the ethical teachings of such philosophers as Confucius and Mencius in carrying out his ambitious schemes and despotic measures. Nearly 500 of the literati were also put to death. (See CHINESE LITERATURE.) In the twenty-eighth year of his reign he made a grand progress through his dominions, visiting all the famous mountains in the kingdom. Arrived at the shore of the Eastern Sea (the promontory of Shanting), he with great pomp and ceremony offered solemn sacrifices to the Lords of Heaven and Earth, of the YIN and YANG (*q. v.*), the sun, moon, the four seasons, etc. The name of Chi-Hwang-Ti is also intimately associated with the vagaries and superstitions of the Taoists (see TAOISM), and especially with the search for the elixir of immortality. He died in 210 B. C., and was succeeded by his son, a weakling, who reigned for seven years, when the Ts'in dynasty came to an end. ROBERT LILLEY.

Chihli, chĕĕ'lĕĕ (i. e. Direct Rule, referring to the fact that this is the metropolitan province), or **Pechihli** (i. e. Northern Chihli): the northeasternmost province of China, extending from 35° to 43° N. lat., and from 114° 30′ to 122° E. lon., and containing Peking, the capital of the empire. Area, 58,949 sq. miles. The northern part is mountainous, the southern a plain with somewhat alkaline soil near the coast. The principal rivers are the Peiho and Lanho, both emptying into the Gulf of Pechihli. Agriculture is extensively practiced, but often requires irrigation, and large tracts of land have been abandoned or were originally sterile. The climate is healthful, and the rainfall small and mostly confined to June and July. Coal is found in many places, and is being extensively mined, under the superintendence of foreign engineers, especially in the regions to the N. and E. of Tientsin, with which the coal-fields are connected by rail. Iron is also abundant, and silver has been found near Ching-Shui and elsewhere throughout the province. The Great

Wall passes through this province, and the Grand Canal enters it from the S. For administrative purposes the province is divided into eleven foo or departments. The department of Shun-Tien Foo, in which Peking is situated, does not fall within the jurisdiction of the viceroy of Chihli. Principal cities, besides Peking, are Tientsin, Paoting (the capital), Chingting, Yungping, Tûngchow. Pop. (official for 1879) 17,937,000.

Chihuahua, chĕe-waa'wăă: a state of Mexico, bordering on Texas; area, 83,746 sq. miles. It is bounded N. E. by the Rio Grande del Norte, and is drained by the Conchos. The west part is occupied by a long mountain-chain called Sierra Madre. The surface E. of this chain is mostly a high tableland; the soil is generally arid and sterile. The state is rich in minerals, including gold, silver, copper, lead, tin, and cinnabar. The silver mines, which are in the Sierra Madre, were formerly very productive. The chief wealth of the inhabitants consists in herds of cattle, horses, and mules. This state is infested by Apaches, who greatly retard its prosperity. Capital, Chihuahua. Pop. of the state (1895) 266,831.

Chihuahua: a town of Mexico; capital of the state of same name; about 310 miles N. N. W. of Durango; lat. 28° 50′ N., lon. 105° 33′ W. (see map of Mexico, ref. 3–E). It has a fine stone cathedral which cost about $800,000, a state prison, a state-house, and a mint. It is supplied with water by a good stone aqueduct 3 miles long. Silver mines have been opened in the vicinity. Chihuahua is on the Mexican Central Railway. Pop. 12,000.

Chilblain: one of the secondary effects of cold and moisture upon the human system, principally affecting the feet, hands, nose, ears, etc.; after a first attack chilblains are likely to recur on the slightest exposure. Mild cases are marked by swelling and redness of the affected part, accompanied by intolerable itching. The more severe forms assume an ulcerated, and sometimes even a gangrenous, character. Those troubled with chilblains should carefully protect the feet and hands from cold, should wash the feet frequently, and dry them very thoroughly, and avoid going near a fire when they are very cold. An attack is treated by rubbing the part with cold water or snow, and later applying various stimulant applications, as citrine ointment, tincture of iodine, solution of nitrate of silver, or the like. Surgical treatment may become necessary.

Revised by WILLIAM PEPPER.

Child, FRANCIS JAMES, Ph. D., LL. D., L. H. D.: scholar; b. in Boston, Mass., Feb. 1, 1825; graduated at Harvard College in 1846, and then was tutor there until 1849, when he went to Europe, and studied for a semester at Göttingen. In Aug., 1851, he returned to Cambridge to become Boylston Professor of Rhetoric and Oratory. In 1876 he exchanged this chair for a simple professorship of English. Though his earlier appointments had to do rather with the rhetorical, or formal, than with the historical and linguistic aspects of English, he early became the chief representative in America of the scientific method of treating both. Before going to Europe he had edited *Four Old Plays, with Introduction and Notes* (Cambridge, 1848). After his return he became the chief editor of a series of British poets, published in Boston. Many of the volumes he edited in detail—notably, the works of Spenser (5 vols., 1855). In the same series he issued his first collection of *English and Scottish Ballads* (8 vols., 1857–58). In 1863 appeared the first scientific examination of the language of Chaucer, his *Observations on the Language of Chaucer* (*Mem. Amer. Acad. of Arts and Sciences*, vol. viii.), and in 1873 his *Observations on the Language of Gower's Confessio Amantis* (*Mem. Amer. Acad.*, vol. ix.). He assisted J. W. Hales and F. J. Furnivall in the publication of *Bishop Percy's Folio Manuscript* (3 vols., London, 1867–68); and then he began the publication of *The English and Scottish Popular Ballads* (1882, *seq.*, 8 parts to 1892), upon which his reputation mainly rests. He prepared also two anthologies: *War Songs for Freemen* (1862) and *Poems of Religious Sorrow, Comfort, Counsel, and Aspiration* (new ed. 1886). D. Sept. 11, 1896. A. R. M.

Child, LYDIA MARIA: See the Appendix.

Child-birth: See OBSTETRICS.

Chil'dermas, or **Holy Innocents' Day** [*childermas is* from O. E. *cildra*, of infants + *mæsse*, mass]: the day (Dec. 28th, or in the East the 29th) observed by the Roman, Anglican, Greek, and various Eastern Churches as a festival in commemoration of the children killed by Herod. It was formerly considered unlucky to marry or undertake any work of importance on this day. In the Middle Ages it was a widely spread custom to whip children on the morning of the Innocents' Day. This was called giving them the "innocents."

Chil'ders, HUGH CULLING EARDLEY, M. P., F. R. S.: statesman; b. in London, England, June 25, 1827; graduated at Trinity College, Cambridge, 1850; went to Australia, and was prominent in the Government of Victoria; returned to England and became agent-general for the colony of Victoria 1857; entered Parliament 1860; Financial Secretary of the Treasury, Aug., 1855; First Lord of the Admiralty in Mr. Gladstone's cabinet 1868–71; Chancellor of the Duchy of Lancaster 1872–73; Secretary of State for War in the Liberal cabinet of 1880; succeeded Mr. Gladstone as Chancellor of the Exchequer Dec. 16, 1882; Home Secretary in the Gladstone administration 1886. D. Jan. 29, 1896.

Childs, GEORGE WILLIAM, LL. D.: publisher and journalist; b. in Baltimore, Md., May 12, 1829; removed to Philadelphia in his youth; became a partner in a publishing-house in 1849; and in 1864 became editor and proprietor of the *Public Ledger*. Besides other gifts to the public, he erected a Shakespeare memorial fountain at Stratford-on-Avon, a memorial window in Westminster Abbey to Cowper and Herbert, and aided in founding a home for printers at Colorado Springs. D. in Philadelphia, Feb. 3, 1894. Author of *Recollections of General Grant* (1885) and *Personal Recollections* (1889).

Childs, THOMAS: soldier; b. in Pittsfield, Mass., in 1796; graduated at West Point in 1814; served with distinction in the war of 1812–15 at the battle of Niagara, and at Fort Erie in 1814; was engaged in the Florida war 1836–42, and in the Mexican war, at Palo Alto, Resaca de la Palma, Monterey, Vera Cruz, and Cerro Gordo; was breveted brigadier-general. D. at Fort Brooke, Fla., Oct. 8, 1853.

Child-study: See the Appendix.

Chile, or **Chi'li** (Sp. pron. chee'lăy): a South American republic, stretching from lat. 56° S. to lat. 16° 30′ S., and from the Pacific Ocean to the summits of the Andes, having a breadth varying from 50 to 200 miles. It has an area of 293,970 sq. miles, and a population (1885) of 2,527,350. In 1895 the population was officially estimated at 3,414,000, of whom about 50,000 were Indians. Two-thirds of the population are rural and about one-third urban. The language and conventionalities are Spanish, except in ARAUCANIA (*q. v.*), which retains a quasi-independence. SANTIAGO (*q. v.*) is the capital.

Physical Features, Productions, etc.—The Andes form the eastern boundary, an unbroken wall from 6,000 feet in average height southward to 15,000 feet northward, and with peaks rising above 22,000 feet. North of Chiloé there is a secondary and lower coast range, in parts divided into two, and broken at intervals to allow the passage of rivers. The space between the Andes and the coast range, S. of lat. 33°, consists of plains and rolling lands, with isolated hills. This is the so-called valley of Chile, the richest part of the republic and containing the bulk of the population. From lat. 33° to 37° the land was originally open prairie; farther S. it is more or less varied with woods of evergreens, oaks, and myrtles, and there are numerous lakes. All this region is well watered and fertile, adapted for grazing and the cultivation of grains, and with a delightful and very healthful climate. S. of lat. 42° the whole country is mountainous and covered with heavy forests. N. of lat. 33° the space between the mountains is much broken by spurs and cross-chains, and the intermediate plains are high, rainless, and barren; these are the deserts of Atacama and Tarapaca. There are several active and quiescent volcanoes, and the whole country is subject to earthquakes. One of these in 1822 not only destroyed several towns, but raised a portion of the coast line 3 to 4 feet. The most important mineral product is nitrate of soda, which occurs in large beds in the northern deserts; 1,028,000 tons in 1890 and 794,000 tons in 1891 were exported for fertilizing purposes, and the export tax pays one-third of the expenses of the state.

Excellent bituminous coal is extensively worked; there are important mines of copper and silver; gold, quicksilver, lead, iron, antimony, and bismuth have been found. The staple agricultural products are wheat (about 21,000,000 bush. a year) and wine (24,000,000 gal.); abundant crops are also grown of barley, maize, hemp, potatoes, and beans. Apples, pears, peaches, and oranges are largely cultivated. The value of exports of all kinds amounted in 1893 to 72,245,114

silver dollars; imports for the same year were valued at $68,235,874. In 1893, 1,782 miles of railway were in operation, of which 686 belonged to the state, and 11,465 miles of telegraph lines, of which about 6,900 belonged to the state.

Religion.—The official religion of the state is Roman Catholic, but the public worship of other denominations is protected by the constitution. There are, however, but very few Protestant congregations. The estates of the church were seized by the Government at the time of the revolt and separation from Spain. The president invests with their temporalities the bishops, and the state pays all ecclesiastics, but the salaries of the curates are small.

For the literature of Chile, see SPANISH-AMERICAN LITERATURE.

Government.—The constitution of the republic was framed, with certain important variations, on the model of the constitution of the U. S. The executive power is vested in a president, who is elected for five years by electors chosen by popular vote; is not eligible for re-election for the term immediately following; and is liable to impeachment for a year after the end of his term, during which time he can not leave the country without permission. He is assisted by a cabinet of six ministers, who are in charge of the seven departments of government. The president also is advised and held in check by a council of state of eleven members, five of whom are nominated by him, and six by Congress. The legislature consists of a Senate and a Chamber of Deputies, the former of whom are elected for six years, the latter for three. The senators, one for each three deputies, are chosen by direct vote of the people. The deputies, one for each 30,000 or fraction in excess of 15,000 of the population, are also chosen by popular vote. In Jan., 1890, the total debt of the country, external and internal, issued and authorized, including the amount of paper money, was $124,667,512 in silver.

History.—Northern Chile to lat. 37° was a part of the dominions of the Incas of Peru. The Spaniards under Almagro invaded it in 1535, but soon returned to Peru. The final conquest was commenced by Valdivia in 1541 and by 1550 was complete to lat. 37°; S. of that the Araucanians kept up the struggle for two centuries and were never entirely subdued. In 1810 Chile, in common with many other Spanish provinces, revolted against Spain; defeated at first, the revolutionists finally succeeded with the aid of Gen. San Martin, who marched over the Andes from Buenos Ayres. The independence of Chile was formally proclaimed on Jan. 1, 1818, although the last stronghold of the Spaniards was not taken until 1826. The constitution which had been adopted in 1824 was remodeled in 1828, in 1833, and a few subsequent amendments have been made. The country was reorganized by law in 1887. In 1844 the independence of Chile was formally recognized by treaty with the mother country. Between 1851 and 1861, during the presidency of Manuel Montt, the country was greatly advanced in agriculture, mining, and commerce. In 1865 Chile and Peru were engaged in a war with Spain, which continued with many vicissitudes until 1869, when the dispute was ended through the mediation of the Government of the U. S. After a successful war with Peru and Bolivia, extending over a period of three years (1879–83), the northern frontier of Chile was advanced from 24° to 16° 30′.

The turbulent condition of the country between 1886 and 1892 is of peculiar interest because of the difficulties in which the U. S. Government was involved. The social organization of the country was feudal in its character, and it is not singular, therefore, that for many years after the adoption of the republican form of government it was strongly conservative. The owners of the soil and the mines, often descendants of the Spanish conquerors, constituted an oligarchy which found it not difficult to control political affairs. As time passed on, however, modern ideas and liberal views came to be entertained. The clash between these ideas and those of the old conservative party led to revolutionary outbreaks, which ended (in 1874) in the triumph of liberalism and the adoption of some important amendments to the constitution. As time passed on the spirit of modern liberalism became more and more prevalent. The conservative party finally withdrew from electoral contests and contented itself with exercising simply a restraining influence. As the liberal party grew in power it experienced the common fate of being split into factions and divided by struggles for leadership and office. The president has generally been compelled to act in harmony with the majority in Congress, for the reason that the members of his cabinet have been representatives of the dominant element in Congress, and have been dismissed whenever a vote of censure has been passed. With this limitation the power of the Chilian president is very great, embracing as it does the general civil service and all local officials, excepting those of the cities, and all appointments in the army and navy as well as the telegraph and railroad service. Through the exercise of this power the president has uniformly been able to control the choice of his successor.

At the beginning of the recent revolution the most radical section of the liberal party had its nucleus in a reform club in Santiago, which was composed for the most part of young men of university education, of whom BALMACEDA (*q. v.*) was the most conspicuous. Having entered Congress in 1868 he had risen to great distinction as a congressional leader and debater. As one of the founders of the liberal party that had demanded important changes in the constitution, he acquired great popularity and strength, and a little later added to his reputation by his service as minister to the Argentine Republic during the Peruvian war. In 1885 his popularity carried him into the presidency by an overwhelming majority. The early part of his administration was characterized by great liberality and success. He caused to be adopted a thorough system of popular education, the complete separation of Church and state, a system of normal schools, and extensive school-houses. He secularized the cemeteries, caused a civil marriage law to be adopted, and banished sectarian teaching from the schools and colleges. He also entered upon an elaborate system of internal improvements, building railroads, constructing harbors, providing dry-docks, wharves, and piers. This remarkable prosperity, however, was but the antecedent of great dissension and disorder. A part of the liberal members, thinking the president was going too far, united with the old conservative leaders, and the new union succeeded in overthrowing his cabinet in 1888. Congress was soon broken up into five separate factions. What were thought to be the arbitrary characteristics of the president led to hostility and revolt. A war ensued. The president issued a manifesto virtually assuming a dictatorship, although disclaiming to be a dictator, and defending his acts on constitutional grounds. Before many months the contest took the form of a war between Balmaceda on the one hand, and the representatives of Congress, known as the Junta, on the other. Balmaceda, after numerous engagements, was overwhelmed with defeat. Attempting to escape from Santiago, he remained for a time concealed in the Argentine legation, where, in a fit of desperation on Dec. 19, 1891, he took his life with his own hand.

During the whole of this struggle the partisans of the Junta were hostile to the Government of the U. S., believing that Patrick Egan, their minister, had conducted himself in a manner unfriendly to their cause. It was claimed that Egan's dispatches to his Government had belittled the importance of the rebellion, and had magnified Balmaceda's strength. Exception was also taken to the fact that the U. S. minister had afforded an asylum in the legation to fugitives from Balmaceda's army. While this state of feeling was active, two boats' crews from the U. S. war-vessel Baltimore, while on shore, got into an altercation in a drinking-saloon with some Chilian sailors. The testimony subsequently taken proved that sailors from the Baltimore knocked down one of the Chilians, whereupon knives and other weapons were drawn, and finally the affair grew into a riot. The difficulty was not limited to the saloon but was taken into the street, and several U. S. sailors received dangerous wounds. Minister Egan at once reported the indignity to the Government at Washington. The attack on sailors wearing the uniform of the U. S. was regarded in Washington as a national insult, and redress was firmly but courteously demanded. The provisional authorities in Chile not only refused satisfaction, but also to grant safe conduct to the men who had been assaulted, and demanded their surrender on the ground that they were criminals. The Government of the U. S. in reply took vigorous measures by sending the Yorktown and Boston to Chile to back up the demand for satisfaction. The reply of the Chilian Government had been couched in language so offensive that no answer was returned. On the appearance of the men-of-war, however, President Montt, who had now been inducted into office, directed the Minister of Foreign Affairs to withdraw the offensive note, and to tender apologies, while compensation was made to the injured men and the families of the killed. Thus the demands of the U. S. were satisfactorily complied with.

Authorities.—Theodore Child's *The Spanish-American Republics* (London, 1891); *Memorias presentadas al Congresso nacional*, etc. (Santiago, 1891); C. R. Markham, *The War between Chili and Peru* (London, 1883); *Report on the Export of Niter from Chili in 1890* (Berlin, 1891).

C. K. Adams.

Chiliad, kil'i-ăd [from Gr. χιλιάς, -άδος, a group of a thousand; cf. *triad*, *myriad*, etc.]: an assemblage of things grouped or ranged by thousands. The word is chiefly used by the early computers of logarithmic tables, who expressed the extent of the table by saying it contained the logarithms of so many *chiliads* of absolute numbers.

Chiliasm: See Millennium.

Chiliasts: See Millenarians.

Chill: the subjective sensation of cold, accompanied by general shaking of the body, chattering of the teeth, etc., and induced by exposure to moisture or cold, by fevers and inflammatory diseases, and various nervous conditions. The sensation of cold produced by exposure is so well known as to require no extended discussion. (See Cold, Effects of.) Chills as indications of disease are of the greatest importance. Their association with malarial fever is so intimate as to have given rise to the term "chills and fever" or "fever and ague," synonymous with malarial fever. In malaria the chills appear with the most striking regularity and periodicity, and according as they appear every day, every third or every fourth day, the terms quotidian, tertian, and quartan have been assigned. Malarial chills are apt to appear in the forenoon, and set in with most extreme sense of cold, great chattering, etc. The surface of the body feels somewhat cool to the hand, but the real interior temperature of the body is greatly elevated. The explanation of these phenomena is found in the fact that the vessels of the skin are contracted, with production of the exterior fall of temperature, and the blood is driven to the interior with production of great internal heat. Following the chill, which may last from a few minutes to an hour or longer, comes the stage of fever and sweating, the blood now reverting to the exterior, with a resultant sense of high fever and production of great sweating. The true bodily temperature is now lower than during the stage of chill. A peculiar form of intense malarial infection is that producing the so-called "congestive chill," a most fatal form of the disease, which simulates to a certain extent the last or algid stage of cholera. There is not the same periodicity in these cases as is seen in ordinary cases of malaria, and in general they present features not seen in other forms of the disease. Aside from malarial infection, chills are of very great importance as indicating the onset of a variety of diseases, and especially in children must the occurrence of a chill without or with previous indisposition be looked upon as a danger-signal of great moment. Scarlet fever, diphtheria, meningitis, and other severe infectious diseases may all be ushered in with more or less pronounced rigor or chill, and therefore this symptom is one rightfully viewed with apprehension. In adults chills are symptoms of lesser gravity, though here also the greatest affections, such as pneumonia and specific diseases, are so initiated. In all forms of violent septic disease chills play a prominent *rôle*, either at the onset or during the course of the malady, and occasionally may present sufficient periodicity to lead to the mistaken diagnosis of malaria. Thus in cases of consumption, when there are cavities in the lungs, there is apt to be absorption of septic matters from the pus contained in the cavities, and therefore repeated chills, and in not a few cases mistakes of diagnosis have been made on this account. After child-birth the occurrence in the puerperal woman of a chill is regarded with the greatest apprehension, as usually indicating the much dreaded childbed fever, a virulent form of septic infection.

Besides these grave diseases, chills may indicate a variety of more trivial conditions, such as slight cold with bodily depression, nervous excitement, and the like; but the frequent gravity of their occurrence renders it necessary to examine with great care every case in which they arise.

William Pepper.

Chillan, chēēl-yaan': the capital of Nuble, Chile; situated in a depression in a fertile plain, between the rivers Nuble and Chillan; lat. 35° 56′ S., lon. 71° 37′ W.; about 120 miles N. E. of Concepcion; and a railway station (see map of South America, ref. 8–C). The town is the center of a rich agricultural district, and is celebrated for its hand-made lace and its mineral baths. It was originally founded in 1594 by Ruiz de Gamboa, was laid waste by Indians in 1601, was destroyed by Indians and an earthquake in 1657, by an earthquake in 1751, by an overflow of the river Nuble in 1797, and by an earthquake in 1835. In recent times, however, the town has been prosperous. Pop. (1885) 21,000; (1895) 28,738.

Chillicoth'e: city of Peoria co., Ill. (for location of county, see map of Illinois, ref. 4–D); on C., Rk. I. and P. and A., Y. and S. F. R. Rs.; on the Illinois river; 18 miles N. N. E. of Peoria. It has five churches, canning-factory, flouring-mill, pottery, electric lights, and street cars, and is a dépôt for large quantities of grain. Chillicothe is a popular summer resort. Two packet-boats run daily to Peoria. Pop. (1880) 936; (1890) 1,632; (1900) 1,699.

Publisher of "Bulletin."

Chillicothe: city; capital of Livingston co., Mo. (for location of county, see map of Missouri, ref. 2–F); on Han. and St. Jo., Wabash, and Ch., M. and St. P. R. Rs.; 76 miles E. of St. Joseph. It is the principal city in Grand river valley, and contains eight churches, normal, high, and graded schools, manufactories of ax-handles and stoves, street railways, electric lights, gas and water-works. There is an abundance of timber near Grand river. Pop. (1880) 4,078; (1890) 5,717; (1900) 6,905.

Editor of "Tribune."

Chillicothe, or **Chilicothe**: a beautiful city and railroad center; the capital of Ross co., O. (for location of county, see map of Ohio, ref. 7–E); finely situated on the Scioto river, and in a plain inclosed on several sides by verdant hills nearly 500 feet high. It is on the Ohio and Erie Canal, about 48 miles S. of Columbus, and 99 miles E. by N. from Cincinnati. The streets are wide, straight, and lighted with electricity. It has a stone-front court-house which cost about $100,000, five commodious brick union school-houses, electric street railroad, water-works; also manufactures of steam-engines and farming implements, flour-mills, furniture, buggies, wagons, boots and shoes, and other manufactories, and the B. and O. S. W. R. R. shops. Chillicothe was the capital of Ohio from 1800–10. Pop. (1880) 10,938; (1890) 11,288; (1900) 12,976.

Editor of "News."

Chil'lingham Cattle: a herd of cattle preserved at Chillingham Park, Northumberland, England. These cattle are of peculiar interest, from the fact that they are the descendants of the wild cattle which formerly inhabited Scotland. They are cream white, the insides and tips of the ears reddish, the hoofs and tips of horns black. They feed at night, sleep during the day, and hide their calves. "Once the bulls in the herd were reduced to three; two fought and killed each other, and the third proved impotent, so that the preservation of the herd depended on the accident of a cow producing a bull-calf."

F. A. Lucas.

Chil'lingworth, William: divine and controversialist; b. in Oxford, England, Oct., 1602. In 1618 he became a scholar, and in 1628 a fellow of Trinity College, Oxford. In 1630, through the influence of John Fisher, the famous Jesuit, he became a Roman Catholic, and entered the Jesuit College in Douay, France. In 1631 he was persuaded by his godfather, Laud, then Bishop of London, to reconsider the question and return to Oxford. In 1637 he put forth his great work, *The Religion of Protestants a Safe Way to Salvation*, a work of singular acuteness and ability. He became chancellor of Salisbury and prebendary of Brixworth (1638), and soon after master of Wigstan's Hospital, Leicestershire. In theology he was a latitudinarian, and in politics a royalist. D. at Chichester, Jan. 30, 1644. His collected works appeared in London (10th ed. 1742), with *Life* by Rev. Thomas Birch. See Des Maizeaux, *Life of Chillingworth* (1725); August Neander, *Erinnerung an den evangelischen Gottesgelehrten W. Chillingworth* (1832); and the Oxford edition of his works (3 vols., 1838).

Chillon, shil'lŏn (Fr. pron. shĕĕ'yōñ'): a castle and fortress of Switzerland; in the canton of Vaud; 6 miles S. E. of Vevay. It is at the east end of the Lake of Geneva, on an isolated rock, standing out from the edge of the lake. It consists of a number of towers grouped about a higher central tower. Bonnivard was confined here from 1530 to 1536 for his efforts to liberate the Genevese. His imprisonment is commemorated in Byron's *The Prisoner of Chillon*.

Chilo, kī'lō, or **Chilon** (Gr. Χίλων or Χείλων): a Spartan who is enumerated among the Seven Wise Men of Greece.

He became one of the ephori of Sparta in 556 B. C. Among the maxims ascribed to him is "Know thyself." He is said to have died of joy when his son gained a victory at the Olympic games.

Chiloé, chĕĕ-lō-ay′: an island off the coast of Chili, between lat. 41° 40′ and 43° 43′ S., with an average width of 35 or 40 miles. The mainland at this point suddenly recedes, forming the Gulfs of Ancud and Corcovado, with the island in front of them. It may be regarded as a continuation of the land north of it, from which it is separated by a winding channel less than 2 miles broad. The western coast of Chiloé is high, precipitous, and forest-covered; one of the peaks at the southern end is more than 3,000 feet above the sea. The eastern side is lower, and some portions are very fertile, producing wheat, barley, potatoes, etc. The climate is very damp. Chiloé, with about 120 neighboring islets, forms a province of Chili, sometimes called Ancud, the total area being 3,995 sq. miles, and the population (1895) 77,750. Capital, San Carlos de Ancud, at the northern end of the island, with a population of about 4,000.

HERBERT H. SMITH.

Chilognatha, kī-log′na-tha: See MYRIAPODA.

Chilopoda, kī-lop′ō-da: See MYRIAPODA.

Chil′tern Hundreds, The Stewardship of: in England, a nominal office which a member of Parliament, desiring to withdraw from the House of Commons, receives and immediately resigns. A member can not surrender his representative seat unless disqualified, and an appointment by the crown works such disqualification. In old times the steward's duties were to protect from the robbers who lurked in the forests of the Chiltern Hills, in Buckinghamshire. When this office is occupied the stewardship of the manors of East Hendred, Northshead, and Hempholme is made to serve the same purpose. The Chancellor of the Exchequer controls this patronage, which began to be used for this purpose in the middle of the eighteenth century.

Chil′ton: city; capital of Calumet co., Wis. (for location of county, see map of Wisconsin, ref. 5–F); on railroad and the Manitowoc river; 24 miles S. of Appleton; has 1 public school, 2 parochial schools, and 5 churches. Its chief industry is agriculture. Pop. (1880) 1,132; (1890) 1,424; (1900) 1,460.

EDITOR OF "TIMES."

Chilula Indians: See WEITSPEKAN INDIANS.

Chimæra, kī-mee′ra (in Gr. Χίμαιρα): a monster of classic mythology, having the fore part that of a lion, the middle that of a goat, and the hind part that of a dragon. It was supposed to exhale flames of fire. In Hesiod's account Chimæra was a daughter of Typhaon and Echidna, and wasted Lycia until Bellerophon slew her. In modern languages the term chimera is applied to any wild or incongruous fancy.

Chimæridæ: the sole family of the order *Holocephali*, a group of cartilaginous marine fishes related to the sharks and rays. The chimæras have a naked body which tapers gradually into the long, filamentous tail. There are two

Chimæra, or sea cat.

dorsal fins, the first high, pointed, and armed with a spine; the second long and low; anal variable; pectorals large. There are four cutting teeth in each jaw. The males are provided with "claspers" and the head bears a pointed, erectile appendage which fits into a groove when depressed. The eggs have a horny case. The species of the family are few and found in deep water. The best known is *Chimæra monstrosa* of European seas. *C. affinis* is found on the eastern coast of the U. S. and *C. colliei* on the western. The genus *Callorhynchus* has the nose terminated by a cartilaginous prominence ending in a flap.

F. A. L.

Chimakuan Indians: a linguistic family represented by two small tribes, the Chimakum and the Quileute. The original territory of the former, or eastern, division embraced Port Townsend, Port Ludlow, and Port Gamble, on Puget Sound, Washington. While probably never a large tribe, the Chimakum were noted among their neighbors, the Clallam, Makau, and others, for their unusually warlike habits, which seemed early to have diminished their numbers. In 1853 they numbered ninety souls; in 1884 about twenty-four survived—four on the Skokomish reservation and the remainder near Port Townsend.

The Quileute, or western, division of the family inhabited the banks of the Quileute river and the seacoast above and below, between the Makau on the N. and their kindred, the Hoh, on the S. The Quileute appear to be the remnant of a more powerful body, and the isolation and position of this and the Chimakum division suggest that the Chimakuan family once occupied the coast of Puget Sound and Straits of Fuca from Port Townsend to the Quileute country. The Makau and Clallam, of the Wakashan and Salishan families respectively, who have held this area since historic times, appear to be intruders from Vancouver island, and it seems by no means improbable that the tribes they dispossessed were Chimakuan. There is traditionary evidence that the Chimakum came from the Quileute. This latter tribe also owes its diminution in number to a pugnacious tendency toward the neighboring and more populous Salishan tribes. In 1891 there were 245 living on the Pacific coast S. of Cape Flattery. The Hoh, a sub-tribe of the Quileute, are under the Puyallup agency, and number about seventy.

AUTHORITIES.—George Gibbs in *Cont. N. A. Ethnology*, i. (Washington, 1877); Myron Eells in *Smithsonian Report for 1886–87* (Washington, 1889); Franz Boas in *Am. Anthropologist* (Washington, Jan., 1892). See INDIANS OF NORTH AMERICA.

F. W. HODGE.

Chimalpopo′ca: the third war-chief or so-called "Emperor" of the Aztecs of Mexico; ruled from 1417 to 1428, according to some chronologies, but according to others from 1410 to 1422. He was elected by the chiefs to succeed his brother, Huitzilihuitl, Maxtla having usurped the chieftainship of the Tepanecs. Chimalpopoca tried to aid the legitimate ruler; Maxtla seized and imprisoned him, and he hung himself in the cage in which he was confined. Lineal descendants of Chimalpopoca are still living in Mexico.

H. H. S.

Chimaltenan′go: the name of a department and city of Guatemala. The department lies on the northern slope of the main Sierra in about the middle of the state; is well watered and fertile; gold is found in the streams. The inhabitants are Christianized Indians, devoted to the rearing of cattle and cultivation of soil. Area, 800 sq. miles. Pop. 57,000. The town is in the department, 25 miles W. of the city of Guatemala (see map of Central America, ref. 4–D). It has a considerable trade. Pop. 14,000.

Chimariкan Indians: a linguistic family comprising the Chimariko and Chimálakwe tribes, formerly of Trinity co., Cal., the former inhabiting Trinity river from Burnt Ranch northward to the junction of the north and south forks, the latter residing on New river, a tributary of the Trinity.

Of the general characteristics of these two tribes very little is known. From the friendly Wintu tribes, their eastern and southern neighbors, they borrowed their mortuary customs and in part their medical practices. In lieu of tobacco they smoked the mistletoe. Their hunters were accustomed to smear their bows and arrows with "medicine" to prevent the deer from detecting the human odor.

By an early pioneer it is stated that the Chimarikan Indians were once as numerous as the Hupâ, an Athapascan tribe adjoining them on the W. and S. W., who, through constant aggression particularly toward the Chimálakwe, from whom they exacted an annual tribute, finally succeeded in overpowering the latter and in compelling them to adopt much of the Hupâ tongue. Thus it was that about 1850 the Chimálakwe numbered but two families, aggregating twenty-five persons, who spoke their own language.

Salmon had formed the chief article of subsistence of the two Chimarikan tribes up to the advent of the whites into their territory, when the pollution of the streams from mining operations rendered the fisheries of the Indians useless, and continued warfare ensued. In 1876 but half a dozen Chimariko survived; a year before only three members of the Chimálakwe were known to exist. In 1889, in Hupâ valley, a Chimariko man, seventy or more years of age, was found, who was then believed to be one of two survivors of the tribe.

Authority.—Stephen Powers, *Tribes of California, Contributions to North American Ethnology*, vol. iii. (Washington, 1877). See Indians of North America.

F. W. Hodge.

Chimbora'zo: a province of Ecuador; in the highlands S. of the volcano of the same name; area, 5,544 sq. miles. Pop. estimated (1885) 122,300. Capital, Riobamba.

Chimborazo: the highest mountain of Ecuador, and one of the highest in America; in the Western Cordillera; about 100 miles S. of Quito and 80 N. E. of Guayaquil. It is a magnificent dome, its snowy summit towering far above the surrounding peaks, and visible at times from the ocean, 150 miles distant. Several glaciers extend far down the sides. The mountain is of volcanic formation, but no crater has been discovered, and there is no record of an eruption. The ascent is extremely difficult, owing not only to the height and the rarefied air, but to the deep powdery snow of the summit through which the explorer must force his way. It was vainly attempted by Humboldt, Boussingault, and others. Jules Rémy reached what he believed was the top in 1856, but could not recognize the surroundings owing to a blinding snowstorm. The feat was finally accomplished by Whymper in 1879, and again in 1880. His careful measurements show that the height is 20,496 feet. He had the fortune of viewing from the summit an eruption of Cotopaxi, 60 miles distant. See Whymper, *Travels among the Great Andes of the Equator*; Wolf, *Geografía y Geología del Ecuador*.

Herbert H. Smith.

Chime [M. Eng. *chimbe, chymbe, chim*; abbrev. of * *chimbel* < O. Eng. *cimbal*, from Lat. *cym'balum*, a cymbal]: the consonant or harmonic sounds of several instruments; correspondence of sound; music performed on a set of bells in a church tower. The term is sometimes used to denote a set of bells which chime or ring in harmony. The carillon differs from the chime in that its bells are more in number and are stationary. See Bell-ringing.

Chimere [O. Fr. *chamarre*, fur cloak; Span. *chamarra, zamarra*, sheepskin; Ital. *zimarra*, long cloak; origin obscure; that from Basque *echamarra* improbable]: the upper robe worn by a bishop, to which the lawn sleeves are now generally attached. Since the time of Queen Elizabeth it has been of black satin, but previously it was of a scarlet color, like that now worn by bishops assembled in convocation or when the sovereign of Great Britain attends Parliament.

Chimmesyan Indians [from the Chimsian terms *ts'em*, on, and *kcian*, main river (Bois); literally on the main (Skeena) river; according to Tolmie and Dawson the name signifies people or our people]: a linguistic family comprising the Chimsian and Nasqá tribes of British Columbia, with their various divisions. The Chimsian occupy the territory drained by the lower Skeena and the coast of Chatham Sound, Grenville channel, and the adjacent islands, except Hawkesbury island, southward to Milbank Sound in latitude 52° 15′. The Nasqá (also called Nass and Naas) inhabit the banks of Nass and upper Skeena rivers.

The Chimmesyan people are said to be strong and finely formed, and to compare well physically with the best specimens of the Indian race. They do not have the habit of deforming the heads of their children, like the neighboring tribes, but the custom prevails of perforating the lower lip of the females for the insertion of labrets. They also perforate the septum of the nose as well as the helix and lobe of the ear to admit of ornamentation, and tattoo arms and feet.

The tribes of this family can not be said to be hunters, though in the interior the chase is more or less resorted to, chiefly to procure skins for clothing. Bows and arrows until recently were used. The Chimmesyan tribes, particularly those of the coast, are expert fishermen, and large quantities of fish are dried for winter use. Sea-grass and various berries are also eaten.

Their principal article of clothing is the blanket, made of tanned skins, or more frequently woven of mountain-sheep wool and dog-hair, or both, and even of cedar bark. Their heads are covered with water-tight hats made of roots, and in rainy weather and in the canoe a water-tight cap of cedar bark is worn. The legs are left bare.

Baskets are made for various purposes, dried seaweed, cedar bark, roots, wood, etc., being employed in their manufacture. Cedar bark, reed, and rush mats are used for many purposes. Canoes were made principally of cedar, being hollowed out by means of wedges, adzes, and axes, aided by fire. The art of pottery is unknown, but for cooking purposes large water-tight baskets and hot stones were employed.

The houses, which are of wood, with gable roofs supported on beams, are built to face the sea. A platform about 2 feet high and 4 feet wide is built around the interior walls, and very large houses have two or three such platforms upon which small sleeping apartments are constructed. Four families usually occupy a single house, a family living in each corner and having its own fireplace.

Three social classes are found among the Chimmesyan. Common people are those who have not been initiated into one of the four secret societies. By the initiation they become middle-class people, but can never become chiefs, who form a distinct class and who are hereditary. Chiefs, however, have little influence upon the members of the tribe. The Chimmesyan have four gentes—the raven, the eagle, the wolf, and the bear—and in each village the houses of members of each gens are grouped together. One of their institutions is the "potlatch"—the custom of paying debts and of acquiring distinction by means of giving a great feast and making presents to all guests. Curious natal rites are observed and interesting maturity and mortuary ceremonies performed. Slavery is said to be common to both the tribes.

In 1888 the population of the entire family was estimated at 5,000. In 1887 about 1,000 of these, in charge of William Duncan, removed to Annette island, about 60 miles N. of the southern boundary of Alaska, near Port Chester, where they founded the settlement of Metlakahtla. Here houses have been erected, schools and churches established, and the natives are said to be making remarkable progress in civilization.

Authorities.—Tolmie and Dawson, *Comp. Vocabs. Ind. Tribes Brit. Columbia*, with map (Montreal, 1884); Franz Boas, in the British Association for Advancement of Science *Proceedings*, Newcastle-upon-Tyne meeting (London, 1889). See Indians of North America.

F. W. Hodge.

Chimney: a structure of masonry or of iron, usually of considerable altitude, containing a flue or flues for conveying the gases from a furnace to the outer air. It produces, in whole or in part, also the draught required to give the needed rate of combustion. Its main purpose is sometimes simply the discharge of noxious gases at great altitudes, as, for example, in chemical works. Such chimneys are sometimes built up to heights of 400 and 500 feet, and produce a draught sufficient to burn 30 to 50 lb. of coal on each square foot of grate. The intensity of draught thus measured varies as the square root of the altitude, and with good proportions and proper adjustment to their work the weight thus burned in pounds on the square foot of grate will be not far from twice that numerical quantity taken in feet. Every pound of fuel produces 15 to 25 lb. of gas, sometimes more, and the flue is commonly made about one-fifth or one-sixth the area of the grate.

Where, as on shipboard or the locomotive, an exceedingly strong draught is demanded, a "forced draught" is resorted to, the current being produced by the action of a revolving fan, a steam-jet, or the impulses of the exhaust steam from the engine. By such expedients more than 100 lb. of coal are sometimes burned on a square foot of grate. Such intensity of combustion by natural draught would require a chimney exceeding half a mile in height. These figures are given for the usual marketable qualities and sizes of fuel. Fuels of poor quality or of small size require greater intensity of draught than those of good quality or of large size. Anthracites demand higher chimneys than bituminous coals.

House-chimneys were probably introduced into the better class of houses in Europe about the twelfth century. The first in the city of Rome was erected in 1368, and they only came into general use in England and on the continent of Europe in the seventeenth century. Previously the fires were built on the stone or earthen floors and in the middle of the room, the gases and smoke emerging through a hole in the middle of the ceiling, as still practiced by semi-civilized and barbarous nations.

R. H. Thurston.

Chimney-swallow: in the U. S. the common name for the chimney-swift (*Chætura pelagica*); a bird which outwardly bears some resemblance to the swallows, but is not related to them. (See Swift.) It is very abundant during summer in the Eastern U. S., and seems perpetually on the wing, gathering while in full flight the little twigs of which

its nest is made. In Europe the name is given to a true swallow (*Hirundo rustica*) very much resembling our barn-swallow. Both chimney-swift and chimney-swallow are so called from their habit of nesting in chimneys.

F. A. Lucas.

Chimpan'zee (*Troglodytes niger*): an anthropoid or tailless ape inhabiting the dense forests of the Congo region of Africa, from near the coast eastward to the great lakes. When fully grown it is 4 feet or a little more in height, blackish, with pale hands and feet. It more nearly resembles man in general appearance than does any other of the great apes, and assumes an upright attitude with greater ease than its relatives. The gorilla is, however, anatomically more closely related to man. The chimpanzee is largely terrestrial in its habits and runs on all fours, the knuckles of the hands being applied to the ground. It builds nests in trees, and is usually found in small bands of from five to ten. When young the chimpanzee can be readily tamed and taught various tricks. Many have been taken to Europe and several have from time to time been brought to the U. S., but sooner or later they die from diseases of the lungs. See R. Hartmann, *Anthropoid Apes* (International Science Series, 1885).

Chimpanzee.

F. A. Lucas.

Chimsian: See Chimmesyan Indians.

Chi'mu, or **Grand Chi'mu**: the name given by archæologists to an ancient city of Northwestern Peru; on the seashore; 4 miles N. of the present city of Truxillo. It was the chief town and probably the capital of the people called Chimu or Yuncas, whose civilization was entirely distinct from that of the Incas until the fifteenth century. The ruins of this city are the most extensive in America, covering a space 12 to 15 miles long and 5 to 6 broad. They comprise vast buildings, palaces, and temples, some of the walls being ornamented with arabesques and paintings; immense reservoirs, which were filled by an aqueduct 14 miles long; a great truncated pyramid, used as a burial-mound; and other interesting structures. One of the buildings is supposed to have been a prison. Excavations among these ruins have yielded many ornaments of gold and silver, remains of rich cloths, pottery, and other objects. See Squier, *Peru* (1877); Charles Wiener, *Perou et Bolivie* (1880).

Herbert H. Smith.

China: a large, compact, and populous country of Eastern Asia, which, excluding its dependencies, has an area of nearly 1,300,000 sq. miles, and extends through twenty-five degrees of E. lon. (98° to 123°) and about twenty-three degrees of N. lat. (18° W. to 41°). It is bounded on the N. by Mongolia, one of its largest dependencies; on the E. by a part of Manchuria and those western extensions of the Pacific Ocean which are known as the Gulfs of Liao-tung and Peh-Chih-li, the Hwang-Hai, or Yellow Sea, the Tûng-Hai, or Eastern Sea, and the China Sea; on the S. by the Nan-Hai, or Southern Sea, and by Tong-king (Tonquin) and Burma: and on the W. by Tibet and Eastern Turkestan.

Name.—The name *China* is entirely unknown to the people of the country. It is probably derived from *Ts'in*, the name of the most powerful of the feudal states of ancient China, which finally became paramount, overturned the dynasty of Chow (1121 to 284 B. C.), and established under Chi-Hwang-Ti (*q. v.*) the short-lived dynasty of Ts'in, about 255 B. C. As Ts'in guarded the northwest part of the empire, occupying most of the present province of Shensi and the regions beyond, it would naturally be the one with which travelers from Western and Central Asia would become first and best acquainted. From this arose perhaps the many variations of the name which we find applied in ancient times to this region, e. g. *Sin* (the *Sinæ* of Ptolemy and the *Sinim* of the Bible being the people of *Sin*), *Chin*, *Thin*, Tsin-is-*tan* (the *-tan* or country of the Ts'in), and lastly Chin-a or Chin-tan (compare *-tan* in Baluchis*tan*, Afghanis*tan*, Hindus*tan*, etc.), the forms most commonly used by Chinese Buddhist writers. Among the Chinese themselves the country is most commonly known as *Chung-Kwoh*, or "Middle Kingdom," a name which takes us back to the feudal times of the Chow dynasty, when the imperial domain was called the "Central Kingdom or State," as distinguished from the surrounding feudal kingdoms and the territories of the outlying "barbarians." Many other names are in use among the people, such as *T'ien Chao*, or "Celestial Dynasty" (from which probably comes our phrase "Celestial Empire"), in allusion perhaps to the claim of each succeeding dynasty that it has been commissioned by Heaven to rule. The name of the reigning dynasty is also much used, generally preceded by Ta-, great, as *Ta Ming Kwoh*, the "Great Illustrious Kingdom," from *Ming*, "illustrious," the dynasty which began in 1368 and lasted until 1643, when the present *Ta Ts'ing* or Great "Pure" Dynasty "received the appointment of Heaven" and displaced it, and China became *Ta Tsing Kwoh*, the "Great Pure Country." In ancient classical writings we also find mention of *Serica* (Seriee in Ptolemy), the land of the *Seres*, and it is now well understood that the reference is to China as the land of the silkworm and of silk, from the Chinese word *sze*, for "silk as it comes from the cocoons."

In the Middle Ages the country was most commonly known as Cathay, a corruption of *Khitai*, the Persian form of *Khitan*, the name of a Tartar tribe which first comes into notice in the fifth century of our era, and which was in possession of Northern China during the tenth and eleventh centuries. Marco Polo speaks of China as Khitai, and by that name the country is still known among the Russians. See Cathay.

Physical Features.—China may be described as a series of basins sloping eastward to the Pacific from the great mountain masses of Central Asia which bound it on the W., and which extend as far E. as the 112th or 113th meridian. East of that line the country may be roughly divided into two parts: (1) a hilly region S. of the Yang-tse, and (2) a great plain stretching northward from the latitude of Hang-chow Bay some distance S. of the Yang-tse, almost to the latitude of Peking, where it meets the foot-hills of the eastern extensions and outliers of the great mountain-chains of the northwestern provinces.

Mountains.—In the mountainous belt of provinces which lies W. of the 112th meridian we find two distinct systems—the Kwŭn-lŭn and the Himalayan. The former consists (1) of several nearly parallel ridges of great height, reaching far above the snow-line at some points, which break off from the Kulkun or Kwŭn-lŭn range N. of Tibet, and take a generally S. E. or S. S. E. direction through Sze-chuen and part of Hupeh, separating the Ya-lung, the Min, the Kia-ling, and other considerable affluents of the Great River from one another and from the Kin-sha-kiang or uppermost courses of the Yang-tse after it enters China proper. (2) An eastern extension of the Kwŭn-lŭn chain, in two parallel ridges of 6,000 to 8,000 feet, through Kansuh, Shensi, and Shansi into Honan. These are known as the Tsing-ling (or "Azure Mountains") and the Fû-niu Shan, and divide the Wei and other tributaries of the Yellow river from the Han and its affluents, which join the Yang-tse at Hankow. (3) The Pa-ling, or Kiu-tiao (or "Nine Branch Mountains"), thrown off by the Sinch-ling, with a S. E. trend, and forming the watershed between the Han and the Kia-ling, which joins the Yang-tse at Ch'ung-K'ing-Foo in Sze-chuen. The peaks of this range are not as lofty as those of the Tsing-

R U S S I A N
Irtish
Obi
Biisk
Semipolatinsk
L. Balkash
Zaisan Nor
Saiausk Mts.
Kureuy R.
Irkutsk
Tannu-ola Mts.
Ubsa Nor
Khangai Mts.
Kobdo
Uliassutai
Buyantu
Selenga
Tulta
Z U N G A R I A
Bulun Tokhoi
Urungu
Ala Kul
Altai Mts.
Khargana
Karakorum ruins
M O N
Southern Altai
Viernoie
Ili R.
Issik Kul
Khan Tengri 24,000
Naryn
Chatyr Kul
Tien shan Mts.
Kulja
Shikho
Manas
Urumtsi
Barkul
Turfan
Pijou
Hami or Khamil
Kutcha
Karashar
Korla
Bugur
Aksu
Bai
E A S T. T U R K E S T A N
Kashgar
Maralbashi
Yangihissar
Yarkand
Mustagh-Ata
Tashkurgan
Khotan
Kiria
Tarim
TAKLA MAKAN DESERT
Cherchen
Kara Nor
Khubatar-baychang
Sogo
Chukhan Mts.
G O B I
Ansitan
Su-chow
Kau-chow
Yung-chang
Liang-chow
Ning-hia
Karakorum Mts.
Altyn-Tagh Mts.
Chamen Tagh Mts.
Toguz Dahan Mts.
Moscow Mts.
Valley of the Woods
Kuen Luen Mountains
Nan-Shan Mts.
Koko Nor
Si-ning
Lan-chow
K A N S
T I B E T
Rudock
Ike-Namur Nor
L Kashua
Bokha Namur Nor
Aling Gangri
Gartokh
Kailas Mt.
Monasarowar L.
Thok Marshera
Chargut-tso
Ombo
Yangdo
Dangra Yum
Daru L.
Tengri Nor
Niamelio
Patshika
Oring Nor
Kegudo
Kuug-chang
Sung-pan
Lung-ngan
KHAM
Tsaimdo
R. Sanpo or Brahmaputra
Lassa
Shigatse
Jiamda
Chamkar
Chetang
Karkang
Gya-la-Sindong
Ninber
Sur
Litang
Batang
Ta-tsien-lu
Kia-ting
Mt. Everest 29,002
Yatung
Himalaya Mts.
Dhawalagari
NEPAL
KHATMANDU
BHUTAN
Tawang
Sadiya
Darjiling
Cawnpur
Lucknow
Jumna
Ganges
Patna
Tezpur
Goalpara
Brahmaputra
Dibrughur
Ye-kala
Niang-fan-wei
Siu-chow
Ning-yua
Li-kiang
Ta-li-fu
Tung-chwan
Yunnan
Chao-tung
Tung-chang
Bhamo
Manwyne
Chu-ning
Kwang-nan
Lin-ngan
Mengtsz
Lao-kai
Puerho
Szemao
Kiang hung
I N D I A
TROPIC OF CANCER
CALCUTTA
Balasore
Chittagong
Cuttack
Chatrapur
Vizagapatam
BAY OF BENGAL
Akyab
B U R M A
Mandalay
Salween R.
R. Irawady
Ha-noi
TONQUI
Luang-Prabang
Mekong
Longitude East


CHINA
SCALE OF MILES
0 100 200 300 400 500
Railroads
Caravan Routes
L.L.Poates, Engr., N.Y.
from H 110 I Greenwich 115 J K 120 L 125 M N 130
H 110 115 I 120 J 125 K 130 L 135 M 140 N 145
E M P I R E
A
MANCHURIA
HEH-LUNG-KIANG
KIRIN
SHING-KING
MONGOLIA
SHAMO DESERT
Khingan Mts.
KOREA
JAPAN
SEA OF JAPAN
YELLOW SEA
TUNG HAI OR EASTERN SEA
NAN HAI OR SOUTH CHINA SEA
PACIFIC OCEAN
SAGHALIN ISLAND
Gulf of Tartary
La Perouse Strait
YEZO
Amur R.
Shilka R.
Nerchensk
Ingoda R.
Onon R.
Blagovestchensk
Aigun
Mergen
Khailar
Dalai Nor
Puir Nor
Kerulen R.
R. Nonni
R. Yal
Tsitsihar
Sungari
San-sing
Ussuri R.
Kabarofka
Khanka L.
Vladivostok
Peter the Great B. (Victoria B.)
Harbin
Ningnta
Kirin
Bodune
Kwang-chung-tse
Sira muren
Pan-tsi-koten
Shan-yan-alin Mts.
Tiumen R.
Mukden
Yenden
Liao Ho
Loh-ning
Dolon-nor
Kin-chow
Cheng-te
Niu-chwang
Yin-hwa
Sin-yang
Gulf of Liaotung
Port Adams
Taku-shan
Kalgan
Siuen-hwa
Shanhaikwan
Ta-tung
So-ping
PEKING
Tientsin
Tungchow
Pongatai
Ta-ku
Gulf of Pechili
Talienwan
Port Arthur (Rus.)
Korea Bay
Tung-chow-foo
Cheeoo
Shantung Prom.
Wei-hai-wei (Br.)
Hai-yang
Kiaochow Ger.
Lai-chow
Tsing-chow
Tsi-nan
SHANTUNG
Yen-chow
I-chow
Tsau-chow
Paoting
Ho-kien
CHIHLI
Ing
Kho-tan
Tsing-lo
Tai-yuen-foo
SHAN-SI
Kwang-ping
Cheng-te
Ping-yang
Wei-hwai
Tse-chow
Pu-chow
Hwai-king
Hwang Ho
Fuen-ho
Tung-chow
Yen-ngan
Kia
GREAT WALL
Kai-fung
Ho-nan
HO-NAN
Chin-chow
Nan-yang
Su-chow
Hwai-an
Former mouth of Hwang Ho
Grand Canal
KIANG-SU
Fung-yang
Hing-chow
Hwai Ho
NGAN-HWUY
Lu-chow
Nanking
Wu-sung
Shanghai
Su-chow
Chin-kiang
Tai-ping
Ning-kwei
Hu-chow
Hang-chow B.
Hang-chow
Ngan-king
Ningpo
Chin-Hai
CHUSAN ARCHIPELAGO
Shao-hing
Kin-hwa
San Mun Bay
CHEHKIANG
Tai-chow
Wen-chow
Wen-chow B.
Yen-chow
King-teh-chin
Yao-chow
Nanchang
KIANGSI
Kiang-chang
Shao-wu
Kian-ning
Fu-ning
Yen-ping
FUH-KIEN
Fuh-chow
R. Min
HAI-TAN I.
Tsuen-chow
Ting-chow
Kan-chow
Ki-ngan
Chang-chow
Chao-chow
Amoy
Swatow
Hwei-chow
KWANGTUNG
Canton
Samshui
Shao-king
Fatshan
Macao (Port.)
Kowloon
Mirs Bay
Hongkong Br.
Canton R.
Tappa
Kao-chow
Kwang-chow-wan Fr.
Lui-chow
Hainan Str.
Kiung-chow
HAINAN
Wau-chow
Gulf of Tonquin
Pakhoi
Taifong
Lien-chow
Nan-heong
Nan-ning-foo
Chin-chow
Kwei-lin
Ping-lo
Wu-chow
KWANGSI
Yung
Shao-chow
Ing-te
Hankow
Han-yang
Wu-chang
Ngan-lo
HU-PEH
Kwei-chow
I-chang
Shashi
Su-nan
Yang tse Kiang
Han Kiang
Siang-yang
Fan-ching
Shu-ning
Mu-ling Mts.
Hwang-chow
King-chow
Yo-chow
Kiu-kiang
Nan-kang
Su-chow
Chang-sha-foo
Siang-tan
HUNAN
Heng-chow
Pao-king
Chang-te
Shin-chow
Yuen Kiang
Siang Kiang
Chin-yuen
SHEN-SI
Si-ngan-foo
Han-chung
Hing-an
Fung-siang
KWEI-CHOW
Kiang
Kalgan
Sam-su
Kil-yu
Kang-ge
Kiong-hung
C. Kozakof
C. Bruat
Broughton B.
Port Lazaref
Wi-yu
An-yu
Gensan
C. Durock
Yang-yang
Phung-kong
SEOUL
Chemulpo
Yong-hai
Thai-an
Chin-yu
Fusan
Na-yu
Unkofsky B.
OAGELET I.
OKI IS.
AMHERST I.
Port Hamilton
QUELPAERT I.
YOO-CHOO I.
Korea Strait
Tsuwano
Shimonoseki
Saga
KIUSIU
Nagasaki
Takanabe
Kagosima
Bungo Str.
SIKOKU
Kotsi
C. Tasa
Van Dieman Strait
TANEGA SIMA
LINSHOTEN IS.
NORTHERN GROUP
CHUNGSAN OR MIDDLE IS.
Nafa
LIUKIU OR LOOCHOO IS.
Kioto
Kobe
Hiogo
Osaka
Sakai
Iseno B.
C. Noto
Niigata
Hakodate
Matsumayi
TAI-WAN (FORMOSA) To Japan
Tamsui
Kelung
MAJICO SIMA GROUP
Formosa Str.
PESCADORES
Mt. Morrison
Tai-wan
Ta-kao
South Cape
BASHEE IS.
BUBUYAN IS.
C. Engano
LUZON
50
45
40
35
30
25
20
1
2
3
4
5
6
7
8
9
10

ling, which in turn are inferior in height to the Sze-chuen peaks.

The Himalayan system of Yunnan and Kwei-chow is but an eastern extension of the mountains which bound Tibet on the S., and consists of several ranges collectively called Nan Shan, or the "Southern Mountains." These spread eastward, separating the Yang-tse and its southern feeders from the Si-kiang, cover the province of Kwang-tung, and on the borders of Fuh-kien merge into what Pumpelly calls the "coast range" of his "Sinian system of parallel ridges" which cross the empire from N. E. to S. W., and "determine the outlines and nearly all the physical features of the continent, just as the Appalachians have determined those of the eastern part of North America."

Rivers.—The Chinese have several words for "river." *Chuen* is a book-word found in such names as Sze-chuen, "Four Rivers," the name of the largest province of the country. The most common words, however, are *kiang* and *ho*. The former is used in the formation of river-names from the Yang-tse southward, while *ho* is used N. of the Yang-tse. The only exceptions to this use of these syllables are the Ya-lu-kiang, which flows westward between Manchuria and Korea, and Heh-lûng-kiang, or "Black Dragon river," the Chinese name of the Amur, and both of these lie outside of China proper.

The great river-basins of China proper are three in number—(1) the Yang-tse in the center, (2) the Hwang-ho, or "Yellow River," in the north, and (3) the Si-kiang (which enters the sea partly along the channel of the Chu-kiang, or "Pearl River") in the south, and partly in a channel of its own parallel to the Chu-kiang. These, like almost all the rivers of China, flow S. E. through the greater part of their courses. The chief exceptions are the Woo and the Yuen in Kwei-chow (already mentioned), the Siang in Hunan, and the Kan in Kiangsi, which find their way to the Yang-tse through the Tung-ting and Poyang lakes respectively.

The Hwang-ho and the Yang-tse rise beyond the western boundary of the country at no great distance apart. The former has its origin in some little lakes situated in lat. 35° N. and lon. 96° E. in a plain of Kokonor, called by the Chinese Sing-suh-Hai, or "Constellation Sea." For the first 700 miles its course is very crooked, winding its way through gorges in the Kulkun range. It then bends to the N. E. and N. through Kansuh and the Great Wall for 450 miles more, when it is deflected eastward by the In-Shan. About the 110th meridian it is again forced S., and flows for 500 miles in that direction between the provinces of Shensi and Shansi as far as the fortress of Tung-Kwan at the foot of the Tsing-ling, where it receives the Wei from the W. Here it is again deflected to the E., and flows in that direction through the Great Plain, carrying immense quantities of the *loess*, or "terrace deposit," which is so characteristic of this region of China, and which, as it settles in the more level parts of the river's course, forms banks and shoals, and has gradually raised the bottom of the river itself above the surrounding country. A short distance beyond Kai-fŭng-foo, near the borders of Shantung, it takes a northward course, flowing past Tsao-chow Foo on the Grand Canal. Here it joins the Ta-tsing-ho, and through its channel pours its waters into the Gulf of Peh-chih-li. At the point where it turns northward it has changed its course several times, having taken its present course in 1853. Up to that time it had made its way to the sea in a S. E. direction, using the channel of the Hwai in Kiangsu. In 1853, when it changed its course, again in 1867, and on several occasions since, the bursting of its banks has resulted in widespread disaster and immense loss of life. It receives its name from the yellow *loess* which tinges its waters, has a course of about 2,600, and drains an area of 475,000, sq. miles.

The most important river of China, and one of the longest and greatest in the world, is that which is known to foreigners as the Yang-tse-Kiang, a name, however, which is applicable only to that portion of the river which flows through the ancient province of Yang—that is, through Ngan-hwuy, and the region stretching thence to the sea. In that part of its course which lies beyond China proper it is fittingly called the *Murui Ussu*, or "Tortuous River." Thence to where it is joined by the Min it is called the *Kin-sha-kiang*, or "River of Golden Sand." From its junction with the Min as far as Foo-chow in Sze-chuen, where it receives the Woo from Kwei-chow, it takes the name of *Min*, while lower down to Ngan-hwuy and beyond it is known indifferently as the *Ta-kiang*, or "Great River," the *Ch'ang-kiang*, or "Long River," or simply as the *Kiang*. It is sometimes incorrectly spoken of, especially in French books, as the "Blue River," and the name Yang-tse is also sometimes incorrectly translated "Son of the Ocean." In its uppermost courses in Tibet its bed is 10,000 feet above the level of the sea, and in China proper its fall is very great. For the first thousand miles of its course in China it flows in a S. E. direction to the borders of Yunnan (26° N. lat.), where the Yun-ling merges into the Nan-ling. It then makes a great bend to the N. E., as far as 30° N. lat., thence in a generally S. E. direction, falling into the sea at the islet of Sha-wei-shan in about lat. 31° 25′ N. and lon. 122° 14′ E., having drained an area of 548,000 sq. miles. In its course it receives the waters of several important affluents, the Ya-lung, the Min, the Loh, the Kialing, and the Han from the N., and from the S. the Woo in Sze-chuen, the Yuen from Kwei-chow, the Siang from Hunan, and the Kan from Kiangsi. At Chin-kiang, 150½ geographical miles from the sea, it connects with the Grand Canal, which reaches N. as far as Tien-tsin (less than 80 miles from Peking) and S. as far as Hang-chow. The river is now open to foreign trade as far as CH'UNG-K'ING (*q. v.*), about 1,700 miles from the sea. For 600 miles of this distance—as far as Hankow—it is navigable by the largest ocean-going steamers, and for 500 miles more—to Ichang—by steamboats. Above Ichang the river is a succession of gorges and formidable rapids, up which native junks, specially built for this traffic, are towed by large crews of trackers at the rate of a few miles a day. Toward the end of summer, when swollen by the melted snows of the great mountains of the west, the river rises 50 feet or more, flooding the fields and the towns on its banks.

The third great basin of China is that of the Si-kiang, or West river, which drains a region of 130,000 sq. miles lying E. of the Yun-ling and S. of the Nanshan. It rises in Yunnan, flows eastward through Kwangsi and Kwang-tung for 5,000 *li* (about 1,650 English miles), and joins the CHU-KIANG (*q. v.*) at Samshui, through which part of its waters find their way to the sea, but the greater part soon branches off through a separate channel parallel to the Chu-kiang and enters the sea at Macao.

Lakes.—There are three considerable lakes in China, and several smaller ones, mostly south of and connected with the Yang-tse. The Tung-ting Lake, in Hunan, is about 200 miles in circumference, and connects with the Great river at Yo-chow-foo, 150 geographical miles W. of Hankow. It is apparently a part of a much larger lake which extended northward as far as the Han, but which has become silted up N. of the Great river, and is rapidly silting up S. of it. The second lake in size is the Poyang, in Kiangsi. It is about 90 miles in length and 20 in breadth, and connects with the Yang-tse at Hu-kow, about 430 miles from the sea. It is studded with numerous picturesque and populous islands. The third is the Ta- or Tai- hu, i. e. "Great Lake," near Su-chow, a shallow sheet of water 60 miles in length and 30 in width, and connected with the Yang-tse and with the ocean. In Northern Kiang-su and Southwestern Shantung there are other lakes that played an important part in the construction of the Grand Canal.

Islands.—Besides the two great islands, Hainan and Taiwan, or Formosa (ceded to Japan in 1895), lying off the coasts of Kwangtung and Fuh-kien respectively, there are several groups of smaller islands much nearer the coast. Among these are the Lintin group (to which Hongkong may be said to belong), in the estuary of the Chu-kiang; the group near the mouth of the Lung-kiang, to which AMOY (*q. v.*) belongs; the Pescadores, 20 miles W. of Formosa; the Chusan Archipelago, off the coast of Cheh-kiang (see CHUSAN); and the Miao-tao group, in the Gulf of Peh-chih-li, off the coast of Shantung.

The Great Plain is an irregularly shaped alluvial tract, slightly undulating in some parts, with occasional isolated hills and groups of low mountains. It is about 700 miles in length, and varies in breadth from 150 to 500 miles; area, 210,000 sq. miles. It is thickly studded with towns and villages, mostly walled, and supports an immense population. It is traversed from north to south by the Yun-ho, or "Transit River," known among foreigners as the GRAND CANAL (*q. v.*), a great public work designed by Kublai Khan, the founder of the Yuen or Mongol dynasty (1272–1368), and carried out by his successors. Its total length is about 650 miles. See CANAL and YUN-HO.

GEOLOGY.—Little is known of the geology of China, though something has been accomplished by the investigations and studies of Kingsmill, Pumpelly, and von Richthofen. Coal,

both bituminous and anthracite, is found in almost every province, most of it in proximity to iron, and all readily accessible. The province of Honan alone has 21,000 sq. miles of anthracite, declared by von Richthofen to compare favorably with the best anywhere. The total coal area of the country has been estimated at 419,000 sq. miles. Until recent times this coal has never been worked to any depth or to any extent by the Chinese, (1) because it was illegal, all minerals being claimed by the emperor; (2) because of the Fung-shui superstition (see FUNG-SHUI), which deprecates all tampering with the earth, lest the equilibrium of the elements be disturbed and calamity result; and (3) because of the lack of engineering skill, and such Western appliances as the pump (a thing unknown in China), which are essential in deep mining. Since the establishment of native-owned steamship lines, however, a supply of steam-coal has become necessary, and now mining is in active operation under Government auspices and foreign superintendence, both in Chih-li (about 50 miles from Peking) and in Northern Formosa. Gold, silver, lead, and tin are also abundant, and Yunnan has long been known for its rich supplies of copper. Petroleum and natural gas are found in Sze-chuen, the gas being utilized to some extent in the great salt-making industry for which that province is noted.

Loess.—This remarkable formation, called "lake loam" by Pumpelly and terrace deposit by some, covers the provinces of Chih-li (except the alluvial part), Shansi, Shensi N. of the Tsing-ling range, Kansu, and Northern Honan, and stretches eastward into Liao-tung. It also covers large portions of Shantung and Southern Honan, and big patches of it are found in the neighborhood of the Tung-ting and Poyang Lakes. It is a brownish-yellow, unstratified, friable earth, with a highly porous tubular structure and a tendency to vertical cleavage, which has a most marked effect on the scenery. The depth varies from a few inches to a thousand feet or more, and it is found at all altitudes, rounding the hillsides and filling the valleys. It is exceedingly fertile, but owing to its very porous nature it demands a rainfall that would be excessive elsewhere. It is in this region that the famines of China occur, in seasons when the rain is too scant to fill the tubes and pores of the loess to bring up to the growing grain the chemical substances it needs.

Geologists are not agreed as to the mode of the origin of this peculiar formation. Pumpelly and others hold that it is a marine or lacustrine deposit, while Baron von Richthofen claims that it is of "subaërial" origin—that is, that it was carried by the wind from some region farther west and deposited in its present position. In proof of this he points to the fact that it is full of fossil land-shells, and contains bones of land quadrupeds, but no remains of either marine or fresh-water shells. See LOESS.

PRODUCTS.—Agriculture is the chief industry, and the most honorable. Every acre of cultivable land is cultivated with care; even the hillsides are terraced and turned to account. The principal cereal in the southern, central, and western provinces is rice, which grows in standing water. In the north, owing chiefly to the porous nature of the soil, rice is not much grown. Here wheat, barley, millet, and maize are the chief cereals. Pulse is also extensively grown, as well as tobacco, cotton, hemp, opium, and sugar-cane. Tea is grown on the hillsides (not in gardens), especially in the south, center, and west. The chief tea-exporting ports are Fuh-chow, Hankow, Amoy, and Canton. The tea of Formosa resembles that of Japan, but is superior in quality. (See TEA.) Silk both for domestic use and for export is also produced extensively. Among other products are cotton, camphor, vegetable or insect wax (see PEH-LA), and medicines. Fruits of many kinds, including grapes, peaches, apricots, oranges, loquats, kumquats, lichees, persimmons, etc., are grown. The native cotton is woven into a very substantial narrow-width fabric on the hand looms of the country.

CLIMATE.—In a region so large as China there must naturally be much diversity of climate. In general it may be said that it resembles that of the U. S. in its range of temperature, except that while in North China the temperature is higher in summer and lower in winter than in the corresponding portions of the U. S., there is less humidity. The rainy season of North China lasts for about six weeks, and the dry season for the rest of the year. In the south the heat is greater, and so is the humidity. In the north the rivers are frozen over during winter, and all navigation ceases. In Sze-chuen dense fogs prevail all winter, and the sun is seldom seen.

POLITICAL DIVISIONS.—The number of provinces has varied at different periods. During the Ming dynasty (1368–1643) there were thirteen provinces. In the period K'ang-hi—that of the second emperor of the present dynasty—it was cut up into eighteen provinces, and ever since *Shih-pah Sung*, or "the eighteen provinces," has been a common colloquial name for the country. In 1886, shortly after the French difficulty, the island of Taiwan, called Formosa by foreigners, was detached from Fuh-kien, and made into a separate province. In 1895 it was ceded to Japan.

TABLE SHOWING THE AREA, POPULATION, AND CAPITALS OF THE EIGHTEEN PROVINCES.*

PROVINCES.	Area in sq. miles.	Population.	Year of census or of estimate.	Population per sq. mile.	CAPITALS.
Chih-li.....	58,949	17,937,000	1879	304	Pao-Ting-Foo.
Shantung ..	65,104	36,247,835	1882	557	Tsi-Nan-Foo.
Shansi.....	56,268	12,211,453	"	221	Tai-Yuen-Foo.
Shensi.....	67,400	8,432,193	1879	126	Si-Ngan-Foo.
Kansuh	125,450	9,285,377	"	74	Lan-Chow-Foo.
Sze-chuen ..	166,800	67,712,897	1882	406	Ching-Tu-Foo.
Hupeh	70,450	33,365,005	"	473	Wu-Chang-Foo.
Honan	65,104	22,115,827	"	340	K'ai-Fŭng-Foo.
Kiang-su ...	44,500	20,905,171	"	470	Nanking.
Ngan-Hwuy	48,461	20,596,288	"	425	Ngan-k'ing-Foo.
Cheh-kiang.	39,150	11,588,692	"	296	Hang-Chow-Foo.
Kiangsi.....	72,176	24,534,118	1879	340	Nan-Chang-Foo.
Hunan	74,320	21,002,604	1882	282	Chang-Sha-Foo.
Kwei-chow.	64,554	7,669,181	1879	118	Kwei-yang-Foo.
Yunnan	107,969	11,721,576	"	108	Yun-nan-Foo.
Kwangsi ...	78,250	5,151,327	"	65	Kwei-lin-Foo.
Kwangtung	79,456	29,706,249	1882	377	Kwangchow-Foo.
Fuh-kien...	38,480	23,000,000†	....	...	Fuh-chow-Foo.
Totals	1,322,841	383,182,793	....	289	

* To these might very properly be added Shingking, the most southerly of the "Three Eastern Provinces," commonly known as Manchuria, as since 1876 it has been administered by a civil governor.
† Estimated.

PEOPLE.—History shows that the people of China entered the country at a very early period as a band of immigrants from some place in Central Asia, and recent researches seem to point to Babylonia as their original home. It is said that they followed the course of the Yellow river and settled in Shensi, Shansi, and Honan. The aboriginal tribes they found in possession were gradually overcome and absorbed, though remnants of some of them are still found in wild independence in the southwestern provinces (see MIAO-TSE) and on the islands of Hainan and Formosa. These immigrants brought with them a considerable degree of civilization, and their descendants have continued to be the great civilizers of Eastern Asia. Korea, Japan, Loochoo, etc., have all received their culture and arts from China.

Education.—Education is widespread and highly prized. It is the only passport to social and official position; each village has at least one school, and at least one male member of each family can read, write, and cipher—the ciphering being done with the swan-pan, or ABACUS (*q. v.*). Competitive examination for literary degrees dates, in its present form, from about the beginning of the eighth century. The scholars or literati form the highest of the four social grades, farmers coming next, then the artisans, and lastly merchants. In point of intellect, as in business and diplomacy, the Chinese are the equals of the ablest and most civilized nations of Christendom.

Social Life.—The Chinese are a gregarious people living in cities and villages (most of them defended by high walls and fortified gates which are closed every night at sunset). Scattered dwellings are as a rule unknown, yet agriculture is one of their chief occupations. There are no grass-fields and no grazing herds; beef is not used, except by the Mohammedans, and milk, butter, and cheese are entirely unknown. Pork, chickens, eggs, and fish, with vegetables and rice (in the southern and central provinces), and wheat, barley, maize, and millet, etc. (in the northern provinces), form the chief articles of food.

Dwellings.—To a European, Chinese homes seem very comfortless, with their paper windows, their lack of outlook to the street, their earthen or tiled floors, their straight-backed chairs, the absence of fireplaces and stoves, and of a second story, except for purposes of amusement. The better class of buildings are of slate-colored brick (red bricks and tiles are practically unknown), the under courses probably of limestone, with tiled or thatched roof, and heavy, ornamented, overhanging eaves. The less wealthy use sun-dried bricks covered by a thin coating of plaster or cement, or

faced with a single thickness of burnt brick. The poorest use *adobe*, or else a wooden framework filled up with wattled bamboos, or stalks of millet or maize thickly daubed with mud and mortar. Timber is scarce, the principal supply for the best buildings coming from Manchuria in the north or from Annam or Burma in the south. The framework of the roof is first set up on posts (about 9 feet apart) which are afterward built into the walls.

There are few notable buildings in China except pagodas and temples, the gate-towers of the cities, a few palaces and government offices, and, owing to the perishable nature of the materials employed and the havoc wrought by frequent rebellions, few can boast of any great antiquity. There can be no doubt that the tent is the real model of all Chinese buildings. This is proved chiefly by the shape of the roof, which shows the curves of an easy-hanging tent-cloth over a tent-frame.

Marriage is universal, and is contracted in childhood, though from sixteen to eighteen is the usual age for marrying. Persons of the same surname can not intermarry. The son takes his wife to his father's home and not to one of his own. Few women can read; some, however, have attained distinction as scholars. The women never eat with the men, even of their own family, and are seldom seen abroad. The cramping of the feet of girls is a custom of long standing, the origin of which is unknown. For social reasons it can not well be changed until the court ladies give it up.

Religion.—In religion the Chinese are easy going, and draw on three different systems. From primitive times they got the notion of a supreme Being (still worshiped twice a year by the emperor on behalf of the people), a host of spirits, and the worship of ancestors. On this have been grafted the Confucian morality and many superstitious notions and practices from BUDDHISM and TAOISM (*qq. v.*). The former was introduced into China in the period Ming-ti (A. D. 67) and at once took root. Monasteries, usually styled temples, abound, and the system has so spread over the empire that people forget its foreign origin. There are about thirty millions of Mohammedans in the country, and until recent times a Jewish community, with a synagogue and copies of the Pentateuch in Hebrew, existed at Kai-fŭng-foo, the capital of Honan. Christian missions are now found everywhere throughout the eighteen provinces and beyond.

GOVERNMENT.—The government of China is a despotism constituted on the model of the family. The Hwang-ti or emperor is the "son and minister of Heaven," but he is also the "father and mother" of the people, and what he is to the people at large each district official is to those under his jurisdiction. Under the emperor, the supreme direction of affairs is intrusted to a grand council or cabinet composed of four high officials, the highest in the empire, of whom two are Chinese and two are Manchus. Under the orders of this grand council are the seven boards or executive departments, each with two presidents, a Chinese and a Manchu. These are (1) the board of civil office, which superintends the appointments, salaries, and movements of officials; (2) of rites; (3) of revenue and population; (4) of war, which until 1885 included both the army and navy; (5) the board of punishments; (6) the board of works; and (7) the admiralty or navy department. Besides these there are many other important bureaus and offices, such as the Tu-Cha-yuen, or board of censors, "the eyes and ears of the emperor" (whose business is to expose corruption and misgovernment, and who are privileged to rebuke the emperor himself); the Li-Fan-yuen, which has charge of the "colonies" and dependencies; the Tsung-li-Yamen, or foreign office, etc.

For administrative purposes each of the eighteen provinces is divided into *departments* called fu (or foo), and *districts* called chow or hien. The official at the head of each of these is called a *chih-fu*, a *chih-chow*, or a *chih-hien*—that is, "the one who knows" the fu, the chow, or the hien. The district mandarin has charge of everything connected with his district, and is at once sheriff, coroner, judge, tax-collector, superintendent of education, etc. Several districts make a fu or department, and two or more departments a *tao* or circuit, at the head of which is a tao-tai, or intendant of circuit. The district magistrates report to the chih-fu, and the chih-fu to the provincial authorities. Each district has at least one walled town, that in which the chih-hien has his yamŭn or office. That in which the chih-fu has his headquarters is called a fu or departmental city, hence the frequency of the syllable fu as a final in Chinese place-names—e. g. Chin-kiang-fu. There are in China proper 182 departments, 79 minor departments called *ting* and *chow*; 1,280 districts called hien, 140 called chow (the standing of which is somewhat higher than that of the hien), and about 50 called ting. At the head of each province is a *Tsung-tuh*, or governor-general, as in Chih-li and Sze-chuen, or a fu-tai, or governor, as in Shansi, Shantung, and Honan. The remaining fourteen provinces are grouped in twos and threes, with a governor for each, but subordinate to the governor-general at the head of the group. These governors communicate directly with the throne, or with the grand council at Peking. Associated with the governor of each province are the fantai, or provincial treasurer; the ngan-cha-sze, or criminal judge; the hioh-tai, or literary chancellor (a sort of commissioner of education), a kien-tuh, or commissioner of excise, and a ti-tuh, or commander of the forces. All these officials, from the tsung-tuh down to the chih-hien, are appointed by the emperor, but are as a rule chosen from among the graduates. Of the 144 officials who now form the supreme government only 13 obtained their first appointment by purchase. All officials are ranged in nine ranks, the distinguishing mark of each being the button or knob worn on the official hat or cap. (See BUTTON.) No one can hold office in his native province. Each province is practically self-governing, raises its own taxes, makes a fixed contribution to the central government, and has its own army and navy.

Army and Navy.—Besides these provincial forces there is the national army, which consists (1) of about 320,000 Manchu bannermen, and (2) of 656,459 officers and men who compose the *Ying Ping*, "camp troops" or regular army. Irregular levies called yung or "braves," a kind of militia, may be called out and disbanded as occasion demands. As a rule, the regular army is drilled after Western methods, and armed with modern arms, but bows and arrows and pikes are still much used, especially among the Manchus and the yung. The Chinese fight well when properly led, but as yet they are poorly officered. The navy, which in 1894 was considerable, included (1) two squadrons comprising 4 barbette ironclads, 1 turret ship, 18 cruisers, 27 torpedo-boats, 14 gunboats, and several dispatch-boats, etc.; and (2) two flotillas comprising an armored frigate, 14 gunboats, 6 floating batteries, 3 transports, etc.

There are arsenals at Tientsin, Tsi-nan-foo (in Shantung), Shanghai, Nanking, Hanyang-foo, Fuh-chow, and Canton, and dockyards at Wei-hai-wei, Shanghai, and Fuh-chow.

Revenue.—The normal revenue amounts to about 75,000,000 hai-kwan taels, or about $78,750,000 U. S. gold. It consists (1) of land tax, payable part in silver (about 20,000,000 taels) and part in rice (= taels 2,750,000); (2) the profits of the salt monopoly (about 9,600,000 taels); (3) customs dues (native 6,000,000, foreign (in 1892) 23,200,000 taels); (4) likin and transit dues (about 11,000,000 taels; and (5) licenses (about 2,000,000 taels.)

Trade and Commerce.—The native trade is very extensive. Foreign trade is carried on at certain ports which have been opened from time to time by treaty with European nations, chiefly Great Britain. These are given in the following table, together with the amount of imports and exports for each in 1894, stated in taels:

PORT.	Where situated.	Population.	When opened.	Imports.	Exports.
Tientsin.....	Chih-li	950,000	May, 1861.	4,551,175	6,605,997
Niu-chwang*	Shingking...	60,000	.....	864,494	1,534,664
Chefoo.....	Shantung ...	32,500	Mar., 1862.	1,684,190	632,792
Shanghai....	Kiangsu.....	400,000	May, 1843.	96,661,920	58,421,830
Ningpo	Cheh-kiang .	250,000	May, 1861.	133,238	11,002
Hangchow...	"	800,000	Sept., 1896.	.....	.....
Wênchow....	"	80,000	Apr., 1877.	21,529	1,671
Fuh-chow....	Fuh-kien...	636,000	July, 1861.	4,411,414	4,765,719
Amoy.....	"	96,000	Apr., 1862.	6,372,311	6,637,484
Swatow.....	Kwangtung.	40,000	Jan., 1860.	8,600,195	2,250,559
Canton	"	1,600,000	Oct., 1859.	13,741,801	15,777,828
Kiung-chow .	"	40,000	Apr., 1876.	1,817,840	1,257,177
Pakhoi.....	"	25,000	Apr., 1877.	2,983,903	1,112,621
Tamsui†.....	Taiwan.....	100,000	Sept., 1863.	2,260,727	604,027
Kelung†.....	"	70,000	"	.....	.....
Tainan†.....	"	135,000	"	1,700,719	1,189,650
Chinkiang ...	Kiangsu.....	135,000	Apr., 1861.	29,428	561,209
Suchow.....	"	500,000	Sept., 1896.	.....	.....
Nanking.....	"	150,000	.....	.....	.....
Wuhu.....	Ngan-Hwuy.	80,000	.....	24,309	3,142
Kiu-kiang ...	Kiangsi	53,000	Jan., 1862.	2,500	.....
Hankow.....	Hupeh	800,000	"	14,381	4,399,022
Shashih.....	"	.....	Sept., 1896.	.....	.....
Ichang.....	"	34,000	Apr., 1877.	.....	.....
Ch'ung-k'ing	Sze-chuen...	250,000	Mar., 1891.	.....	.....
Lungchow...	Kwangsi	20,000	Aug., 1889.	108,361	44,772
Mŭng-tsze ...	Yunnan.....	12,000	"	1,241,879	943,321

* Niu-chwang lies outside of China proper, but was one of the ports opened by the treaty of 1860. † Now Japanese ports.

This trade is chiefly with Great Britain and her colonies, Japan, the U. S. and the continent of Europe coming next in the order here given. In 1891 the total foreign imports amounted to over 134,000,000 taels (cotton goods, 53,290,200; opium, 28,353,156; metals, 7,254,448; woolens, 4,695,256; and sundries, 40,329,599 taels). The exports for the same year were valued at 100,947,849 taels, mostly tea and silk.

Means of Communication.—The country is unfenced, and tracks (they can not be called roads) run everywhere. In the plain, wagons form the chief means of conveyance, though pack-animals and wheelbarrows are also used. In the hilly parts pack-animals and mule-litters are resorted to, while in the mountainous parts porters and sedan chairs are employed. In the central and southern provinces connected by the Yang-tse, the lakes, and the canals, the means of travel are convenient and cheap, though slow. A railway is in operation in Chih-li, from the coal mines at Kai-ping to Hokow on the Peh-tang, thence viâ Taku to Tientsin; thence to Shan-hai-kwan, at the E. end of the Great Wall and a little beyond. In 1876 a line from Shanghai to Woosŭng, 12 miles in length, was begun by some foreigners, and operated along half that distance for nearly a year, when it was purchased by the Chinese authorities and torn up. A trunk line from Peking to Hankow has been sanctioned. Telegraphs now connect Peking with the principal cities of the country and with foreign countries.

Money, Weights and Measures.—The only coin used is the CASH (*q. v.*). Payments of small sums are made in cash; payments of larger sums are usually made in silver by weight. The unit is the *liang* (called tael by foreigners), which is equal to $1\frac{1}{3}$ oz. avoirdupois. The tael is divided into tenths called *tsien* or mace, and these again into tenths, called *fŭn* or candareen. Sixteen *liang*, or ounces, make a *kin*, or pound (equal $1\frac{1}{3}$ lb. avoir.), called catty by foreigners. One hundred kin make one picul, equal to $133\frac{1}{3}$ lb. avoir. Ten *tsun*, or inches, make a foot, which according to treaty stipulation is equal to $14\frac{1}{10}$ English inches. A *li*, or native mile, equals about one-third of an English mile.

History.—The Chinese claim for themselves a hoary antiquity, the more extravagant of their writers going back several millions of years to Pân-Kû, the first man, who chiseled himself out of chaos. Others begin with a great chieftain named Foh-hi, 2852 B. C., the first of the "Five Rulers." The *Book of History*, edited by Confucius, begins with Yao, 2357 B. C., who, however, appears with a well-developed governmental system. He was succeeded by Shun, 2255 B. C., and he in turn by Yu, who had labored so successfully in remedying the great flood of the time of Yao that he was chosen first as the associate and then as the successor of Shun. These three (with Wŭn Wang of the twelfth century B. C.) are the "ancient kings" lauded by Confucius for their virtue. (See CONFUCIANISM.) From Yu to CHI-HWANG-TI (*q. v.*) there were three dynasties, the Hia (2208–1766 B. C.), Shang (1766–1122), and Chow (1122 to 249 B. C.). From the abolition of the feudal system and the consolidation of the empire under Chi-Hwang-ti down to the present dynasty twenty-one dynasties have ruled over the country, sometimes only in part. The most illustrious of these are the Han (202 B. C. to 220 A. D.), the T'ang (618–907), the Sung (960–1280), the Yuen or Mongol dynasty (1280–1368), and the Ming (1368–1643). The Han, the T'ang, and the Sung are the periods of greatest literary activity. The rulers of the present or Ta-Tsing dynasty are Manchus, but they rule China on Chinese lines of polity, and have practically lost their own nationality. The only really distinctive custom which the Manchus have compelled the Chinese to adopt is the wearing of the queue, or "pigtail"; and of the 144 officials who now form the supreme government of the empire only 32 are Manchus.

Originally called in to assist in suppressing the internal troubles which threatened the overthrow of the Ming dynasty, they refused to withdraw when the object of their mission had been accomplished, but proceeded to conquer the country for themselves. In 1643 they proclaimed the ninth son of their own ruler Tien-ming as the first emperor of the Ta-tsing dynasty, the name chosen for his reign-period being *Shun-chi*. In the following period, K'ang-hi, the empire was fully consolidated, and an era of great prosperity as well as of literary activity inaugurated. The ninth emperor of this dynasty now reigns, his reign-period being called *Kwang-sü*. He came to the throne in 1875. The great events of this dynasty have been the opening of the country to foreign trade, residence, and travel, the introduction of steam machinery, steamboats, railways, and telegraphs, the establishment of diplomatic relations with Western nations, and the protection accorded to those who profess, as well as to those who teach, Christianity.

In connection with Korean internal troubles in 1894, China became involved in a war with Japan, which resulted in the loss of most of her fleet, of the island of FORMOSA (*q. v.*), and, for a time at least, of the seaboard of Liao-tung, and the great fortified ports of PORT ARTHUR and WEI-HAI-WEI (*qq. v.*), besides the payment of a large money indemnity. (See KOREA.) See CHINA in the Appendix.

BIBLIOGRAPHY.—Du Halde's *Description Géographique, etc., de la Chine*, etc. (Paris, 1735; Eng. trans. 2 vols. fol., London, 1735–41); Moyriac de Mailla's *Histoire Générale de la Chine* (12 vols. 4to, Paris, 1776–85); Meadows Taylor's *Chinese and their Rebellions* (London, 1856); Col. Yule's *Book of Ser Marco Polo* (2d ed. 2 vols., 1875); S. Wells Williams's *Middle Kingdom* (2d ed. New York, 1883); Doolittle's *Social Life of the Chinese* (2 vols., New York, 1867); W. A. P. Martin's *The Chinese: their Education, Philosophy, and Letters* (New York, 1881); Williamson's *Journeys in North China*, etc. (2 vols., London, 1870); Baron von Richthofen's *China: Ergebnisse eigner Reisen und darauf gegründeter Studien* (2 vols., Berlin, 1877–82); Wilson's *China: Travels and Investigations in the Middle Kingdom* (New York, 2d ed. 1894); Hosie's *Three Years in Western China* (London, 1890); Moule's *New China and Old* (London, 1892). ROBERT LILLEY.

China, or **Chinaware**: See the article POTTERY AND PORCELAIN.

China Clay: See KAOLIN.

China Grass, or **Chinese Grass**: a vegetable fiber which the Chinese manufacture into a beautiful fabric called by themselves *hia-poo*, or summer cloth, and by foreigners "grass cloth." It is also manufactured in Europe to some extent. It is obtained mostly from the *Bœhmeria nivea*, a plant of the order *Urticaceæ*. (See RAMIE.) Grass cloth has a glossy appearance and a silky luster. The plant flourishes in the Southern U. S. under proper cultivation.

China, Great Wall of: a remarkable fortification constructed by order of the celebrated Emperor Shi-Hwang-Ti, the first universal Emperor of China, for the purpose of protecting the northern and northwestern frontier of his empire from the hordes of barbarians who then swarmed in that part of Asia. To accomplish this great object, he united the several defenses which had been erected for the same purpose by the feudal princes. Several millions of men, it is said, were occupied for the space of ten years, during which time half a million of those employed on the work perished. It was completed in 211 B. C. The entire length of the wall is about 1,255 miles, the height being from 20 to 25 feet, with towers about 100 yards apart and 40 feet high. The wall is thick enough at the summit to admit of six horsemen riding abreast. Each face of the wall was built of hewn stone or brick, with earth filled in between. The Chinese name for the wall is Wan li Ch'ang Ching, or "Ten Thousand Mile Rampart."

Chinam'pa: the Aztec name for a floating garden, whether natural or artificial. The shallow lakes around ancient Mexico were often partly covered with floating masses of grass and weeds, such as are often seen in similar bodies of water; these held portions of soil entangled in their roots. Some families of the Nahua or Aztec race took advantage of them to make floating homes, strengthening the unsteady mass with poles and brush, on which earth was piled, and eventually, it would appear, constructing rafts covered with soil. On these their homes were built, and gardens of considerable extent were planted. The Indians living in this manner were called Chinampenecs, and for a time they ranked as an independent tribe. They became tributary to the Mexicans about 1425. At the time of the conquest these gardens were very numerous and supplied the markets of Mexico with vegetables. HERBERT H. SMITH.

Chinande'ga: a department and town of Nicaragua, Central America. The town is in a fertile plain about 13 miles from the Pacific Ocean and 20 miles N. W. of Leon (see map of Central America, ref. 6–G). The houses are built of *adobe*, and are only one story high. Cotton and sugar are produced in the vicinity. Pop. of department (1888) 23,719; of town, 8,000.

China-root: a drug, consisting of the dried roots of a woody, climbing, thorny shrub, *Smilax china*, native of

Eastern and Southeastern Asia. The plant is closely related to the common greenbrier (*S. hispida*) of the U. S., and also to *S. officinalis*, from which the drug sarsaparilla is obtained; in fact, the China-root is sometimes substituted for the true sarsaparilla. It was formerly held in high repute as a remedy for rheumatic and syphilitic complaints.

Chinard, shĕc'naar', Joseph: b. 1756; d. 1813; a sculptor of Lyons; studied in Rome, and based his style on the antique; he executed many public works for Lyons, and some for Marseilles, and left many portrait busts.

China Sea: that portion of the Pacific Ocean which extends from Japan, Korea, and the S. of the Yellow Sea to Borneo, with the Philippine islands on the E., with China, Tonquin, Siam, and the Malay Peninsula on the W. It includes the East Sea (*Tung-hai*), stretching from Korea to Formosa, and the South Sea (*Nan-hai*), stretching from Formosa to Borneo. These two seas are connected by the Straits of Formosa, while the southern sea makes the great Gulfs of Tonquin and Siam. Navigation is hazardous on account of the typhoons that visit these waters. Some geographers restrict the name China Sea to the second of these divisions.

China-tree: See China, Pride of.

China Wax: See Pela or Peh-la.

Chin'cha Islands: three small islands in the Pacific Ocean; situated about 14 miles from the coast of Peru; near lat. 39° 4′ S.; total area, 4,000 acres. They are mere rocks, with perpendicular cliffs 200 feet high and numerous surf-caves. Multitudes of sea birds frequent them, and the islands had large deposits of guano, now practically exhausted. See Guano.

Chinch-bug: the *Rhyparochromus leucopterus* of Say; a hemipterous insect of the family *Lygæidæ*, which is a subdivision of Latreille's great family *Corisiæ*. The chinch is a great pest to the wheat crops of the U. S., attacking also Indian corn, grass, and the various kinds of grain and garden vegetables, destroying in some years much property. The female lays her eggs, some 500 in number, in the ground, and there are often two broods of larvæ in a single year—the first attacking the wheat sometimes as early as the middle of June, and not always disappearing until the middle of August. The next brood comes in autumn. The bug is $\frac{3}{16}$ of an inch long, and has white fore wings, each having a black spot on the middle of its edge; the body is mainly black, but the wingless young are at first red, with a white band on the back. The chinch-bug attacks the tender parts of plants, sucking the juices, and apparently poisoning the part which is bitten. The insect is not uncommon in the E. and N. E. of the U. S., but there its ravages are not conspicuous, and little attention is paid to it. The valley of the Mississippi has in some years suffered terribly from this cause. Thus in 1864 one-half the corn (maize) and three-fourths of the wheat were destroyed by this pest throughout large districts, and the total damage to crops was estimated at $100,000,000 in U. S. currency. In 1865 a seemingly providential epidemic attacked the larvæ of the chinch-bug, and most effectually checked the destructive process, so that for some years it was not easy for entomologists to find specimens; but since that time the species has so multiplied that in some districts great destruction of grain has ensued. There are several germ diseases infesting the chinch-bug which are now well known; one of them is a fungus belonging to the genus *Sporotrichum*. As this fungus can be artificially cultivated, it has been found practicable to use it as a means of destroying this pest. The fungus is cultivated during the winter in artificial media, and during the summer months bugs are infected with it and distributed to localities where there are serious outbreaks. Much use of this method has been made, especially in Kansas. See *Report* by Prof. F. H. Snow, director of the experiment station, University of Kansas (1891).

Chinchil'la (Sp. pron. chin-cheel'yăă): a small South American rodent, the best-known member of the family *Chinchillidæ*. It is about 10 inches long, exclusive of the bushy tail; clothed with soft, dense fur, gray above and dusky white beneath. The ears are large, and the hind legs much longer than the fore. It dwells in colonies along the eastern slopes of the Andes, from Northern Peru to Southern Chili, at elevations of from 8,000 to 12,000 feet. The chinchilla is a burrowing animal, and comes out in the morning and evening to feed on roots and grass. It is docile and mild in temper, and may be easily tamed as a pet. Its fur was much valued by the ancient Peruvians, and is still in demand for cloak linings, trimmings, and similar purposes.

Chinchilla.

Many thousands are annually taken by the Indians, who capture them by the aid of a trained weasel (*Galictis vittata*). F. A. Lucas.

Chinchilla (anc. *Salaria*): a city of Spain; province of Albacete; on a hill 12 miles S. E. of the city of Albacete. It has a fine church, and manufactures of cloth, linen, glass, earthenware, etc., and marble is quarried in the neighborhood. Pop. (1887) 6,096.

Chinchil'lidæ: a family of medium-sized rodents characterized by short incisors, molars divided by continuous folds into transverse plates, perfect clavicles, and long hind limbs. The fur is soft, the tail bushy. They dwell in burrows, and are limited to the pampas of La Plata and the highlands of the Andes. There are, according to Flower, but three species, each representing a separate genus readily distinguished by the number of toes on the fore and hind feet: *Chinchilla* has five toes on each of its front feet and four on each of those behind; *Lagidium* has four on each foot; and *Lagostomus* has four and three respectively. See Chinchilla and Lagotis. F. A. Lucas.

Chinchon', Ana, Countess of: Vice-Queen of Mexico and Peru; b. in Astorga, Castile, 1576. Her father was the eighth Marquis of Astorga. In 1593 she married the Marquis of Salinas, who was successively Viceroy of Mexico (1594–96), Viceroy of Peru (1596–1604), and again Viceroy of Mexico (1604–11). After his death she married (1621) the fourth Count of Chinchon, and when he was made Viceroy of Peru she accompanied him to Lima (1629), thus being a second time vice-queen in that city. While there in 1638 she was ill of a tertian ague, and was cured by some powdered quinquina bark which had been sent to her physician by the Corregidor of Loxa, Don Juan Lopez de Canizares. She died, while returning to Spain, at Cartagena, Dec., 1639. A package of the bark which she had brought with her was taken to Spain, and she was thus the means of first introducing this important remedy into Europe. Linnæus named the genus of quinquina-bearing plants, in her honor, *Cinchona*, or, as it should have been written, *Chinchona*.

Herbert H. Smith.

Chindwara: See Chhindwara.

Chinese Architecture: See China.

Chinese Empire: the immense region of Eastern and Central Asia which is subject to the Emperor of China. It may be divided into four parts:

I. Chung-Kwoh, the "Middle Kingdom," or China Proper, which borders on the Pacific Ocean, and has an area of about 1,322,841 sq. miles, with a population of 383,000,000, or more. See China.

II. The "Three Eastern Provinces" lying to the N. of Korea, and commonly called Manchuria (*q. v.*). It has an area of 362,310 sq. miles, and a population of about 18,000,000.

III. The regions subject to the Li Fan Yuen or "Colonial Office," viz.: (1) Mongolia (between China proper and Siberia) and Kokonor (between Tibet and the province of Kansuh); area, 1,288,000 sq. miles; pop. 2,000,000; (2) Ili, or Kulja, stretching westward into Central Asia, and marching with the Russian possessions there. It includes Sungaria and Eastern Turkestan, and is officially called *Sin-tsiang*, "the New Frontier (province)"; area, 579,750 sq. miles; pop. 1,180,000; (3) Tibet; area, 651,500 sq. miles; pop. 6,000,000.

IV. Tributary states. These formerly included Burma, Annam, Loochoo, Korea, etc. (see all these titles); but one by one they have slipped from China's grasp.

Chinese Language: the leading member of the group of monosyllabic languages which occupy Southeastern Asia, and constitute, with a possible exception or two, the whole of the monosyllabic class. This monosyllabism is not, as a few scholars have held, a state to which they have been reduced by a process of phonetic decay, but manifestly a primitive condition. It represents a stage out of which all other languages, whether of the agglutinative or inflective type, have passed, while these, from arrested development, have remained behind. Chinese words are not only altogether destitute of inflection, but they are hardly parts of speech in the sense which we attach to the term, being to a great extent still in the root state. The same word may, according to its position in the sentence, be noun, adjective, adverb, or verb; e. g. *sin* must be variously translated "fidelity," "faithful," "faithfully," "believe." This indefiniteness, however, attaches to the words only when taken separately, and disappears in the sentence. Chiefly by the value given to position, but partly also (especially in the spoken language) by the use of certain words as signs of grammatical relation, logical precision of statement is attained. Being cut off from the resources of derivation for the multiplication of forms, while the development of signification has gone on as in other languages, the number of homophonous words is very great. The phonetic combinations of which the language admits are comparatively few and simple. The number of distinct vocables differs considerably in the various dialects, the highest limit being not far from 1,000 and the lowest 500. By the aid of tones, similar to those which we use for the purpose of emphasis and expression, this number is increased two or three fold, being raised in the Kwan-hwa to about 1,600. The same phonetic combination pronounced in different tones constitutes so many different words, and so essential a part of the pronunciation is the tone that a wrong tone will sooner occasion misunderstanding of a word than will the substitution of a wrong consonant. In the modern dialects the number of tones varies from four to eight, the smaller number being found in some of the districts of Central China; in the Kwan-hwa there are five, in the Fuchow and Amoy dialects seven, in the Canton eight. The number of words which coincide both in sound and tone being, however, still very large, other means are necessary to remove the ambiguity, and in the spoken language phrases composed of two or more words are largely used in the place of simple terms. Two synonyms are frequently thus joined; e. g. *shu-muh*, "tree." *Shu* and *muh* have each various significations besides that of "tree," but there is no other in which they agree, and the combination thus becomes definite. Other phrases are taken in a collective sense; e. g. *hiung-ti*, "older brother, younger brother," for "brother" or "brothers"; or in a derived sense; e. g. *tung-si*, "east-west," for "thing." These phrases, which often extend to four or five words, make a near approach to proper compounds, one of the words uniformly receiving a stronger accent, supported in the case of the longer phrases by a secondary accent.

Spoken by a population variously estimated at from three to four hundred millions, the Chinese not unnaturally is divided into strongly marked dialects. Of these the Kwan-hwa, commonly called by Europeans the mandarin or court dialect, has the widest currency, being spoken with minor differences over the whole north and west of the empire, and on the east reaching as far south as the Yang-tse-Kiang. It is, further, the language of official communication throughout the empire, and the only one of the popular dialects which has received any considerable literary cultivation. Phonetically, it is the poorest of the dialects. The only consonant finals of which it admits are the nasals *n* and *ng*, and the sonant initials *b*, *d*, *g*, *v*, *z*, found in some of the other dialects, are wanting here. The southeastern dialects, in the provinces of Canton and Fukien, on the other hand, are the most archaic, having preserved the final mutes *p*, *k*, *t*. Differing largely in vocabulary, as well as in the form and tone of the words common to them, these several dialects are not generally understood (except the Kwan-hwa) beyond the limits of a single province. There are in addition many local dialects, less marked in character and of a more limited currency. This diversity does not, however, extend to the written language, which is uniform throughout the empire, and, to a degree unapproached in any other literature, uniform also throughout the whole course of its history. Its development has been to some extent independent of the spoken language, and forms one of the most interesting chapters in the history of writing.

The date of the invention of the present characters, commonly ascribed to Tsang-kié, about 2600 B. C., can not be fixed even approximately, but the history of the successive stages of the development of the system is written in the characters themselves. The first signs were purely ideographic, being rude representations of the objects named. A circle with a point in the center stood for the sun, a crescent for the moon, a three-pointed peak for a mountain. The changes of form which they have undergone, arising in part from the different materials used in writing, have left in the present characters little resemblance to the objects pictured. The limits of this method of direct representation were soon reached. A few words denoting position and number were represented by points and strokes; thus a point above or below a horizontal line signified "above" or "below"; a stroke through the center of a circle, "middle." The combining of two or more signs to express a single idea, either by direct or symbolical representation, was another easy step; thus "water" and "eye" make up the sign for "tear"; "sun" and "moon" for "bright."

By far the greater number of characters, however, are formed on a new principle, the combination of an ideographic and phonetic element in one sign. The number of homophonous words is, as we have seen, very large, and a sign having been found for one of these, it is used phonetically to represent the sound of the others, being differentiated in each case by an additional sign, which indicates in a general way the meaning. In this combination one of the parts, termed the *phonetic* or *primitive*, gives up its meaning and retains only its sound; the other, the *radical*, gives up its sound and retains only the meaning. For example, the syllable *tao* has among other significations the following: "sword," "anxious," "appetite," "heart of a tree," "long narrow boat," "a species of fish of a slender form." The first of these, "sword," being represented ideographically, the others are written phonetically by the same sign, further defined by the radicals for "heart," "eat," "tree," "boat," "fish."

The number of different phonetics employed in writing a single vocable is in some cases twenty or more, and the aggregate number of characters thus formed may exceed a hundred. Some characters are used both as phonetics and radicals; and a character composed of a radical and phonetic may itself be employed as a phonetic in forming new characters. The number of phonetics in common use is about 1,000. These phonetics represent the sound of the word as a whole, without analyzing it into its elements.

There is, however, a kind of syllabic spelling called Fan-ts'ieh, introduced from India by Buddhist priests, and first currently used in dictionaries of the fifth and sixth centuries to mark the sound of characters with more precision. One series of characters is chosen to represent the initial sounds, another the final sounds, together with the tone, the number of both varying according to the dialect. Thus *king*, "classic," in the dictionary of K'ang-hi is spelled with the characters *k-ien l-ing*, the first being simply the sign of the initial *k*, the second of the final *ing*.

In the arrangement of the characters Chinese dictionaries follow three different methods. By the first the characters are distributed according to their meaning under a certain number of categories, such as heaven, earth, body, etc. The second principle of arrangement is according to the radical part of the character. This appears first in the *Shuoh-wén* published A. D. 100, in which 10,000 characters are arranged under 540 radicals, a number slightly increased in subsequent dictionaries, but in the *Tzŭ-Hwui*, published during the Ming dynasty, reduced to 214. This last number is retained in the two principal dictionaries of the present dynasty, the *Ching-tzŭ-t'ung* and the *K'ang-hi-tzŭ-tien*. In the last-mentioned work, with a total of about 44,000 characters, the number found under the different radicals varies from 5 to 1,300, or, counting duplicate forms, 1,900, the following radicals having each 1,000 and upward: *mouth*, *heart*, *hand*, *tree*, *water*, *plant*. Under each radical the characters are arranged in the order of the number of strokes contained in the phonetic. The third and last method of arrangement is according to the sound of the characters. The usual order in works of this class is the following: the characters are divided into four great classes, according to the tone; each tone divided into smaller classes, according to the final sound,

and these sometimes further subdivided, according to the initials. To this class belongs the *Pei-wén-yun-fu*, one of the most extensive lexicographical works in any language. It gives by numerous citations the fullest illustration of the usage of the language, and was published in 1711 in 130 thick volumes. Of the total number of characters in the language extravagant statements have often been made. The more complete dictionaries contain from 40,000 to 60,000, of which obsolete and duplicate forms and proper names make up perhaps one-half. The number of really different characters which have the sanction of good usage is not far from 25,000. Even in the number last given a large proportion of the characters are of rare occurrence, and a knowledge of from 5,000 to 10,000 is sufficient for almost all the needs of the scholar.

In no language are the differences between the literary and colloquial idioms so great as in Chinese. Words alike in sound but distinct in meaning being written with different characters, the precautions against ambiguity required in the spoken language are to some extent unnecessary. In the classical style conciseness is carried to the extremest limit. It is in general true of the classical books that, while to the eye they are definite, to the ear they convey no meaning. In this ancient style, termed Ku-wên, all historical, philosophical, and critical works are still written, and no accomplishment is so highly valued among scholars as the mastery of it. Novels and dramatic compositions, which are regarded as quite inferior classes of literature, are written in the Kwan-hwa, in a style but little elevated above the colloquial, and, like it, abounding in compound phrases. The Wên-chang, the style of the literary essays, which is also much cultivated, is of a more artificial character than the Ku-wên, and less esteemed.

The relation of the Ku-wên to the ancient spoken language, whether and how far it represents it, and how far it is the product of a merely literary development, are points upon which scholars are not agreed. Doubtless the Chinese written characters would long ago have given place to an alphabetic system had they not been peculiarly suited to the genius of the language, which, being monosyllabic, abounds in homophonous words. Still there are serious drawbacks, not the least of which is this, that the labor involved in learning and holding in the memory so many arbitrary characters absorbs no small portion of the intellectual energy of the people. Attempts have been made, not without success, to romanize some of the popular idioms, the tones being marked by diacritic signs. Books have been published by missionaries in this character in the Shanghai, Ningpo, Fu-chow, and Amoy dialects. To the concise classical style, however, this method is quite inapplicable.

The Chinese characters have undergone in the course of their history great changes of form, and six varieties are now in use. These are the *Chuen-shu*, or seal character, used in seals and ornamental inscriptions; the *Li-shu*, and, closely related to it, the *Kiai-shu*, a pattern style employed in careful writing; the *Sung-shu*, the common book character; the *Hing-shu*, or running hand; and the still more abbreviated "grass-character," *Ts'au-tzŭ*. In no country is the art of calligraphy so highly esteemed or so sedulously cultivated as in China, and no written character is so well adapted to the display of it.

Of the Chinese language in general we may say, in conclusion, that, notwithstanding its poverty of forms, it has been made, solely by the genius of those who use it, superior as an instrument of thought to many, perhaps to most, inflected languages. ADDISON VAN NAME.

Chinese Literature: In the history of literature there is hardly to be found another example of so high an antiquity, and none of so great a longevity, as the Chinese—an age which at least reaches, and perhaps exceeds, 3,000 years. Neither in language, literature, nor institutions is the modern period in China separated from the ancient by so wide an interval as elsewhere; an unbroken tradition holds together all. In few countries has the cultivation of letters been so general. In theory, at least, all offices beneath the throne are not only open to the scholar, but official promotion is made to depend directly on scholarship. The entrance to the various grades is guarded by public competitive examinations, which at each successive step become more rigorous. This system, introduced under the Han dynasty near the commencement of the Christian era, has been adhered to with more or less fidelity under the succeeding dynasties. Under such conditions, with the long history and vast population of China, a literature of immense extent is a natural result. Nor is any great literature so purely national, so little affected by foreign influences, as the Chinese. Buddhism, brought from India in the first century of the Christian era, has created for itself a literature apart, without much disturbing the general course of development. During the past three centuries of intercourse with Western nations their influence upon the literature, except in the department of mathematics, has been hardly felt. The exaggerated reverence paid to the classical models has so strengthened the conservative tendency as to check the growth of originality.

There is, however, more of variety both in the history and the literature of China than the commonly received opinion gives to them. The first period of marked activity is that commencing with Confucius (d. B. C. 478) and Lao-tsĕ, and covering a period of about three centuries. Mencius and many other less celebrated writers belong to this period, which was rudely brought to a close by Shi Hwang-Ti, the founder of the Ts'in dynasty. This ruler, famous also as the builder of the Great Wall, having consolidated into an empire the petty states into which China had been divided, and fearing that the study of the literature would lead to an attempt to restore the old order of things, ordered (B. C. 212) the destruction of all books except those on medicine, divination, and husbandry, and the records of his own dynasty. This edict remained in force only twenty-two years, the Ts'in dynasty having been soon succeeded by the Han, under which strenuous efforts were made to recover the lost books. The catalogue of the library thus formed, which is found in the history of the Han dynasty, enumerates more than 13,000 volumes by 600 different authors. This collection perished in the burning of the imperial palace at the close of the dynasty, and similar collections made under succeeding dynasties met a like fate. Including the burning of the books by Shi Hwang-Ti, five great catastrophes of this kind are enumerated by Chinese historians, the last in the sixth century.

The period of the T'ang dynasty (A. D. 618–905) was the golden age of Chinese poetry; that of the Sung (960–1279) was the era of philosophical speculation and of criticism; the Yuen (Mongol) dynasty (1280–1367) was the most flourishing period of the drama, and produced also some of the best novels; the Ming and the reigning Manchu dynasties have been less distinguished for the originality of their productions than for works of an encyclopædic character, digests of the older literature. Printing from wooden blocks was invented before the close of the sixth century, but did not come into general use until the tenth. Movable types were employed as early as A. D. 1040, four centuries before the invention was known in Europe, without, however, displacing wooden blocks, which have remained in general use. Chinese literature is abundantly supplied with works in bibliography and literary history, which for many centuries have been favorite subjects of study. In the several dynastic histories also an important section is devoted to the literature of the period. An index of works prohibited on account of their moral or political tendency has been published by the present dynasty. It contains many thousand volumes, mostly written about the close of the Ming dynasty.

The term *king* or "classic" is used in a narrower and a wider sense. It belongs *par excellence* to the *Five King*, but very commonly includes also the *Four Books*, and is not unfrequently used in a still wider sense. Among the *Five King* the first place is accorded to the *Yih*, partly for its antiquity and partly for its enigmatical character. The proper text consists of eight trigrams, made up of horizontal lines, whole and broken, afterward increased by combination to sixty-four hexagrams. With these are incorporated commentaries by Wên-Wang, the ancestor of the Chow dynasty, by his son, Chow-Kung, and by Confucius, which constitute the only intelligible part of the work. These mystical figures, ascribed to the ancient sage Fuh-Hi, are much used in divination, and on this account the work is said to have been excepted from the general destruction of books under Shi Hwang-Ti. Next in rank is the *Shu King*, a collection of historical documents relating to the Yu, Hia, Shang, and Chow dynasties, and covering the period, according to the received chronology, from the middle of the twenty-fourth century down to B. C. 721. The *Shu* is largely occupied with discourses on government put in the mouths of ancient sovereigns, the historical matter being quite subordinate. The third classic is the *Shi King*, or *Book of Odes*, which contains 305 pieces (origi-

nally 311, but of six only the titles are preserved), selected by Confucius as the most worthy of preservation out of nearly 4,000. The poetical merit of these pieces is very unequal, but is in general superior to that of later productions. They belong, with few exceptions, to the Chow dynasty, and for the light which they throw on the history and customs of the time are of great value. The fourth place among the classics is occupied by the Rituals, three in number. The *Li-ki*, which is designated by imperial authority as one of the *Five Classics*, is a compilation made in the first century B. C. out of the older Rituals. The last of the *Five Classics* is the *Ch'un Ts'iu* (Spring and Autumn Annals), the only one of which the authorship can be properly ascribed to Confucius, his labors upon the others being merely those of an editor. It is a chronicle of events from 720 to 480 B. C., written in continuation of the *Shu King*. In it are recorded thirty-seven eclipses of the sun (the earliest 720 B. C.), which, with few exceptions, have been proved by calculation correct. The *Four Books* are next in rank. Two of them, the *Ta Hioh* and the *Chung Yung*, formed parts of the *Li-ki* (Book of Rites), but were detached and arranged in the present order by Chu Hi, the great critic of the twelfth century. The *Ta Hioh* (Great Learning) is a discourse on the principles of government, in eleven chapters, the first containing the words of Confucius, and the remaining ten a commentary on them, commonly ascribed to his disciple, Tsŭng Ts'an. The *Chung Yung* (Invariable Mean) is a philosophical treatise, attributed to K'ung Keih, the grandson of Confucius, in which the observance of the right mean is set forth as the highest wisdom and virtue. The *Lun Yu* (Miscellaneous Conversations) of Confucius and his disciples is a collection of mostly disconnected sayings, embodying the substance of his teaching, which was altogether of a practical character, on ethics, government, ceremonies, and the like. The last and most extensive of the *Four Books* contains the works of Mencius, who now ranks second only to Confucius in the general esteem, though not until the twelfth century were his writings definitely admitted to a place among the classics. All of these are now accessible to the English reader in Dr. Legge's excellent translation. His edition of the Chinese classics, published at Hongkong, 1861–72, in the original text, with translation, elaborate introductions and notes, included the *Four Books*, *Shu King*, *Shi King*, and *Ch'un Ts'iu*. The translations have also for the most part been separately published, and the series has since been completed in the *Sacred Books of the East*, where his translation of the *Yih King* forms the sixteenth volume, and the *Li-ki* the twenty-seventh and twenty-eighth volumes. Many other works bear the title of *king* (classic); nor is it confined to the orthodox school, but applied also to the canonical books of the Taoist and Buddhist faiths, and even to works of a more miscellaneous character, such as important technical writings. Thus we have the *Ch'a King* (Tea Classic), on the culture of the tea-plant, and the *Shan-hai King* (Hill and River Classic), an ancient geographical work from which many poetical allusions are borrowed.

The historical works, which are very voluminous, fall mostly into three classes. First in importance are the histories of the several dynasties, the work of official historiographers, and constructed mostly on a uniform plan. The variety of subjects treated of, each in a distinct section, gives them an encyclopædic character. The order, varying somewhat in the separate works, is in general the following: First, the personal history of the successive emperors of the dynasty, followed by a series of memoirs on chronology, rites, music, jurisprudence, political economy, state sacrifices, astronomy, influence of the five elements, geography, and literature, closing with biographies of the eminent men of the dynasty, and historical and geographical notices of foreign nations. The series as at present established consists of twenty-four histories, comprising 3,264 books. They are of very unequal merit; some of them the work of single authors, others prepared by a board of scholars. The second class of histories follows a chronological order. The most celebrated general history on this plan is the *Tzŭ-chih-t'ung-kien* of Szŭ-ma-Kwang, a writer of the eleventh century. It was revised in the next century under the direction of Chu Hi, and published with the title *Tung-kien-kang-muh*. Continuations were added in the following dynasties. De Mailla translated it into French (Paris, 1777–83, 12 vols., 4to). The abridgment of the above work, entitled *Kang-kien-i-chi-luh* (History Made Easy), is one of the most useful compendiums. Another class of works, called *Complete Records*, follows neither the one nor the other of the above methods, but gives with more freedom of arrangement a general survey of the subject treated.

In biographies the literature is unusually rich. Besides the space accorded to them in the dynastic histories and in statistical works, separate biographies, many of them of a collective character, abound.

The geographical works are hardly surpassed in extent by those of any country. There are works on the geography of the whole empire, such as the *Ta-ts'ing-yih-t'ung-chi*, published under the present dynasty, which give under each province the topography, population, taxes, etc.; under each prefecture and department, the antiquities, public works, eminent and notorious characters born there, productions of the soil, and a variety of other details. In addition, every province, every prefecture, every department, nearly every district, and frequently a town or famous locality within a district, has its separate description, amounting in all to thousands of volumes. Some of these works are of considerable antiquity, and in successive editions have been gradually enlarged. Of the history and geography of Eastern Asia, beyond the limits of the empire, Chinese literature contains many valuable notices. The accounts of the journeys of Buddhist pilgrims to India between the fourth and the tenth centuries are the most important sources of information for the history of Buddhism in India during that period that we possess.

The three principal philosophical and religious sects, the Confucianists, Taoists, and Buddhists, have each an extensive literature. Of the orthodox school the most celebrated among the near successors of Confucius and Mencius was Sun-tzŭ, who held, in opposition to Mencius, to the original depravity of human nature. In the eleventh and twelfth centuries, under the Sung dynasty, Chow-tzŭ, and especially Chu Hi, gave a new impulse, and in some particulars a new direction, to philosophical speculation. The authority of Chu Hi, who was equally eminent as a commentator of the classics and in other departments of literature, has remained paramount to the present day, though under the present dynasty there is some disposition to rebel against it. Laotzŭ, the founder of the Taoist school, was a contemporary of Confucius. The principal texts of Taoism, translated by Dr. Legge, are contained in *The Sacred Books of the East*, vols. xxxix., xl., Oxford, 1891. Taoism has long since degenerated into superstitious practices, its followers being devoted to magic, alchemy, and the like. Buddhism was introduced from India in the first century of our era. The earliest translation from the Sanskrit, the *Sutra of Forty-two Sections*, was made A. D. 67, and for several centuries there was constant activity in this work. The catalogue of Chi-Shing, published in 730, gives a list of 2,278 separate works which had been translated up to that date. These constitute the more important part of the literature of Chinese Buddhism, though in the fifth and sixth centuries original works began to appear, and have since greatly multiplied.

In the history of Chinese poetry there are two distinctly marked periods. In the earlier, previous to the T'ang dynasty, the structure was less artificial and the rhythm freer. In the *Shi King* the verses are mostly of four syllables; the rhyme is often imperfect, and sometimes altogether wanting. In the T'ang period a more rigid consecution of tones was introduced, and verses of five and seven syllables became the favorites. The tones for rhythmical purposes are divided into two classes—the *p'ing* or "even" tone constituting one, while the other three tones are considered "uneven." In every verse the first, third, and fifth syllables are indifferent with respect to tone; the second, fourth, and sixth must alternate, so that the order is either "even," "uneven," "even"; or "uneven," "even," "uneven."

The weakest side of Chinese literature is the scientific. It has a tolerably complete system of arithmetic, older than the Christian era, a system of algebra which dates from the thirteenth century, but no theoretical astronomy worthy of the name, except what is borrowed from the West. For the regulation of the calendar, and for astrological purposes, observations of a simple character were very early made, and numerous eclipses recorded. During the Ming dynasty mathematical knowledge had greatly declined, and the first Jesuit missionaries recommended themselves to the imperial favor chiefly by their acquirements in this science. The mathematical works since published are mainly based on European methods. Medical writers are numerous, and some of them very ancient, but the science, notwithstand-

ing its long history, has made little progress. The chief work on materia medica is the *Pun-Ts'au*, in fifty-two books, compiled by Li Shi-chin of the Ming dynasty. He made extracts from more than 800 earlier writers, and gives 1,892 medicaments, selected and original. ADDISON VAN NAME.

Chinese Wall: See CHINA, GREAT WALL OF.

Chinese White: a name sometimes given to the white oxide of zinc. It is much used as a pigment instead of white lead in painting woodwork, since it is not liable to be much changed by atmospheric action. It was experimentally made as early as 1780, but has been manufactured commercially only since 1844.

Chinghis' Khan: same as GENGHIS KHAN (*q. v.*).

Ching-kiang-foo: a common mis-spelling of CHINKIANG (*q. v.*).

Chingleput', **Chingalpat**, or **The Jaghire**: a maritime district of India; province of Madras; area, 2,842 sq. miles. It is bounded on the E. by the Indian Ocean, and adjoins Madras on the N. The chief river is the Palaur. The soil is poor. Capital, Chingleput. Pop. about 1,000,000.

Chingleput, or **Chingalpat**: (anc. *Singalapetta*): a town of India, in the above district; 36 miles S. W. of Madras (see map of S. India, ref. 6–F); has a large citadel or fort. It is accessible to an enemy only on the S., being protected on the other side by a large tank. It was captured in 1752 by Clive. Pop. 7,500.

Chingú: See XINGÚ.

Chin-Hai: seaport-town of China; in the province of Che-Kiang; at the mouth of the Takia river; 20 miles E. of Ning-po (see map of China, ref. 6–K). It has a strong citadel on a high and steep rock, and is 3 miles in circumference. The British defeated the Chinese here in Oct., 1841.

Ching-tu: a foo or departmental city of China; capital of the province of Sze-chuen, and the residence of the viceroy. It is situated on a branch of the Min (a tributary of the Yang-tse), in the midst of a very fertile plain with an area of 2,400 sq. miles; 1,700 feet above the level of the sea; lat. 28° 21′ N., lon. 104° 33′ E. (see map of China, ref. 6–G). It is a walled city with a circuit of 12 miles; has extensive suburbs, especially on the north side. The streets are straight, well paved, and clean. The houses are well built, the shops and stores well stocked, and the people civil and prosperous. There is a greater demand here for foreign goods, articles of luxury, such as carpets, rugs, clocks, watches, etc., than in any other inland city of China. Pop. 800,000.

Chiniquy, CHARLES P. T.: See the Appendix.

Chinkiang, or **Ching-kiang-foo**: a fortified departmental city and river-port of China; province of Kiang-Su; on the right bank of the Yang-tse-Kiang, near its junction with the Grand canal; 43½ miles E. of Nanking and 150½ geographical miles from Shanghai (see map of China, ref. 6–K). Its walls are about 4 miles in circuit, and are about half a mile from the river. It was a populous and important commercial city before it was taken by the Taipings in 1859. It was captured by the British in July, 1842, and was opened to foreign trade by the treaty concluded at Tientsin June 26, 1858. Pop. (1890) 135,000.

Chinnery-Haldane, JAMES ROBERT ALEXANDER: Bishop of Argyle and the Isles, Scotland; only son of the late Alexander Haldane, barrister-at-law, heir-male of the family of Haldane of Gleneagles; b. 1842; educated at Trinity College, Cambridge, 1864. Ordained deacon 1866 and priest 1867; on his marriage with the daughter of Rev. Sir Nicholas Chinnery, Bart., he assumed the additional name of Chinnery; consecrated bishop 1883. Author of *Charges on the Holy Eucharist and Kindred Subjects* (1883–87).

W. S. PERRY.

Chinon, shĕĕ'nōṅ' (anc. *Castrum Caino*): a town of France; department of Indre-et-Loire; on the river Vienne; 25 miles S. W. of Tours (see map of France, ref. 5–E). It has remains of a large castle, which was the residence of several kings of England. Here Henry II. of England died, and here Rabelais was born. Charles VII. of France resided here when Joan of Arc disclosed her mission to him. Pop. (1896) 6,187.

Chinook': a warm, dry westerly wind of winter; occurring on the eastern slopes of the mountains from Colorado to Oregon and northward to the Peace river. It brings a vernal mildness of temperature, and is so dry that the snow and ice disappear without the visible production of water. It occurs several times each winter, and usually lasts two or three days. It is due to the drawing of the wind over the mountains, and is paralleled by the *Föhn* in Switzerland and similar winds in Greenland, New Zealand, and other parts of the world.

Chinookan Indians: This linguistic family of Indians includes a number of tribes whose former homes extended along the Columbia river, chiefly upon the northern bank, from its mouth to the Dalles, about 200 miles. Their villages also extended along the Pacific coast from and including Long Island, in Shoalwater Bay, on the N., to about Tillamook Head, some 20 miles S. of the mouth of the Columbia. Following are the most important Chinookan tribes: *Lower Chinuk*, Chinuk and Clatsop; *Upper Chinuk*, Cathlamet, Cathlapotle, Chilluckquittequaw, Clakama, Kuniak, Echeloot, Multnoma, Wahkiakum, Wasco.

The Chinookan may be regarded as typical representatives of the fishing tribes of the northwest coast, deriving their subsistence from the salmon-fisheries, and, to a very slight extent, from berries and roots. The remaining necessities and luxuries of savage life, above those obtainable by their own efforts, such as skins for clothing, ornaments, etc., they formerly procured by barter chiefly for dried salmon and roots. Their trade was extensive, not only among tribes of their own language, but also with inland Indians of the Shahaptian, Kalapooian, Salishan, and other stocks, and evidence is not wanting to show that this early intertribal trade had received much impetus from the presence of white traders at the mouth of the Columbia. From their proximity to Astoria, the Chinuk proper early became well known, and their language formed the basis of the widely spread trade jargon which is still used as a medium of communication between the whites and the various Indian tribes of this region.

One band of the Chinuk only was found by Lewis and Clarke in possession of horses, the Weocksockwillacum above the Cascades, and most of the dozen or more owned by them had recently been taken from the neighboring Shoshonean tribes. As remarked by Lewis and Clarke, most of the Chinuk country was so densely wooded as to forbid the use of horses.

Though hardly to be called warlike, the Chinuk were quarrelsome, and maintained a petty warfare among themselves and with the Shoshoni and other tribes.

Though conforming in appearance and in their general habits, the Chinookan tribes presented to the early observer many minor points of difference. Thus it is stated by Lewis and Clarke that on the lower part of the Columbia the practice of head-flattening was universal, while on the upper part the practice was limited to a few of the women.

Slavery largely prevailed among the Chinuk. They obtained slaves by capture or by purchase.

Little is known of their tribal laws or of their social and political usages. There appears to have been no such thing as a political union of the Chinookan tribes as a whole, or indeed of any considerable part of them. They seem to have lived generally in small communities, the size and location of which were determined by the season and by the nature and extent of the fishing-stations, which for obvious reasons were always situated at falls or rapids. They were generally regarded as indolent, thievish, and treacherous.

Every village had a chief who, in some cases, either from personal popularity or other cause, seems to have been able to extend at least a nominal authority over contiguous villages speaking closely allied dialects.

The Chinuk were in the main a sedentary people, though frequent changes of residence from one fishing-point to another were common, as from a summer to a winter location. Their houses were built on the communal principle, and were occupied by three or four families, aggregating from fifteen to twenty individuals to each house.

Population.—As a rule, the figures given by Lewis and Clarke for the Indian population were estimates made with all the care possible under the circumstances. They passed through the greater part of the Chinookan territory twice, probably visited a great many of their settlements, and in many cases counted the houses and based their estimates of the proper occupants upon actual observation. Hence their statement of the Chinookan population is probably to be accepted as a near approach to truth. The number given for the several divisions is about 1,800, a population by no means

excessive when the extent of country inhabited and the abundant food-supply are considered. Evidence is given by Lewis and Clarke that some four years previous to their visit, or about 1800, a reduction which had occurred in the number of the Clatsop tribe at the mouth of the Columbia was attributed to smallpox. Practically, however, the Indian tribes along the river were found by the travelers in their pristine condition.

There are 256 Waseo on the Warm Springs reservation, Oregon, and 150 on the Yakama reservation, Washington. On the Grande Ronde reservation, Oregon, there are 59 Clakama. It is learned that there still remain three or four families, probably belonging to one of the down-river tribes, about 6 miles above the mouth of the Columbia. Two of these speak the Chinuk proper, and three have an imperfect command of Clatsop. There are eight or ten families, probably also of one of the lower river tribes, living near Freeport, Wash.

Some of the Watlala, or Upper Chinuk, live near the Cascades, about 55 miles below the Dalles. There thus remain probably between 500 and 600 of the Indians of this family.

AUTHORITIES.—*History of the Lewis and Clarke Expedition*, edited by Nicholas Biddle and Paul Allen, vols. i.–ii. (Philadelphia, 1814); Lee and Frost, *Ten Years in Oregon* (New York, 1844); Alexander Ross, *Fur Hunters of the Far West*, vols. i.–ii. (London, 1855); James G. Swan, *The Northwest Coast* (New York, 1857); see also *Seventh Annual Report*, Bureau of Ethnology, pp. 65–66 (Washington, 1891), and works cited therein. See INDIANS OF NORTH AMERICA.

H. W. HENSHAW.

Chinquapin: See CHESTNUT.

Chintreuil, shăn'trö-ĕĕl', ANTOINE: landscape-painter; b. in Pont-de-Vaux, Ain, France, May 15, 1816; d. at Septeuil, Seine-et-Oise, Aug. 13, 1873; pupil of Corot; medal, Paris Exposition, 1867; Legion of Honor 1870. His pictures are mostly effects of sunlight on meadows and trees in summer foliage, and are truthful and pleasing. His *Thicket with Deer* (1873) is in the Luxembourg Gallery, Paris.

WILLIAM A. COFFIN.

Chintz: originally, an Oriental cotton fabric printed in patterns with bright colors, the ground being usually of the natural color of the stuff. In Europe and America a highly glazed printed cotton stuff is used for furniture and curtains. The exact character of the fabric called chintz varies with the fashion.

Chinuk, or **Chinook**: See CHINOOKAN INDIANS.

Chio, or **Chios**: See SCIO.

Chioggia, kĕe-od'jăa, or **Chiozza** (anc. *Fossa Clodia*): seaport-town of Italy; province of Udine; on an island of the Adriatic; 15 miles S. of Venice (see map of Italy, ref. 3–E). It is built on piles like Venice; is joined to a fort on the mainland by a stone bridge of forty-three arches; has a fine main street lined with portieoes, a cathedral, several schools, a theater, and a harbor protected by two forts. Here are ship-building yards, salt-works, and fisheries. Pop. 25,084.

Chionides, kī-on'i-dēez: a Greek comic poet, who began to exhibit, according to Suidas, in B. C. 487. Aristotle puts him somewhat later than this. Though not the first in time, yet from the more careful and artistic preparation of his pieces he was regarded as the leader of the Old Attic comedy. The fragments are brought together in Meineke's and Koek's collections.

Chionid'idæ: See SHEATHBILL.

Chion (kī'on) **of Heracle'a** on the Pontus: a pupil of Plato: sought to free his native city by slaying the tyrant Clearchus (B. C. 353), but was himself slain. Seventeen letters, late productions, under the name of Chion, are edited by Coberus (1765), and by Orelli in his *Memnon* (1816).

Chipman, DANIEL, LL. D: b. in Salisbury, Conn., Nov. 15, 1765; graduated at Dartmouth in 1788; became distinguished as a lawyer and an author. He was a member of Congress from Vermont (1815–17), and prominent in the politics of that State. He published a valuable work on the *Law of Contracts* (1822); *Reports of Cases in the Supreme Court of Vermont* (1824); and other works. D. in Ripton, Vt., Apr. 23, 1850.

Chipman, NATHANIEL, LL. D.: soldier and jurist; brother of Daniel Chipman; b. in Salisbury, Conn., Nov. 15, 1752; graduated at Yale in 1777. He was an officer of the Revolutionary army; was admitted to the bar in 1779; chief justice of Vermont for several years; judge of the U. S. district court for Vermont (1791–93); and U. S. Senator 1797–1803. His work on the laws of Vermont are highly commended. He published *Principles of Government* (1793) and other works. D. in Tinmouth, Vt., Feb. 15, 1843. See his *Life* by his brother Daniel (1846).

Chipman, WARD, LL. D.: a jurist of New Brunswick; son of a Tory refugee from Massachusetts to that province; b. in St. John, July 10, 1787; graduated at Harvard in 1804. He succeeded his father as judge in 1824, and as boundary commissioner; became chief justice of the Supreme Court of the province in 1834, and was prominent in its legislature. D. in St. John, Dec. 26, 1851.

Chipmunk: a popular name in the U. S. for various small ground squirrels of the genus *Tamias*, more particularly for the common *Tamias striatus*. This little striped

Chipmunk.

squirrel is about 10 inches in total length, reddish brown above, white below, marked with two white and five black longitudinal stripes. It is abundant throughout the Eastern U. S., N. of the lowlands of the Southern States. It feeds on nuts, seeds, and grain, laying up a store for winter's use; as much as two pecks of provision have been taken from a single burrow. See also SCIURIDÆ. F. A. LUCAS.

Chip'pawa: a post-village and port of entry of Ontario, Dominion of Canada, Welland County; on the Niagara river; about 3 miles above Niagara Falls (for location, see map of Ontario, ref. 5–E). This village is memorable as the scene of an important victory of a portion of the U. S. army under Maj.-Gen. Joseph Brown (but see SCOTT, WINFIELD) over a superior British force under Maj.-Gen. Rial, July 5, 1814. The number actually engaged on the U. S. side was 1,900; the British force numbered 2,100. The U. S. loss in killed and wounded was 328; the British loss was reported at 505.

Chippewa [native, *Ojibway* or *Ojibbewa*]: a river of Wisconsin: rises in Ashland County, flows nearly southwestward through Chippewa and other counties; enters the Mississippi river at the foot of Lake Pepin; length about 220 miles. It traverses extensive forests of pine.

Chippewa Falls: city and railroad junction; capital of Chippewa co., Wis. (for location of county, see map of Wisconsin, ref. 3–C); on Chippewa river. It has gas and electric light, complete system of water-works, graded schools, ample water-power, several mills, and extensive manufactures of lumber. Pop. (1880) 3,982; (1890) 8,670; (1900) 8,094.

EDITOR OF "INDEPENDENT."

Chippewas: See ALGONQUIAN INDIANS.

Chipping Barnet: town, England. See BARNET.

Chipping Bird, or **Chipping Sparrow**: a common little North American bird (*Spizella socialis*, Bonap.). It is between 5 and 6 inches long, whitish underneath, crown chestnut, back and sides ashen, with streaks of white and black. Its song consists of six or seven notes rapidly repeated.

Chiquichi'qui Palm, or **Piassa'ba Palm**: the *Leopoldina piassaba*; a tree of the Palm family, found in the tropical portions of South America, from which much of the piassaba fiber of commerce is derived. It bears large pinnate leaves, which, after dying, remain hanging from the trunks until they finally split up into tangled masses of fibers, giving them an unsightly appearance. The fiber is

collected and sent to Europe and America, where it is made into brooms, cordage, etc. This tree is nearly related to the *Attalea funifera* of the same region, and known also by the name of piassaba palm, since it yields a similar fiber.

Chiquimu'la: the easternmost department of Guatemala, Central America; bordering on the Caribbean Sea; between the Bay of Honduras on the north and the state of San Salvador on the south. It is hot and unhealthful. Area, 4,000 sq. miles. Pop. 62,878. Capital, Chiquimula de la Sierra, with 9,000 inhabitants.

Chiquinquirá, chĕĕ-kēēn-kē-raa': a city in the western part of the department of Boyacá, Colombia; about 70 miles N. of Bogotá, and 8,576 feet above the sea. It is the center of a grazing region and has a considerable trade, but is principally known for an image of the Virgin, reputed to be miraculous. The chapel devoted to this image is probably the finest church in Colombia, and it is said that over 60,000 pilgrims have visited it in a single year. The lake of Fúquene, near the city, was a sacred place of the Chibchas Indians, and was surrounded by their villages. Chiquinquirá, though its name is Indian, is a Spanish town, founded soon after the conquest. Pop. of the city (1893) about 12,000; of the district, 19,000. HERBERT H. SMITH.

Chiquitos: a province of the department of Santa Cruz de la Sierra, Bolivia, occupying the plains of the eastern part to the frontiers of Brazil; area unknown, but probably not less than 40,000 sq. miles. Pop. about 35,000, mostly Indians. It is continuous with the Chaco region, and is a vast area of low, flat land, with a few isolated hills; much of it is occupied by grass-lands, but there are extensive forests near the mountains and toward the river Paraguay; portions are flooded every year. The climate is hot and unhealthful. The Chiquitos region is very imperfectly known, and has no important towns. A road from Santa Cruz de la Sierra crosses it to the Paraguay near Corumbá, Brazil. See Castelnau, *Expédition dans les parties centrales de l'Amérique du Sud*, tom. iii., p. 205, 1851. HERBERT H. SMITH.

Chiricahua: See ATHAPASCAN INDIANS.

Chiriqui': name of a volcano, lagoon or bay, and river; at the extreme north of the department of Panama, Colombia; hence given to the district in which they lie. The Chiriqui lagoon is a large and almost completely inclosed bay opening into the Caribbean Sea. The river empties into the sea a short distance to the E. of the lagoon. The volcano lies about 40 miles S. W. of the lagoon, in the main cordillera, and is 11,260 feet high. The district, which is claimed by Costa Rica, is fertile, devoted to agriculture and cattle-raising, and contains considerable coal. Capital, the beautiful town of David, 10 miles from the sea; pop. 9,000. The isthmus is here very narrow, with a good harbor on each side. M. W. H.

Chiriqui Ornaments: See CENTRAL AMERICAN ANTIQUITIES.

Chiriquis: See INDIANS OF CENTRAL AMERICA.

Chirisophus, kī-ris'ō-fŭs: a Lacedæmonian officer who joined Cyrus the Younger in his expedition against Artaxerxes (B. C. 401) at Issus, with 700 heavy-armed men. He first appeared prominently after the death of Clearchus, when he was, at the suggestion of Xenophon, appointed to lead the van of the retreating Greeks. After reaching Trapezus, Chirisophus attempted to secure vessels for the Greeks, but was unsuccessful. At Sinope, through Xenophon's refusal of the office, he was chosen commander of the Greek forces, but six or seven days after, while at Heraclea, the army was broken up into three parts, which set out separately. Chirisophus died soon after at Calpe.

Chiromancy: same as CHEIROMANCY (*q. v.*).

Chiron: same as CHEIRON (*q. v.*).

Chironectes, kī-rō-nek'tēēz [from Gr. χείρ, hand + νήχειν, swim]: a term used by Cuvier for a genus of fishes belonging to the family *Antennariidæ* and order *Pediculati* (*q. v.*); antedated by *Antennarius*.

Chis'elhurst: a parish of England, in Kent; 11 miles S. E. of London (see map of England, ref. 12–J). The Emperor Napoleon III. fixed his residence at Chiselhurst early in 1871, after he was released from captivity by the Emperor of Germany, and here, Jan. 9, 1873, he died.

Chis'wick: a suburb of London; county of Middlesex; on the Thames; about 7 miles nearly W. from the Bank of England, in London (see map of England, ref. 12–J). It contains the gardens of the London Horticultural Society. In Chiswick House, a villa belonging to the Duke of Devonshire, Fox died in 1806, and Canning in 1827. Hogarth lies buried in the churchyard. Pop. (1891) 21,964.

Chitaldrug' (anc. *Sitala Durga*, the spotted castle): a town and fortress of Nagar, Mysore, British India; 128 miles N. N. W. of Seringapatam (see map of S. India, ref. 5–D). Here is a rock-fortress which is one of the strongest and most remarkable in India. It is occupied by a British garrison. The town is in a thinly populated district of the same name, which in 1876–78 was decimated by famine. It has an area of 4,871 sq. miles. Pop. of district about 400,000; of town 4,300.

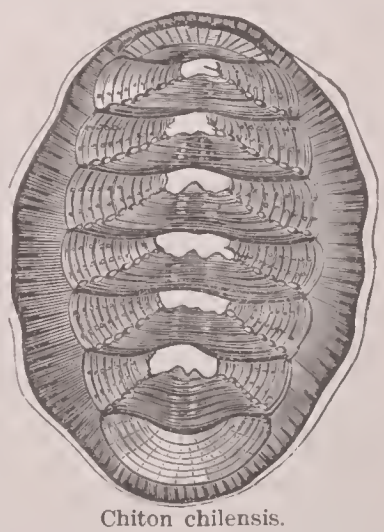
Chitimachan Indians: a linguistic family of North American Indians, whose name is derived from the Choctaw language, in which *tchuti* means cooking-pot or vessel, and *imasha*, they possess. Only one tribe is known to exist; its habitat is at Clarenton, St. Mary's parish, Louisiana, and another settlement is on Bayou Plaquemine, N. E. from Grand Lake, around which fifteen of the Chitimachan villages were built in the eighteenth century. Some of these Indians lived farther E. At present the tribe consists of mixed-blood Indians only. They have no remembrance of early migrations. They do not figure prominently in colonial history, for they lived inland, far from the high roads of travel and commerce; but they had many encounters with lawless bands of the Choctaw people. In 1881 their population amounted to fifty-five people, who gained subsistence as farm-hands, lumbermen, makers of basketry, etc. At the death of their chief, A. Dardin, in April, 1879, the tribal government was abandoned, and no Indian has since held the chieftainship. The Chitimachan language is now spoken in one dialect only.

AUTHORITIES.—Butel-Dumont, *Mémoires historiques sur la Louisiane* (2 vols., Paris, 1753); Le Page du Pratz, *Histoire de la Louisiane* (3 vols., Paris, 1758; London, 1763 and 1774); Thomas Jefferys, *The Natural and Civil History of the French Dominions in North and South America* (2 parts, London, 1761). See INDIANS OF NORTH AMERICA.

A. S. GATSCHET.

Chitin, kī'tin, a substance that forms the principal part of the covering of insects and crustacea. It is also found in the bones of cuttle-fish. The best method for its preparation consists in treating lobster-shells and carapaces successively with dilute acid, caustic potash, alcohol, and ether. It is a colorless, amorphous mass which is insoluble in water, alcohol, ether, alkalies, and dilute acids. When boiled with concentrated hydrochloric acid, it is decomposed, forming glycosamine and acetic acid. As glycosamine appears to be closely related to the sugars, chitin is regarded as a GLUCOSIDE (*q. v.*). Further, it is stated that, when chitin is dissolved in concentrated sulphuric acid acetic acid, ammonia, and a carbohydrate are formed. In a way, chitin serves a purpose similar to that which CELLULOSE (*q. v.*) serves in the vegetable world, namely, to protect the more active and vital parts of the beings or plants of which they form a part. I. R.

Chiton, kī'ton [from Gr. χιτών, tunic]: a Linnæan genus of mollusks now divided into many genera. They are characterized by having a flattened body covered above with an eight-jointed shell. Several hundred species, all marine, are known. To the naturalist the chitons are extremely interesting, as they retain the primitive bilateral symmetry of the body, there being a terminal vent and paired genital, excretory, and circulatory organs, while the numerous gills are arranged on either side of the body, and the nervous system is not twisted as in all gasteropods. The chitons were long regarded as blind, but Prof. Henry N. Moseley pointed out that in many species the whole back was covered with hundreds of minute eye-like organs. The chitons form the class *Polyplacophora*, a pri-



Chiton chilensis.

mary division of the mollusca. The species on the Atlantic coast of North Ameriea are small, but on the Pacific coast species 4 inches in length occur. J. S. KINGSLEY.

Chiton: in ancient Greeee was the undermost garment, and was worn by both sexes. In early times it was a long tunic worn by men. Subsequently two forms arose: the Ionian, made of linen, reaching to the feet, with sleeves, appropriated exclusively by women from the time of Pericles; and the Dorian, a square garment of wool, with short sleeves or mere armholes, peculiarly the garment of men, though common to Spartan women.

Chitore: a town and fortress of India; province of Rajputana; 64 miles E. N. E. from Udaipur (see map of N. India, ref. 7–C). The fortress consists of a rock smoothly scarped to a height of from 80 to 190 feet by nature, surmounted by a rude bastioned wall 12 miles in its entire circuit. The inclosure is narrow and irregular, and contains temples and palaces.

Chitral: See KASHKAR.

Chittagong': a district (and city) of British India; on the Bay of Bengal; in the presidency of Bengal, at its S. E. extremity. Area of district, 2,567 sq. miles. A great part of the country is mountainous; covered with forests; penetrated by canals or streams used for traffic, but a source of malaria. Cholera is endemic. The soil is fertile, but little cultivated. Towns are only found on the seacoast. The population is more than half Mohammedan. Pop. of district, 1,200,000. Chittagong port, or Islamabad, is on the right bank of the Karnaphuli river, 6 or 8 miles from its mouth (see map of N. India, ref. 8–K). It is a straggling, hilly city of 21,000 inhabitants, with a considerable maritime trade. Under the Portuguese it was one of the chief commercial ports of India. It was captured in 1665 by Moguls, who gave it its Mohammedan name, meaning the city of the faithful.

Chittagong Hill Tracts is a wild region of dense vegetation on the west border of Burma. Area, 6,882 sq. miles. Tigers and elephants are numerous in the jungles; population about 70,000, barbarous tribes ruled by chiefs feudatory to the Bengal presidency.

Chittagong Wood, so called because produced extensively E. of Bengal, is a cabinet wood, finely grained or marked, called in India a *cedar*. It is from a tree of the order *Cedrelaceæ*.

Chitteldroog: same as CHITALDRUG (*q. v.*).

Chittenan'go Springs, or **White Sulphur Springs**: in Sullivan township, Madison co., N. Y.; 15 miles E. from Syracuse; a saline and sulphur spring, surrounded with accommodations for receiving visitors, and highly recommended for many cases of disease. Chittenango village, 2 miles N., on a creek of the same name, has an academy and textile factories. Pop. (1890) 792; (1900) 787.

Chittenden, RUSSELL HENRY, Ph. D.: physiological chemist; b. in New Haven, Conn., Feb. 18, 1856; was graduated Ph. B. at Yale University 1875; studied also in Heidelberg; instructor in physiological chemistry, Sheffield Scientific School of Yale University 1875–82; professor of same branch since 1882; author of several volumes of *Studies* in physiological chemistry based on laboratory investigations; member of National Academy of Sciences; contributor to scientific periodicals.

Chitty, JOSEPH: English lawyer and legal writer; b. in 1776; studied law and practiced under the bar till June 28, 1816, when he was called to the bar at the Middle Temple; was a man of remarkable memory and of great legal erudition, and an assiduous worker. He had a very large practice as a barrister (he never became a queen's counsel), trained in the law many men who were afterward eminent in their profession, and wrote in rapid succession a large number of legal works, many of which have passed through numerous editions. They are still standards for the practitioner, and have done as much perhaps to facilitate the study of the law as the work of any man of his time. Among his best-known works (with the dates of the first editions) are *Treatise on Bill of Exchange, Checks on Bankers, Promissory Notes*, etc. (1799); *Precedents in Pleading* (1808); *Treatise on Criminal Law* (1816); an edition of *Blackstone's Commentaries* (1832); *The Practice in the Courts of King's Bench, Common Pleas, and Exchequer* (1831–32); *Treatise on Medical Jurisprudence* (1834); *Practice Respecting Amendments of Variances Pending a Trial* (1835); *Collection of the Statutes of Practical Utility* (1829–37); *Practice of the Law in all its Departments* (1833–38). D. in London, Feb. 17, 1843. His sons adopted the legal profession, and of them Joseph Chitty, Jr. (d. Apr. 10, 1838), was a special pleader, and wrote, among other works, a *Treatise on the Law of Contracts*; and Thomas Chitty (b. in 1802; d. Feb. 13, 1878) also was a special pleader, who wrote, among other works, *Forms of Practical Proceedings* (1834), and had many pupils in the law who afterward attained eminence.

Revised by F. STURGES ALLEN.

Chiusi, kē-oo'sē: a town of Italy; province of Siena; in the Val di Chiana (see map of Italy, ref. 4–B); the residence of a bishop; has a large cathedral. It was the *Clusium* of the ancients, one of the twelve cities of the Etruscan confederation, and the headquarters of Porsena. Its museum contains a very interesting collection of Etruscan bronzes, mirrors, vases, funeral urns, etc., found in the vicinity. In Dante's time the district was a "pestilential pool," but the drainage of the Chiana in 1816 has brought fertility to the valley and prosperity to the town. Pop. 5,005.

Chivalry [from O. Fr. *chevalerie*: Ital. *cavalleria* (whence Fr. *cavalerie*, Eng. *cavalry*), from deriv. of Lat. *caballarius*, horseman, hostler]: the system or dignity of knighthood; originally a body or assembly of knights or horsemen. The word has the same etymology as *cavalry*, and in the Italian and Spanish languages the same term is used for both. Chivalry was an institution originating in the Middle Ages. Its origin is to be traced to the customs and sentiments of Teutonic nations, especially remarkable for the respect which they evinced for the female sex, and for their development of the feudal system. It was essentially aristocratic, and included military accomplishments, the relation of vassal to his lord, the defense of women and devotion to their honor and persons. The moral and social standards of the institution were high, and the manners inculcated heroic and elevated. The ceremonial relation assumed by the Church to KNIGHTHOOD (*q. v.*) enhanced these ideals, and tended to make them the common rule of life for persons of gentle birth, although in conduct individuals frequently fell far below them. Without chivalry the crusades could not have taken the form or proportions which they did. The appearance of chivalry marks the transition of feudalism from violence to culture. It gave rise to the literature of chroniclers, like Villehardouin and Froissart, of troubadours and *trouvères* and other mediæval singers. Its extravagances were ridiculed by Cervantes, but it created traditions of manners, poetry, and art which still have force in society. In English law chivalry denotes a land-tenure conditioned on the performance of knight-service. It was a service due the crown, and was ordinarily of a military nature for forty days annually, but by commutations it was made to disappear.

The Court of Chivalry was instituted by Edward III., regulated by Richard II. in 1390, and of it the earl marshal and the lord high constable were joint judges. When both were present the court had summary jurisdiction in criminal cases; the earl-marshal sitting alone constituted a court of honor. It is represented now only by the earl marshal of the Heralds' College, a sinecure hereditary in the dukedom of Norfolk.

Chivasso, kē̆-vaas'sō: a town of Italy; province of Turin; on the left bank of the Po, near the influx of the Oreo (see map of Italy, ref. 3–B). It was at one time considered the key to Piedmont, but its fortifications were destroyed in 1804 by the French, and it now has no military importance. It carries on some trade in grain and wool. Pop. 4,375.

Chiverny, PHILIPPE HURAULT, Comte de: memoir-writer; b. at Chiverny, in Brittany, Mar. 25, 1528. He received a Government office in 1562 through the influence of Marie de Médicis. He fell into disgrace in 1582, but in 1594, on the accession of Henry IV., he was received into favor with that monarch, which lasted until his death at Chiverny, July 29, 1599. His work, *Mémoires d'Estat de Messire Philippe Hurault, etc.*, was first printed in Paris in 1636.

Chives, or **Cives**: a garden name for *Allium schœnoprasum*, a small onion-like plant, which is wild in Europe and the northern parts of North Ameriea. It is grown in gardens for the slender hollow leaves, which are used for flavoring in soups or stews. It is a perennial plant, growing in tough clumps, and bearing rose-purple flowers in dense erect umbels or heads. The plant grows to a height of 6 to 10 inches. It is propagated by dividing the clumps. Chives is little grown in the U. S.

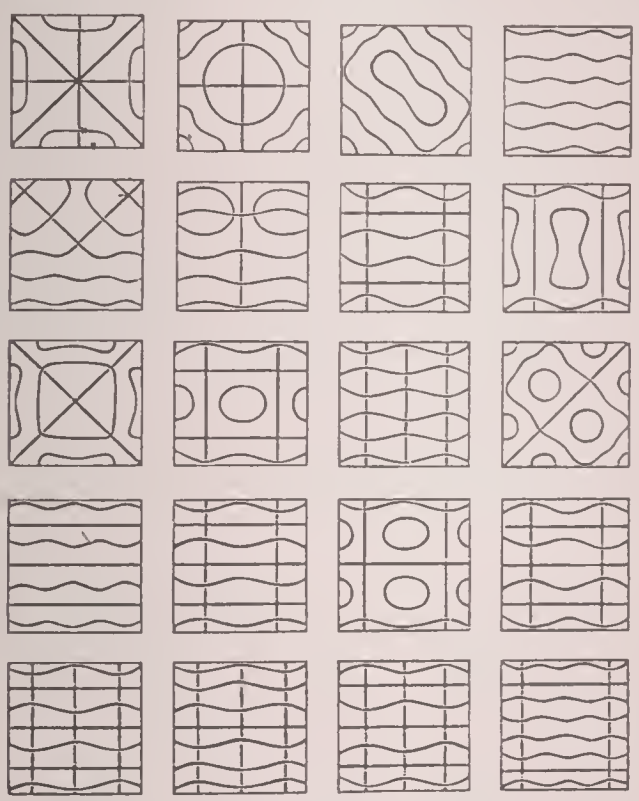
Chivilcoy, shĕĕ-vĕĕl-kō'ĕĕ: a city of the Argentine Republic: in the province of Buenos Ayres, and about 100 miles west of the city of Buenos Ayres, with which it is connected by rail. It is situated in the center of a rich grazing region, settled principally by Italian, Basque, and German immigrants. The town is well built, with wide streets, excellent shops, a theater, free library, club-house, etc. Pop. (1880) 11,000, and rapidly growing.

HERBERT H. SMITH.

Chivot, MARIE ANTOINE FRANÇOIS: classical scholar; b. at Roye, in the old province of Picardy, France, in 1752. After a brilliant course of studies in the University of Paris, he was made Professor of Humanities there. He gave several years to his great work, *De l'esprit ou de la filiation des langues*. D. at Roye in 1786.

Chladni, khlaad'nĕĕ, ERNST FLORENS FRIEDRICH: b. in Wittenberg, Germany, Nov. 30, 1756: educated at Leipzig; the founder of the science of acoustics. He devoted much time to the perfecting of the theory of sound, and published, besides other works, *Discoveries on the Theory of Sound* (1787); a *Treatise on Acoustics* (1802); and a *Treatise on Fiery Meteors* (1819). D. in Breslau, Apr. 3, 1827. See his *Life* (1866) by Melde.

Chladni's Figures [so named from the acoustician E. F. F. Chladni]: sand figures by means of which the vibrations of plates may be studied. When a metal plate of any

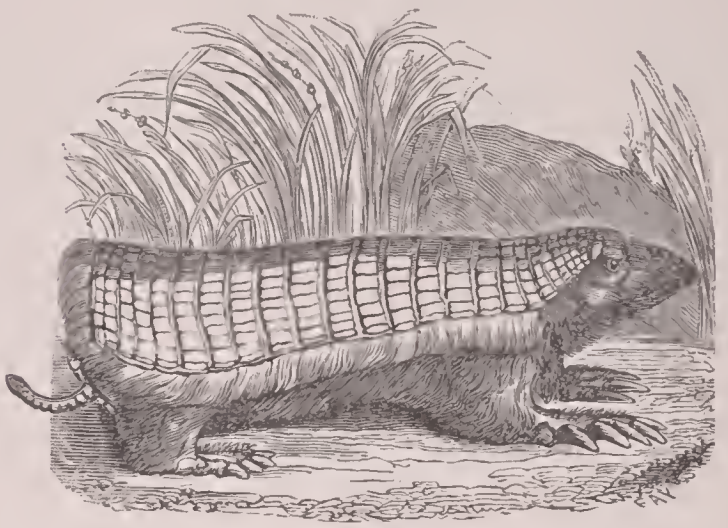


Chladni's figures.

regular geometrical form is clamped at the center and thrown into vibration by the application of a bow upon one of its edges, it gives out a more or less complex musical note. If dry sand be strewn upon the surface of the plate it will arrange itself along certain well-defined lines (nodal lines), producing a symmetrical pattern, by means of which the number and shape of the vibrating segments into which the plate is broken up are indicated.

The illustration is a reduced fac-simile (omitting the reference letters) of one of the pages of Chladni's classical work, *Entdeckungen über die Theorie des Klanges* (Leipzig, 1787). In that and in later volumes hundreds of such sand figures have been depicted by him. E. L. NICHOLS.

Chlamydoph'orus [from Gr. χλαμύς, -ύδος, cape + φέρειν, carry]: a genus of armadillos (see DASYPODIDÆ), distinguished by the abrupt truncation of the hinder portion of the body, which looks as though cut off with a hatchet. Two species are known, both extremely rare, only about thirty specimens of the commonest species, *Chlamydophorus truncatus*, the pichiciago, being preserved in museums. This little animal, the smallest of the armadillos, is about 5 inches long, clothed with soft, silky hair, and with the upper and the hinder part of the body protected by a shield of four-sided, horny plates. The dorsal portion of this shield is almost free, being attached to the body only along the middle line of the back. The tail, which is also covered with plates, projects downward through a notch in the hinder shield. It is inflexible, turned up toward the end, and terminates in a little trowel-shaped point. The pichiciago is only known to occur in the vicinity of Mendoza, Argentine Republic, and



Chlamydophorus.

is seldom taken, except by the Indians, who find it nestling in their blankets. It is nocturnal in habit, and burrows with incredible rapidity in the light, sandy soil. F. A. LUCAS.

Chlamydosau'rus [from Gr. χλαμύς, -ύδος, cape + σαῦρος, σαύρα, lizard]: a genus of reptiles often called the "frilled lizards" (from the large, plaited frill on the neck), of which

Chlamydosaurus.

the best-known species is the *Chlamydosaurus kingii*, a native of Australia. The general color of the chlamydosaurus is yellow brown, mottled with black, and it is remarkable that the tongue and the inside of the mouth are also yellow. The frill forming so conspicuous an ornament to this creature is covered with scales, and toothed on the edge. During the early stage of the animal's life this appendage does not reach even the base of the forelegs, but when the animal has attained maturity it extends considerably beyond them. The chlamydosaurus is very courageous, and when provoked it erects the frill, and by showing its teeth presents a formidable aspect. When at rest its frill lies back in plaits upon the body. This lizard measures at full growth nearly a yard in total length. Revised by F. A. LUCAS.

Chla'mys (in Gr. χλαμύς): a woolen outer garment of the Greeks, differing from the usual *amictus*, the ἱμάτιον of the men, in being finer, gayer in color, and oblong instead of square. It was fastened round the neck by a brooch (fibula), and hung down the back to the calf, or over the left shoulder, covering the left arm.

Chlopicki, JOSEPH: Polish soldier; b. 1771; fought in the Polish army 1794–95, in the French 1797–1813, and in the Russian, as general of division, 1814–18. At the second insurrection of the Poles he acted as dictator for six weeks, resigning in Jan., 1831; while fighting as a private was badly wounded Feb. 25. D. at Cracow, Sept. 30, 1854.

C. H. T.

Chlo'ral [from first syllable of *chlorine* and the first syllable of *alcohol*]: a liquid composed of chlorine, carbon, hydrogen, and oxygen, obtained by the action of chlorine on absolute alcohol. Its formula is $CCl_3.CHO$. Chemically considered, chloral is acetic aldehyde in which the H_3 is replaced by Cl_3. Bromine acts similarly on alcohol, producing bromal, $CBr_3.CHO$. When kept for a time it becomes solid, but is not changed in composition, and may be restored to its original form by heat. With water it forms a solid hydrate known as chloral hydrate or hydrate of chlo-

ral, which is now much used in medicine as a hypnotic. Liebreich introduced chloral as a hypnotic, thinking that it would be broken up into chloroform and formic acid in the animal body. This is, however, not the case. Chloral acts as chloral and is eliminated from the body as urochloralic acid. The dose is from 10 to 20 grains to an adult. Much larger doses have been given with no bad results, but well-authenticated fatal cases of chloral poisoning indicate the necessity of caution in its use. The sleep produced by hydrate of chloral is wonderfully sweet and refreshing to most patients. Hydrate of chloral sometimes increases hysterical symptoms, and unless well diluted is irritant to the stomach. It is peculiarly valuable in tetanus. Given in large doses, it powerfully diminishes reflex action, and is a physiological antidote in poisoning by strychnia. Croton chloral is a by-product in the manufacture of chloral. It possesses similar properties in less degree, unites with water to form a hydrate, and is used in medicine as a hypnotic. It is chiefly used as a remedy for neuralgia, in which chloral itself is not as efficacious.

Revised by H. A. HARE.

Chlo'rate: a compound formed by the replacement of the hydrogen of chloric acid by a metallic element. The best known of these salts is potassium chlorate ($KClO_3$), which, mixed with combustibles, such as sulphur and charcoal, forms highly explosive compounds, which ignite by a blow or friction. It is also a useful medicine. See CHLORIC ACID.

Chlorhydric Acid: See HYDROCHLORIC ACID.

Chlo'ric Acid ($HClO_3$): forms with potash the white crystalline salt called potassium chlorate, or chlorate of potash. (See CHLORATE.) This acid is a sirupy liquid, setting fire to dry organic substances with which it comes in contact.

Chlo'rine [from Gr. *χλωρός*, green + suffix *-ine*]: one of the seventy chemical elements. It occurs in nature in very large quantities, but always in combination. The most widely distributed and abundant compound containing it is common salt, or sodium chloride. It was early found that when this compound is treated with sulphuric acid an acid is formed. This is now called hydrochloric acid, but it was once called muriatic acid. In 1774 Scheele, in the course of an investigation on black oxide of manganese, or pyrolusite, treated this compound with muriatic acid and obtained chlorine, which he studied very thoroughly. It was supposed to contain oxygen. It forms an acid without the addition of oxygen, but at that time it was regarded as necessary that all acids should contain oxygen. It has been proved, however, beyond a doubt that nothing simpler can be obtained from chlorine than chlorine itself, and so it is regarded as an element. It belongs to the family of the halogens, of which fluorine, bromine, and iodine are the other members. It is formed most easily by the method used by Scheele—that is, by treating black oxide of manganese with hydrochloric acid. It is made also by passing hydrochloric acid gas mixed with air over clay balls saturated with a solution of blue vitriol and heated to a rather high temperature. Chlorine is a greenish-yellow gas of extremely disagreeable odor. It acts with great energy upon most substances, disintegrating them and forming new compounds, among which are chlorides, by a process analogous to ordinary COMBUSTION (*q. v.*). When inhaled it causes most uncomfortable sensations in the throat, and in large quantities it is very dangerous. Its chief use is for bleaching. It is passed into lime, and thus a compound of lime and chlorine, known as bleaching-powder or "chloride of lime" is formed. When this is dissolved in water in contact with the air, the solution is an excellent bleacher. The chemical symbol of chlorine is Cl, its atomic weight 35·4. Binary compounds of chloric acid and an element or radical are chlorides.

IRA REMSEN.

Chlo'rite [from Gr. *χλωρός*, green, with suffix *-ite*]: the name of a group of minerals composed of various proportions of hydrous silicates of aluminium, magnesium, and ferrous iron. They are generally of various shades of green in color, and in structure resemble mica, but some are granular. They are soft and yield easily to the knife. A chlorite in chemistry is a salt formed by chlorous acid.

Chlo'roform [from the first syllable of *chlorine* + the first syllable of *formyl*, of which it was considered to be a trichloride]: a heavy, colorless, and very volatile liquid, which is not inflammable, and possesses a sweet taste and a neutral reaction. It is soluble in about 200 parts of water and in all proportions in alcohol and ether. Because of its power as a solvent it is sometimes used by chemists and pharmacists for other than medicinal purposes. The only chloroform which should be used in medicine is known as *Chloroformum purificatum*. It has a formula of $CHCl_3$ and a molecular weight of 119·08, and should contain, according to the U. S. Pharmacopœia, 99 per cent. by weight of pure chloroform and only 1 per cent. of alcohol. It should be kept in a dark-glass stoppered bottle and in a cool dark place. Locally applied to the skin chloroform is capable of producing very considerable irritation and even blisters if evaporation is prevented. When inhaled it very speedily produces a condition of anæsthesia and unconsciousness during which any major surgical operation may be performed without pain to the patient. It was first introduced into medicine as a general anæsthetic by Simpson, of Edinburgh. The substance itself was originally discovered by Guthrie, of Sackett's Harbor, N. Y., and also almost simultaneously by Soubeiran, of France. Guthrie, however, failed to recognize it as chloroform, and called it chloric ether.

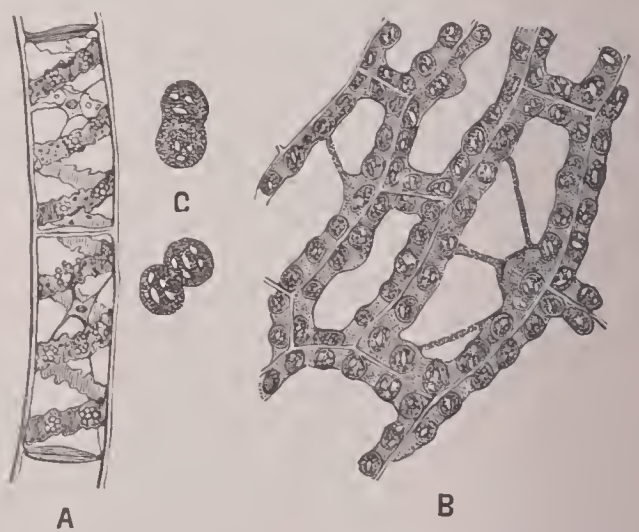
Much discussion has arisen in the medical profession as to the safety of this anæsthetic. The enormous amount of statistics that has been collected proves that the death-rate all over the world from the administration of chloroform is about 1 to 3,000 administrations, while that of ether varies from 1 in 6,000 to 1 in 13,000 administrations. It is evident, therefore, that chloroform is much the more dangerous drug. The advantages which it possesses are its rapidity of action, the fact that only a small quantity is required to anæsthetize the patient, and again that its inhalation, to most patients, is not very disagreeable. On the other hand, there is no doubt that it possesses very powerful depressing influences which are chiefly exercised upon the two vital functions of respiration and the heart.

Chloroform is sometimes used internally, generally in the form of the "spirit of chloroform," in the dose of 1 to 5 drops for the relief of abdominal pain and for the removal of tapeworm, when used by inhalation. In such cases it should always be diluted with water.

H. A. HARE.

Chlo'rophane [from Gr. *χλωρός*, green + *-φανης* (*φαίνεσθαι*), appearing]: a name given to those varieties of fluor spar which when heated shine with a beautiful emerald-green, phosphorescent light.

Chlo'rophyll [from Gr. *χλωρός*, green + *φύλλον*, leaf]: the green coloring-matter of plants. It is a product of



A, a pond-scum (*Spirogyra*) with spiral chloroplasts; B, cells from a moss leaf (*Funaria*) with spherical chloroplasts; C, chloroplasts dividing.

protoplasm, and is usually secreted by definite portions (plastids) known as chloroplasts or chloroplastids. In some of the lower plants (e. g. *Schizophyceæ*), and apparently in the *Mesocarpeæ*, the whole mass of protoplasm in the cell is colored, but in the great majority of cases the chloroplasts constitute but a small part of the protoplasm of the cell.

Chloroplasts are mostly minute, rounded bodies, occupying the peripheral portions of the cell; in a few cases they are ribbon-shaped, as in *Spirogyra*, or star-shaped, as in *Zygnema*. Chlorophyll is developed in the chloroplasts only in the light (with a few remarkable exceptions), and in prolonged darkness it almost invariably disappears, as in the blanching (etiolation) of celery. It may be removed artificially by alcohol, ether, chloroform, and many other

reagents, leaving the chloroplasts colorless, and by proper treatment of the green solution the chlorophyll itself may be obtained, although mixed with other extracts. Chemical analyses of chlorophyll solutions indicate that it is composed of carbon, hydrogen, oxygen, and nitrogen, with a small quantity of ash.

In sunlight (or other strong light) the chloroplasts form starch, or, rarely, some related hydrocarbon, and this appears to be the proper function of the chlorophyll. Plants which obtain their carbon compounds already made, as is done by parasites and saprophytes, develop little or no chlorophyll; hence those organs which normally contain chlorophyll (as leaves, stems, thallomes, etc.) are themselves but poorly developed. The non-development of chlorophyll results in the atrophy and degeneration of the vegetative organs of the plant-body. CHARLES E. BESSEY.

Chlo'roplasts, or **Chlo'roplastids**: See CHLOROPHYLL.

Chloro'sis, or **Green Sickness** [from Gr. χλωρός, green + suffix *-osis*; cf. Gr. χρύσωσις, act of making golden, χήρωσις, act of making lonely, κένωσις, act of making empty]: a disease almost peculiar to young women and girls, and usually associated with other troubles peculiar to that time of life. It takes its name from a greenish-yellow tint of the skin which some patients exhibit. There is also great pallor and debility, often disturbance of the heart's action, breathlessness, and a variously perverted and capricious appetite. The disease is characterized by a peculiar impoverishment of the blood. Most cases are readily curable by the use of rest and, later, moderate exercise, good air, proper food and clothing, and, above all, by the administration of iron, which is almost a specific in this disease. See BLOOD. Revised by WILLIAM PEPPER.

Chlorosis is also the name of the "yellows," a disease which attacks plants and trees, especially the peach-tree. A deficiency of chlorophyll causes a blanched and yellow appearance. Damp soil, wet weather, and insufficient culture and manuring are assigned as causes, but widespread climatic influences of a character which is little understood appear to be the principal cause of this destructive malady. No treatment except underground drainage and good culture promises any benefit.

Chlorox'ylon [from Gr. χλωρός, green + ξύλον, wood]: a genus of plants of the order *Cedrelaceæ*, its fruit having only three cells and splitting into three parts. *Chloroxylon swietenia* is the SATIN-WOOD (*q. v.*) of India. Its wood is exported, and is used by cabinet-makers and brushmakers.

Chmunu: See HIEROPOLIS.

Chnum, or **Khnum**: a deity. See EGYPT, ANCIENT.

Choate, JOSEPH HODGES: See the Appendix.

Choate, RUFUS, LL. D.: eminent advocate and orator; b. in Essex, Mass., Oct. 1, 1799. Both his parents were distinguished for quickness of intellect, as well as weight of character. He entered Dartmouth in 1815. After taking his degrees he remained in the college as tutor for one year. He commenced the study of law at Cambridge, and subsequently studied under the distinguished orator and lawyer, Mr. Wirt, then U. S. Attorney-General at Washington. He began the practice of law in his native State at Danvers, whence he removed to Salem and afterward to Boston. While at Salem he was elected to Congress (1832), and later (1841) he was chosen Senator as successor to Mr. Webster, who had been appointed Secretary of State under President Harrison. In political life he acted with the Conservative or Websterian wing of the Whigs. After Webster's death Mr. Choate was the acknowledged leader of the Massachusetts bar, and was regarded by the younger members of the profession with a love equal to their reverence. As an orator, Mr. Choate's powers were of the rarest order. He was not merely eloquent when he spoke on themes that were calculated of themselves to touch the feelings or stir the passions of his audience, but his genius enabled him to interest and fascinate his hearers even while discussing the driest and most unpromising subjects. His health having failed, in 1858 he retired from business, and, a sea-voyage having been recommended by his physicians, he embarked for Europe in 1859, but he was unable to proceed farther than Halifax, where he died on July 13. See *Works of Rufus Choate, with a Memoir of his Life*, by S. G. Brown (1862); Neilson, *Memoirs of Rufus Choate* (Boston, 1884); *Addresses and Orations* (5th ed. Boston, 1885).

Choco', a region of Western Colombia, embracing the Atrato valley and nearly the whole Pacific slope, from the Isthmus of Panama southward. It was formerly a province of the Spanish viceroyalty of New Granada, and now constitutes the northwestern and most populous portion of the department of CAUCA (*q. v.*). H. H. S.

Chocolate [viâ Fr. and Span. from Mexican *chocolatl*, prob. unconnected with *cacao*]: a dried paste made from the kernel of cacao or chocolate nuts, which, after being roasted, are deprived of their shell and reduced by grinding between heated stones. To this paste are frequently added rice flour or other starch powders, and lard or butter, for the purpose of improving its taste and nutritive properties. In other instances certain flavoring substances are employed, such as cinnamon or vanilla. Chocolate is generally used in the form of a drink made by the addition of hot water or hot milk to the powdered nut, which has been flavored and sweetened. In other instances, after proper treatment, it is eaten in the form of confections or in plain chocolate cakes. It possesses a high nutritive value, both on account of the starch it contains and the very considerable amount of oily material which is present in it. It is to be distinctly understood that chocolate is derived from cacao or cocoa, which has been technically called theobroma, and not from coca, from which is derived the anæsthetic alkaloid cocaine.

Choctaws: See MUSKHOGEAN INDIANS.

Chodowiecki, DANIEL NICHOLAS: b. in Dantzic, Oct. 16, 1726; an engraver and designer of great originality, whose illustrations were almost the necessary aids to popularity in Prussia in his day, and have since been the object of the quest of collectors. He was a pupil of Kaufmann. He left over 3,000 engravings, most of them of small proportions, and they have been noted as the most remarkable as well as the earliest of that manner of illustration. He was rector of the Berlin Academy of Fine Arts and Mechanical Sciences in 1764, and director in 1793. Many of his prints were illustrations of Shakspeare. He also produced a *History of the Life of Christ*, which consisted of a series of painted miniatures which brought him great renown; was called the Hogarth of Germany, but had no tendency to caricature or satire. D. in Berlin, Feb. 7, 1801. W. J. S.

Chœrilus of Iasus: an attendant of Alexander on his march to the East, who sought to flatter him by his verses. According to the scholiast on Horace, Alexander said "he would rather be the Thersites of Homer than the Alexander of Chœrilus." The scholiast adds that Alexander agreed with him to give him a gold piece for every good verse, but a blow for every bad one, and that Chœrilus received only seven gold pieces in all, but was killed by the blows for his numerous bad verses. See Näke's *Chœrilus of Samos*. HENRY DRISLER.

Chœrilus of Samos: Greek epic poet: contemporary of Herodotus. His poem on the Persian war (Περσηίς) was popular at Athens because of the praise he lavished on the conduct of the Athenians during the conflict with Persia. The few fragments extant, which are not uninteresting, may be found in Kinkel's *Epicorum Græcorum Fragmenta* (1878, vol. i., pp. 265–277).

Chogset: See CONNOR.

Choir (Lat. *chorus*; Fr. *chœur*): a company of singers or choristers in a church; the part of a church occupied by the singers. Although in some of the basilicas, and generally in Spain, the choir is placed in an inclosure at the crossing of nave and transepts, the term signifies architecturally that portion of the church between the transepts and the apse, and which in parish churches, having no side aisles or chapels around it, is called the chancel. The choir in many large churches is furnished with stalls or *sedilia* for the choristers and clergy, and is separated from the nave by an elaborate screen, either of stone or of metal open-work, called the *rood-screen*. See CHORUS. A. D. F. HAMLIN.

Choiseul, shwää'zöl', ÉTIENNE FRANÇOIS, de, Duc de Choiseul et d'Amboise: a French statesman; b. June 28, 1719. He entered the army, gained the rank of lieutenant-general, and was sent as ambassador to Vienna in 1756 to secure coalition against Frederick the Great, and he was author of the Bourbon Family Compact, and of the policy of securing the liberties of the Gallican Church, the East Indian trade, and the commercial development of France. Favored by Madame de Pompadour, he became prime minister and favorite of Louis XV. He was an able diplomatist, popular with the nation, but he was removed from power by the influence of Madame du Barry in 1770. Retired to his estate of Chanteloup, returned to Paris four years later, and be-

came an unofficial adviser of Louis XVI. D. May 7, 1785. See *Mémoires de M. le Duc de Choiseul, écrites par luiméme* (2 vols., 1790).

Choke-cherry: the common name of *Prunus virginiana* and its fruit; a species of bird-cherry; a native of North America; the fruit is very astringent.

Choke-damp: See Carbonic Acid.

Chok'ing: the obstruction of the pharynx or œsophagus, or more rarely of the larynx or trachea, by masses of food or other foreign bodies. Choking by obstruction of the pharynx or œsophagus is sometimes relieved by the operation of an emetic, sometimes by the use of gullet-forceps, of which there are many varieties, or by other appropriate instruments. Œsophagotomy, or cutting, has been resorted to, but this is one of the most formidable operations of surgery, and is not often necessary. When foreign bodies lodge in the larynx, aphonia, or loss of voice, is one of the symptoms. If the substance is in the windpipe or bronchi, the surgeon may often detect its presence by auscultation. The symptoms caused by foreign bodies in the œsophagus are often surprisingly like those which occur when similar bodies lodge in the air-passages. These symptoms are various; there may be spasmodic coughing, redness of the face, ineffectual attempts to swallow, unusual discharge of saliva, and generally great difficulty of breathing. There is also a great tendency on the part of the patient to bend the head back, and thus to increase the difficulty in breathing by pressing the foreign body against the trachea.

Revised by William Pepper.

Cholera, kol'e-ra [Gr. χολέρα, used by Hippocrates as name for cholera nostras, from χολή, bile]: an acute infectious disease in which purging and vomiting are prominent symptoms. The home of genuine Asiatic cholera is in India, whence all its great epidemics have taken origin. The first outbreak of which we have accurate record occurred in 1817, and the disease first appeared in Europe in notable degree in 1830–32, since which time a number of epidemics have occurred, the one in 1866 being noteworthy, that of 1892 in Russia, France, Italy, and Hamburg also being severe. The disease has appeared in epidemic proportions in America a number of times, the outbreaks of 1832, 1849, 1854, and 1866 being notable examples. The nature and history of the disease had long made it clear to the minds of the medical profession that an infectious agency is operative in the production of cholera; but the actual demonstration of the specific germ remained for the genius of Koch, who discovered the "bacillus of cholera" in Egypt in 1883, a year after communication of his still more important discovery of the cause of tuberculosis. The bacillus of cholera is a short rod-shaped organism generally presenting a slight curve, whence the name by which it is often known, "comma bacillus"; but under certain circumstances it is seen as long spiral threads, and is therefore, strictly speaking, a *spirillum*. This organism occurs only in the intestinal canal and contents, never in the blood or distant organs. There is no longer much question as to the method of infection. Pure contagiousness, that is, infection by association with a patient by emanations, or the like, probably never occurs. The dejecta being cast out are preserved in the soil, the germs enter water which is afterward drank, and the disease so produced. Other methods may occur, but this is doubtless the most common. The bacilli have been actually discovered in water supplied for drinking in cisterns. The nature of the soil has some part in the propagation of the disease, but this is certainly of less importance than was formerly believed. The fact that the poison does not become disseminated by the air and wind is well proved by the observation that cholera proceeds from place to place along the beaten lines of travel, and no more rapidly than the means of human intercommunication render it possible.

Epidemics of cholera are apt to occur during the summer months, like *cholera morbus*, a similar but entirely distinct disease. In the early part of an epidemic, and to an extent during its course, cases of cholera, presenting no symptoms beyond a mild diarrhœa, are apt to occur. These cases, called *cholerine*, are as infectious as the severe attacks, though the person affected is more likely to recover. The worst forms are also ushered in with slight diarrhœa, attended with malaise and general depression. Later the dejections grow more and more frequent and copious, at last consisting of large quantities of watery fluid containing loosened epithelium from the bowel-wall ("rice-water discharges"). At the same time vomiting begins and grows in intensity, and the patient's general condition grows more and more profoundly depressed, until in the last or "algid stage" he lies collapsed, with cold exterior, pinched features, whispering or absent voice, and finally death. There is rarely much abdominal pain, but there is commonly much cramp-like pain and tenderness in the limbs. It is at times difficult to distinguish violent cases of *cholera morbus* from true *Asiatic cholera*; but the presence of the comma bacillus, which is not difficult to demonstrate, is an infallible test. *Cholera infantum*, also similar in its clinical manifestations, is an entirely distinct disease, and distinguished by the absence of Koch's bacillus.

The treatment of the disease is of little importance compared with the prevention. The dejections of each case must be rigidly guarded, being received at once into strong solutions of carbolic acid. The patient should, as far as possible, be isolated in a healthful locality. Every person in the affected locality must exercise the most scrupulous personal cleanliness and attention to his general health. Especially must any tendency to diarrhœa or disturbance of the stomach be righted at once. Sanitary cordons have been found of much less value than was expected, and are looked upon by many as useless and unjustifiable. Water, milk, and foods in general should be boiled or heated before being used. The treatment of the disease consists largely in palliation of the symptoms, with supporting measures. During the early stage of diarrhœa it is necessary to check this, to which end some advise opium, others more simple remedies, as bismuth. During the stage of collapse it is necessary to supply the fluids wasted by the enormous discharges, and this is best done by injecting large quantities of weak salt solution under the skin or into the rectum. Further, it will be necessary in this stage to supply external heat, stimulants, and supporting measures, but generally they prove of little avail. The mortality is sometimes frightfully high (50 to 70 per cent.), but generally is considerably less than this.

William Pepper.

Cholera Infan'tum, or **Acute Intestinal Catarrh**: a severe and dangerous form of infantile diarrhœa, seen principally during the first two years of life, and more commonly among the poor, but not confined to them. It is most frequently observed in hot climates, and during the hot season in more temperate zones, not alone in the U. S. but in Europe as well, occurring just as frequently during the first as the second summer. It has no direct relation to dentition, which is illogically accused of being the cause of many infantile diseases; it also is but rarely due to exposure, or to mental emotions of infant, mother, or wet-nurse. Usually the cause is found in improper feeding, especially during hot weather; the former does direct injury, and the latter, by debilitating the nervous system and lowering the functions of all the digestive organs, diminishes the general strength and power of endurance. Thus nurslings are but seldom affected, and many infants will recover from an attack by being returned to the mother's breast. It may be noted, however, that an improper condition of the breast-milk—i. e. undue proportion of water, fat, or casein, admixture of medicinal agents taken by mother or nurse, or a change produced by mental emotions in the latter—are known to be injurious. Artificially fed babies and those already weaned are mostly attacked. Artificial food is seldom identical in nutritive value with mother's milk; cow's milk contains more butter and casein than the former, and requires boiling, skimming, and subsequent dilution with water, preferably barley water. Vegetable food is dangerous, unless carefully selected and prepared.

Onset of the disease is characterized by vomiting, oftentimes incessant, and frequent profuse diarrhœal passages, very offensive, both containing varieties of undigested food, particularly large curds of milk; later, the stools are more watery, with an acid or fetid odor, and more or less vomiting continues. These passages contain many bacteria, none of which is considered characteristic of the affection; they encourage the formation of poisonous products of decomposition, which act on the system. Moaning, crying, and restlessness are soon replaced by debility; the body, being rapidly deprived of a large portion of the water contained in it, emaciates; the eyes lie deep in the orbits; sutures and fontanelles of the skull sink; the skin becomes dry and ashy; the face looks shrunken and senile; hands and feet are cold, while the body temperature rises; the pulse becomes rapid and weak; the voice is feeble, and the expression listless. This described condition often results in convulsions or

coma, with subsequent collapse and a fatal termination. A most alarming mortality is found among the poor in large cities. Preventive measures consist in supplying infants with proper artificial food when breast-milk is unavailable, at regular intervals, and in attention to general health and hygienic surroundings. When developed, the principal means of checking the disease are the following: During the first three to eight hours no food or drink should be given, in order to secure rest for the irritated stomach, and vomiting will cease on this condition only. Then give teaspoonful doses of iced water with a few drops of brandy every ten minutes as long as the tendency to vomiting persists.

When feeding can be recommenced, avoid milk in any form, excepting breast-milk. Strained barley water with white of egg and a little whisky, a teaspoonful at short intervals, is well borne and easily digested. Many cases will get well with this dietetical treatment. The air should also be kept as fresh and cool as possible, at night as well as day. Medicinal treatment, which is under all circumstances the domain of a physician, varies according to the nature of the case. Frequently calomel will be of service to remove irritating material from the intestinal tract, to be followed by such antacids and antifermentatives as subnitrate of bismuth, resorcin, etc., to which opium or Dover's powder can be added. Whisky and camphor are advised as stimulants. The extremities should be kept warm. Enemas of salt water to fill vessels by absorption are of value. Astringents are useful in cases which threaten to become chronic.

A. Jacobi and F. E. Sondern.

Cholesterin, kō-les'ter-in [from Gr. *χολή*, bile + *στέαρ*, contr. *στῆρ*, fat]: the principal constituent of gall-stones, in which it was discovered in 1775. It is also found in the bile, in human blood, in the brain, in the excrement of crocodiles, in wool-oil, in milk, and in other animal products. It can be prepared by treating powdered gall-stones, first with boiling water and then with boiling alcohol, in which latter the material dissolves. It can also be prepared from the brain substance, but the process is somewhat more complicated than that employed in the case of gall-stones. One pound of brain yields 2 grammes of cholesterin. It crystallizes from chloroform in needles, from alcohol or ether in plates. It is insoluble in water, soluble in 9 parts boiling alcohol. It is easily soluble in ether and in carbon disulphide. That made from wool-oil is sold under the name *lanolin*, and is used in medicine instead of vaselin and other similar substances. I. R.

Cholet, shō'lay': a town of France: department of Maine-et-Loire: on the river Maine; 32 miles S. S. W. of Angers (see map of France, ref. 5–D). It is well built, and has manufactures of cotton and woolen stuffs and leather. Pop. (1891) 14,987; (1896) 17,844.

Choliam'bus (in Gr. *χωλίαμβος*. Lame Iambus); also called **Scazon** (Limper): an iambic verse in which a spondee or trochee is substituted for the final iambus, and the rhythm reversed. This "halting" measure is used in satirical, mocking, querulous poems, notably in the fables of Babrius and the recently discovered mimes of Herondas.

Cholmondeley, chŭm'lĕe, Marquesses of: Earls Rocksavage (United Kingdom, 1815), Earls Cholmondeley (1706), Viscounts Malpas (1706), Barons Cholmondeley (England, 1689), Barons Newburgh (Great Britain, 1716), Viscounts Cholmondeley (1661), Barons Newburgh (Ireland, 1714), and baronets (1611).—William Henry Hugh Cholmondeley, third marquess, joint hereditary lord grand chamberlain of England, b. Aug. 31, 1800, was member of Parliament for South Hants 1852–57, and succeeded his brother, George Horatio Cholmondeley, May 8, 1870. D. in 1884.—Fourth marquess, George Henry Hugh Cholmondeley, b. in 1858; succeeded in 1884.

Chols: See Indians of Central America.

Cholu'la: a town of Mexico, in the state of Puebla, 7 miles W. of Puebla city; in a plain 6,906 feet above the sea (see map of Mexico, ref. 8–H). It was an Indian settlement of great antiquity and unknown origin. At the time of the conquest it was occupied by a tribe of the Nahuatl race, and formed, with the neighboring villages, a semi-independent state, with only a nominal allegiance to Montezuma. The government was democratic. Cortés estimated that the town contained 20,000 houses and the outskirts as many more; but this is evidently a great exaggeration. The Cholulans were noted traders, holding regular fairs and exchanging their manufactures of pottery and fine cloths for the produce of neighboring tribes. In the outskirts of the town there was an immense, irregular brick pyramid or mound, covering over 20 acres and 170 feet high. This pyramid, which still exists, is much more ancient than the Nahuatl occupation, and is connected with the legends of the hero-god Quetzalcohuatl. There are remains of several smaller mounds. These and the pyramid were occupied by Indian temples, the resort, it is said, of numerous pilgrims. Cortés, on his way to Mexico in 1519, stopped at Cholula for some weeks. At first he was entertained hospitably, but, hearing of or suspecting a plot against the Spaniards, he surprised and massacred a great number of the people in the public square. The present population of Cholula is about 6,000. There are considerable manufactures of fireworks and hand-woven cotton cloths. The park and the pyramid, now surmounted by a chapel, are the principal objects of interest. See Bandelier, *Report of an Archæological Tour in Mexico* (1884). See Mexican Antiquities. Herbert H. Smith.

Cholute'ca: a town of Southern Honduras; on the navigable Choluteca river, 35 miles from its mouth in the bay of Fonseca (see map of Central America, ref. 6–G). Pop. about 5,000 (1890). It is the capital and principal town of a department of the same name, which has an area of 2,000 sq. miles, and a population of 50,000 (1884). H. H. S.

Chondrostes [Gr. *χόνδρος*, cartilage; *ὀστέον*, bone]: a group of fossil ganoids (see Fishes) closely allied to the sturgeons.

Chondropterygii [Gr. *χόνδρος*, cartilage; *πτέρον*, wing or fin]: a name sometimes used for the group containing the sharks and skates, otherwise known as Elasmobranchiates (*q. v.*), in allusion to the cartilaginous character of the fin skeleton.

Chonós Archipelago: a group of high islands and islets along the west coast of Patagonia, between the island of Chiloé and the peninsula of Taytas. They number more than 1,000, including rocks, and are separated from the mainland and from each other by intricate channels. The larger ones are covered with forest, and all are very picturesque. These islands belong to Chili. They were formerly the homes of the Chonós Indians, now extinct. At present they are uninhabited, or nearly so. Herbert H. Smith.

Chonsu: a deity. See Egypt, Ancient, and Khonsu.

Chontáles: a department of Nicaragua; bordering the northeastern side of Lake Nicaragua and the San Juan river, with a short coast on the Caribbean Sea; area about 3,000 sq. miles. Pop. 30,000. Capital, Acoyapa. The southern part is mountainous, except near the coast; the northern part, comprising the valley of the Bluefields river, is imperfectly known, and inhabited mainly by uncivilized Indians. Herbert H. Smith.

Chopin, shō'păn'. Frédéric François: pianist and composer; b. near Warsaw, Poland, Mar. 1, 1809; son of a French father; studied under Elsner in Warsaw; published first at sixteen years of age; at eighteen began to give concerts in Vienna; traveled in Eastern Germany; removed to Paris about 1832, where there gathered about him a select society, for which he delighted to play. He was seldom heard in public. George Sand, with whom he formed an intimacy, is said by Liszt to have added him to her "collection of heroes" in *Lucrezia Floriani* (see her *Histoire de ma Vie*). He twice visited Great Britain (1837 and 1848). He composed concertos, waltzes, nocturnes, preludes, and mazurkas, which display a poetic fancy and abound in subtle ideas, with graceful harmonic effects. His compositions are strikingly peculiar in melody, rhythm, and harmony, and possess a delicate though powerful charm. He was one of the first of pianists, and his playing, like his music, was marked by a strange and ravishing grace. He was the great interpreter of the music of his native country, and to his passionate patriotism must be referred the exuberance, subtle refinements, and tone of strange romance in his piano music. He wrote nothing of consequence for the orchestra. He suffered long from the inroads of pulmonary disease, and died in Paris, Oct. 17, 1849. In 1869 a monument was erected to him at Warsaw. See his *Life* (Dresden, 1877; Eng. trans. 1879) by M. Karasowski; also that by Niecks.

Chopine, chō-peen', also **Chiopine** [from Span. *chapin*, shoe with cork sole]: a shoe, sandal, or clog, having a sole and heel of such thickness as to add several inches to the height of the wearer. Those worn in Venice in the sixteenth century had a single pillar replacing sole and heel, and were 6 or 7 inches high. Vecellio (1590) gives a plate

showing a lady wearing chopines at least 8 inches high. The gown usually reached the ground, however, and concealed them. Chopines were also used on the stage.

Chop'tank: a river which rises in Kent co., Del., and flows southwestward into Maryland. It expands into an estuary, forming the boundary between Talbot and Dorchester Counties, and communicates with Chesapeake Bay. Length nearly 100 miles. Sloops can ascend it about 50 miles.

Chopunnish Indians: See Shahaptian Indians.

Choragus, kō-ray'gŭs, or **Choregus** (in Attic Gr. *χορηγός*): originally an Athenian citizen appointed by the state to be the leader and trainer of a chorus in dramatic contests in Athens. Later the functions of the choragus was to supply the money necessary for living and feeding the coach and the choreutæ, for the purchase of costumes, and the rent of training quarters. His prize consisted of a crown and tripod; he might build a monument and on it expose his tripod.

Cho'ral, or **Chora'le** [Fr. *choral*, Med. Lat. *chorālis*; deriv. of *chorus*]: a tune written or arranged for a hymn or psalm to be sung by a congregation in public worship. This style of music has its origin in the *Enchiridion* of Luther and Walther (1524), and the Lutheran Church produced many subsequent collections. The melody was given in them to the tenor, and there were at times even five and six parts. The greatest composer of such music was Johann Crüger (1598–1662), whose *Praxis Pietatis Melica* (1649) preserves much of his work. Sebastian Bach, a hundred years later, applied counterpoint to many of these themes, and from his time the old chorales have had great influence on the development of Protestant church music in Great Britain and on the European continent. In Germany they are still sung in unison, and slowly and strongly with organ accompaniment; but much English choral music is in parts. It involves a development of harmony, is stately, devout, and excellently adapted to congregational singing. In the Roman Catholic Church a choral is any part of the service which is sung by the whole choir.

Chord [a spelling of *cord* to adapt it to etymol.; Lat. *chorda*, Gr. *χορδή*, a string of gut]: in geometry, the straight line which joins the two extremities of the arc of a curve; so called because while the arc resembles the bow (*arcus*), the chord may be likened to the bowstring. The chord of a circular arc may be found by multiplying the radius by twice the sine of half the angle which the arc subtends. The use of chords in trigonometry is mostly superseded by the use of sines.

Since two circles can cut each other in only two points, they can have only one common chord. But by Poncelet's "principle of continuity," to which modern geometry owes so much, the circle may be considered as a curve of the second order, and as such two circles may be said to have four points of intersection, two of which are, however, always imaginary. These imaginary points are called "circular points at infinity." This view also gives the two circles six common chords instead of one. Four of these chords are imaginary, and the fifth is infinitely distant; while the sixth (and most obvious) chord may or may not cut the two circles in real points. This last chord is often called the radical axis, and has many remarkable properties. See Geometry.

Chord, in music: See Consonance.

Chor'da dorsa'lis: See Notochord.

Chorda'ta [from Lat. *chorda*, a cord]: Since the term vertebrata implies the existence of a back bone made up of separate vertebræ, it has been found necessary to make a new term to include not only the true vertebrates but several other forms closely allied to them, yet which lack the separate vertebral elements. All of these forms agree in having the nervous system unperforated by the alimentary canal, in the possession in either embryo or adult of gill slits connecting the throat with the exterior, and in the possession of a cartilaginous axis, the notochord, produced from the intestinal wall and lying between the alimentary canal and the nervous system. The body is made up of a series of similar joints or metameres, and the principal circulatory organ consists of a tube, often twisted, lying upon the side of the body opposite to the nervous system. The chordata are divided into (1) the *Urochorda*, or Tunicata; (2) the *Hemichordia*, or Enteropneusti; (3) the *Cephalochordia*, or Leptocardii (with the single genus Amphioxus, *q. v.*); and (4) the Vertebrata. J. S. Kingsley.

Chore'a (in Gr. *χορεία*, a dance), or **St. Vitus's Dance**: a disease characterized by irregular, involuntary, and often grotesque muscular action, without appreciable organic change in any tissue, and generally without pain or any known derangement of mental action or of sensation. It is most common in children after the second dentition and before puberty; much more common in girls than in boys; sometimes attacks pregnant women and other adults, though some cases once called adult chorea would now be recognized as locomotor ataxia, a very different disease. Chorea is sometimes hereditary, sometimes epidemic. Many writers have classed the dancing mania (the original "St. Vitus's dance"), tarantism, and the strange excesses of certain religionists (dervishes, French prophets, "jumpers," and "convulsionists") all as varieties of chorea. Stammering has been called a chorea of the vocal organs. The disease is sometimes associated with rheumatism and generally with anæmia. Such complications should receive special treatment. The metallic tonics are generally useful, and so are systematic gymnastics, life in the open air, and a kind and unobtrusive discipline, which shall teach the young patient the power of the will over the movements of the body.

Chorepis'copus (in Late Gr. *χωρεπίσκοπος*): country bishop, *vicarius episcopi*, or *villanus episcopus*, as opposed to the *cathedralis episcopus*; to be distinguished, as being stationary, from the *visitator*, who itinerated; a class of bishops called into existence in the latter part of the third century, and first in Asia Minor, in order to meet the want of episcopal supervision in the country parts of the then enlarged dioceses, and to avoid the necessity for the subdivision of these sees of vast territorial extent. The functions of the *chorepiscopi* were episcopal, though the exercise of their powers was limited to minor offices. They gave a measure of supervision to the country of which they were assigned the charge. *In loco episcopi* they ordained readers, exorcists, subdeacons, but, as a rule, not priests or deacons (and of course not bishops), unless by express permission of their diocesan. They administered confirmation in their own districts, and (in Gaul) consecrated churches. They were held therefore to have "mission," that is, the power of ordination, but to lack jurisdiction save subordinately and as expressly assigned. Among the Eastern sects the *chorepiscopi* were presbyters, and, in at least one ritual, their setting apart for their office is prescribed to be without the laying on of hands. English writers, such as Beveridge, Hammond, Cave, Bingham, and Routh, assert the true episcopal character and consecration of the *chorepiscopi*. Van Espen takes the same view. Morinus and Du Cange, with others, allege them to have been presbyters only. The weight of evidence would prove that at first they were duly consecrated to the episcopal office, but that in later years they became simple presbyters with no claim to "mission" and possessing such "jurisdiction" only as might be exercised by an archdeacon. W. S. Perry.

Choriam'bus (in Gr. *χοριαμβος*); a classic measure compounded of a choree (trochee) and iambus, thus: *dimoveas*. But the choriambi that occur most frequently are now measured as irrational dactyls. See Metres.

Chor'ley: a town of England, in Lancashire; on a hill and on the river Chor; 20 miles N. W. of Manchester, 8 miles S. E. of Preston (see map of England, ref. 7–F). It has an ancient parish church in the Norman style, and a handsome Gothic church. The place owes its prosperity to various manufactures of cotton yarn, muslin, jaconet, calico, gingham, and railway cars. Mines of coal and lead and quarries of slate are worked, and bleaching is carried on in the vicinity. Pop. (1891) 23,082.

Chorley, Henry Fothergill: journalist, author, and music critic; b. in Blackley Hurst, Lancashire, England, Dec. 15, 1808; educated in local schools, but mostly self-taught; began to write for the London *Athenæum* in 1830, and continued till his death, Feb. 16, 1872. He wrote reviews of literature, art and music, obituary notices, etc., but his most enduring work was his volumes on *Modern German Music* (1854); *Thirty Years' Musical Recollections* (1862); and *National Music of the World*, published posthumously. He wrote the librettos of many operas and cantatas, words for many songs, and translated many foreign librettos into English. He also wrote novels, dramas, and poems. He was honest and conscientious as a critic, but very stubborn and self-willed. D. E. Hervey.

Cho'rogi: the Japanese name of a mint-like plant which bears short, white, and crisp subterranean tubers. It was in-

troduced into Europe from China in 1882, was exhibited in England in 1887, and appeared in the U. S. in 1888. Its proper name is *Stachys sieboldi*, but it is commonly known as *S. tuberifera* and *S. affinis*. It is perennial, and is an important secondary vegetable. L. H. Bailey.

Cho'roid (kō'roid) **Coat** [*choroid* is from Gr. *χόριον* (Lat. *corium*), the afterbirth, any intestinal membrane + *εἶδος*, appearance]: the second of the tunics of the eye, covering the posterior five-sixths of the eyeball, and coming as far forward as the edge of the cornea. In front it is continued by the ciliary processes and the iris. It joins the sclerotic by means of the ciliary ligament and muscle. It is highly vascular, and is pigmentary, being of a kind of chocolate color. It is in three layers. The outermost is connected to the sclerotic by the *membrana fusca*. This coat consists principally of the vorticose veins, with pigment-cells. The middle layer (*tunica Ruyschiana*) consists of capillaries. The inner layer consists of tessellated epithelium, charged with pigment. This layer is lined by the retina. The choroid coat is liable to an inflammatory disease known as choroiditis.

Chorrillos: city on the Peruvian coast; about 30 miles S. E. of Lima, with which it is connected by a railroad (see map of South America, ref. 5–B). It is the residence of many wealthy Peruvians, and is a noted resort for bathing and recreation during the warm months. The town is irregularly built and covers a large space. Pop. (1891) 3,000. On Jan. 13, 1881, the Peruvians under Iglesias and Caceres were defeated before Chorrillos by the Chilians, Iglesias surrendering with 5,000 men. Herbert H. Smith.

Chorus (Lat. *chorus*; Gr. *χορός*): the union of musicians for the performance of a musical work. In modern music a combination of voices is called a chorus. It is mixed or complete where it consists of all or part of the four principal voices. There are also choruses for male and female voices. The word *chorus* is not applied to instrumental combinations, but the word *choir* sometimes is when speaking of subdivisions of the orchestra, thus, the "wood-wind choir," "the brass choir," but never the string choir.

The chorus of the ancient drama is not, as is often insinuated, an element of special æsthetic excellence, but a mark of its historical origin from the worship of Dionysus, which it never succeeded in getting rid of. In the olden times solemn narratives of the exploits of the god were recited between the hymns sung in his honor, and this character of being a recital of an epic interspersed with the singing of lyrical poems the ancient drama never fully outgrew. The hymns were sung by the chorus; the epic was recited by the actors. The chorus never—or at least very seldom—entered the stage. Its place was in the orchestra, in the center of which stood the altar of Dionysus, on which a sacrifice was offered before the representation began. Around that altar the chorus was dancing to the flute while singing its songs. Its connection with that which took place on the stage was often very loose—a kind of running commentary; it very seldom took an active part in the dramatic development of the plot. Its members were citizens of good reputation. The expenses of their training and outfit were defrayed by some rich man, the *choragus*. Their leader bore the name of *coryphæus*. When the chorus did its part well, not only the *coryphæus*, but also the *choragus*, was crowned and applauded. Revised by Dudley Buck.

Chose, shōz: in law, a thing; an article of personal property. A *chose in action* is a phrase used to express all rights enforceable by action in a court of justice. Blackstone in his *Commentaries* confines it to rights growing out of contracts. Modern usage extends it to claims arising from torts. Formerly, at common law, choses in action, except bills of exchange, checks, and other negotiable paper, could not be assigned so as to give to the assignee the right to sue upon it in his own name. *Choses in possession* are commonly called Chattels (*q. v.*). See Assignment, Contracts, and Tort. Revised by F. Sturges Allen.

Chōsen and **Chosön**: See Chaosien.

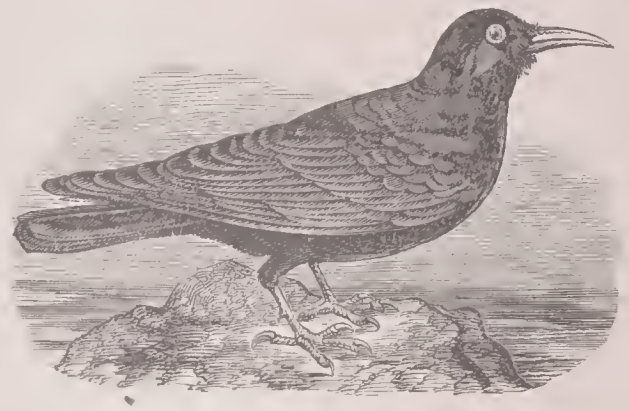
Chota Nagpur: See Chutia Nagpur.

Chotin: See Khotin.

Chouans, shoo'anz (Fr. pron. shoo'ăn'): the French royalists of Maine and Brittany who revolted against the French Convention in 1792. Chouan, which signifies an "owl," was perhaps the nickname of Jean Cottereau, who was the leader of the insurgents, or an imitation of a signal cry that summoned men to their rendezvous. This insurrection was called *La Chouannerie*. Cottereau, who had been pardoned for smuggling by Louis XVI. and never forgot the favor, began peasant reprisals in Maine, whence the insurrection spread to Brittany. He gained some success in guerrilla warfare, and in 1793, under the name "La petite Vendée," united his troops with the Vendeans. They were defeated at Le Mans in Dec., 1793. Cottereau was killed in an ambuscade in July, 1794. A succession of leaders now arose, Cormatin, Georges Cadondal, and Charette; the army increased to 10,000 men: but they were overthrown by La Hoche at Quiberon in 1795, and he stamped out the remnants of the revolt. New movements of the Chouans took place in 1799; again in 1814 and 1815; and finally in 1830 an insurrection known as Chouan broke out on behalf of the Duchess of Berri and her son, subsequently known as the Duc de Chambord, but these all were easily suppressed. See Seguin, *Histoire de la Chouannerie*.

Revised by C. H. Thurber.

Chough, chŭf (sometimes *Cornish chough*): the *Fregilus graculus*, a bird of the crow family inhabiting Europe and Northern Africa. It is about 15 inches long, of a purplish black color, with a rather long, slender, curved beak, which,



Chough.

as well as the feet, is vermilion red. It was formerly abundant along the cliffs of the southern coasts of England and Wales, as well as parts of Ireland and Scotland, but has been greatly reduced in numbers, largely on account of the fact that it has been crowded out of its favorite haunts by the jackdaw, *Corvus monedula*. Possibly, too, it is a case of a species naturally on the decline, for its remains have been found in caverns associated with those of the reindeer. A somewhat larger form, distinguished as a separate species, *F. himalayanus*, occurs in Central Asia. The chough lives in communities and feeds on insects, grain, and berries. The alpine chough, *Pyrrhocorax pyrrhocorax*, which dwells in the mountains of Central Europe, is similar, with the exception of the bill, which is orange yellow. F. A. L.

Chowles, chōlz, John Overton, D. D.: b. in Bristol, England, Feb. 5, 1801; studied theology at Bristol College, England. He arrived in America in 1824, and engaged immediately in teaching, for which he seems to have had unusual adaptation, and to which he devoted himself to some extent, throughout his life. He was pastor of Baptist churches in New Bedford, Mass., Buffalo, N. Y., Jamaica Plain, Mass., and Newport, R. I., and edited several works, the most important of which was Neal's *History of the Puritans*, and published *The Young Americans Abroad* and completed Thomas Smith's *History of Christian Missions* (2 vols., New York, 1832; 8th ed. 1837). D. in New York, Jan. 5, 1856.

Chowan, chō-waan': a river of North Carolina; formed by the Meherrin and Nottoway rivers, which unite about 5 miles above Winton. It flows southeastward, and then southward; forms the boundary between Chowan and Bertie Counties; enters Albemarle Sound at its western end. It is about 50 miles long, and is navigable for sloops.

Choya: See Chay-root.

Chrestien or **Chrétien de Troyes**, krā'ti-ăn'de-trwăă': mediæval French poet; flourished in the second half of the twelfth century, dying toward 1195. He was regarded by his contemporaries as the greatest of French poets, and his works were known and admired all over Europe. Little is known of his life. He seems to have been a native of Troyes, and to have passed most of his productive period in the society which gathered at the court of the brilliant Countess Marie of Champagne in that place. He was also familiar, probably, with the courts of Flanders, Hainault,

and Alsace. He was the chief poetic exponent of the ideals of courtesy, chivalric love, and mystical devotion, which, coming perhaps originally from Provence with the famous Eleanor of Poitiers, Queen of France and then of England, were taken up by her daughter, Marie of Champagne, and made the tests of virtue at her court. To Chrestien is due in particular the identification of the legends of Celtic origin, just then becoming popular in Europe, with these ideals. Geoffroy of Monmouth had indeed plainly allowed chivalric elements to intrude themselves in his Latin version of the legends; but Chrestien first made the identification complete, and after his time the Arthurian and other Celtic heroes and heroines were everywhere thought of as peculiarly representative of the dreams and aspirations of chivalric society. Chrestien's Arthurian poems and their approximate dates are the following: *Tristan* (1160; now lost); *Érec et Énide* (1165); *Le Conte de la Charrette*, or *Lancelot* (1170); *Le chevalier au lion*, or *Ivain* (1172); *Perceval*, or *Le Conte de Graal* (1175). Besides these poems Chrestien imitated at least two episodes in Ovid's *Metamorphoses*, that of Philomela being preserved to us; and he translated into French Ovid's *Ars amatoria*, and perhaps his *Remedia amoris*. He also composed one of the earliest *romans d'aventures*, his *Cligès* (1165), based upon an Oriental legend of a wife of Solomon stolen by a ruse in which she has a part herself. For analyses of the French romances of Celtic origin, with full bibliographical information, see *l'Histoire littéraire de la France*, t. xxx. (Paris, 1888). For Chrétien, see G. Paris, *Le Conte de la Charrette*, in *Romania*, vol. xii., p. 459 (1883); W. Förster, *Christian von Troyes sammtliche erhaltene Werke* (Halle, 1884, *seq.*). A. R. Marsh.

Chrestom'athy [from Gr. χρηστομάθεια, a collection of choice passages from authors, as of things worthy to be learned]: χρηστός, useful + μαθεῖν, learn]: literally, that which is useful to learn. The Greeks frequently formed commonplace books by collecting the various passages to which in the course of reading they had affixed the mark χ (χρηστός). Hence books of extracts chosen with a view to utility have received this name.

Chres'tus of Byzan'tium: one of the most distinguished pupils of Herodes Atticus, a contemporary of the Emperor Aurelius. He was celebrated for his eloquence, and taught rhetoric with great success, having many distinguished men among his hearers. Of his writings nothing is preserved. Philostratus has given notices of him in his lives of the Sophists.

Chrism, krizm, or **Chrisom**, kriz'ŭm [from Gr. χρῖσμα, an anointing; deriv. of χρίειν, anoint. Doublet of *cream*]: an ointment or oil, consecrated by a bishop, and used in the Roman Catholic, Greek, and Oriental Churches in the consecration of chalices, altar-stones, and churches, in the blessing of the water for baptism, and in the ceremonies of baptism, confirmation, ordination, and extreme unction. In the R. C. Church it is a mixture of oil and balsam, but in the Eastern it contains over forty ingredients.

Christ [O. Eng. *crist*, from Lat. *Christus*, Gr. χριστός, anointed; deriv. of χρίειν, anoint; a translation of Heb. *māshīax*, messiah]: a word which was at first a title of our Saviour, now in general use as part of his name. As kings were anointed on being called to their offices, so the Saviour was anointed (Acts x. 38) "with the Holy Ghost and with power." This anointing signifies a consecration or setting apart for a peculiar work. For the historical account of Christ, see Jesus; for an account of the doctrines held with regard to Christ's nature, see Christology.

Christ, krist, Wilhelm, von: Greek scholar; b. in Geissenheim, Germany, Aug. 2, 1831; professor in the University of Munich since 1861. Among his best-known works are *Metrik der Griechen und Römer* (1879, 2d edit.); text editions of Aristotle's *Poetics* and *Metaphysics*; Homer's *Iliad*, with prolegomena (2 vols., Leipzig, 1884); *History of Greek Literature* (vol. vii. of I. Müller's *Handbuch der classischen Alterthumswissenschaft*, 2d edit. 1891). Author of a great number of valuable articles in the publications of the Munich Academy. Alfred Gudeman.

Christadel'phians (liter., brothers of Christ): a religious body originating in the U. S. about 1855, with John Thomas, M. D., a man of English birth, after whom the sect is sometimes called Thomasites. They attach equal importance to the Old and New Testaments, and believe that the intention of the Creator is to recall to immortal life all who love him in this life, and with them to people this world. All who have not caught the immortal principle perish in death. They reject the doctrine of a personal devil. Christ, they believe, is the Son of God, deriving from the Deity moral perfection, but from his mother the common nature of Adam. They ascribe to him the threefold character of prophet, priest, and king. The first office he fulfilled by his life and death on earth; as priest he now mediates before the Deity; and as king he will return to earth and reign from the throne of David over the glorified world. This denomination is small in numbers; its monthly organ, *The Christadelphian*, is published in Birmingham, England; the exposition of its views may be found in the publications of Thomas and of Robert Roberts.

Christchurch: a borough and seaport of Hampshire, England; on the English Channel and at the head of the estuary formed by the rivers Avon and Stour; 33 miles by rail S. W. of Southampton (see map of England, ref. 14–H). Here is a priory church, founded as an Augustinian priory by Flanbard, dean of Christchurch, early in the twelfth century. It is over 300 feet long by 100 across the transept. Christchurch has several breweries, but the former noted manufacture of fusee-chains for watches is no longer carried on. The borough, which includes Bournemouth (*q. v.*), returns one member to Parliament. Pop. of parliamentary borough (1891), 53,300; of municipality, 3,994.

Christchurch: a town of New Zealand; capital of the province of Canterbury; on the banks of the river Avon, 7 miles from the sea. It is connected by railway with Lyttelton, which is its port, and by telegraph with nearly all the leading towns. It is the seat of an Anglican bishop, and has a college. Pop. (1881) 15,213; with Sydenham and suburbs, 30,970; (1896) with suburbs, 51,330.

Christ, Pictures of: The New Testament contains no hint at the personal appearance of Christ, and the double tradition which soon began to form was evidently based, not on actual knowledge, but on the prophetic descriptions of the Old Testament, the persecuted Church imagining Christ as the suffering Messiah, in accordance with Ps. xxii. and Isa. liii.; the victorious Church as the glorified Messiah, in accordance with Ps. xlv. and the Song of Songs. Of formal descriptions three have come down to us, but none of them has any real value. The first is found in a Latin letter which pretends to have been written by Publius Lentulus, "president of the people of Jerusalem" and a contemporary of Pilate. It was first discovered in a manuscript copy of the works of Anselm, and is certainly not older than the fourth century. A second description is found in the works of John of Damascus (*Ep. ad. Theoph. Imp. de venerandis imaginibus*) from the eighth century, and a third in the ecclesiastical history of Nicephorus (i. 40) from the fourteenth century. All those descriptions agree in depicting Christ as having florid or reddish hair parted down the middle of the crown, blue eyes, and forked beard. Finally, two portraits of Christ are spoken of. Eusebius tells us (*Hist. Eccl.* i. 13) of a correspondence between Christ and King Abgarus of Osroëne, and when repeating this story Moses Choronensis adds (*Hist. Arm.* ii. 30–33) that Christ sent his portrait to Abgarus. Both Rome and Genoa claim to be in possession of the genuine portrait. Another portrait of Christ became imprinted on the silken handkerchief of Veronica when she wiped the sweat from his face while he was carrying his cross to Golgotha. That portrait, too, has multiplied, and several cities claim to have the genuine one. See Mrs. Jameson and Lady Eastlake, *The History of our Lord in Works of Art* (London, 1865).

Christian II.: King of Denmark; b. in Nyborg, Fünen, July 2, 1481. He began to reign in 1513, and married Isabella, a sister of the Emperor Charles V., in 1515. In 1520 he invaded Sweden, which he partially conquered. He usurped the throne of Sweden, and abused his power with cruelty, but he was expelled by Gustavus Vasa in 1522. His Danish subjects also revolted, deposed him, and elected his uncle, Frederick I., king in 1523. Christian retired to Flanders, and returned with an army in 1531, but was defeated and kept in prison until his death, Jan. 25, 1559. See Behrmann, *Kong Christiern II., Historie* (1815).

Christian IV.: King of Denmark; b. in Frederiksborg, Zeeland, Apr. 12, 1577; the son and successor of Frederick II., who died in 1588. He became in 1625 the commander of the Protestant armies in the Thirty Years' war against the Emperor of Austria, but his campaigns were unfortunate

and he gave up the leadership to Gustavus Adolphus, after having been defeated in 1626 by the imperialist Gen. Tilly at Lutter. He waged war against Sweden from 1611 to 1613, and again from 1643 to 1645. He was an able ruler, and promoted the trade of the Hanse towns with Denmark, and the literary and scientific growth of his country. He became eventually an heroic figure in Denmark, and several cities of Norway perpetuate his name. D. in Copenhagen, Feb. 28, 1648. See Rasmus Nyerup, *Charakteristik af Kong Christian IV.*, 1816.

Christian VII.: King of Denmark; b. Jan. 29, 1749; son of Frederick V. His mother was Louisa, a daughter of George II. of England. He began to reign in Jan., 1766, and married his cousin Caroline Matilda, a sister of George III. of England, in the same year. His physician, Struensee, obtained the chief power in 1770, and was supported by the favor of the queen, but he was unpopular with the nation. Christian VII. was so feeble and morbid that he was incapable of reigning. D. Mar. 13, 1808, and was succeeded by his son, Frederick VI., who had been regent since 1784.

Christian VIII.: King of Denmark; b. Sept. 18, 1786; cousin of Frederick VI. He was chosen King of Norway in 1814, but being unable to defend it against Bernadotte, who invaded Norway, he abdicated in Oct., 1814. He succeeded Frederick VI. in Denmark in 1839, and d. Jan. 20, 1848, leaving the throne to his son, Frederick VII.

Christian IX.: King of Denmark; b. Apr. 8, 1818; ascended the throne on the death of Frederick VII. in 1863 by virtue of a London protocol of 1852, which conferred the right of succession after the extinction of the house of Oldenburg upon the house of Glücksburg. The Schleswig-Holstein difficulty culminated soon after his accession, and he found himself involved in war with Prussia and Austria, those two powers having resolved on a joint occupation of the disputed territory. Denmark was completely defeated, and Christian was forced to renounce all claims to Schleswig, Holstein, and Lauenburg.

Christian and Missionary Alliance: See the Appendix.

Christian Commission, or, more fully, **The United States Christian Commission**: a great organization in the Northern U. S. during the civil war. It was organized Nov. 14, 1861, at New York. Its work was designed to supplement that of the great Sanitary Commission, for while the object of the latter was more especially the care of the sanitary condition of the national armies, the relief of the wounded and sick, etc., the Christian Commission also gave especial attention to the religious needs of the troops, co-operating with the chaplains, while the Sanitary Commission more especially co-operated with the medical officers of the army. The Christian Commission was first proposed by Mr. Vincent Collyer, of New York, and originated by a call of the Young Men's Christian Association of New York (Sept. 23, 1861) upon all similar associations in the North to unite in this great undertaking. George H. Stuart, of Philadelphia, was its president until its affairs were wound up at the close of the war. Its disbursements were valued at about $5,000,000. See Moss, *Annals of the Christian Commission.*

Christian Connection: See CHRISTIANS.

Christiancy, ISAAC P.: b. at Jamestown, Montgomery co., N. Y., Mar. 12, 1812; went to Monroe, Mich., in 1836, and was admitted to the bar in that place in 1838; was a delegate to the Free-soil convention which nominated Martin Van Buren to the presidency, and was one of the founders of the Republican party in Michigan; served two terms in the Michigan Senate; was editor for a year of the Monroe *Commercial*, and in 1857 was elected a judge of the Supreme Court of the State; was re-elected in 1865 and again in 1873. In Jan., 1875, he was elected U. S. Senator from Michigan. Resigned Feb. 10, 1879, and was U. S. minister to Peru 1879–81. D. Sept. 8, 1890.

Christian Endeavor, YOUNG PEOPLE'S SOCIETY OF: an organized religious movement, which numbers within its ranks three and a half million young people of both sexes. The first society was started in the Williston Congregational church of Portland, Me., on Feb. 2, 1881. After a period of special religious interest, the pastor of the church, Rev. F. E. Clark, called his young people together and presented to them the constitution of a society called the *Young People's Society of Christian Endeavor*, which is substantially the same as the one used now by 60,000 societies in all parts of the world. The Society of Christian Endeavor is a purely religious organization, though there may be social features, literary features, and musical features connected with it. In fact, the society is meant to do anything that the church wishes to have it do. The scope of its energies is almost limitless. It may relieve the destitute, visit the sick, furnish flowers for the pulpit, replenish the missionary treasuries, build up the Sunday-school, awaken an interest in the temperance cause, preach a White-Cross crusade. The inspiration for all these manifold forms of service comes from the weekly prayer-meeting, which is always a vital matter in a Christian Endeavor society. The prayer-meeting pledge, while no uniformity of language is insisted upon, binds the young disciple to daily private devotions, to loyal support of his own church, and to attendance upon and participation in the weekly prayer-meeting, "unless prevented by a reason which he can conscientiously give to his Master." This perhaps is the most vital and important thing in the society. It has rejuvenated and revived the young people's prayer-meeting in all parts of the world, and has poured new life into the other services of the church. The monthly consecration meeting, at which the roll is called and the members answer to their names, is also a very serious and important meeting, and shows who are faithful to their covenant vows. There is no central authority or board of control. The United Society of Christian Endeavor, with trustees from the various evangelical denominations, is simply a bureau of information. Every local society is entirely controlled by its own church and denomination. The interdenominational features of the movement are also most important, since the conventions bring the young people together from every State and province in North America, and from at least thirty evangelical denominations. Students of Church history have declared that more than anything else this movement has promoted practical Christian fraternity and co-operation in all the denominations, though it does not strive for organic unity. The annual international conventions of this organization have been remarkable gatherings, surpassing in size any religious conventions that have ever been held, bringing together more than fifty thousand young people, and inspiring them with unlimited enthusiasm for future work. The Presbyterian denomination leads in the number of societies, but is closely followed by the Congregational, Baptist, Methodist, and Disciples, while in many other denominations there are quite as many societies in proportion to their size as in those enumerated. THE EPWORTH LEAGUE (*q. v.*) is a similar organization, confined to the Methodist Episcopal Church.

FRANCIS E. CLARK.

Christian Era: the great era from which all Christian nations compute their time; once supposed to correspond to the date of the birth of Christ. But, according to some of the best authorities, Christ was born on Apr. 5, four years before the commencement of our era (others say on Dec. 25, four or five years before that time). The practice of reckoning time from the (supposed) birth of Christ appears not to have been introduced into the Christian Church until the sixth century, when Dionysius, surnamed the Little (Exiguus), a monk of Syria, first made use of it, about 527 A. D. It was soon after introduced into Italy, and into France in the following century. The first instance recorded of its being employed in England was in 680. But the practice did not become universal throughout Christendom until about the middle of the fifteenth century.

Christia'nia, or **Kristiania** (Norw. pron. kris-tēĕ-aa'-nēĕ-a): the capital of Norway and of the stift of the same name; picturesquely situated in a valley and at the head of the navigable Christiania Fiord, about 55 miles from the sea; lat. of observatory, 59° 55′ N., lon. 10° 43′ E. (see map of Norway and Sweden, ref. 10–C). The environs of the city are beautiful, and visitors who approach it by the fiord pass through magnificent scenery. It contains a cathedral, a citadel, a royal palace, a great arsenal, a town-hall, two theaters, an exchange, an asylum for lunatics, and a university founded in 1811, which has a library of 250,000 volumes. The number of students in 1890 was 1,537. Connected with the university is an astronomical observatory. Here are manufactures of cotton, paper, glass, soap, etc. The commerce is considerable. In 1889 2,120 vessels entered the port, and 1,407 cleared. It is the port of the Thingvalla line to the U. S. The chief articles of export are timber, ice, and fish. The harbor and fiord are closed by ice for three or four months in the year. It is a bishop's see, and was founded in 1624 by Christian IV. on the site of the burned royal city of Oslo. Pop. (1891) 150,444.

Christianity: the religion of those who accept Jesus of Nazareth as the Messiah, that is the Christ, promised of old to Israel. It is now the dominant religion in Europe (Turkey excepted), in North and South America, and in Australia, Southern Africa, and many islands, and is making steady progress in the other parts of the earth. It exists in the form of a large number of particular churches, sects, denominations, which may be classified in three large groups: the Roman Catholic Church; the Oriental Churches, including the Greek Church; and other Churches, mainly those grouped under the name Protestant. The aggregate nominally Christian population of the earth exceeds 400,000,000. Of these, somewhat more than half are Roman Catholics, more than one-fourth Protestants, and less than one-fourth connected with the Oriental Churches. There is no room in this article to discuss the characteristics of those Christian bodies or opinions that may be regarded as exceptional, nor even to discuss the differential characteristics of the various churches. For these, see EASTERN CHURCHES, GREEK CHURCH, ROMAN CATHOLIC CHURCH, PROTESTANTISM, REFORMATION, and the names of the various denominations and movements. There are certain things which most Christians of different names have in common, and to these we must now confine our attention.

Its Relation to other Religions.—Christianity is monotheistic, in distinction from all polytheistic, pantheistic, nature-worshiping, or agnostic religions. It claims to be of divine origin, and that not merely in the sense of its having come into existence through the providential guiding of the ordinary forces of nature and the human spirit, but also in the sense of its being the product of divine spiritual operations that transcend what we commonly call nature. In other words, it claims to be a supernatural religion. Professing thus to be no product of the human intellect, and acknowledging no author but the Being whom it sets before us as the object of worship, it claims to be the only true religion, and is consequently exclusive; that is to say, it admits of no compromise with any other religious system. But it does not claim that there is nothing true or good in other systems, or that no adherents of other systems are true worshipers of the one true God.

To the ancient religion of Israel it stands in peculiar relations, claiming for its own the Old Testament as well as the New. The only logical position for Christianity to take here, though not all Christians take it, is that Christianity is itself the ancient religion of Israel, in a changed dispensation, adapting it to new conditions; and that the present religion of the Jews is a less correct branch of the same ancient religion. Historically, Mohammedanism is a shoot—from the Christian point of view a corrupt shoot—from the same root.

Christianity as a Revealed Religion.—Christians hold that God, in addition to his providential manifestation of himself in nature and in human history, makes a spiritual revelation of himself to men in three different forms: in the Scriptures of the Old and New Testaments, in the spiritual illumination and guidance of individuals, and in spiritual supervision of the acts and traditions of the Church in its organic character. Protestants regard the first of these three as supreme; the hierarchical churches exalt the third; among men of certain types of thinking, or among very different men of certain types of feeling, the second is made prominent.

Salvation in the Christian System.—For the various doctrines of the Christian religion, see such articles as those on GOD, INCARNATION, CHRISTOLOGY, JESUS CHRIST, HOLY GHOST, GRACE, ATONEMENT, JUSTIFICATION, IMPUTATION, SANCTIFICATION, etc. So far as men are concerned, its central idea is that men are lost, and need to be saved.

Man is represented as involved in misery, incapacitated for the service of God, and liable to punishment for sin in a future state. In its teachings concerning a remedy for this state of things the doctrine of the atonement claims special attention—a doctrine taught in all the sacrifices of the patriarchal and Jewish dispensations, as well as by the words of the Bible. Man being utterly incapable of effecting his own deliverance, God sent his Son to save sinners, to make them holy and partakers of eternal life. By Unitarians and others who do not accept the above view, atonement or reconciliation with God is made to depend on repentance, while the life and death of Christ are represented as an example to us of obedience, virtue, goodness, and beneficence, under most trying circumstances; in which view the doctrines of a propitiatory sacrifice and imputed righteousness fall to the ground. These doctrines, however, are held by most of those who receive the doctrine of the Trinity and the generally received doctrine as to the incarnation of the Son of God.

The doctrine of divine grace is a part of the system of Christianity on which very important differences of opinion subsist, especially as to the relation of grace to individual men. Such are the differences concerning election, and concerning man's ability or inability to exercise saving faith of himself. But by Christians generally the relation of the believer to Christ and his faith in Christ are ascribed to the Holy Ghost or Spirit of God, the third person of the Godhead. See CALVINISM and ARMINIANISM.

Salvation is viewed as beginning in regeneration, and as carried on in sanctification, and all its joys as connected with the progress of sanctification in this life or in that which is to come. Faith in Christ can not be unaccompanied with repentance; though believers are holy in contrast to what they once were, yet there is none in this life free from sin, the tempter of our first parents being still the active enemy of men. Responsibility belongs to human nature; and the doctrine of a judgment to come may be considered as to a certain extent a doctrine of natural religion, as may also that of the immortality of the soul; but the clear and distinct enunciation of these doctrines belongs to the Christian religion.

Of the moral element of Christianity it is sufficient here to state that it is harmonious with the doctrinal part and inseparable from it; that it is founded upon the teachings of the Bible with regard to the moral attributes of God, and is exemplified in the character of Jesus Christ; and that it is divisible into two great parts—one of the love of God, and the other of the love of man.

Among what are termed the means of grace, which form so important a part of the system, the doctrine contained in the Bible first claims attention as the means of conversion and of edification, the instrument by which salvation is begun and carried on. The ordinances of worship, prayer, and sacraments are means of grace, concerning the relative importance of which, as compared with the other means, considerable difference of opinion prevails. The same remark applies also to the combination of Christians into an organized body with its own system of Church government and discipline.

The truth of Christianity is supported by many different evidences, independent, but mutually corroborative. It appeals to reason, and demands to have its claims examined. Nor is there any faith where there is not a mental conviction arrived at by reasoning, direct or indirect. See APOLOGETICS and EVIDENCES OF CHRISTIANITY.

Revised by W. J. BEECHER.

Christian Reformed Churches: See PRESBYTERIAN CHURCH.

Christians, or **Christian Connection**: the resultant of several distinct and independent movements. 1. In North Carolina and Virginia, in 1792, James O'Kelly and twenty or thirty ministers and above 1,000 members withdrew from the recently formed Methodist Episcopal Church, in opposition to what they considered the unwarranted assumption of the episcopate by Coke and Asbury. At their first conference, Dec. 25, 1793, they informally discussed the principles since characteristic of their movement. At the second conference, Aug. 4, 1794, they all agreed that they should "be known only as Christians, and should acknowledge no head over the Church but Christ, and should have no creed or discipline but the Bible." 2. In New England, Abner Jones, M. D., left the Baptists and earnestly advocated similar principles. He organized the first churches in New England to assume no name but Christian at Lyndon, Vt., in Sept., 1800, at Bradford, Vt., in 1802, and at Piermont, N. H., and Haverhill, Mass., in 1803. 3. In Apr., 1801, a peculiar manifestation of religious excitement, known as "the falling exercise," appeared in Southern Kentucky, and it and the accompanying revival spirit spread in all directions. In May it reached 100 miles northward into the Presbyterian churches at Cane ridge and Concord in Bourbon and Nicholas Counties, then under the pastoral care of Barton W. Stone. His usual "May meeting," lasting several days, was attended by 2,500 people, many from distant States, and hundreds were converted. This famous Cane ridge revival continued several years and spread over several States, and is considered the historical beginning of a half dozen different denominations. The religious enthu-

siasm and Christian fellowship broke over the usual denominational limits of those days, and Christians of the most diverse creeds were freely fellowshiped by the young ministers who led in the work. This resulted in "heresy" trials and the formation of a new presbytery. But, soon finding that they had ceased to be Presbyterians, they disbanded on June 28, 1804, and published a unique document called *The Last Will and Testament of the Springfield Presbytery*, in which they discarded denominational names and doctrinal standards.

As a basis of universal Christian fellowship for the reunion of the divided Church they make "Christian character the only test of membership" and "individual interpretation of the Scriptures the right of all." At first they did not think of a separate ecclesiastical organization, but worked like Wesley and Moody within existing churches, seeking to destroy sectarianism by destroying its fruits. In the South their conferences at first had neither presidents nor secretaries; but after a time "a scribe was appointed for the convenience of the meeting," but at the adjournment he destroyed his minutes lest they become laws for the Church. They began everywhere to erect "meeting-houses free for all ministers of the gospel," but finally, being excluded from these as well as other church houses, they were compelled to organize. In 1893 they had more than 1,500 ministers, 1,600 churches, and 150,000 adult and active members. They are strongest in Ohio, New York, and Indiana, which include about one-half their membership. Their churches are mainly in rich farming communities and not many in cities. They have ten institutions of learning under their general patronage, and a mission work in Japan since 1887.

In 1802 Elias Smith, a Baptist pastor at Portsmouth, N. H., met Abner Jones and accepted his views, and afterward led his church over to the new name and movement. In 1805 Smith began the publication of the *Christian's Magazine Reviewer and Religious Intelligencer*, which continued two years. On Sept. 1, 1808, at Portsmouth, N. H., he issued the first number of the *Herald of Gospel Liberty*, which after several changes of location is now published at Dayton, O., and is therefore the oldest regular religious newspaper in the U. S., if not in the world. The Christian Publishing Association, at Dayton, O., also issues Sunday-school and other publications. They elsewhere publish several papers. They have no uniform system of doctrine or ritual, ordain women to the ministry, and have steadily refused to accept any doctrinal basis or statement either *for or against* the Trinity, etc. In the practice of the ordinances there is the same liberty and diversity, modified of course by local influences. In government their churches are purely independent, but usually are associated in conferences. Several of these in one or more States combine to form State conferences or associations or conventions; and these, all in the U. S. and Canada, are represented in the American Christian Convention, which meets quadrennially.

At the session of the body in Cincinnati in 1854 resolutions pertaining to the slavery question offended the Southern delegates, most of whom withdrew and formed "The General Christian Convention," under the leadership of W. B. Wellons; but soon after the war friendly relations were resumed and fraternal visits were exchanged. Commissioners from the general convention were present at the session of the A. C. C. at Marion, Ind., in 1890; and, as no law of either body hindered, they were received to seats with the delegates from other sections, but for prudential reasons chose to vote only on those questions likely to be approved by their own people. Their general convention will be preserved co-ordinate with that of New England Christian Convention and various State associations, while the churches and ministers are co-operating more and more fully in missionary, educational, and evangelistic work.

In 1890 delegates from the Christian Union were welcomed to seats, and hopes are yet entertained of a full amalgamation of these people with such similar principles.

According to the census of 1890, the Christian Connection had in the U. S. 1,424 churches, with 103,722 communicants, and church property valued at $1,774,202. See CHRISTIAN UNION CHURCHES and DISCIPLES OF CHRIST.

E. A. DE VORE.

Chris'tiansand, or **Kristiansand** (Norw. pron. kris'tĕeăan-săand): a fortified seaport-town of Norway; near its southern extremity and on the Skager-Rack; about 160 miles S. W. of Christiania (see map of Norway and Sweden, ref. 12–B). It has a good harbor, at the entrance of which is the beautiful island Odderö. Ship-building and fishing are the principal industries. It is a bishop's see and the capital of a stift of the same name. Timber, salmon, etc., are exported hence. Pop. (1891) of town, 12,541; of stift, 359,416.

Christiansborg: a fortified town on the Gold Coast, West Africa; occupied by Great Britain since 1850.

Christiansburg: capital of Montgomery co., Va. (for location of county, see map of Virginia, ref. 7–D); on Norf. and West. R. R.; 86 miles W. of Lynchburg; 2,200 feet above the sea-level. It has a female college, an academy, tobacco and shoe factories. Pop. of district of this name (1880) 4,772; (1890) 5,215; (1900) 4,888; of town, 659.

Christian Science: See SCIENCE, CHRISTIAN.

Christians of St. John: a name mistakenly applied to the MANDÆANS or MENDAITES (*q. v.*).

Christians of St. Thomas: a body of Christians found in the southern part of the Malabar coast of India. It is claimed that these Christians are the descendants of the converts of the apostle Thomas, who is supposed to have visited India, but it is probable that this sect originated from a Nestorian colony, and was in the sixth century in regular communication with the Nestorian Church of Western Asia. When the Portuguese landed in India the Church of St. Thomas numbered about 16,000 families, but was in a very poor condition. In 1599 the Jesuits attempted the conversion of this people to the Roman obedience. A connection with the papal see was established, but in 1653 most of the converts broke loose from the Roman Church. There was anciently, it would seem, more than one sect among the Christians of St. Thomas. According to Mr. Ludlow, they are at present both socially and morally much debased, though they were once the dominant class in Malabar. They are now found principally in Travancore. Attention was first called in modern times to this interesting people by Dr. Claudius Buchanan, a missionary of the Church of England in India, whose *Star in the East* was a popular work on missions at the close of the last century and the beginning of the present. See James Hough's *History of Christianity in India* (4 vols., 1839–45), *passim*.

Revised by W. S. PERRY.

Christianstad, or **Kristianstad**: a town of Sweden; capital of a laen of its own name; on the river Helge, about 9 miles from its entrance to the Baltic and 267 miles S. W. of Stockholm (see map of Norway and Sweden, ref. 14–E). It has broad streets and wooden houses. In the vicinity are the immense alum-works at Andrarum (5,000 tons annually). It has an arsenal, barracks, and a fine church; also manufactures of linen and woolen fabrics and gloves. Pop. 10,700; of laen (1891) 221,697.

Christiansted, or **Bassin**: the chief town of the island of St. Croix, in the West Indies; on the northeast coast (see map of West Indies, ref. 6–K). It has a good harbor, which is defended by a fort. The headquarters of the Danish West Indies were removed hence to St. Thomas in 1871. Pop. 5,127.

Christiansund, or **Kristiansund**: a seaport-town of Norway; on three islands, which inclose its harbor. It is in the district of Romsdal, and 85 miles W. S. W. of Trondhjem (see map of Norway and Sweden, ref. 7–B). The trade is good, and fishing is largely pursued. Pop. (1891) 10,130.

Christian Union Churches is the name adopted by a denomination which first came together in convention at Columbus, O., in 1863, though the organization was not completed until 1865. Their principles, as stated by themselves, are—(1) the oneness of the Church; (2) Christ the only Head; (3) the Bible the only rule of faith and practice; (4) good fruits the only condition of fellowship; (5) the repudiation of controversy; (6) each local church governs itself; (7) no preaching of partisan politics. Their motto is, "In things essential, *unity*; in non-essentials, *liberty*; and in all things, *charity*." They practice baptism as a condition of membership, but are practically unrestricted in their communion. They have about 30,000 members and an adherent population of about 150,000, principally in Ohio, Indiana, Michigan, Iowa, Illinois, Missouri, Arkansas, Texas, Nebraska, and Kansas. They have one newspaper, *The Christian Witness*, published at McArthur, O., and have issued several books and tracts. They are active in revival and missionary work. In Oct., 1890, they became affiliated with the Christian Connection.

Christie, WILLIAM H. M., F. R. S.: b. in Woolwich, England, Oct. 1, 1845; educated at King's College School, Lon-

don, and at Trinity College, Cambridge. In 1870 he became chief assistant at the Royal Observatory, Greenwich. He introduced several valuable improvements in the scientific apparatus used there, and became secretary of the Royal Astronomical Society in 1880. In Sept., 1881, on the retirement of Sir G. B. Airy, he succeeded him as astronomer royal. He has contributed a number of valuable papers to the proceedings of the Royal Society and of the Royal Astronomical Society; he is also the editor of *The Observatory, a Monthly Review of Astronomy*, and the author of *Manual of Elementary Astronomy*, published in 1875.

Christina, Queen of Spain: See MARIA CHRISTINA.

Christina, Queen of Sweden; b. Dec. 6, 1626; was the only surviving child of Gustavus Adolphus. She received a solid and masculine education, and learned Latin, Greek, Hebrew, politics, etc. When her father died in 1632 she was recognized as his successor under the regency of Oxenstiern. In 1644 she assumed royal power, and in 1648 concluded the treaty of Westphalia, by which Pomerania was annexed to Sweden. Her mind was strong and her character eccentric. Her subjects wished that she should choose a husband, but she manifested a constant aversion to marriage. Her eccentricity was also exhibited in an extravagant patronage of authors, pedants, artists, and buffoons. In 1650 her cousin, Charles Gustavus, was designated as heir to the throne by the states of Sweden, with the assent of the queen. Impatient of the personal restraint which the etiquette of court imposed on her, she abdicated the throne in June, 1654, while still in the bloom of youth. This act has been variously attributed to levity and magnanimity. She reserved supreme power over her suite and household, embraced the Roman Catholic religion, and became a resident of Rome. She patronized artists, founded an academy at Rome, and meddled with astrology and other chimerical pursuits. In 1657 she caused her grand equerry, Monaldeschi, to be put to death for treason. It is said she wished to recover the crown of Sweden when the king died in 1660, but she did not succeed. D. Apr. 19, 1689. See Lacombe, *Histoire de Christine* (1762); Archenholz, *Memoirs of the Life of Christina* (Stockholm, 4 vols., 1751, in French); H. Woodhead, *Memoirs of Christina of Sweden* (1863).

Christinos, kris-tee'nōs: the name of a political party in Spain during the regency of Queen Maria Christina, the mother of Isabella II., embracing the adherents of the queen. They were opposed by the CARLISTS (*q. v.*).

Chris'tison, Sir ROBERT: a Scotch physician; Professor of Materia Medica in the University of Edinburgh; b. in Edinburgh, July 18, 1797, studied in Paris with Orfila. He wrote, among other works, a *Treatise on Poisons* (1829), a standard authority; also *On Granular Degeneration of the Kidneys*, and *The Dispensatory, or Pharmacopœias of Great Britain* (1842). He was made a baronet in Nov., 1871. D. Jan. 23, 1882. See his *Life* by his sons (1886).

Christlieb, krist'lēp, THEODOR, D. D.: b. in Birkenfeld, Würtemberg, Mar. 7, 1833; studied at Tübingen; taught in France, and became a preacher in London, where he published his famous lectures on *Modern Doubt and Christian Belief*. He returned to Germany in 1865, and in 1868 became university preacher and Professor of Theology at Bonn. In 1873 he visited the U. S. as a delegate of the Evangelical Alliance. Here he delivered a fine address upon the rationalism of the present day. He published *Leben und Lehre des Johannes Scotus Erigena* (1860) and *Modern Doubt and Christian Belief* (transl., 1874). D. at Bonn, Aug. 15, 1889.

Christmas, FESTIVAL OF [so called because an especial mass, the "mass of Christ," was celebrated on that day; Fr. *Noël*; Ger. *Weihnachtsfest* (from the solemn vigils which preceded the feast itself): Ital. *Natale*, i. e. birthday]: the day on which the birth of Jesus Christ is celebrated throughout the Christian world. This event was, in the East during the third century, set on the same day of the year with his baptism and the two commemorated on Jan. 6, which in the West is the feast of Epiphany. The Romans had, like other pagan nations, a nature festival, called by them Saturnalia, and the northern peoples had Yule; both celebrated the turn of the year from the death of winter to the life of spring—the winter solstice. As this was an auspicious change the festival was a very joyous one. It began with the Romans on Dec. 17 and lasted seven days. The giving of presents and the burning of candles characterized it. Among the northern people the lighting of a huge log in the houses of the great and with appropriate ceremonies was a feature. The Roman Church, finding this festival deeply intrenched in popular esteem, wisely adopted it, and at the same time altered it in intention and observance. It was no longer natural delight at the prospect of spring, the conquest of the sun over cold and barrenness, but peculiarly Christian joy in the rise of the Sun of Righteousness with universal life and warmth which the feast set forth. The day was put just at the close of the heathen festival, and the presents and the ceremonies were meant to symbolize the unspeakable gift of God—the Saviour. Like many other popular usages the exact course of Christmas can not be traced. The authority and example of the Roman Church, and perhaps the inconvenience of celebrating two such different events as the birth and the manifestation of Christ upon the same day, caused the Eastern Church as early as the latter part of the fourth century to separate the events and keep the birth of Christ on Dec. 25.

Christmas has always been the most popular of festivals. It is in Christendom the time of gift-giving and merry-making. Even the Jews keep it in this way, and multitudes of Christians as little think of or care for its special significance. The ceremonies of the day are a mixture of pagan and Christian elements, and formerly were conducive to disorder and immorality. Thus in England there was a Lord of Misrule, and in Scotland an Abbot of Unreason, appointed to superintend and concoct the Christmas revels. The sports were boisterous and coarse, and extended from All-Hallow eve (Nov. 1) to Candlemas (Feb. 2). The favorite dish for breakfast and supper during this period was a boar's head with an apple stuck in its mouth; and by way of pastry there were plum-puddings and mince-pies. Evergreens and the sacred mistletoe decorated house and church—plainly a borrowing from the Druidic worship. In Germany and France and in other countries during the Middle Ages, from the eleventh century on, there were sacred plays at Christmas in which the scenes attendant upon the birth of Christ were enacted. At first they were in Latin, and followed the scriptural story as amplified by legend; later a comic element was introduced, and this part was in the vernacular; later, the entire play was in the vernacular. The earliest performers were the clergy and the place was the church or churchyard. But as a vernacular play it was more under purely secular control, if not entirely in lay hands, and given in a public square.

The Christmas mass, celebrated by the pope in person, is very elaborate. Formerly he said three masses—one in the Liberian basilica at midnight Christmas eve, one in the Church of St. Anastasia at dawn Christmas day, and the third in the Vatican church in the course of the day. Ordinary priests are allowed to celebrate three masses that day, because in a sense there were three births of Christ—first, the eternal generation; second, the earthly birth from a woman; and third, the birth in the believer's heart. The pope was in the habit of calling upon any sovereign who might be present in the papal chapel on Christmas night to read the fifth lesson in the office, sword in hand, and the pope would bless a ducal cap and sword, which he presented in person or sent to some prince.

Christmas has always had its appropriate songs, commonly called carols: many are most beautiful. (See next article.) It has been the theme of innumerable eloquent sermons. It is the great Sunday-school festival of the year. In liturgical churches it has its special services. But Puritanism took offense at its association with what is called "popery" and refused to observe the day. S. M. J.

Christmas Carols [*carol*, from O. Fr. *carole*: Provenç. *corolla*, ring-dance < Lat. *corol'la*, dimin. of *coro'na*, crown]: songs or hymns sung, generally in the open air, in celebration of Christmas. These were not always of a sacred character, and those of a jovial kind were sometimes sung at the Christmas board. The custom of singing Christmas carols dates from a very early period, and in the Middle Ages became very popular, when the clergy and people often joined in the singing, which was accompanied with dances and the music of various instruments. Those with which the dawn of Christmas is now ushered in in Great Britain and the U. S. are generally religious; they are sometimes sung in churches. A collection of early English carols was printed by Wynkyn de Worde in 1521. The most complete collection is by Sandys (London, 1833). There is a collection of German carols by Karl Weinhold (Gratz, 1855; new ed. Vienna, 1875),

and among the many editions of French carols, called *noëls*, there was one published at Poitiers in 1824.

Christmas Islands: See the Appendix.

Christology [from Gr. *Χριστός*, Christ + *λόγος*, word, reason]: may include everything relating to the work as well as to the person of Christ, but as the work of Christ is discussed under ATONEMENT (*q. v.*), it is better to confine Christology to the person of Christ. See also SOTERIOLOGY.

The incarnation of one of the persons of the Trinity results in a peculiar kind of self-consciousness, which is neither divine alone nor human alone, but Divine-human. Jesus Christ is not merely God, for in this case he would not differ as a person from the unincarnate Logos in the bosom of the Father. (John i. 18.) Neither is he merely man, for in this case he would not differ in respect to species of personality from any other human being. But he is God and man united—the God-man—a unique species of person.

The early Church was not forced, by false theories respecting the nature of Christ, to make nice distinctions and definitions, and consequently made none. It was content with worshiping Jesus Christ; and worship is a more direct and impressive affirmation of his divinity than even a dogmatic assertion of it. In course of time, however, several errors arose which compelled the Church to make a careful and guarded statement of the peculiarity of Christ's complex person. The first of these errors was Arianism, which denied the existence of a truly and properly divine nature in Jesus Christ. The Arians allowed that he had in the composition of his wonderful personality a very exalted nature, which is higher than that of any creature whatever, but which is not literally and metaphysically divine. This highly exalted and superhuman nature, united with a human soul and body, constituted the Arian Christ. The second error was Patripassianism. The Patripassians asserted the real and strict Deity in Christ's person, but denied his humanity. According to them, the one solitary person of God (for they also denied a real distinction of persons in the Godhead) united itself with a human body, but not with a human soul. This single person of God, whom they denominated the Father, thus united with a material body, was the Patripassian Son of God, or Christ. Anterior to this union there was no Son of God. The third error was the Nestorian. This pertained to the relations of the two natures to each other, and not to the natures themselves, both of which were conceded. The Nestorian Christ is two persons, one divine and one human, in union. The important distinction between a nature and a person is not recognized. Nestorianism overlooked the fact that the second person in the Trinity did not assume into union with himself a human individual, but a portion of human nature not yet individualized. The Logos, in the words of Hooker, "did not assume a man's person into his own person, but a man's nature to his own person; he took *semen*, the seed of Abraham (Heb. ii. 16), the very first original element of our nature, before it was come to have any personal subsistence." The union is embryonic, and thus yields only a single personality. But instead of thus blending the divinity and the humanity into one self, the Nestorian scheme places two distinct selves, one divine and one human, side by side, and allows only a moral and sympathetic union between them. There is a God and there is a man, but there is no God-man. The fourth of the ancient errors in Christology is the Eutychian or Monophysite. This is the opposite error to Nestorianism. It asserts the unity of self-consciousness in the person of Christ, but loses the duality of the natures. In and by the incarnation the human nature is transmuted into the divine, so that after the incarnation there remains only one nature. For this reason the Monophysites held that it is correct to say that "God suffered," meaning thereby that Jesus Christ suffered in the divine nature.

The Council of Ephesus in 431 made some beginning toward the settlement of the questions involved, but it was reserved for the Council of Chalcedon in 451 to make the final statement. The Chalcedon symbol defines Christ's person as follows: "We teach that Jesus Christ is perfect as respects Godhood and perfect as respects manhood—that he is truly God, and truly a man consisting of a rational soul and body. He was begotten of the Father before creation as to his deity, but in these last days he was born of Mary, the mother of God, as to his humanity. He is one Christ existing in two natures, without mixture, without change, without division, without separation—the diversity of the two natures not being at all destroyed by their union in the person, but the peculiar properties of each nature being preserved, and concurring to one person and one subsistence."

This statement asserts the continued and everlasting existence of two natures in Christ's complex person, and adjusts their relations to each other. In the first place, the union of the two natures does not confuse or mix them in such a manner as to destroy their distinctive properties or transmute one into the other. The deity of Christ is just as pure and simple deity after the incarnation as before it; and the humanity of Christ is just as pure and simple human nature as that of Mary his mother or any other human individual, sin being excluded. In the second place, the Chalcedon statement prohibits the division of Christ into two selves or persons. The incarnating act, while it makes no changes in the properties of the two united natures, gives as a resultant a person that is a *tertium quid*—a resultant that is neither a human person nor a divine person, but a *theanthropic* person. Contemplating Jesus Christ as the result of the union of God and man, he is not to be denominated simply God, and he is not to be denominated simply man, but he is to be denominated God-man.

This union of two natures in one self-conscious ego may be illustrated by reference to man's personal constitution. An individual man is one person, but this person consists of two natures—a material nature and an immaterial nature. The personality, the self-consciousness, is the result of the *union* of the two. Neither one taken by itself would yield the person. Both body and soul are requisite in order to a complete individuality. The two natures do not make two individuals in union and alliance. The material nature, taken by itself, is not the man, and the mental part, taken by itself, is not the man; only the union of both is. Yet in this intimate union of two such diverse substances as matter and mind, body and soul, there is not the slightest alteration of the properties of each substance or nature.

It follows from this statement of the Council of Chalcedon that while the properties of one nature can not be attributed to the other nature, the properties of both natures may be attributed to the person resulting from their union. While it is not proper to say that the Divine nature suffered, it is proper to say that the God-man suffered. The first statement attributes to one nature the properties and acts of the other, and is therefore not allowable. The second statement asserts that Jesus Christ, the self-conscious Ego resulting from the incarnation, endured a passion, the seat and medium of which was the human nature in this Ego. Here, again, the analogies of finite existence furnish an illustration. A man suffers the sensation of heat from a coal of fire. In this instance it would not be correct to say that the man's immaterial nature suffers in the sense of being itself burned by the fire. The immaterial soul is not the sensorium in this instance. It is not the seat of the physical sensation. To say that it is would be to attribute to an immaterial nature the properties of a material nature. Yet, at the same time, the self-conscious person, the Ego resulting from the union of body and soul, feels the sensation of physical pain, but it feels it in and through the material part, and not the immaterial. In like manner, the entire humanity of Christ, the true body and reasonable soul, sustained the same relation to his divinity that the fleshy part of a man does to his rational part. It was the sensorium, the passible medium, by and through which it was possible for the self-conscious Ego, the God-man, to suffer. Hence while it is proper to say that Jesus Christ, the God-man, existed before Abraham, and was born in the reign of Augustus Cæsar, that he was David's son and David's Lord, it would not be proper to say that the divine nature of Jesus Christ was born in B. C. 4, or that it died upon the cross in A. D. 30.

The positions taken at Chalcedon have been reaffirmed both in the mediæval and the modern Church. The doctrine of Christ's person is in some of its aspects even more mysterious and baffling to finite comprehension than the doctrine of the Trinity, and Christian science has not been inclined to go beyond the general outlines and distinctions made in 451. The Lutheran Church, in connection with the doctrine peculiar to it of the ubiquity of Christ's person, has made some attempts to explain that peculiarity of Christ's self-consciousness by which it is sometimes that of finite weakness and sorrow, and at other times that of infinite majesty and power. But the endeavor runs too near the brink of the confusion of natures, and their transmuta-

tion into each other, to be regarded as a real advance upon the Chalcedon Christology. Upon the subject of Christology, see Athanasius, *Against the Arians*, iii.; Augustine, *Letter to Volusianus*; Anselm, *Cur Deus Homo*, ii., vii.–ix.; Aquinas, *Summa*, iii., i.–xxxv.; Petavius, *De Incarnatione*; Calvin, *Institutes*, ii., xii.–xiv.; Ursinus, *Christian Religion*, Q. 35; Turrettin, *Institutio*, xiii., iv.–xiv.; Usher, *The Incarnation*; Hooker, *Polity*, v., li., lii.; Pearson, *Creed*, art. iii.; Owen, *Person of Christ*, xviii.; Dorner, *Person of Christ*; Hagenbach, *History of Doctrine*, §§ 64–67, 95–105, 179, 266, 267, 299; Neander, *Church History*, ii., 478–616; Hengstenberg, *Christology of Old Testament*; Schaff, *Church History*, iii., 705–772, article *Christology*, in *Schaff-Herzog Encyclopädie*; Shedd, *History of Doctrine*, i., 392–408; *Dogmatic Theology*, ii., 261–349; Delitzsch, *Messianic Prophecies*; Riehm, *Messianic Prophecy*; Bruce, *Humiliation of Christ* (Kenotic Theories).

Christology, Heretical and Unaccepted Theories of.—The orthodox doctrine of the person of Christ set forth in the preceding article is the resultant of many forces. It will be convenient to state in chronological sequence the various "heresies" which conditioned its development.

A. From the Apostolic Age to the Fourth Century.—1. *Ebionism* in the second century, which affirmed the humanity to the exclusion of the divinity of Christ.

2. *Gnosticism*, which came up about the same time, and resolved Christ's humanity into a delusive appearance.

3. *Rationalistic Unitarianism*, second and third centuries, which denied his divinity or claimed that it was a mere power, while generally admitting his supernatural birth.

4. *Patripassianism*, third century, which affirmed that the distinctions of Father, Son, and Holy Spirit were only verbal.

5. *Sabellianism*, third century, which affirmed that the Father, Son, and Holy Spirit were only three relations in which the one God stood toward the world. Over against such more or less prevalent opinions the Church taught the full divinity of Christ, his full humanity, and his independent personality.

B. From the Council of Nicæa, 325 to 381.—*Arius*, a presbyter of Alexandria (*q. v.*), taught that Christ was not co-equal with the Father, but was a subordinate divinity, different in essence from God, not eternal, though existent before the world, a creature of God, although the creator of the world and its incarnate Saviour. As a variant from his views the *Semi-Arians* taught that Christ was similar in his essence to God. Hence came the two terms, the orthodox *homo-ουσια*, oneness of essence between Christ and God, and the heterodox *homoi-ousia*, similarity of essence. . . . The great opponent of Arius was Athanasius. The first œcumenical council, that of Nicæa, 325, settled the controversy on the orthodox side, and the second œcumenical council, that of Constantinople, 381, reaffirmed its decision, and since then the Church has never receded from its belief in the essential oneness of the Son with the Father, which carries with it his eternal deity. Arianism was not killed by these councils. It continued to flourish for centuries among the barbarians. Ulfilas, the apostle of the Goths, was an Arian, and so were the conquerors of the Roman empire in the fifth century.

C. Having settled the question of Christ's deity, the Church was agitated by questions as to the proper constitution of his theanthropic person. There were three principal heresies:

1. *Apollinarianism*, i. e. the doctrine of Apollinaris the Younger of Laodicea (d. 390), which was that Christ had a human body and a human soul, but not a human spirit or reason. In place of the latter, he taught, was the Logos, which was therefore organically united with the man Jesus.

2. *Nestorianism*, i. e. the doctrine attributed to Nestorius, Patriarch of Constantinople (428–435), who died in exile. This was that the two natures, although subsisting in unity, so that Christ is both divine and human, are not so united as to make it admissible to call the Virgin Mary the "Mother of God," as she was often called. Christ was man and God, a twofold person.

3. *Eutychianism*, i. e. the doctrine attributed to Eutyches, abbot of a monastery near Constantinople, excommunicated by the Council of Constantinople, 448. He taught the directly opposite view to Nestorius, viz., that in the incarnation there is an absorption of the human nature by the divine. Human nature, even the human body, is deified. Hence the Eutychians considered it allowable to say "God is born," "God was crucified," "God died."

The third œcumenical council, that of Ephesus, 431, and the fourth, that of Chalcedon, 451, condemned the opinions just cited, and affirmed that the one and the same Christ is "to be acknowledged in two natures, inconfusedly, unchangeably, indivisibly, inseparably." Symbol of Chalcedon; cf. Schaff's *Creeds*, ii., 62.

D. But Greek speculation was not yet exhausted and new heresies sprang up.

1. *Monophysitism*, or the doctrine that Christ had but one composite nature; hence his humanity is a mere accident of the immutable divine substance.

2. *Monothelitism*, or the doctrine that since Christ had only one person he had only one will.

These theories met their death-blow at the sixth œcumenical council, that of Constantinople, 680, which thus defined the relation between the two wills: "We likewise preach two natural wills [in Christ] and two natural operations undivided, inconvertible, inseparable, unmixed, . . . and the two natural wills [are] not contrary, . . . but his human will follows the divine will, and is not resisting or reluctant, but rather subject to his divine and omnipotent will." See Schaff's *Creeds*, ii., 72, 73.

3. Another heresy was *Adoptionism*, or the doctrine that Christ as man was the Son of God by adoption, not by nature. This was a Western theory, and condemned at the synod of Frankfort-on-the-Main, 794.

E. Down to the Reformation the Chalcedonian Christology reigned undisputed in the Church, East and West, and passed over practically unchanged into the Lutheran and Reformed Churches. There has been discussion, however, as to (1) the *communicatio idiomatum*, in the interest of the Lutheran theory of the ubiquity (see Lutheran Church) of Christ's body, which doctrine indeed is essential to their view of the Eucharist; (2) in relation to the twofold state of Christ, viz., of humiliation and exaltation; and (3) in relation to the threefold office of Christ, viz., of prophet, priest, and king. In regard to (1) the Lutherans claimed that the human nature of Christ was in such a sense clothed with the attributes of the divine nature that the body of Christ was ubiquitous. The Reformed Churches, while willing to grant the phrase, denied that there was any transformation of the human nature into the divine, or *vice versa*, affirming that the two natures remain separate and distinct. Hence there is no ubiquity. In regard to (2) the Lutherans deny and the Reformed Churches affirm that the states refer to both natures. Upon (3) the Confessions do not materially differ.

F. Modern Christologies.—The only one which has denominational importance is the Unitarian, which is held by that body in all forms, from the old Socinian theory, which attributes semi-divinity to Christ, to the extreme humanitarian which sees in Christ merely a man. The only recent discussion in orthodox circles which has attracted attention is in relation to the Kenosis, the "emptying" of the divine attributes of Christ spoken of in Phil. ii. 7. There was such a discussion in Germany in the early part of the seventeenth century between the Lutheran divines of Giessen and Tübingen, the former holding that Christ entirely abstained during his earthly life from the use of his divine attributes, while the Tübingen divines maintained that he used them secretly. The Kenotic theory is a revival and modification of the Giessen view. It asserts that our Lord from his incarnation to his resurrection "literally emptied himself not only of his divine glory but also of his divine mode of existence, and assumed the human mode of existence, subject to the limits of space and time and the laws of development and growth" (Schaff).

Literature.—In addition to the books named by Dr. Shedd, see on the general subject Schaff's *Creeds of Christendom*, vol. i.; Hefele, *Conciliengeschichte*; A. Harnack, *Dogmengeschichte* (Freiburg in Br., 2d ed. 1888, 3 vols.). For the Lutheran view, see C. P. Krauth, *The Conservative Reformation and its Theology* (Philadelphia, 1872, p. 456, *sqq.*); H. Schmidt, *Doctrinal Theology of the Evangelical Lutheran Church* (trans. by H. E. Jacobs and C. A. Hay, Philadelphia, 1875). For the Reformed view, see the systems of Hodge (New York, 1871–73, 3 vols.); Van Oosterzee (2d ed. 1878); Shedd (1889, 2 vols.); and Strong (3d ed. 1890).

Samuel Macauley Jackson.

Christophe, krees-tof', Henri: a Negro, one of the chiefs of the insurrection of Haiti; b. of slave parents in the island of Grenada, Oct. 6, 1767. He was emancipated in his youth; went to Haiti, joined the insurrection of 1793, and

was one of the most active lieutenants of Toussaint Louverture. On the arrival of the French expedition at Cap Français (Feb., 1802), he burned the town and retired into the interior, but submitted in April. Later in the year he joined in a new insurrection; was generalissimo under Dessalines, and succeeded him in Oct., 1806, in command of the north; was made president for life Feb., 1807, and crowned king as Henri I. Mar. 28, 1811. Meanwhile he was bitterly opposed by Pétion, who had proclaimed a republic, and was followed by the southern and western districts; an almost continual war was carried on, each striving to acquire the whole island. Christophe's cause was weakened by his despotic acts and extravagance; an insurrection broke out, he was attacked in his palace of Sans Souci, and shot himself to avoid capture, Oct. 24, 1820. Christophe's body of laws was published as the *Code Henri*. HERBERT H. SMITH.

Christophe, JOSEPH: painter; b. in Utrecht about the middle of the fifteenth century. He was a pupil or imitator of Bellini and Perugino, and painted many pictures at Lisbon, to which he was called by the king, and where he passed the later years of his life. He was a master of perspective. D. in Lisbon about 1550. W. J. S.

Christopher, SAINT: a native of Syria or Palestine; supposed to have suffered martyrdom about 250 A. D. The Roman Catholic Church celebrates his festival July 25, and the Greek Church on May 9. In art he is represented as carrying the child Christ on his shoulders, and leaning heavily on his staff to support the great weight. Many wonderful legends cluster about the name which have nothing to do with the martyr. See *Legenda Aurea* (Leipzig, 1850).

Christ's Hospital, or the **Bluecoat School**: in London, was founded by Edward VI. in 1553 as a hospital for orphans and foundlings. The dress worn by the boys at present consists of a blue woolen gown, with a red leather girdle, yellow breeches and stockings, a clergyman's bands, and a blue worsted cap, which, however, they seldom wear, generally going about bareheaded. The color of the dress was formerly russet. No child is admitted before eight or after ten years of age, and none can remain after fifteen, except "king's boys" (who attend the mathematical school founded by Charles II. in 1672) and "Grecians" (the highest class), of whom five are sent on scholarships to the universities. About 1,100 boys can be admitted. Latin and Greek are the basis of instruction, but the modern languages, drawing, etc., are taught. In 1683 the governors built a preparatory school at Hertford, where the children are instructed till they are old enough to enter the hospital. By a new scheme, which came into effect in 1891, the hospital is to be transferred to the country, and this, together with the girls' school and the preparatory school, will constitute "the hospital schools." Two day-schools will subsequently be started, and the whole number of children accommodated will be 2,170, instead of about 1,200 as at present.

Christy, EDWIN P.: minstrel; b. in 1815; was manager and organizer of the original "Christy's Minstrels" in Buffalo, N. Y., in 1842; met with great success with his troupe in New York and London, and retired with a fortune in 1854. D. in New York, May 21, 1862, from injuries received by throwing himself from a window while temporarily insane. B. B. VALLENTINE.

Chromate of Lead: See CHROMIUM.

Chromatic [from Gr. *χρωματικός*, deriv. of *χρῶμα*, color; applied as a name to one of the scales in Greek music]: the name given to a succession of notes which are raised or lowered by accidentals—that is, sharps, flats, and naturals, the key being preserved throughout the passage. In the chromatic scale the differences of the notes are all by semitones. The series is formed by dividing the intervals between the whole tones of the natural diatonic scale by means of semitones. These are twelve in number and are all made equal to each other in modern music. The name chromatic is also applied to chords composed of such notes.

Chromatics: See COLOR.

Chrome, **Chrome Green**, and **Chrome Yellow**: See CHROMIUM.

Chromic Acid: See CHROMIUM.

Chromic Iron, or **Chromite**: the most abundant ore of chromium; found near Brusa, Asia Minor, in the Ural Mountains, Siberia, Norway, New Caledonia, in Maryland, and in Del Norte, San Luis Obispo, Shasta, and Placer cos., Cal., the production of the U. S. in 1888 having been 1,500 gross tons, while the imports during the fiscal year 1888 were 4,440 gross tons. It is composed chiefly of the oxides of chromium and iron. It sometimes occurs crystallized in octahedrons, but commonly massive. Chromite is used chiefly for the manufacture of potassium and sodium bichromates. It has been employed also as a neutral lining for open-hearth steel furnaces. C. KIRCHHOFF.

Chromium [from Gr. *χρῶμα*, color]: one of the elementary substances. It is found in nature for the most part in the form of the mineral *chrome-ironstone*, or *chromite*, which has essentially the composition represented by the formula $FeCr_2O_4$. It was discovered in 1797 by Vauquelin, who gave it its name on account of the number of colored compounds which it forms. Several of these have come into use on account of their color, as will be pointed out below. From chrome-ironstone, *bichromate of potash*, or potassium bichromate, is first made, and from this most other chromium compounds. The conversion of the chrome-ironstone into the bichromate is accomplished by finely powdering, mixing with lime and caustic potash, and heating to bright redness in contact with the air. This treatment gives rise to the formation of the yellow chromate of potash, or potassium chromate, K_2CrO_4. By dissolving this in water and treating with sulphuric acid, it is converted into the bichromate, $K_2Cr_2O_7$. The element chromium (symbol Cr; atomatic weight 52·45) is not made in quantity. It has been described as a grayish-white powder, not easily changed in the air. It is used to some extent as an addition to steel for the purpose of hardening the latter. The presence in steel of 2 to 4 per cent. of chromium and 1·2 to 1·4 per cent. of carbon renders it so hard that it is bored with difficulty by good steel drills. Among the most important compounds of chromium are the following: *Chromic oxide*, Cr_2O_3. This is used under the names *chrome green* and *ultramarine green* to color glass and porcelain green, and as a pigment in oil and water colors. *Guignet's green* and *Amandon's green* are chromic oxide prepared by special methods. *Chrome alum*, $KCr(SO_4)_2 \cdot 12H_2O$. This resembles ordinary alum very closely, differing from it in composition in that it contains chromium instead of aluminium. It is used in dyeing, calico-printing, and tanning. *Chromates.—Potassium chromate*, K_2CrO_4, is not largely used. *Potassium bichromate*, $K_2Cr_2O_7$, is used extensively in the preparation of chrome pigments, in the manufacture of safety matches, etc. When a mixture of gelatin and potassium bichromate is exposed to light, the gelatin is rendered insoluble. This fact is utilized in the "carbon" process of photography. *Lead chromate*, $PbCrO_4$, is formed by treating a solution of a chromate with a solution of lead acetate. It is of a lemon-yellow color. It is used as a pigment under the names *chrome yellow* and *Paris yellow*. A basic chromate is known as *chrome red*. By mixing chrome yellow and chrome red in different proportions, pigments varying in shade between vermilion and lemon yellow are made. A substance made by mixing chrome yellow with Prussian blue is used under the name *green cinnabar*.

IRA REMSEN.

Chromo: See LITHOGRAPHY.

Chromoplasm: See *Cell*, in BIOLOGY.

Chromosphere [Gr. *χρῶμα*, color + Eng. *sphere*]: a layer of gases and vapors which covers the surface of the sun, resting upon the photosphere. It is entirely invisible to direct vision, except at the very moment of the beginning or ending of a solar eclipse. See SUN.

Chronicle [M. Eng. *cronikle*, from Angl. Fr. *cronicle*, modified from O. Fr. *cronique* (cf. Engl. *chronique*) < Lat. *chronica* = Gr. *τὰ χρονικά*, annals, deriv. of *χρόνος*, time. The modification of suffix in Engl. is an adaptation to the commoner type of *particle*, *article*, *miracle*, *oracle*, etc., and is parallel to *syllable* for Fr. *sillabe*, *principle* for Fr. *principe*, *manciple* for Fr. *mancipe*, *participe*, etc.]: an historical register of facts and events arranged in the order of time; a history in which the events are related in the order of time. The histories written in the Middle Ages were chronicles. Among the most celebrated writers of chronicles were Froissart, Eginhard, Monstrelet, Holinshed, and Geoffrey of Monmouth.

Chronicles: the name of two canonical books of the Old Testament. They are counted as one book in the reckoning which reduces the number of the Old Testament books to twenty-four. The first nine chapters are genealogical, and cover a period from the creation to the middle of the Persian times. The remaining chapters consist of selections or

abridgments of the matters contained in Samuel and Kings, with a large amount of supplementary matter. Hence the Septuagint named it Παραλειπόμενα (Paraleipomena, Supplements), and the Vulgate borrowed this name. The last two verses repeat the first verses of Ezra, the author apparently regarding his task as complete when he had brought the earlier history up to the times treated of in Ezra. The book was composed at or soon after the time of Nehemiah. Its peculiar characteristic is that it is written from the standpoint of interest in the Levitical and ritualistic institutions. Its authority was assailed during the first half of the nineteenth century by the rationalists, but no one doubts that it contains valuable contributions to our knowledge of the history of the Israelites. Beyond this the views of men differ much according to their different views of the inspiration of the Scriptures. Revised by W. J. Beecher.

Chronogram [from Gr. χρόνος, time + γράμμα, writing, deriv. of γράφειν, write]: an inscription in which a certain date is indicated by printing some of the letters in larger type than the others, and taking them as Roman numerals. The date 1632 is thus expressed in the inscription of a medal of Gustavus Adolphus: ChrIstVs DVX ergo trIVMphVs. If it is a verse, it is called chronostichon.

Chronograph [from Gr. χρονογράφος, recording time; χρόνος, time + γράφειν, write]: an instrument used (chiefly in astronomy) for recording the exact instant of the occurrence of an event, such as the transit of a star over the spider-lines of a telescope. The record is made by electro-magnetism. A point or pen, governed by the clock, marks uniformly the seconds. It can also be brought into action at any desired instant by an electric key under the finger of the observer. The first chronograph was simply Morse's telegraphic instrument slightly modified. The method was originally suggested by Prof. Locke, of Cincinnati, about 1850. The chronographs now in use usually employ a rotating cylinder covered with paper, and turning on a helical axis, each revolution occupying one minute. See Chronoscope, Velocimeter, and Ordnance. Revised by E. L. Nichols.

Chronology [from Gr. χρόνος, time + λόγος (-λογία), word, reason]: the science that treats of the succession of events in time. As an essential part of the sciences of astronomy and geology in determining the order of natural events and the duration of periods, it is discussed in those articles. The present article deals with the subject in its more limited sense as applying only to human events. Before the art of writing was known the dates of events were matters of mere oral tradition, and even after the invention of letters a period was described as lasting so many "generations," and an event as occurring in the reign or archonship of some king or magistrate. Before the eighth century B. C. dates of events are largely conjectural. The attempts to assign a precise date to the creation of the world occasioned much fruitless labor and led to the most diverse results, of which Archbishop Ussher's estimate is the most familiar to English readers. From the time of Adam to the birth of Christ he reckons 4,004 years, a conclusion wholly at variance with modern science. Of early chronological systems the most definite is the Babylonian. Sir Henry Rawlinson's discovery of the Assyrian canon, published in 1862, determines the chronology of Assyria from 1330 B. C. for the next 700 years. (See the articles Babylonia, Babylon, and Assyria.) The point of time, however, from which Babylonian history is reckoned is 747 B. C. This is the so-called era of Nabonassar, and curiously enough both the Roman and the Greek eras date from nearly the same point, the former beginning with the year 776 B. C., when Coræbus was victor at the Olympic games, and the latter from 753 B. C., the supposed date of the founding of Rome. The unit of time in the Greek chronology was the Olympiad (*q. v.*), a period of four years, while the Romans designated an event by naming the consuls in whose term it occurred. After 312 A. D., however, the authorized system throughout the Roman empire was by the Indiction (*q. v.*) a period of fifteen years, and its use can be traced in the West as late as the fifteenth century, though the Olympiads were followed in the East till 440 A. D. The simple plan of counting by years was first adopted in 150 B. C. by Eratosthenes, whose works have perished. Dionysius Exiguus in the sixth century A. D. was the first to employ the Christian era, beginning with the birth of Christ, which, however, probably occurred from two to four years earlier than the point from which Dionysius reckoned. Down to the middle of the eighteenth century A. D. historical records are often confused by the fact that at different periods and among different nations various dates were selected for the beginning of the year, e. g. March 25, Christmas Day, Easter, and January 1. (See Calendar.) The Christian era is attended by this inconvenience, that we must count backward for the dates of events prior to the birth of Christ, a difficulty obviated by the Julian system, proposed by Joseph Scaliger in the sixteenth century, which selects the date 471 B. C. as a starting-point. Other important eras are the era of Constantinople, which began with 5509 B. C.; that of the Seleucidæ, dating from the capture of Babylon by Seleucus in 311 B. C.; the Mohammedan era from the Hegira (*q. v.*), 622 A. D.; and the Persian era of Yezdegerd, 632 A. D. For the ancient chronologies, see Persia, India, China, Egypt, etc. See also Year, Month, Day, Cycle, Period, and Week. The most laborious work on chronology is *L'Art de Vérifier les Dates* (1818–31). There are manuals by Ideler (1831; n. ed. Berlin, 1883); Blair (1851); Brinckmeier (1882); Woodward and Cates (1872); Brockmann (Berlin, 1883); Haydn (New York, 1883). F. M. Colby.

Chronometer [from Gr. χρόνος, time + μέτρον, measure]: a watch of peculiar construction and great perfection of workmanship, used where time must be measured with extreme accuracy, as in the determination of geographical longitudes by measuring the difference of time. The chronometer differs from the ordinary watch in the principle of its escapement, which is so constructed that the balance is entirely free from the wheels during the greater part of its vibration; and also in having the balance compensated for variations of temperature. Marine chronometers generally beat half-seconds, and are hung in gimbals in boxes about 6 or 8 inches square. The pocket chronometer does not differ in appearance from the ordinary watch, excepting that it is generally a little larger. Chronometers are of immense utility in navigation, and ships going on distant voyages are usually furnished with several, for the purpose of checking one another, and also to guard against the effects of accidental derangement in any single one. The accuracy of chronometers is truly astonishing, the departures from perfect uniformity of running amounting only to small fractions of a second from day to day for long periods of time.

Chronophotography: See the Appendix.

Chronoscope [from Gr. χρόνος, time + σκοπός, watching, watchman; deriv. of σκοπεῖν, observe]: a kind of chronograph invented in 1835 by Wheatstone for measuring the duration of the electric spark. It consisted essentially of a plane mirror revolving with a high but known velocity, the elongation of the image of the spark as seen in this mirror furnishing the measure of the duration. In 1858 Feddersen substituted a concave for the plane mirror, with better results. In 1867 Rood replaced the concave mirror by a set of achromatic lenses and a plane mirror, and succeeded in measuring intervals of time as small as 40 one-billionths of a second. A chronoscopic apparatus was constructed by Fizeau for measuring the velocity of light. In this there was employed a rotating circular disk with sectors alternately open and closed. A ray from a luminous source transmitted through one of the open sectors, and reflected back from a distant mirror, is, with a certain velocity of rotation, intercepted by a closed sector, and with a higher velocity is transmitted through the next following open sector. The distance traversed in Fizeau's experiment was 8,633 meters (about 5⅜ miles). With this and the known velocity of rotation the velocity of light per second is computed. Foucault, and later Michelson, and also Newcomb, used for the same determination a chronoscope with a concave revolving mirror. Chronoscopes for measuring the time of flight of projectiles have been invented by Wheatstone, Hipp, Henry, Navez, Benton, De Brettes, Gloesener, Schultz, Bashforth, and others. In these the beginning and end of the interval measured are marked by the passage of the induction spark, or mechanically by electro-magnetism, generally upon a revolving cylinder, but in some upon a fixed arc before which a pendulum swings. For marking *equal* minute intervals steel tuning-forks are used in various ways.

Revised by E. L. Nichols.

Chrudim, *k*hroo'dim: a town of Bohemia; on the Chrudimka, a small river; 62 miles S. E. of Prague (see map of Austria-Hungary, ref. 3–E). It has several churches, a convent, and a gymnasium; also manufactures of cloth, beer, and sugar, and a large market for horses. Pop. (1890) 12,128.

Chrysalis [Lat. from Gr. χρῡσαλλίς, the gold-colored sheath of butterflies, deriv. of χρυσός, gold]: originally, the pupal stage of certain butterflies, as, for instance, the thistle but-

terfly, on account of their golden spots; but the term has been extended to the pupal condition of all *Lepidoptera* (butterflies and moths), and even of all insects. While at a first glance a chrysalis bears but little resemblance to the perfect insect, a little examination will reveal all the parts. The wings are folded around the body, while between them can be seen the legs and antennæ, and behind the rings of the abdomen, all inclosed in a hard, horny skin. In some cases the chrysalis is without other protection, but in others the larva, before passing into this stage, spins a silken cocoon, inside of which the transformation is undergone.

Chrysamine: See BENZIDENE DYES.

Chrysanthemum [Gr. χρυσάνθεμον, the corn-marigold; χρυσός, gold + ἄνθεμον, flower]: a composite Japanese flower which has become popular in Europe and America. There is much confusion respecting the original species or form of the chrysanthemum, but recent authorities hold that it is derived from *Chrysanthemum sinense*, and that *C. indicum*, which was formerly supposed to be the original form, has given comparatively few garden types. The genus *Chrysanthemum*, as now accepted by English botanists, comprises a great variety of plants, including the pyrethrums or feverfews and the ox-eyed daisy. The chrysanthemum has been grown from the earliest times in Japan, and an open 16-rayed chrysanthemum is one of the imperial emblems. The greatest diversity of forms has arisen in recent years, largely because of the free introduction of the loose and odd forms from Japan, which are much unlike the older, stiff, and bell-form (or "incurved") types which are known as Chinese chrysanthemums. In the U. S. the tendency is to breed the Japanese types to the exclusion of the formal kinds, while the opposite is still true in parts of Europe.

Chryselephantine Statues [*chryselephantine* is from Gr. χρυσαλεφάντινος, of gold and ivory; χρυσός, gold + ἐλέφας, -αντος, elephant, ivory]: statues whose surface was of gold and ivory. These statues were made by the Greeks of Pericles's time and later, and were of great celebrity in antiquity, the most important being the statue of Zeus in the temple of that god at Olympia and that of Athena Parthenos in the Parthenon at Athens. The first named of these statues is stated to have been seated and 43 feet in height, with a pedestal about 20 by 30 feet in horizontal dimensions, so that the whole composition must have filled up the western end of the naos or inclosed room of the temple, occupying all the space between the inner rows of columns. In later times chryselephantine statues were made as portraits of kings and princes.

Chrysip'pus (in Gr. Χρύσιππος): an eminent Stoic philosopher; b. at Soli, in Cilicia, 280 B. C.; son of Apollonius of Tarsus. He was a pupil of Cleanthes, and was distinguished for his skill in dialectics and his subtlety as a disputant. He once said to Cleanthes, "Teach me only your doctrines, and I will find the arguments to defend them." The Sorites is said to have been invented by Chrysippus. He wrote a great number of works, none of which is extant. He was considered to be the greatest Stoic philosopher except Zeno. D. in 207 B. C. See Ritter, *History of Philosophy*; J. F. Richter, *Dissertatio de Chrysippo Stoico* (1738); E. Zeller, *History of Greek Philosophy* (4th ed. 1876).

Chrysoberyl [from Gr. χρυσοβήρυλλος, χρυσός, gold + βήρυλλος, beryl]: a mineral sometimes yielding fine gems, an aluminate of glucina. It has a hardness of 8·5, next to that of sapphire, and is usually some shade of yellow, yellowish green, sage green, greenish brown, etc. It crystallizes in rhombic prisms, generally twinned or compounded into hexagonal forms. The transparent, light-colored stones which come chiefly from Ceylon are called by jewelers *Oriental chrysolite* (not the true CHRYSOLITE, *q. v.*). *Opalescent chrysoberyl*, or those that have an opalescent play of light, are properly called *cymophane* (Gr. κῦμα, a wave of the sea, and φαίνεσθαι, appear). The finest variety of cat's-eye, called *Oriental cat's-eye*, is a chrysoberyl, in which the peculiar chatoyant line of light is due to the twinned structure of the crystal, or to included impurities. (See also under CAT'S-EYE for other varieties of cat's-eye.) The line of light appears when the stone is cut across the prism and polished *en cabochon*. This variety, which is highly valued, is found with the others in Ceylon and Brazil. *Alexandrite* is a chrysoberyl containing some oxide of chromium, which gives it a fine rich green color by day, but by artificial light the green changes to a raspberry or columbine red. It was named by Nordenskiold for the Emperor Alexander II. of Russia, on whose birthday it was identified. It was found at Takowaja, in the Urals. Gems of this variety have been found in Kandy, Ceylon, up to 65 carats in weight, and valued at $2,000 each. Chrysoberyl occurs at several places in the U. S., notably at Haddam, Conn., Greenfield, N. Y., and Stow, Me., but not of a quality suitable for gems.

GEORGE F. KUNZ.

Chrysocol'la [Lat., from Gr. χρυσόκολλα, gold-solder; χρυσός, gold + κόλλα, glue]: a hydrated silicate of copper; sometimes called copper-green; used as a pigment by the ancient Greeks. The color is verdigris or emerald green, passing into sky blue, with a shining or dull resinous luster. It is found native in considerable abundance in Missouri and Wisconsin.

Chrys'olite [from O. Fr. *crisolite* < Lat. *chryso'lithus*, from Gr. χρυσόλιθος, a bright yellow stone, prob. the topaz; χρυσός, gold + λίθος, stone]: a mineral (also called *olivine*, and, by jewelers, peridot) consisting of a simple silicate of magnesia and protoxide of iron. It occurs in igneous rocks, such as lava and basalt, and also in meteoric stones, either as grains or in crystals of rather complicated form, having a vitreous luster and conchoidal fracture, transparent and doubly refracting, of an olive-green color, and a hardness somewhat less than quartz. The finer varieties make beautiful and valuable gems, of a rich olive to golden green. Many fine specimens may be seen in the chapel of the Three Magi in the Cologne Cathedral. Recently small transparent gems have been cut from olivine crystals found in meteorites. It was formerly confounded with emerald, but the tint is entirely different; the *chrysolithus* of the ancients would seem to have been our topaz. Fine specimens are found in Egypt and other parts of the East, and in New Mexico.

GEORGE F. KUNZ.

Chrysolo'ras, MANUEL, or EMMANUEL: a Byzantine Greek scholar; b. in Constantinople about 1355; noted as being the first teacher of the Greek tongue of importance in the modern world. His fame as a scholar reached Italy in the end of the fourteenth century, and Guarino da Verona went to Constantinople to study under him. But in the early part of the last decade of the century (1393?), Chrysoloras, with a fellow Greek, Kydonius, went to Venice on a mission from the Greek emperor. The former was at once besieged by would-be learners, and did in fact give lessons in Greek during his stay. He returned soon to Constantinople, and only in 1396, on invitation from the Florentine Republic, did he come to occupy the chair of Greek created originally for Leontius Pilatus, but given up by him in 1363. During the three or four years of his teaching, Chrysoloras had among his pupils several of the leaders in the revival of classical learning—Niccolò Niccoli, Leonardo Bruni, Manetti, Marsuppini, Traversari. Others obtained, at least indirectly, inspiration from him. He composed a Greek grammar (*Erotemata*), which served for generations as the basis of Italian instruction in Greek. In 1400, however, he left Florence to join the emperor, Manuel Palæologus. In 1402 we find him teaching in Pavia. Here he translated Plato's *Republic* into Latin, thus inaugurating the long series of translations which within a century made ancient Greece known to the Western world. In 1404 his presence in both Rome and Venice has been proved. After another visit to Constantinople we find him again in Venice. In the years 1408–10 he seems to have journeyed in France, England, and Spain. From 1410 to 1412 he was in Florence, Bologna, and Rome, probably occupied as before with teaching Greek. At the same time he becomes involved in larger concerns, and we find him engaged in the preliminaries of the Council of Constance, which, among other things, was to unite the Eastern and Western Churches. At Constance, however, before the council had come together, he died Apr. 15, 1415. Besides the works mentioned above, we have from him a comparison of new with ancient Rome (Σύγκρισις παλαιᾶς καὶ νέας Ρώμης) and a number of familiar letters. See G. Voigt, *Die Wiederbelebung des classischen Alterthums* (2d. ed. Berlin, 1880); T. Klette, *Beiträge zur Geschichte und Literatur der Ital. Gelehrtenrenaissance* (Greifswald, 1888).

A. R. MARSH.

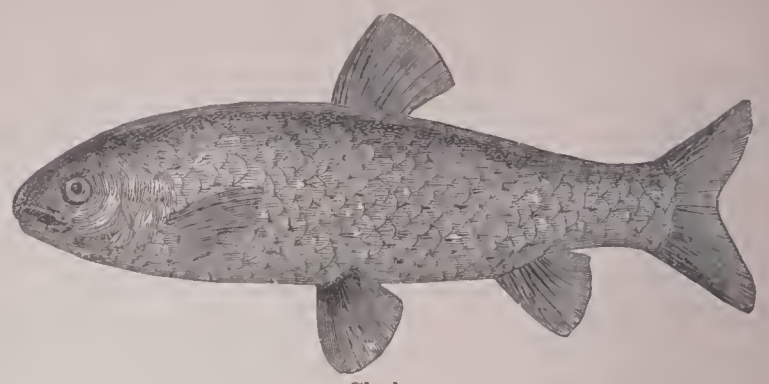
Chrysoprase [older *crisopace*, from O. Fr. *crisopace*, but now adapted in form to its original, Gr. χρυσόπρασος, a golden-green gem; χρυσός, gold + πράσον, leek]: a rare variety of chalcedony, the coloring-matter of which is oxide of nickel; it is a beautiful translucent ornamental stone, specimens of which realized a high figure a century ago, when it was most esteemed. Through age it frequently loses its greenish cast

to some extent, and becomes a dirty yellow green. Dampness, or perhaps darkness, is believed to be favorable to its preservation. The wall of the chapel of St. Wenzel at Prague is covered with slabs of this beautiful material. It is found at Rabenstein, in Silesia; and in the U. S. at Visalia, California, and Riddles, in Oregon. The chrysoprase of the ancients has not been positively identified. It is mentioned once in the Bible (Rev. xxi. 20). G. F. K.

Chrys'ostom [Gr. *χρυσόστομος*, liter., golden-mouthed; *χρυσός*, gold + *στόμα*, mouth], John: the most accomplished orator of the ancient Greek Church; b. in Antioch, Syria, 347. He was brought up by his widowed mother, Anthusa, his father, Secundus, a distinguished military officer, having died soon after his birth. He had an older sister. He studied rhetoric under Libanius, the famous Sophist, and philosophy under Andragathius. Quitting the legal profession, upon which he had entered, he was ordained reader, 370, in Antioch, by Bishop Meletius. While not leaving home, he led a monastic life. In 374 his mother died, and he then retired to a monastic community in the mountains S. of Antioch. But his health being affected by his austerities, he returned to Antioch in 381, and was promptly ordained deacon by Bishop Meletius, whose successor, Flavian, raised him to the priesthood in 386. He quickly was recognized as a great preacher, and his fame spread throughout Christendom. On Feb. 26, 398, he was consecrated Archbishop of Constantinople, having, by a mixture of force and fraud, been carried thither against his will. His boldness as a reformer brought him into trouble. Both among the clergy and at the imperial court enemies rose up against him. They were headed by the empress and by Theophilus, Patriarch of Alexandria. The latter called a council at Chalcedon, and deposed and banished Chrysostom on trumped-up charges in 403. But the sentence was scarcely carried out ere it was revoked, and he returned in triumph. On June 5, 404, he was again banished. Under the scorching heat he was conveyed to Cucusus, a mountain village in the Taurie range between Cilicia and the Lesser Armenia. Thence he carried out an extensive correspondence, so that his influence was really wider than when on his throne. On learning of this, the empress had him transferred, first to Arabissus, then to Pityus in the Caucasus, on the eastern shore of the Black Sea, the most inhospitable spots in the empire. He could not stand the journey, but on Sept. 14, 407, died at Comana, in Pontus. He was little of stature, with a large, bald head, hollow cheeks, and deep sunken eyes. His eloquence was of the highly ornate Asiatic type, but also very incisive and practical. In rebuke he was terrible, calling things by their right names. He had great reverence for the Scriptures, lived abstemiously, defied danger, promoted missions, and died exclaiming, "Glory be to God for all things! Amen." He was the most voluminous of the Greek Fathers. His most important and permanently useful writings are his homilies and commentaries. As a preacher he has no superior in the history of the Church. As a foremost representative of the Antiochian school, which sought to give the Scriptures their grammatical and historical sense, he seldom uses allegory, but speaks plainly and practically. He laid great stress upon the freedom of the human will and its co-operation in the work of conversion. He magnified the grace of God which extends salvation to all who will accept it. His laudation of saints promoted hagiolatry, but it is remarkable that he furnished no support to mariolatry. He considered the Bishop of Rome as the successor of Peter, and appealed to him in his first banishment; but this was conceding to him "a primacy of honor, not a supremacy of jurisdiction." (Schaff.) The best edition of his works is the Benedictine (13 vols. folio, Paris, 1718–38; reprinted by Migne, 1859–63, 13 vols.). His most important works have been translated into English (edited by Dr. Schaff) by the Christian Literature Company (New York, 1889–90, 6 vols.). The best biography of Chrysostom is by W. R. W. Stephens (London, 1872; 3d ed. 1883). Cf. the sketches by R. W. Bush (1885) and Philip Schaff (New York, 1891).

Samuel Macauley Jackson.

Chub: a name given in Great Britain to *Leuciscus cephalus*, a fresh-water fish of the carp family, having a stout, round body and broad head. It attains a weight of 5 lb., and is taken by anglers, although of little account for food. In the U. S. the term chub is applied to various fishes bearing more or less resemblance to their European namesake. In California the chub is *Leuciscus atrarius*; in the Middle and Southern States it is *Semotilus corporalis*, well known as the horned dace: E. of the Alleghanies it is *S. bullaris*, also called fall-fish. These are mostly of small size, rarely



Chub.

reaching a length of 12 inches, and inhabit clear, running streams, where they afford sport to young anglers.

F. A. L.

Chubut': a territory of Argentina, comprising that portion of Patagonia between the rivers Chubut and Negro. Area over 15,000 sq. miles. Civilized population, a few thousand. The interior is in great part arid, and is occupied by roving Indians. Chubut was first settled in 1865 by Welsh immigrants, who established a colony at the mouth of the Chubut river, now known as Rawson. H. H. S.

Chuck-will's-widow: *Antrostomus carolinensis*; a bird of the family *Caprimulgidæ*, so called from its peculiar loud cry. It is the largest member of the group found in the U. S., being about twice the size of its near relative the whippoorwill, which it much resembles in plumage, being mottled with black and brown. It ranges from the South Atlantic States to Central America. F. A. L.

Chu-en-Aten: See Egypt (*Ancient*).

Chufu: king. See Egypt (*Ancient*) and Supms.

Chu-hi, choo'hee, or **Chu-fu-tsĕ** (that is, *Chu* the philosopher): a distinguished Chinese scholar and philosopher whose influence on Chinese learning and thought is second only to that of Confucius; b. in 1130; d. in 1200. As a commentator on the Chinese classics, he successfully introduced interpretations and principles of interpretation almost entirely at variance with those of the scholars who had preceded him. He was also one of the founders and the chief ornament of the speculative school of philosophy in China. A collected edition of his philosophical works was first published in 1415 by the third Emperor of the Ming dynasty. A still more complete edition in sixty-six books was prepared under imperial supervision, and published by imperial authority in 1713. His disciples were numerous, and many voluminous collections of "notes" of his lectures and conversations were compiled and issued by them. A history of China in fifty-nine books was prepared by them under his superintendence. This forms the basis of de Mailla's *Histoire de la Chine* (3 vols., Paris, 1777–85). His most popular work, the *Siao Hioh*, or Juvenile Instructor, is still in use all over China as a text-book. See Wylie's *Notes on Chinese Literature* (London and Shanghai, 1867), and McClatchie's *Confucian Cosmogony* (London, 1874).

Robert Lilley.

Chu-kiang, or **Pearl River**: a river of Southern China, and that on which the city of Canton, in the province of Kwangtung, is situated. It is formed by the union of the "North" and "West" rivers, which unite at a place called Samshui, or "Three Waters," about 30 miles N. W. of Canton, to form the Chu-kiang. From that point it flows eastward past the city of Fat Shan, expanding at Canton into a broad tidal river which, lower down, becomes subdivided into an intricate network of waterways around and between numberless flat alluvial islands. Twelve miles below Canton is the anchorage of Whampoa (or Hwang-pu). Ten miles farther down still the Chu-kiang receives from the left the waters of the East river. Some miles below this the river narrows into what is called the *Hu-mun* or Tiger Gate by the Chinese, the Boca Tigris of the Portuguese, where the famous Bogue forts are situated. (See Boca Tigris.) From this the river widens out into a great estuary, having a breadth of about 70 geographical miles. Total length, 110 miles. For the Si-kiang or "West River," see China. R. L.

Chulpas: See Incan Antiquities.

Chumashan Indians [from *Chumash*, the name of the Santa Rosa islanders. By most authors they have been

mentioned as Santa Barbara Indians, from the name of the town and mission best known]. The tribes comprising this linguistic family were formerly located on the coast of California between 34° 20′ and 36° lat. There are known to have been seven distinct dialects of the family, viz., those spoken around San Luis Obispo, Purissima, Santa Inez, Santa Barbara, and San Buenaventura missions, and the dialects of Santa Rosa and Santa Cruz islands. If, as is probable, the language spoken on other islands of the Santa Barbara group was distinct, the number would be increased by several more. These dialects, with the exception of the first, constitute an unusually homogeneous language. They are so much alike that their close relationship appears from the most cursory examination of vocabularies, and while apparently each dialect contained a greater or less number of words more or less different from the kindred tongues, they were so sufficiently alike as to be in great part mutually intelligible. The tongue spoken by the San Luis Obispo Indians, as appears from a vocabulary collected by the writer in 1884, differs markedly from any of the others, and it has been relegated to the present family with some doubt. Its decided differences from the other dialects are to be accounted for, perhaps, by the greater isolation of the Indians speaking it, they being the most northern of the family, and the probable greater extent to which it borrowed material from its neighbors of other stocks. On the south the Indians of this family were bordered by tribes of the widespread Shoshonean stock, which, occupying an enormous domain in the interior of the country, found their way through the passes of the southern Sierras, overcame the tribes in possession, and gained the coast, to be in turn overcome by the climate and surroundings, and reduced in character and disposition to a position little if any above those of the people they dispossessed. Who the latter were is, of course, only a matter of surmise, but it is highly probable that in part, at least, they were Indians of the present family. Recent linguistic investigations seem to show, indeed, a connection between the language of the present family and that of the Yuman family to the S., the two being separated geographically by the wedge of Shoshonean invasion. Whether the thread of linguistic connection results from a borrowing of material, or the two ultimately will be found to have a common parentage, remains to be seen, but in any case doubtless both the families mentioned were pressed N. and S. respectively by their more warlike Shoshonean neighbors.

Peculiar interest attaches to the Indians of this family, as they were the first of the California tribes to be visited and reported upon by Europeans. Cabrillo sailed along the California coast in 1542, and though the accounts of his voyage contain but meager details of the aborigines, they are yet sufficient to show that little change had taken place between the time of his visit and the subsequent occupation by the Franciscans, more than two centuries later. The mission of San Luis Obispo on the northern confines of the country occupied by this family was established in 1772. San Buenaventura, on the southern extremity, was founded in 1782; the establishment of Santa Barbara, Purissima, and Santa Inez followed successively in 1786, 1787, and 1804.

Though by no means physically weak, the Indians of this family appear to have been of a singularly peaceable and sluggish disposition. Living in a mild and equable climate, and surrounded by a bountiful food supply, their mental faculties were never sharpened by the struggle for existence so necessary for high development. When entered by the Spaniards, the region was found occupied by a large population established in numerous villages, chiefly on the coast and the contiguous islands; for these Indians, though claiming part of their subsistence from the land, especially from seeds, roots, acorns, and the like, were not hunters, but fishermen.

Their political organization consisted of a series of petty confederacies, if so large a term be permissible, united to some extent by the common bond of language and habits, but disconnected in every other way, and often indeed on unfriendly terms. Warlike these Indians never were, and hostilities growing out of trespass disputes or the capture of women never rose to the dignity of wars.

To their peaceable disposition, sluggish habits, and disconnected political state, which prevented all possibility of acting in concert, are due their easy enslavement under the mission system.

It is not necessary to conclude that the names given by Cabrillo in 1542 were allotted to the same village sites in the nineteenth century, though it is probable enough that in some instances such was the case. Recent examinations of some of the village sites near Santa Barbara have shown that they have been occupied for a long term of years, probably for centuries, and as Indian village names often have their origin in geographic peculiarities, it is likely enough that the names were perpetuated. On the other hand, it appears from the duplication of names in the archives of the different missions either that the same village is claimed by two missions, or, as is probable, that not infrequently two or more villages received the same or nearly the same name, the latter supposition being likely enough when the similarity of the dialects spoken is considered.

Of the fifty odd villages named in the Cabrillo narrative, about 11 per cent. appear to be identifiable with the later lists. Considerably more than two hundred years had elapsed between the date of Cabrillo's list and the founding of the missions, and nearly three centuries and a half from the date of that voyage and the taking of the writer's list. Hence any attempt to identify the old names with others recently in use must necessarily be largely conjectural.

In 1884 the writer visited the several counties formerly inhabited by the populous tribes of this family, and discovered that about forty men, women, and children survived. The adults still speak their old language when conversing with each other, though on other occasions they use Spanish. The largest settlement is at San Buenaventura, where perhaps twenty individuals live near the outskirts of the town.

AUTHORITIES.—S. Powers, *Indians of California, Cont. to N. A. Eth.*, iii. (Washington, 1877); H. H. Bancroft's *History of California*, i.–vii. (San Francisco, 1884–90); H. W. Henshaw, *Missions and Mission Indians of California*, in *Popular Science Monthly* (New York, Aug., 1890). See INDIANS OF NORTH AMERICA.

H. W. HENSHAW.

Chumbul′: a river of India; rises in the Vindhyan Mountains; flows nearly northeastward, and enters the Jumna 85 miles S. E. of Agra. Length, 500 miles.

Chumpac: See CHAMPAC.

Chunam′: a mixture of lime with sand and other ingredients, used in India from time immemorial for plastering walls and for the manufacture of many small articles, some of them decorative. Milk, buttermilk, eggs, GHEE (*q. v.*), powdered chick-peas, hemp, sugar, gum, and different dried fruits are among the materials sometimes mixed with the lime and sand. Different makers have their own different secrets for making chunam. The work done with it is often very delicate and beautiful, as it is hard and durable and takes a high polish.

Chunaten: See KHUNATEN.

Ch'ung-k'ing: a foo or departmental city and important riverine port of China, in the province of Sze-chuen, on the left bank of the Yang-tse, and the confluence with it of the Kia-ling river from the north; about 1,700 miles from the sea; lat. 29° 33′ 50″ N., and lon. 107° 2′ E. (see map of China, ref. 6–G). It stands on a rocky promontory, 200 feet above the level of the Yang-tse (here called the Min), and about 840 above the level of the sea. It is a walled city, built in its present form by the first emperor of the Ming dynasty (1368–98), and has seventeen gates, of which only nine are made to open, and eight are permanently closed. Since 1876 it has been the seat of a British consul, though no trading was permitted. On Mar. 2, 1891, it was opened to foreign trade in accordance with a convention signed there Mar. 31, 1890, and a custom-house established. Ch'ung-k'ing is about 600 miles above the port of Ichang, the highest point of steam navigation. From Ch'ung-k'ing to Ichang the river is a succession of formidable rapids and eddies, and requires for its navigation both great skill and native boats specially built for the traffic. Chief exports, silk, salt, *pelah* or insect wax, tobacco, etc. Pop. 250,000.

R. L.

Chunhuhn: See CENTRAL AMERICAN ANTIQUITIES.

Chupra: See CHAPRA.

Chuquisa′ca, or **Char′cas**: a southeastern department of Bolivia; bounded N. by Cochabamba and Santa Cruz, E. by Brazil, S. by Tarija, and W. by Potosí and Oruro; area (including a large tract formerly pertaining to Santa Cruz), 72,700 sq. miles. Pop. (1888) estimated at 123,347, besides wild Indians. Capital, Sucre. The western part is more or less mountainous, with a temperate climate in the high valleys, where most of the civilized population is congregated.

There are extensive forests, and fertile open lands adapted to grazing and agriculture. Some of the richest silver mines of Bolivia are in this region. The eastern and more extensive portion of Chuquisaca is a plain, forming part of the GRAN CHACO (*q. v.*), and it is inhabited only by roving Indians, except near the base of the highlands, where there are a few stock-farms. The principal products are silver and wheat in the highlands, coffee, cacao, and sugar-cane (used principally for making rum) in the lower valleys, and horses on the plains. The exports are limited, owing to the difficulty of transport. HERBERT H. SMITH.

Chuquisaca: city of Bolivia. See SUCRE.

Chur, *khoor* (Fr. *Coire*): the capital of the Swiss canton of Grisons; in a valley and on or near the river Rhine; 60 miles S. E. of Zurich, with which it is connected by railway (see map of Switzerland, ref. 5–I). It has an ancient cathedral of the eighth century and a bishop's palace; also manufactures of cutting tools and zincware. It is a well-known climatic station; elevation, 1,936 feet. Pop. (1888) 9,381.

Church [O. Eng. *circe* (*cirice*) : Northern Eng. *kirke* (whence *kirk*) : O. Sax. *kirika* (Dutch *kerk*) : O. H. Germ. *chirihhe* (Mod. Germ. *kirche*), borrowed probably by way of Constantinople from Christian Greek κυριακόν (or plur. κυριακά), of the Lord (se. δῶμα), Lord's house (Lat. *dominicum*), deriv. of κύριος, master, lord]: primarily, a place of Christian worship; hence the assemblage there worshiping; hence also the whole body of Christians, as in the phrase, "Christ, the Head of the Church." In this sense the word corresponds to the Greek ἐκκλησία as used in the New Testament (Lat. *ecclesia*, Span. *iglesia*, Fr. *église*, Ital. *chiesa*), though somewhat differently used by different communions. Thus Roman Catholics regard the Church as composed of those only who participate in the traditional ordinances administered by the hierarchy in regular succession from the apostles down, and often restrict the term still further to the Roman Catholic hierarchy itself, whose official action is regarded as divinely inspired and infallible. Protestants, on the other hand, consider the "Church Catholic" (or universal) to include all true believers in Christ, who constitute the *invisible* Church; while the collective body of members of Christian communions is designated the *visible* Church, which thus includes the Roman Catholic, the Greek, and the Armenian communions, as well as the Protestant. In theological language, the "Church militant" is the collective body on earth of believers engaged in the battle against sin and error; the "Church triumphant" is the general assembly of the redeemed in Heaven.*

Besides these broad applications of the term, it is also used to designate (*a*) the collective body of members of a given communion or believers in a given creed of Christianity, as the Episcopal Church, the Roman Catholic Church, the Greek Church, the Church of England; (*b*) a sect or denomination, as the Methodist Church, the Moravian Church; (*c*) a single parish or the body of worshipers at a particular church, as "the Central church," "the Church of St. Agnes."

Church: as an architectural term, any edifice consecrated to Christian worship; but it has become especially associated with certain types of religious architecture which have grown up with the development of Christian ritual. The earliest form adopted was that of the Roman basilica, a purely civic structure serving as a public hall, market-place, and court-room. It comprised an apse, within which was the tribune for the magistrate, a broad, open space before this for the public, and a long nave flanked by side aisles, separated from each other by columns bearing walls pierced with windows above the side-aisle roofs. These arrangements were admirably suited to the development of early Christian worship, and the fact that the basilica was not like the temples associated with pagan worship made it the more acceptable to the Christians when, in the fourth century, they were permitted throughout the Roman empire to worship in public and to build new or occupy old structures. From this ground plan, changed slightly by enlarging the central space laterally into *transepts*, and thus securing a symbolic cruciform outline, was developed the plan of the mediæval cathedral and of the great abbey churches of Europe. A fundamental structural change was effected by substituting vaulting in stone for the timber ceiling of the original type. This led to the use of flying-buttresses, pinnacles, and clustered shafts. The *narthex*, or long transverse porch at the front, was exchanged for triple doors; the side aisles were continued around the eastern portion of the building, with its *apse*, or polygonal or semicircular termination, which was assigned to the clergy and singers and called the CHOIR (*q. v.*, also CHANCEL); and in England a second or minor pair of transept-arms was sometimes added. Vestries for the clergy, a baptistery, a campanile for the bells, or else one or two towers with spires at the western end, and chapels with altars for particular saints, were added to the original plan.

In the Eastern Church the circular and domical types of church were developed, the latter employing four short and equal arms like those of the Greek cross, with a dome on their intersection and sometimes one over each of the arms also. The Renaissance architects combined the two ideas in such structures as St. Peter's at Rome, St. Paul's at London, and St. Geneviève at Paris. Parish churches vary more widely in type than the cathedral and abbey churches on account of more widely varying requirements, and a similar reason accounts for the diversity of type or absence of type among modern Protestant denominations.

A. D. F. HAMLIN.

* Roman Catholics acknowledge a distinction between the *body* of the Church, which is the visible organization, and the *soul*, which is the aggregate of all the just known to God alone and united in the Holy Ghost through grace; so that there may be those in the body who are not in the soul, and *vice versa*. They acknowledge also a distinction in the body of the Church, viz., the hierarchy, or the *Ecclesia docens*, the teaching Church, and the faithful, or the *Ecclesia discens*, the Church taught, or the hearing Church. JOHN J. KEANE.

Church, ALBERT E., LL. D.: U. S. military officer and mathematician; b. in Salisbury, Conn., in 1807; graduated at West Point in 1828. He served, while lieutenant of artillery, at the Military Academy as assistant professor 1831 and 1833–37, and as acting Professor of Mathematics 1837–38, and in garrison at Newport and Boston harbors 1832–33. He resigned Mar. 13, 1838, and was appointed Professor of Mathematics in the U. S. Military Academy. He was member of several scientific associations and author of valuable mathematical works especially prepared for the use of his cadet pupils, viz.: *Elements of Differential and Integral Calculus* (1842), and of an *Improved Edition Containing the Elements of the Calculus of Variations* (1851); *Elements of Analytical Geometry* (1851); *Elements of Analytical Trigonometry* (1857); and *Elements of Descriptive Geometry, with its Application to Spherical Projections, Shades, and Shadows, Perspective and Isometric Projections* (1865). D. at West Point, N. Y., Mar. 30, 1878.

Revised by JAMES MERCUR.

Church, ALFRED JOHN: professor, translator, commentator, and author; b. in London, Jan. 29, 1829; educated at King's College, London, and at Lincoln College, Oxford, where he took the degree of B. A. in 1851; ordained priest in 1853; Professor of Latin in University College, London, 1880–89. Author (in connection with Rev. W. T. Brodribb) of translations of *Tacitus* (3 vols., 1862–77) and *Livy*, books xxi.–xxv. (1883); editor of *Tacitus, Agricola, and Germania* (1869); Tacitus, *Annals*, vi. (1878); Pliny, *Select Letters* (1869). The works by which Prof. Church is best known are a series of volumes which aim at popularizing the more famous Greek and Latin classics. *Stories from Homer* appeared in 1877, and have been followed by *Stories from Virgil* (1878); *Stories from the Greek Tragedians* (1879); *Stories from the East* (1880); *The Story of the Persian War* (1881); *Stories from Livy* (1882); *Roman Life in the Days of Cicero* (1883); *The Chantry Priest of Barnet* (1884); *With the King at Oxford* (1885); *A Traveler's True Tale, after Lucian* (1879); *The Story of Jerusalem* (1880); *Two Thousand Years Ago; or, The Adventures of a Roman Boy* (1885); *Isis and Thamesis* (1886); *Carthage*, in Putnam's Series of Stories of the Nations (1886); *Stories of the Magicians* (1887); *The Legend of St. Vitalis and other Poems* (1887); *The Count of the Saxon Shore* (1887); *Three Greek Children* (1888); *To the Lions* (1889); *Burning of Rome* (1891); *Pictures of Roman Life and Story* (1892). W. S. PERRY.

Church, FREDERIC EDWIN: landscape-painter; b. in Hartford, Conn., May 4, 1826; pupil of Thomas Cole; National Academician 1849; painted tropical scenery in South America 1853 and 1857; second-class medal, Paris Exposition, 1867. His *The Great Fall—Niagara* (1857) is in the Corcoran Gallery, Washington. D. Apr. 7, 1900. W. A. C.

Church, FREDERICK STUART: genre and animal painter; b. in Grand Rapids, Mich., 1841; pupil of the National Academy and Art Students League, New York; member of the Society of American Artists (1890); National Academician 1885; member American Water-color Society. His

works are generally fantasies representing animals and human figures, original in conception, and notable chiefly for agreeable color schemes; well known as an illustrator. Studio in New York. W. A. C.

Church, Irving Porter: civil engineer; b. at Ansonia, Conn., July 22, 1851; graduated at Cornell University in 1873. From 1876 to 1892 he was assistant and associate Professor of Civil Engineering in Cornell University; in 1892 was appointed Professor of Applied Mechanics in the same institution. He is the author of *Statics and Dynamics for Engineering Students* (1886); *Mechanics of Materials* (1887); *Hydraulics and Pneumatics* (1889), which were issued later in one volume as *Mechanics of Engineering*; and *Notes and Examples in Mechanics* (1892).

Church, John Adams, E. M.: b. in Rochester, N. Y., Apr. 5, 1843; graduated in 1867 at the School of Mines in New York city. After three years of professional travel in Europe, he published in 1871 a pamphlet on *Mining Schools in the United States*, in 1873 *Notes on a Metallurgical Journey in Europe*, and in 1880 *The Comstock Lode*, the material for which was obtained during an examination made for one of the Government surveys. Mr. Church has contributed largely to recent technical literature, and was for two years associate editor of the *Engineering and Mining Journal of New York*. From 1872 to 1874 he filled the chair of mineralogy and metallurgy in the School of Mines, and is now engaged in the active practice of his profession.

Church, Pharcellus, D. D.: b. in Seneca, Ontario co., N. Y., Sept. 11, 1801; educated at Hamilton, N. Y.; pastor of Baptist churches in Poultney, Vt., Providence, R. I., Rochester, N. Y., Boston, Mass.; was for ten years editor of the *Chronicle* (Baptist), New York city, a frequent contributor to other journals, and author of *Philosophy of Benevolence* (New York, 1836); *Religious Dissensions: Their Cause and Cure* (1838); *Antioch, or Increase of Moral Power in the Church* (Boston, 1843); *Memoir of Theodosia Dean* (1850); *Mapleton, or more Work for the Maine Law*, a tale (Montreal, 1853); *Seed Truths, or Bible Views of Mind, Morals, and Religion* (New York, 1870). D. in Tarrytown, N. Y., June 5, 1886.

Church, Sir Richard: a Greek general; b. in Cork, Ireland, in 1784; entered the British army. In the Greek war for independence he commanded the land forces. Afterward he was made a general in the Greek army (1854), and continued to live in Athens a retired but honored life, and there he died Mar. 30, 1873.

Church, Richard William, D. C. L.: dean of St. Paul's, London; b. in Lisbon, Apr. 25, 1815. After a distinguished career at the University of Oxford, proceeded B. A. with first classical honors in 1836, and shortly afterward became fellow of Oriel College. He was appointed dean of St. Paul's, London, Sept. 6, 1871. Of delicate physique and uncertain health, his prospects of preferment were slight, and yet it is understood that he declined the archiepiscopal seat. His administration of St. Paul's brought the great cathedral of London in touch with the people. The ornamentation of St. Paul's was specially furthered through his intelligent taste and judgment. In 1854 he published a volume of essays, two of which on *St. Anselm* were afterward expanded into a *Life of Anselm* (1871). In 1869 he published a volume of *University Sermons on the Relations between Christianity and Civilization*. His other works are as follows: *The Catechetical Lectures of St. Cyril*, translated with notes in the Library of the Fathers; *Essays and Reviews* (1854); *Essays of Montaigne*, in *Oxford Essays* (1855); *Civilization and Religion* (1860); *University Sermons* (1868); *Civilization before and after Christianity* (1872); *On Some Influences of Christianity upon National Character* (1873); *On the Sacred Poetry of Early Religions* (1874); *The Beginning of the Middle Ages* (1877); *Human Life and its Conditions* (1878); *Dante* (1878); *Spenser* and *Bacon* in English Men of Letters (1879). D. in London, Dec. 9, 1890. His posthumous work on *The Oxford Movement* (1891) is of great interest and value. W. S. Perry.

Church, Sanford Elias, LL. D.: jurist; b. in Milford, Otsego co., N. Y., Apr. 18, 1815; studied law and rose to prominence in his profession. He was chosen Lieutenant-Governor of the State of New York in 1850, and again in 1852. In 1857 he was elected comptroller. In May, 1870, he was elected chief judge of the court of appeals of the State of New York, which position he accepted and held till his death. In politics he was a steadfast Democrat. D. in Albion, N. Y., May 14, 1880.

Church-ale: in mediæval England, a merry-making for the purpose of raising church funds; generally held at Whitsuntide and in the churchyard. Large quantities of ale were sold by the churchwardens, and the people indulged in the popular amusements of the time.

Church Calendar: See Calendar, Easter, and Epact.

Church Congress: the title assumed by a voluntary organization of the Church of England associated for the free discussion of great questions pertaining to both Church and state. The first English Church Congress was held Nov. 27–29, 1861, in the hall of King's College, Cambridge. The preface to its *Report of Proceedings*, issued the following year (1862), refers to "the restless attacks, the systematic organization, and the avowed purposes of the opponents of the Church of England, encouraged by the indifference of the apathetic and backed by the support of the irreligious," as awakening churchmen to make an effort for "the preservation of their constitutional rights and privileges." The formation of church defense associations throughout England in 1859, with a central church institution in London, gave rise to a call for "a congress of churchmen." The meeting at Cambridge was the beginning of a series of annual gatherings, which speedily assumed a most important part in the Church revival of the times. The sessions of the Church congresses are now attended by thousands. The leading ecclesiastics and laymen are found among their promoters, and their published reports are a *thesaurus* of Church literature and arguments.

In Oct., 1875, the first congress of the Protestant Episcopal Church in the U. S. was convened in New York. This congress meets only in the years when the General Convention does not convene. Its discussions have been able and full of interest, and its proceedings as reported and issued in volumes have been widely circulated. W. S. Perry.

Church Discipline: the means employed by the Church to maintain her standard of piety and obedience. From her origin to 312 she was constantly exposed to inroads from pretended friends, who really desired to secure her confidence and then betray her to the civil authority, and from enthusiasts and false teachers who honestly tried to adapt her to their strange beliefs. Her membership, being recruited from the lower classes predominantly, were the victims of low tastes and vitiated appetites. To keep herself pure she was obliged to excommunicate grave offenders, and to enjoin more or less prolonged exclusion from her services, especially from the sacrament of the Lord's Supper, upon those who sinned less grievously. But when the parties repented they were generally restored, and the blessing of the Church was seldom refused those who on their death-bed declared their sorrow. The sins most commonly punished were then and are to-day sexual and other irregularities, heresy and schism, sedition and irreverence, denial of Christ and of Christianity. After 313, when the Church was united to the Roman state, discipline relaxed, and wherever Church and state are united there the difficulty of maintaining a high standard in the Church is greatly increased. The advantage of the union was that notorious offenders could be handed over by the Church to the state for punishment. In a later period the Roman Church in this way used the secular authority in the punishment of heresy, thereby securing its cruel extermination in many quarters.

Church Government: See Baptists, Congregationalism, Episcopal Church, Methodism, Presbyterians, etc.

Church History, or **Historical Theology**: one of the four divisions of theological science—viz., exegetical (or biblical), historical, systematic (or philosophical), and practical (homiletical and pastoral) theology. Of these divisions the historical is the most extensive in bulk, and furnishes material to all the rest. In importance it yields only to exegetical theology, which has to do with the interpretation of the Holy Scriptures. Historical theology begins with the creation of man in the image, and for the glory of God, and comes down to the present as its relative goal, but will go on till the general judgment or the final settlement of all the affairs of men. It embraces within these limits all that belongs to the religious development of the race within the line of revelation—the origin, progress, and fortunes of the kingdom of God, and its relations to the kingdoms of this world. Since the fall of man it has assumed the character

of a history of redemption (and is so represented, for instance, by Jonathan Edwards in his well-known popular book). In a narrower sense, Church history is the history of Christianity from the birth of Christ, or, according to others, from the day of Pentecost (A. D. 30), when Christianity first assumed an organized form distinct from Judaism, down to the present time.

CHURCH HISTORY AND SECULAR HISTORY.—These differ as Church and state, as Christianity and humanity, as the order of grace and the order of nature differ. Yet they are inseparably connected and interwoven, and the one can not be understood without the other. Among the Jews the spiritual and secular history together form one history of a theocracy. Both currents intermingle in the old Byzantine empire, in the European states and the Latin Church during the Middle Ages, in the period of the Reformation, during the colonial period of America, and in all countries where Church and state are united. Gibbon's *History of the Decline and Fall of the Roman Empire* is in great part also a history of the rise and progress of Christianity, which survived the fall of Old and New Rome, and went forth to conquer the barbarian conquerors by Christianizing and civilizing them. A history of the papacy is also a history of the Holy Roman empire, and *vice versa*. No history of the sixteenth century can be written without constant reference to the Protestant Reformation and the Roman Catholic reaction. (Compare e. g. Hume, Macaulay, and Burnet for England; Ranke and Janssen for Germany; Motley for Holland.) The Puritan settlements of New England are the beginning alike of the ecclesiastical and secular history of North America. In modern times the tendency is more and more toward separation of the spiritual and temporal, the ecclesiastical and civil powers; nevertheless, the Church will always be more or less influenced by the surrounding state of civil society, and must adapt itself to the wants of the age and progress of events; while, on the other hand, the world will always feel the moral influence, the restraining, ennobling, stimulating, purifying, and sanctifying power of Christianity, which works like a leaven from within upon all ramifications of society.

PERIODS AND EPOCHS.—These represent the different stages in the religious development of the race, and must not be arbitrarily made according to a mechanical scheme (such as the centurial division adhered to by Mosheim), but taken from the actual stops or starting-points (ἐποχή), and circuits (περίοδος) of the history itself. The following are the natural divisions:

A. *Sacred* or *Biblical History*, the history of the Divine revelation from the creation to the close of the apostolic age, running parallel with the Scriptures from Genesis to Revelation. Here we must distinguish the dispensation of the Law and the dispensation of the Gospel, or the history of the Old Testament religion and of that of the New Testament religion.

(*a*) Under the *Old Dispensation*, from the creation down to John the Baptist. Subdivisions: The antediluvian period; the patriarchal period; the Mosaic period (the establishment of the Jewish theocracy); the period of the Jewish monarchy and prophecy; the period of the Babylonian exile; the period of the restoration, the Maccabees, the Roman rule till Herod the Great and down to the destruction of Jerusalem.

(*b*) Under the *New Dispensation*, A. D. 1–100, Christ and the apostles, or primitive and normative Christianity in its divine-human founder and inspired organs. Subdivisions: The preparatory mission of John the Baptist; the life of Christ; the founding of the Church by the apostles; the labors of Peter, Paul, and John. This period connects biblical history with ecclesiastical history and belongs as much to the latter as to the former.

B. *Christian History*, or *Church History* proper, from the close of the apostolic age to modern times. Subdivisions:

(*a*) History of *Ancient* Christianity, embracing the first six centuries to Gregory I. (590): Græco-Latin, patristic, Catholic, the common stock from which the Greek, the Roman, and the Protestant Churches have sprung. Subdivisions: (1) The life of Christ and the apostolic age (1–100; see A *b*); (2) the Ante-Nicene age, or the age of persecution, to Constantine the Great and the Council of Nicæa (325); (3) the Post-Nicene age, or the age of patriarchs, Christian emperors, and œcumenical councils (to 590). Some historians carry the age of ancient Christianity down to Charlemagne, A. D. 800 (so as to include John of Damascus, the last of the Greek Fathers), and the beginning of the German Roman empire and the temporal power of the papacy. In this case we have a fourth subdivision, from Gregory I. to Charlemagne (A. D. 590 to 800). The ancient Church history has its theater in the old Roman empire, around the Mediterranean, among Jews, Greeks, and Romans to the borders of the barbarians.

(*b*) History of *Mediæval* Christianity, from the close of the sixth to the beginning of the sixteenth century, or from Gregory I. (A. D. 590), the first mediæval pope, to Luther, the leader of the Reformation (A. D. 1517). Character: The Greek and Roman Churches, divided, pursue their independent course: the Latin Church extending west among the Celtic and Germanic races, the Greek northeast among the Slavonians (in Russia): conversion of the barbarians of Northern and Western Europe; conflicts with Mohammedanism; the crusades; rise and progress of the papacy in conflict with the holy Roman empire; church architecture; scholastic philosophy and theology; mysticism; the reformatory councils of Pisa, Constance, and Basel; revival of letters; invention of printing; discovery of America; biblical theology; forerunners of Protestantism (Wycliffe in England, Hus in Bohemia, Savonarola in Italy, Wessel in Holland, etc.). Subdivisions: (1) The missionary period of the Middle Ages, from Gregory I. to Hildebrand or Gregory VII. (590 to 1073); (2) the palmy period of the papacy, from Gregory VII. to Boniface VIII. (1073 to 1294); (3) the decay of the mediæval papacy and scholasticism, and the preparation for the Reformation, from Boniface VIII. to Leo X. and Martin Luther (1294–1517).

(*c*) History of *Modern* Christianity, from the Reformation of the sixteenth century to the present time. Protestantism and Romanism; founding of the various evangelical churches, the Lutheran, Calvinistic, Anglican, etc.; progress of Protestantism among the Teutonic races; restoration of Romanism; Jesuitism; Jansenism: Puritanism and Methodism in England; Pietism and the Moravians in Germany; settlements in North America; growth of the Greek Church in Russia, and of the Protestant in the United States; revival and triumph of ultramontane Romanism; conflict of faith with modern rationalism and infidelity; immense activity in theology, literature, missions, and all forms of Christian philanthropy. Subdivisions: (1) The age of the Protestant Reformation and the Roman Catholic counter-reformation or reaction (from 1517 to the Peace of Westphalia, 1648); (2) the age of scholastic and polemic confessionalism in conflict with nonconformity and subjective piety (from the middle of the seventeenth to the French Revolution, 1789); (3) the age of revolution and revival: conflict between Christianity and various forms of skepticism and secularism; progress of missions in all heathen lands; separation of Church and state; development of the voluntary principle; growth of Christian philanthropy; movements toward the reunion of Christendom on the basis of freedom.

SOURCES.—They are mostly written, in part unwritten. The *written* sources include (*a*) the official documents of ecclesiastical and civil authorities, such as acts of councils, creeds, liturgies, hymn-books, church laws, papal bulls and encyclicals; (*b*) the writings of the personal actors in the history, and contemporary observers and reporters, such as the Fathers for ancient Christianity, the Schoolmen for mediæval, the Reformers and their opponents for the Reformation period; (*c*) inscriptions on walls, pictures, churches, tombstones, and other monuments.

The *unwritten* sources are works of Christian art, as churches, chapels, pictures, sculptures, crosses, crucifixes, relics, and other remains which symbolize and embody the spirit of Christianity in different epochs and phases. Thus the Roman catacombs, with their vast extent, their solemn darkness, their labyrinthine mystery, their rude epitaphs and sculptures, their symbols of faith, and their relics of martyrdom, give us a lifelike idea of the Church in the period of persecution, its trials and sufferings, its faith and hope, its simple worship and devoted piety. "He who is thoroughly steeped in the imagery of the catacombs will be nearer to the thoughts of the early Church than he who has learned by heart the most elaborate treatises of Tertullian or Origen." The basilicas are characteristic of the Nicene, the Byzantine churches, of the Byzantine age, the Gothic cathedrals, of the palmy days of the Middle Ages, the Renaissance style, of the revival of letters. Even now most churches and sects can be best appreciated in the localities and in view of the monuments and the people where they originated or have their center of life and action.

Duty of the Historian.—He must (1) master the sources in the original languages in which they were written (Greek, Latin, and the modern languages of Europe); separating the genuine from the spurious, the original from corruptions and interpolations; sifting the truth from falsehood, the facts from fiction and partisan judgment; comparing the accounts of all actors, friend and foe, narrator, eulogist, advocate, and antagonist, whether orthodox or heretic, whether Christian, Jew, or Gentile; aiming in all this laborious investigation at "the truth, the whole truth, and nothing but the truth." (2) He must then reproduce the clearly ascertained facts and results of his investigation in a faithful and lifelike narrative, so as to present the objective course of history itself as it were in a miniature photograph. The genuine writer of history differs as much from the dry chronicler of isolated facts and dates as from the novelist; history has a body and a living soul, and its facts are animated by thoughts and principles. The historian must exhibit both; he must be able to particularize and to generalize, to descend into minute details, and to take a comprehensive bird's-eye view of whole ages and periods. He must have a judicial mind, which deals impartially with all persons and events coming before his tribunal, and is swayed by no consideration but that of strict justice. This aim should be constantly kept in view, although in the limited and imperfect state of our information, and the inability to emancipate one's self from all the influences of education and prevailing opinions and prejudices, we can expect no more than an approximate solution of the difficult task. It is the exclusive privilege of the Divine Mind to view all things *sub specie eternitatis*, to see the end from the beginning. We can only know things consecutively and in fragments. But history is its own best interpreter, and the farther it advances the more we are able to understand and appreciate the past.

Value.—The study of history enables us to understand the present, which is the fruit of the past and the germ of the future. It is the richest storehouse of wisdom and experience. It is the best commentary of Christianity. It is full of comfort and encouragement. It verifies on every page the promise of the Saviour to be with his people always, and to build his Church on the rock against which the gates of hell can not prevail. It exhibits the life and power of Christ in all its forms and phases, and the triumphant march of his kingdom from land to land and generation to generation. Earthly empires, systems of philosophy have their day, human institutions decay, all things of this world bloom and fade away like the grass of the field; but the Christian religion has the dew of perennial youth, survives all changes, makes steady progress from age to age, overcomes all persecution from without and corruption from within, is now stronger and more widely spread than ever before, directs the course of civilization, and bears the hopes of the human race. The history of the world is governed in the interest and for the ultimate triumph of Christian truth and righteousness. The experience of the past is a sure guarantee of the future.

Literature.—(1) Works on *General Church History*; Eusebius (d. 340), *Church History*, from the birth of Christ to Constantine the Great (324). His successors in the Greek Church: Socrates, Sozomen, Theodoret. The *Magdeburg Centuries*, by Matthias Flacius (d. 1575), and other Lutheran divines of Germany (Basel, 1559–74), covering thirteen Christian centuries in as many volumes; the first history from a Protestant point of view in opposition to the claims of Romanism. The *Ecclesiastical Annals* of Cæsar Baronius (d. 1607), in 12 folio volumes, published at Rome, 1588, *sqq.*, to which were added the continuations of Raynaldus, Spondanus, and others—a work of immense learning and industry, but altogether in the interest of the papacy. Tillemont (d. 1698), in his invaluable *Mémoires* (Paris, 1693–1712, 16 vols.), wrote the history of the first six centuries from the sources, in biographical style and in the spirit of the more liberal Gallican Catholicism. Gottfried Arnold (d. 1714), of the Pietistic school of Spener, in his *Impartial History of the Church and of Heretics to A. D. 1688* (Frankfort, 1699, *sqq.*, 4 vols. fol.), advocated the interests of practical piety and the claims of heretics and schismatics and all who suffered persecution from an intolerant hierarchy and orthodoxy. J. L. Mosheim (d. 1755) wrote his *Institutes of Ecclesiastical History* (in Latin, Helmstädt, 1755, and often since in several translations) in the spirit of a moderate Lutheran orthodoxy, with solid learning and impartiality, in clear style, after the centurial arrangement of Flacius, and furnished a convenient text-book which (in Murdock's and Stubbs's editions) has continued in use in England and America even to this day. Schroeckh's *Christian Church History* (Leipzig, 1768–1810, in 45 vols.) is a far more extensive and far less readable work, but invaluable for reference, full of reliable information from the sources; it forsakes the mechanical centurial division, and substitutes for it the periodic arrangement. Henke (d. 1809) followed with a thoroughly rationalistic work in nine volumes (1788–1810). Neander (Professor of Church History in Berlin, d. 1850) marks an epoch in this branch of theological literature, and by his truly Christian, conscientious, impartial, truth-loving, just, liberal, and withal thoroughly learned and profound spirit and method, he earned the title of "father of Church history." His *General History of the Christian Religion and Church* (Hamburg, 1825–52, 11 vols.), though incomplete (it stops with the Council of Basel, 1430) and somewhat diffuse and monotonous in style, is an immortal monument of genius and learning; it pays special attention to the development of Christian life and doctrine, and is edifying as well as instructive. It has been naturalized in England and America by the translation of Prof. Torrey (Boston, 1847–52, 5 vols.; 12th ed. 1872), and will long be studied with profit, although the first volume is superseded by recent discoveries. Equally valuable, though of an altogether different plan and spirit, is the *Church History* of Gieseler (Bonn, 1824–56), translated from the German first by Cunningham in Philadelphia (1846), then by Davidson and Hull in England, and revised and completed by H. B. Smith, of New York (1857–80, 5 vols.). The text is a meager skeleton of facts and dates, except in the last volume, but the body of the work consists of carefully selected extracts and proof-texts from the sources, which furnish the data for independent judgment. Baur's *Church History* (partly published after his death, Tübingen, 1861, in 5 vols.; Eng. trans. of the history of the first three centuries, London, 1878–79, 2 vols.; the original goes down to 1848) is distinguished for philosophic grasp, critical combinations, and bold conjectures, especially in the treatment of the ancient heresies and systems of doctrine. Hagenbach's *Church History*, down to the nineteenth century (Leipzig, 1869–72, 7 vols.; revised ed. by Nippold, vols. i.–iii., 1885–87), is a clear digest of the vast material for the lay reader. Hase's *Lectures on Church History* (Leipzig, 1885–92, in 3 parts, the last edited by Dr. G. Krüger) are an expansion of his admirable manual, and bring the history down to the *Culturkampf* and the settlement between Bismarck and Leo XIII. in a liberal spirit, and clear and elegant style.

Of English Church historians, Waddington represents the general history in six volumes to the Reformation, inclusive (1835, *sqq.*); Robertson in four (1854–73) to the close of the Middle Ages (new ed. in 8 vols., 1873–75). The older work of Milner (d. 1797) is written in popular style for edification.

Schaff's *History of the Christian Church* (New York, 5th ed. revised and enlarged, 1890–92, 7 vols.) is the first general Church history prepared on American soil, but not yet completed (a volume is in course of preparation).

Of the numerous compends of Church history in one or more volumes, we mention those of Döllinger, Möhler, Ritter, Alzog, Hergenröther, Funk, among Roman Catholics; Hase, Niedner, Guericke, Kurtz (12th ed.), Herzog, Möller, Karl Müller, George P. Fisher (1888, the best summary for English readers), and J. F. Hurst (1893), among Protestants.

(2) Works on *special departments* of Church history. On Old Testament history: Milman (*History of the Jews*), Ewald (*History of Israel*, 7 vols., translated by Russell Martineau), Stanley (*History of the Jewish Church*). Life of Christ: Neander (German and English), Lange (German and English, 6 vols.), Pressensé (French and English), Ellicott, Andrews, Ewald, Strauss (mythical theory), Renan (legendary theory), Keim, Weiss, Beyschlag, Farrar, Geikie, Edersheim. History of the Apostolic Church from A. D. 30 to 100: Neander, Thiersch, Lechler, Weizsäcker, Schaff, Conybeare and Howson, Lewin, and Farrar (on St. Paul). History of Christian Doctrines, or Dogmatic History: Petavius (R. C.), Münscher, Baumgarten Crusius (2 vols.), Hagenbach (translated by Buch, revised by H. B. Smith, New York, 1861, 2 vols.; 6th German ed. revised by Benrath), Neander (1 vol., posthumous), Baur (Leipzig, 1867, posthumous, 3 vols.; also a compend in 1 vol.), Shedd (New York, 1863, 2 vols.), Beck, Schwane, Bach (R. C.). The most recent work which makes an epoch is Harnack's *Dogmengeschichte* (2d ed. Freiburg im Br., 1890) in three volumes (also a compendium, 1891; 2d

ed. 1893; Eng. trans. by E. K. Mitchell, *Outlines of the History of Dogma*, New York, 1893). Loofs, *Leitfaden der Dogmengeschichte* (Leipzig, 2d ed. 1890; a third in press, 1893). *History of Protestant Theology*, by Dorner (Munich, 1867; also in English, Edinburgh, 1871, 2 vols.); *History of Roman Catholic Theology since the Council of Trent*, by Werner (Munich, 1866). History of special doctrines: Baur on the *Trinity and Incarnation* (3 vols.), on the *Atonement* (1 vol.); Dorner on *Christology* (2 vols.; also in English, Edinburgh, 1861–63, 5 vols.); Ebrard on the *Lord's Supper*; Ritschl on *Justification and the Atonement* (Bonn, 3d ed. 1870–74; 3 vols., the first is historical). History of Councils: Mansi, Hardouin, Walch, Fuchs, Hefele. Hefele's *History of the Councils*, continued by Hergenröther and others, is a complete Church history down to the Council of Trent from the Roman Catholic standpoint. History of Church Polity: Planck, Ritschl, Sugenheim, Greenwood. History of Missions: Blumhardt, Wiggers, and numerous monographs. Patrology and Patristics: the Benedictine editions, and large collections of the works of the Fathers by Gallandi, Migne, etc. English translations in the Ante-Nicene, Nicene, and Post-Nicene Libraries, ed. the first by Bishop Coxe, the second by Dr. Schaff, the third by Schaff and Wace, and published by the Christian Literature Company (New York, 1888, *sqq.*), making in all when completed thirty-five volumes. The biographical and literary works on the Fathers, by Tillemont, Du Pin, Ceillier, Cave, Lumper, Möhler, Fessler, Alzog, Böhringer, Farrar, Smith and Wace (*Dictionary of Christian Biography of the First Eight Centuries*, 4 vols., invaluable). Separate biographies of Tertullian and Chrysostom, by Neander; Justin Martyr, by Semisch and Engelhard; Origen, by Redepennig and Thomasius; Augustine, by Bindemann and Reuter; Jerome, by Zöckler. Ecclesiastical Antiquities, by Bingham, Augusti, Siegel, Smith and Cheetham (*Dictionary of Christian Antiquities*). On Ancient Christianity: Mosheim, Milman, Schaff, Pressensé. *History of the Greek* (*Eastern*) *Church*, by Dean Stanley (London and New York, 1862); *History of Latin Christianity*, by Dean Milman (to the pontificate of Nicholas V., London and New York, 1860, *sqq.*); *History of the Crusades*, by Michaud, Wilkin, Spittler, Kugler. The Papacy: Walch, Planck, Spittler, Greenwood (*Cathedra Petri*), Riddle, Bauer, Wylie; also many monographs on single popes, as Voight on Gregory VII., Hurter on Innocent III. (4 vols.), Reuter on Alexander III. (3 vols.). On the papacy of the Reformation period: Creighton, Pastor. Scholasticism and Mysticism of the Middle Ages: Stöckl (*History of the Philosophy of the Middle Ages*, Mayence, 1864, *sqq.*, 3 vols.); Görres (*History of Christian Mysticism*, 1836–42, 4 vols.); and the monographs of Hasse, Dean Church, and Rule on Anselm of Canterbury, Werner and Vaughan on Thomas Aquinas, Neander, Morison, and Storrs on St. Bernard, Christlieb on Scotus Erigena, Liebner on Hugo of St. Victor. History of Monasticism: Spittler, Münch, Döring, Montalembert, and especially the colossal biographical work of the Jesuits, *Acta Sanctorum* (for every day in the year). Forerunners of the Reformation: Ullmann on the *Reformers before the Reformation* (2 vols., Hamburg, 1841); Vaughan on John Wycliffe (London, 1854); Lechler on Wycliffe (Leipzig, 1873, 2 vols.; Eng. trans. of vol. i., the life of Wycliffe by Lorimer, n. ed. London, 1884); Helfert and Gillett on Hus and Jerome of Prague; Meier, Rudelbach, Perrens, Madden, especially Villari, on Savonarola; Müller and Drummond on Erasmus; Strauss on Ulrich von Hutten; Seebohm on *The Oxford Reformers, John Colet, Erasmus, and Thomas More* (London, 1869); Voight, Burkhardt, Symonds, Geiger, Schaff, on the *Renaissance. History of the Reformation*, by Marheineke, Neudecker, Ranke, Merle d'Aubigné, Döllinger (R. C.), Fisher (New York, 1873), Kahnis (1873), Bezold (1890); not to mention the numerous monographs on the Reformers and the Luther and Zwingli literature of 1883. On the English Reformation in particular: Strype (*Ecclesiastical Memorials and Annals of the Reformation*; also his *Memorials of Cranmer, Parker, Grindal, Whitgift*, etc.), Burnet, Collier (non-juror), Dodd (R. C.), Cardwell, Fuller, Soames, Froude (from the fall of Wolsey to the death of Elizabeth), Perry, Geikie, etc. On the Reformation in Scotland: Buchanan (*Rerum Scoticarum Historia*), J. Knox (till 1567), Calderwood, Robertson, M'Crie (*Life of John Knox*), Hetherington, Rudloff, Stanley, Cunningham. American Church history will be written in denominations by a number of scholars under the auspices of the American Society of Church History, according to a uniform plan adopted at its fourth annual session in Washington, 1891, and will be published in ten or more volumes as they are ready (beginning in 1893).

PHILIP SCHAFF.

Churchill, or **Missiunip'pi**: a river of the Dominion of Canada; rises in a lake near lon. 109° W. It flows nearly northeastward, passes through Nelson's Lake, and enters Hudson's Bay in lat. 59° N. Length estimated at 800 miles.

Churchill, CHARLES: poet and satirist; b. in Westminster, London, in Feb., 1731. He was a fellow-student and friend of the poet Cowper. Although he had a strong aversion to the clerical profession, he was ordained as a priest in 1756. In 1758 he succeeded his father as curate at St. John's, Westminster. His parishioners were scandalized by his dissipated and licentious habits, and by his negligence of his duties. He produced in 1761 *The Rosciad*, a witty satire on theatrical managers and performers, which was very successful. About this time he resigned his curacy and quitted the profession of clergyman. He defended himself against certain critics by a poem entitled *The Apology*. He was an intimate friend of John Wilkes, whom he assisted in the *North Briton*. In 1763 he published *The Prophecy of Famine*, a satire on the Scotch. Among his other works are *The Conference*, *Gotham*, and *The Author*. D. in Boulogne, France, during a visit, Nov. 4, 1764. See Tooke, *Life of Churchill*, and Macaulay's essay entitled *Charles Churchill* (1845). Revised by H. A. BEERS.

Churchill, JOHN WESLEY, A. M.: instructor in elocution and author; b. in Fairlee, Vt., May 26, 1839; educated at Phillips Academy, Andover, Mass., at Harvard College, graduating in 1865, and at Andover Theological Seminary, graduating in 1868 and being ordained to the ministry. In 1869 he was inaugurated Jones Professor of Pulpit Delivery in Andover Theological Seminary; was instructor in Elocution in Phillips Academy, Andover, from 1867 till his death; in Abbot Academy, Andover, 1867–92; in Wellesley College three years; in Smith College five years; in Mt. Holyoke Seminary five years; in Harvard University divinity school since 1890. He was a trustee of Abbot Academy and an associate editor of the *Andover Review*; contributed to periodical literature articles chiefly of a biographical nature. He received the degree of A. M. from Harvard University. D. at Andover, Mass., Apr. 13, 1900.

Churchill, Lord RANDOLPH HENRY SPENCER, M. P.: English statesman; b. Feb. 13, 1849; the son of the Duke of Marlborough and his wife, Lady Frances Anne Emily, daughter of the Marquis of Londonderry; educated at Merton College, Oxford; represented Woodstock in Parliament Feb., 1874, to Nov., 1885; after 1880 he became conspicuous in the House of Commons by his attacks on the Liberal party, and was the leader of the so-called Fourth party; Secretary of State for India in Lord Salisbury's government 1885; Chancellor of the Exchequer and leader of the House of Commons in Lord Salisbury's second administration 1886, but resigned in December, and was returned to Parliament from Paddington. He was regarded at one time as the coming Tory leader and successor to Lord Beaconsfield. In 1892 he traveled in Southeast Africa as correspondent of a London newspaper. Lord Churchill married in 1874 Miss Jennie Jerome, of New York. D. Jan. 24, 1895.

Churching of Women: the public thanksgiving in church by young mothers, both for their motherhood and their recovery from the perils of childbirth. In former days the practice was usual, if not obligatory, although no formularies for the service have come down to us from ancient times. It imitated doubtless the Mosaic regulation (Lev. xii.): and, as child-bearing defiled, the woman was not to be churched till forty days after her parturition.

Church Jurisdiction: established by Constantine the Great in 331. This, such as it was, did not simply mean that the Church should exercise jurisdiction in all ecclesiastical affairs, but actually meant an absorption by the Church of the jurisdiction of the state also in civil affairs. St. Paul had admonished the Christians not to bring their cases before unbelieving judges, and thus arose a practice which was legalized by Constantine. When, however, the court and the judges had become Christian, there was no reason for so extensive a Church jurisdiction, and the state immediately began to conquer back its old rights, confining the Church jurisdiction to purely spiritual affairs. But the contest was long and fierce, and is by no means ended as yet in certain countries of Europe. A striking exposition of the

extensive claims which the pope made, and of the opposition he met with already in the times of the Council of Constance, may be found in Gerson's *De potestate ecclesiastica*, written during the sessions of the council. (See KULTURKAMPF, *Falk Laws*, *Ferry Laws*). In the U. S. the jurisdiction of a religious body is confined to those who voluntarily submit to it. Ecclesiastical penalties, when they are simply of a spiritual nature, can be enforced without interference of the civil power. If, however, one is injured either pecuniarily or by loss of standing in the community, the civil courts will require that the Church laws obtaining in the case be enforced to the letter and not beyond. Revised by W. S. PERRY.

Church Methodists, or **Primitive Wesleyans**: See METHODISM.

Church of England: See ENGLAND, CHURCH OF.

Church of God: a body of Christians first organized at Harrisburg, Pa., in 1830, by the converts and followers of John Winebrenner, formerly a minister of the German Reformed Church. Its doctrines are a belief in the Bible as the authoritative revelation of God; also in the Trinity, in human depravity, the vicarious atonement, and the freedom of the will (rejecting the Calvinistic doctrine of election). It recognizes adult immersion as the only baptism, and administers the Lord's Supper to all Christians who desire it. Literal washing of the feet is practiced as one of the ordinances of the Church. It holds that the Lord's Supper should be administered in a sitting posture and always in the evening. In all other respects the Church of God agrees with other evangelical Christian Churches. The congregations of this denomination are in part independent in Church government, but are united into "elderships," which are again joined into one "general eldership," which owns the church property. The ministry is itinerant, and under the appointment of the elders. The Church has several newspapers, and a college at Findlay, O. According to the census of 1890, they comprise 479 societies with 22,511 members, and hold church property valued at $643,185. They are strongest in Pennsylvania and the Ohio valley.

Church of Scotland: See the article SCOTLAND, CHURCH OF.

Church of Scotland, Free: See FREE CHURCH OF SCOTLAND.

Church Rates: a tax, as the name implies, formerly levied upon the occupiers of houses or lands, or both, in an English or Irish parish for the incidental expenses of service in the parish church, apart from the priest's salary, but including repairs of the building. The rate was resolved upon at a regularly called vestry meeting. By 31 and 32 Victoria, c. 109, passed in 1868, its payment was made voluntary in England, and when the Church of Ireland was disestablished, rates also ceased in that country. When rates began to be exacted is not known. There is nothing improbable in the supposition that the repair of the parish church and other similar expenses were at first voluntarily assumed by the well-to-do or devoted members of the parish, but after a time when zeal declined the churches were in great danger of decay. So their maintenance and repair became a matter of obligation. The manifest injustice of compelling persons who not only did not attend the parish church, but belonged to rival or hostile communions, to pay perhaps large amounts for the adornment or repair of the parish church gradually impressed the conscience of the English people, who in overwhelming numbers belong to the established church. The legislation alluded to has decreased the amount of money at the disposal of the CHURCHWARDENS (*q. v.*), and correspondingly decreased the importance and perhaps attractiveness of that office. The incidental advantage probably is that the money raised by voluntary contributions is more wisely and economically expended. Doubtless many ardent churchmen considered the abolition of compulsory rates as an entering wedge to the disestablishment of the Church of England. But the two events may not really be so closely connected. S. M. J.

Church Temperance Society: See the Appendix.

Churchwardens: in the Anglican and the Protestant Episcopal Churches, officers whose duty is to protect the church edifice, to superintend the performance of public worship, and maintain order during service. There are generally two in each parish. In some dioceses they are appointed by the clergymen, and in others are chosen by the parishioners. Their assistants are sometimes called questmen. They appear to be the representatives in modern times of the *seniores ecclesiastici* of whom mention is made by St. Augustine and others. These *seniores ecclesiæ* formed a lay council of the bishops, giving advice and assistance in the weighty matters of church discipline or order. The *seniores ecclesiastici* seem to have had charge of the utensils, treasure, and outward affairs of the church, and their office and duties corresponded closely with those of churchwardens. In the U. S. in most dioceses the rector, churchwardens, and vestrymen form the legal corporation of a parish. W. S. P.

Churchyard, THOMAS: b. in Shrewsbury, England, in 1520; was a prolific author of prose and verse in the early part of Queen Elizabeth's reign. He was at first a servant of the Earl of Surrey, and afterward a soldier. Some of his works have been from time to time reprinted, more for the pleasure of bibliophiles than on account of any great merit. His *Worthiness of Wales* (1587), *Chips Concerning Scotland*, and *Legende of Jane Shore* are the best known of his works. D. in 1604. Revised by H. A. BEERS.

Churn: an apparatus for agitating cream so as to make the fat-globules unite to form butter. There is a great variety in the forms of churns. The plunge churn is one of the oldest and simplest forms. In the box churn the agitation of the cream is brought about by dashers revolving on a spindle, which passes through the center of the box. In revolving churns the barrel containing the cream is supported at both ends, and made to rotate by means of a handle; or it may hang from two points on the sides and be made to turn over and over. In churns constructed and used in this way the action may be greatly increased by the use of internal dashers. In the swinging churn a long box is hung by four chains and swung back and forth. Horse-power is often used in the working of churns in large dairies. See BUTTER.

Churubus'co: a village or hamlet of Mexico; on the Rio de Churubusco; about 6 miles S. of the city of Mexico (see map of Mexico, ref. 7–G); the scene of a battle, Aug. 20, 1847, between the U. S. forces under Gen. Winfield Scott, marching on the city of Mexico, and the Mexicans, defending the approaches to their capital, under President Santa Anna. The battle of Contreras was fought on the same day, and in both instances victory remained with the U. S. troops. Three thousand prisoners were taken; 4,000 were killed or wounded, and 37 pieces of ordnance were captured, while the U. S. loss was only 1,053 in killed and wounded.

Chusan' (i. e. Boat Island): an island near the east coast of China; province of Cheh-kiang; about 45 miles N. E. of Ningpo. It is the principal one of a group of islands known as the Chusan Archipelago (see map of China, ref. 6–L). It is nearly 50 miles in circumference, and is mountainous, but mostly fertile and well cultivated. Population estimated at over 200,000. The products of the soil are tea, rice, cotton, tobacco, etc. The camphor-tree and bamboo flourish here. The climate is pleasant and healthful. Tinghai, the capital, was taken by the British in July, 1840, and again in Oct., 1841, but it was restored to the Chinese at the end of the war. It has a secure harbor, and is famous for its carved and silver work. A mile to the E. of Chusan lies the island of Pu-to, a sacred resort occupied by Buddhist temples and monasteries of great wealth and magnificence. Kwan-yin, the Chinese Goddess of Mercy, is said to have resided here for nine years. No woman is allowed to set foot on Pu-to, and no living thing is permitted to be killed on it. R. L.

Chu'tia (or *Cho'ta*) **Nag'pur**: a division of Bengal, British India; comprising 4 districts and 7 tributary states, and occupying the southwestern quarter of Bengal. The British district has an area of 26,941 sq. miles, and a population of 4,645,590 (1891). A large part of this district occupies a plateau averaging 2,000 feet in elevation, containing much forest and jungle. Coal exists in large quantities, and considerable placer gold has been found. Two-thirds of the population are Hindu, the remainder largely aboriginal tribes. The tributary states have an area of 16,054 sq. miles, and a population of about 700,000. They form what is called the Southwest Frontier Agency. These states are mountainous, little cultivated, and inhabited for the most part by wild aboriginal tribes. They contain no towns and only three villages of more than 1,000 inhabitants. M. W. H.

Chutney, or **Chutny**: a stimulating condiment used to a great extent in India, and to a considerable extent in Great Britain and the U. S. Chutney is a mixture composed of capsicum, tamarinds, raisins, mangoes, ginger-root, garlic, lime-juice or vinegar, etc.

Chwalynsk', or **Khvalynsk**: a town of Russia; government of Saratof; a river-port on the Volga (see map of Russia, ref. 8–G). It has various manufactures and large fruit gardens. Pop. 18,000.

Chyle, kīl [from Gr. *χυλός*, juice]: the liquid product of digestion, found in the upper part of the small intestines, and absorbed by the lacteals and the veins and conveyed by the circulation to the various tissues and organs. The food after its complete digestion in the stomach is converted into a yellowish more or less liquid mass known as the chyme. This passes into the duodenum, and is there acted upon by the pancreatic secretion and bile which complete the digestion of the starches and proteids and emulsify the fatty foods. An opaque yellowish-white liquid known as chyle is the result. The chyle is found in the thoracic duct as an oily liquid of greater or less turbidity, which under the microscope shows oil droplets and a small proportion of white blood-corpuscles. From the thoracic duct the chyle passes into the veins, and is thus carried to the tissues, mingled with the blood. Occasionally dilatation of the lacteal vessels leads to rupture, and chyle escapes into the peritoneal cavity (chylous ascites). W. P.

Chyme, kīm [from Gr. *χυμός*, juice. The differentiation in meaning between *χυλός* and *χυμός* appears first in Galen; *χυμός*, juice in raw or natural state, *χυλός*, juice produced by decoction]: the food after the process of stomach-digestion, and before the action of the intestinal juice, bile, and pancreatic fluids has taken place upon it. The name is now not much used, but it is a convenient term, and as such deserves to be retained. Chyme consists of the peptones and the starchy, saccharine, and fatty elements of food, mingled with certain residual matters which are not useful as food, but which, with other waste products, are ultimately expelled directly from the alimentary canal. See DIGESTION.
Revised by WILLIAM PEPPER.

Chyträus, *chĕĕ-tray'oos*, or **Chytræus**, DAVID KOCHHAFF: one of the most influential Lutheran theologians of the second half of the sixteenth century; b. at Ingelfingen, Swabia, Feb. 26, 1530; Professor of Theology at Rostock, and a participant in various religious conferences. He was one of the framers of the *Formula Concordiæ* from 1550, and the chief author of the classical Austrian Lutheran Liturgy of 1571. D. in Rostock, June 25, 1600. See his biography by T. Pressel (Elberfeld, 1863) and by O. Krabbe (Rostock, 1870).
Revised by HENRY E. JACOBS.

Cialdini, *chĕĕ-ăăl-dee'nĕĕ*, ENRICO: general; b. in Modena, Italy, Aug. 10, 1811. Having engaged in the insurrection of 1831, he fled to France; entered the Spanish army in 1835; fought in several campaigns against the Carlists. In 1848 he returned to Italy, and joined the Italian patriots in the war against Austria. He served Victor Emmanuel as a general of a division in the Crimean war (1854–55). In June, 1859, he commanded with success against the Austrians at Palestro. He defeated the papal Gen. Lamoricière at Castelfidardo in 1860, and besieged Gaeta, which he took in Feb., 1861; was created Duke of Gaeta; governor of Naples, where in 1862 he resisted Garibaldi's second military expedition to Sicily. He became a senator of Italy in 1864, commanded one of the armies operating against Austria in 1866, and was appointed chief of the royal staff in the same year. In Oct., 1867, he was requested by the king to form a cabinet after the resignation of Ratazzi, but without success. He withdrew from the army, and opposed the ministry of Lanzi. He accompanied Amadeo as ambassador extraordinary to Madrid. He was ambassador to France from 1876 to 1881; received appointment as one of the two generals in the Italian army. D. Sept. 9, 1892.

Ciampelli, *chĕĕ-ăăm-pel'lĕĕ*, AGOSTINO: b. 1578; d. 1640; a Florentine painter; pupil of Santo Tito; worked for Clement VIII. in the Vatican, S. John Lateran, and the Church of the Gesú: was made superintendent of the works at St. Peter's.

Cianca, *see-ăăn'-zăă*, ANDRES, de: Spanish judge; b. at Peñaficl, diocese of Palencia, about 1500. In 1546 he went with Gasca to Peru, and soon after took a seat in the royal audience, of which he became president. He was one of the judges who condemned Gonzalo Pizarro and Francisco Carvajal to death in Apr., 1548. After the departure of Gasca (1550), Cianca governed Peru as president of the audience until the arrival of Mendoza, Sept., 1551. Nothing is known of his subsequent career. H. H. S.

Cib'ber, COLLEY: dramatist and actor of Danish extraction; b. in London, England, Nov. 6, 1671. His father was a sculptor of merit. He began to act comedies in 1689, and married a Miss Shore in 1693. In 1695 he produced a play called *Love's Last Shift, or the Fool in Fashion*, which was successful. He also wrote *The Careless Husband* (1704); *The Non-juror* (1717); and *An Apology for the Life of Colley Cibber*, an amusing work, of which an edition was published in 1888. Most of his theatrical life was passed in connection with Drury Lane theater, of which he was one of the managers. In 1730 he was appointed poet laureate. D. Dec. 11, 1757. Notwithstanding the reputation for stupidity which Pope's *Dunciad* has conferred upon Cibber, there is no doubt that he was in reality one of the most brilliant writers of that brilliant age. His morals, however, were not of the purest.—His son THEOPHILUS (1705–58) was an actor, an author, and a writer of repute, and husband of Susanna Maria Cibber, a celebrated actress.

Cib'ol: a plant of the onion or garlic genus; the *Allium fistulosum*; an Asiatic plant, much cultivated in parts of Europe for its tops, which are tubular, somewhat like those of the onion. It stands in the ground all winter, growing from year to year without replanting. The name is also sometimes given to the SHALLOT (*q. v.*).

Cibola: See ZUÑIAN INDIANS.

Ci'bolo: a river of Texas; rises in Kendal County, flows southeastward, and enters the San Antonio near Helena. Entire length about 110 miles.

Ciborium [from Gr. *κιβώριον*, a cup-shaped seed-vessel, a drinking cup. False association with Latin *cibus*, food, probably directed the eccles. use of the term]: in the Roman Catholic Church a variety of the pyx, or vessel used to contain the consecrated host. The ciborium is of gold or silver, and its cover is frequently surmounted by a cross. The name is also given to a canopy over the altar, sustained by four columns, to which the pyx, in the form of a dove, was suspended by chains.

Cibrario, *chĕĕ-braa'rĕĕ-ō*, LUIGI: historian; b. in Turin, Italy, Feb. 23, 1802. He published, besides other works, *Economia Politica del Medio Evo* (1839); a *History of the Monarchy of Savoy* (1840); and a *History of Turin* (1847), besides numismatic and antiquarian treatises. He was made a senator of Sardinia in 1848. Became Minister of Public Instruction in 1852, and Minister of Foreign Affairs in 1855. D. Oct. 1, 1870.

Cica'da: the Latin name of a well-known European insect, called also **Cica'la**, which gives its name to a genus of *Hemiptera* noted for the shrill noise which they make. The cicada of the ancient classic poets, admired for its shrill song, is the common species (*Cicada orni*) of Southern Europe. Their organ of sound is situated on each side of the under and anterior part of the abdomen. Cicadas abound in tropical and sub-tropical regions. They mostly have transparent and veined wing-covers. There are several species of cicada in the U. S., commonly termed locusts or harvest-flies. The most remarkable is the "seventeen-year locust" (*Cicada septemdecim*), a species abundant at times in portions of the U. S. to the E. of the great plains. There are two races, one essentially northern in its distribution and appearing at intervals of seventeen years, the other practically southern, and with a period of thirteen years. There are several broods of each, so that while the periodical cicadas are at no time found continuously over the entire area which they inhabit, yet, with rare exceptions, each year is somewhere a cicada year. The eggs of the cicada are deposited in little grooves cut by the ovipositor in the outermost twigs of various trees, and hatch in about six weeks. Almost immediately after liberation the active young leap from the boughs, and, falling to the ground, burrow into the earth, where the greater part of their lives is to be passed. Here they live for nearly thirteen or seventeen years, as the case may be, at depths of from 2 to 20 feet, feeding upon the roots of trees or herbaceous plants. They extract the sap by means of the long, sharp-pointed beak; also, it is said, obtaining nourishment from the moist earth by means of certain capillary hairs at the tip of the proboscis. Having passed through the long period of underground existence, during which the growing larvæ shed their skins many

times, the cicadas tunnel upward, issue from the ground by countless thousands, climb the nearest tree, shed their skin for the last time, and emerge as perfectly formed insects. The freshly formed cicadas are at first soft and creamy white, but a few hours exposure to the air suffices for them to harden and assume the colors of the adult. The ascent takes place about the last of May, a little earlier or later according to locality, and between sunset and midnight.

F. A. Lucas.

Cicatrization [from Lat. *cica'trix*, scar]: the process by which wounds or other destructive processes are repaired. A dense, fibrous tissue takes the place of the lost tissues, and has a great tendency to contract and produce puckering. Scars of the skin are found to lack the glands and other structures of normal skin, and frequently present a white, shining appearance from their density. The cicatrix of burns and scalds has often a remarkable tendency to contract and distort the neighboring surface.

William Pepper.

Ciccione, chit-chi-ō'nāy, Andrea: d. 1445; sculptor and architect of Naples; pupil of the younger Masuccio. His best work is the mausoleum of King Ladislas at Carbonara.

Cic'ely: originally and properly the *Myrrhis odorata*, a sweet-scented plant of the family *Umbelliferæ*, native of Europe and Western Asia. It is also known as myrrh, but it is not the true Myrrh (*q. v.*). It bears small white flowers in terminal compound umbels. It was formerly used as a pot-herb, and is still used in Italy in making salads. In the U. S. species of *Osmorrhiza* are called sweet cicely.

Cic'er: a genus of plants of the Bean family (*Papilionaceæ*) related to the peas and vetches, from which it differs in having toothed leaflets, and in having a terminal leaflet instead of a tendril. *C. arietinum*, the chick-pea or coffee-pea, is grown for its seeds.

C. E. B.

Cicero, sis'e-rō, Mar'cus Tul'lius: Roman orator, author, and statesman; b. at Arpinum (now Arpino), about 70 miles E. S. E. of Rome, on Jan. 3, 106 B. C. He is often called Tully by English writers. The significance of the surname *Cicero* is unknown. He was liberally educated by his father, an opulent *eques* of the same name; was a pupil of Archias, the Greek poet, and learned to speak Greek fluently. He also became deeply versed in Greek literature and philosophy. His disposition was genial and amiable, his habits temperate and exemplary. In the year 90 B. C. he assumed the manly gown (*toga virilis*), and began to study law under Mucius Scævola the Augur, who was a jurist of great eminence. In his early youth he wrote *Pontios Glaukos* and other poems, among them a translation of the *Phainomena* of Aratus, of which fragments are extant. According to Plutarch, "he was regarded as the best poet, as well as the greatest orator, in Rome." He passed through a course of discipline in rhetoric and elocution, studied logic under Diodotus the Stoic, rhetoric under Molo of Rhodes, attended the lectures of the Greek philosopher Philo, and neglected no mental exercise, however arduous. At the age of twenty-five he began to plead in the Forum, and, according to the custom of Roman advocates, his services were always gratuitous. About the year 80 he defended Roscius Amerinus with courage and success when he was prosecuted for a capital crime by an agent or favorite of Sulla, then dictator, the fear of whose enmity deterred the other advocates from pleading for the defendant.

His constitution was naturally delicate, and his physical condition was such that his friends advised him to abandon the bar or to improve his health by travel. In 79 B. C. he departed from Rome and went to Athens, where he passed about six months, and studied philosophy with Antiochus of Ascalon and Zeno the Epicurean, and rhetoric with Demetrius Syrus. He there formed an intimate friendship with the celebrated Titus Pomponius Atticus. He afterward extended his travels through Asia Minor, and returned to Rome in 77 with a great improvement in his lungs, voice, and constitution. About this time, perhaps as early as 79, he married an heiress named Terentia.

In 75 B. C. he obtained the office of quæstor, the first step in the gradation of public honors, and it was decided by lot that he should perform the duties of quæstor in Sicily. The integrity, moderation, and humanity of his official conduct excited general admiration among the people of Sicily. He returned to Rome in the year 74, and soon rose to the foremost rank in his profession. His chief forensic rival was Hortensius. Cicero excelled in sarcasm and witticisms, with which he often seasoned and enlivened his orations and arguments. No advocate had greater power over the feelings and sympathies of his auditors. It was his habitual practice to act as counsel for the defense in criminal trials, but he deviated from this rule in the case of Gaius Verres, who was prosecuted by the Sicilians in 70 B. C. for nefarious acts of cruelty and rapine. Only two of his admirable orations against Verres (the *Divinatio* and *Actio Prima*) were actually spoken in court, for the evidence against the accused was so convincing that his counsel declined to plead, and Verres went into exile before the decision of the cause. Cicero was elected ædile in 69 B. C. by a majority of the voters of every tribe, and in that capacity had the charge of the temples and public edifices. Having offered himself in 67 as a candidate for the office of prætor, which was the next in the ascending scale of public honor, he was elected first *prætor urbanus* by the suffrages of all the centuries. In this magistracy he had to preside as judge over the highest civil court. According to Plutarch, "he acted with great integrity and honor as president in the courts of justice." During his term of office, in 66 B. C., as prætor he made an important political oration for the Manilian Law (*De Imperii Cn. Pompei*), the object of which was to appoint Pompey commander-in-chief in the war against Mithridates the Great.

After the expiration of his term of office (which was one year) he prepared to compete for the consulship, and offered himself as a candidate in 64 B. C. Catiline was one of the defeated candidates in this election, which resulted in the choice of Cicero and C. Antonius. Cicero entered upon the office on Jan. 1, 63, at a time when the republic was in a critical condition in consequence of the prevalence of corruption, sedition, and treasonable designs. He succeeded in forming a political alliance between the senate and the *equites* or knights, and by this wise policy promoted the cause of liberty and order. "He was," says Middleton, "the only man in the city capable of effecting such a coalition, being now at the head of the senate, yet the darling of the knights." He acquired great celebrity by the courage and energy with which he defeated the conspiracy of Catiline, whom he denounced in four eloquent orations. Catiline, who was the leader of a large number of desperate men, had formed a plot to burn the city and massacre many of the senators. Cicero, who was notified of this plot by a woman named Fulvia, pronounced before the senate on Nov. 8 his first oration against Catiline, who was present and rose to reply, but his voice was drowned by cries of "Traitor!" and "Parricide!" (See Catiline.) The versatility and elasticity of Cicero's mind were signally exemplified by the fact that during the crisis of this conspiracy, before Catiline was defeated in battle, he defended Murena against a charge of bribery in an oration which abounds in witty and good-humored raillery.

For the defeat of this great conspiracy, Cicero received unbounded honor and applause. Men of all ranks and all parties hailed him as the saviour of the republic and father of his country. In the language of Juvenal,

Roma Patrem Patriæ Ciceronem libera dixit.

"Cicero could boast," says William Ramsay, "of having accomplished an exploit for which no precedent could be found in the history of Rome. In the garb of peace he had gained a victory of which the greatest among his predecessors would have been proud, and had received tributes of applause of which few triumphant generals could boast." He incurred, however, the enmity of many persons by the capital punishment of Lentulus, Cethegus, and other accomplices of Catiline. He was censured for violation of the constitution and laws by the execution of these conspirators, although they had been condemned to death by the senate. At the expiration of his consulship, having refused to accept the government of a province, he returned to the senate as a private individual (62 B. C.), and purchased an elegant mansion on the Palatine Hill. He also owned villas or country-seats at Tusculum, Arpinum, Formiæ, and other places. He opposed the triumvirs Cæsar, Crassus, and Pompey, whose coalition he considered to be dangerous to the peace and liberty of the state, and he endeavored, without success, to detach from that coalition Pompey, who was his personal friend. In 59 B. C. his malignant enemy Clodius obtained power as tribune of the people, and proposed a law "that whoever has put to death a Roman citizen without due trial shall be interdicted from fire and water." Many thousands of Roman citizens now expressed sympathy

for Cicero, but as the consuls were hostile to him, he yielded to the storm and went into exile in Apr., 58 B. C. A law was then speedily enacted to interdict Cicero from earth and water, and his house on the Palatine Hill was burned by Clodius. The lack of fortitude which he exhibited in his exile (which was passed in Greece) is severely criticised by several writers. In a letter to his wife Terentia he wrote, "It is not my crimes, but my virtue that has crushed me." The excessive violence of his enemies tended to produce a speedy and strong reaction. The new consuls and tribunes elected for the year 57 were friendly to Cicero, whose recall was also advocated by Pompey and a majority of the senate. In Aug., 57, a bill for his restoration was adopted by an overwhelming majority of the voters, who had come from various parts of Italy to the *comitia centuriata* at Rome. "There had never been known," says Middleton, "so numerous and solemn an assembly of the Roman people as this." On his return to Rome he was greeted with abundant demonstrations of popular favor and enthusiasm. Between 57 and 52 he pleaded several causes in the courts, and found leisure to write two important works, entitled *De Republicâ* (On the Republic, or the Principles of Government) and *De Oratore*. The *De Legibus*, a philosophical treatise on the origin, nature, and perfection of law, was probably begun in 52.

For a term of one year (beginning July 31, 51 B. C.) he acted as proconsul or governor of Cilicia and Pisidia, where his administration was a model of moderation, purity, and probity. He returned to Italy in the year 50, and found that a civil war was imminent between Cæsar and the senate. He hesitated whether he should take an active part in the coming contest, and wished to act as a mediator, but eventually he joined the army of Pompey, who fought for the senate. "He fluctuated greatly," says Plutarch, and was in the utmost anxiety; for he says in his letters, "Whither shall I turn? Pompey has the more honorable cause, but Cæsar manages his affairs with the greatest address. In short, I know whom to avoid, but not whom to follow." His wit, however, did not fail even in this gloomy crisis. When Pompey asked him, "Where is your son-in-law?" (Dolabella), Cicero replied, "He is with your father-in-law." After the battle of Pharsalus (Aug., 48 B. C.), Cato offered the command of the army to Cicero, but he declined it, and, returning to Italy, submitted to the power of Cæsar, who treated him with clemency. He afterward devoted himself to literary labors in retirement, and found consolation in the calm enjoyments of speculative philosophy. In the ensuing period of three or four years (47–44) he produced numerous works on philosophy and rhetoric, which are admirable monuments of his profound and varied learning as well as of his immense mental activity. As a philosopher he preferred the principles of the New Academy. In the year 45 he lost his accomplished daughter Tullia, whom he regarded with the fondest affection. He approved the assassination of Cæsar, and denounced the conduct of Mark Antony in a series of orations called *Philippics*, the first of which was spoken in the senate in Sept., 44. The second *Philippic* is a masterpiece of eloquent invective. For a few months in the year 43, while Octavius co-operated with the senate against Antony, Cicero was the most prominent statesman in Rome. Between Dec., 44, and May, 43 B. C., he uttered his last twelve *Philippics*, which were received with general applause, but the republican cause was soon ruined by the coalition of Octavius with Antony and Lepidus. Cicero was proscribed by them, and was killed by the soldiers of Antony near his Formian villa Dec. 7, 43 B. C. He left one son, named Marcus Tullius. The moral character of Cicero is admitted to be excellent even by those who censure his public conduct. His worst foible was vanity, exhibited in a habit of self-laudation. According to Niebuhr, "the predominant and most brilliant faculty of his mind was his wit. In what the French call *esprit*—light, unexpected, inexhaustible wit—he is not excelled by any of the ancients." As an orator he surpassed all the ancients except Demosthenes. Modern critics concur in unanimous admiration of the consummate grace and beauty of diction which enchant successive generations in the periods of Cicero. He amplifies everything. His words seem to gush forth without effort in an ample stream; and the sustained dignity of his oration is preserved from pompous stiffness by the lively sallies of a ready wit and a vivid imagination. His periods are sonorous, but present a great variety of cadences. His *Letters*, of which nearly 800 are extant, are models of exquisite Latinity, and are highly prized for the light which they throw on the history and antiquities of the Roman republic. Among his works which remain entire are fifty-seven orations; also treatises, entitled *De Finibus*, libri v. (an Inquiry into the Supreme Good); *Brutus seu de Claris Oratoribus* (a critical notice of Roman orators); *De Amicitiâ* (a dialogue on friendship); *De Senectute* (a dialogue on old age); *Tusculanæ Disputationes* (disputations on various questions of philosophy); *De Naturâ Deorum*, libri iii. (On the Nature of the Gods); *Orator, seu de Optimo Genere Dicendi* (The Orator, or On the Best Manner of Speaking); and *De Officiis*, libri iii. (an excellent treatise on ethics). One of his greatest works, *De Republicâ*, is lost, except a large fragment. He also wrote treatises, *De Gloriâ* (On Glory) and *De Virtutibus* (On the Virtues), which are not extant. Mutilated copies have been preserved of his works entitled *De Legibus* and *Academicorum*, libri iv. Among the best editions of his complete works are those of Ernesti (Halle, 5 vols. 8vo, 1774–77); Orelli (Zurich, 9 vols. 8vo, 1826–38); Baiter and Kayser (Leipzig, 11 vols. 8vo, 1860–69); and C. F. W. Müller (Leipzig, 1878, still in course of publication). The correspondence, chronologically arranged, is being edited by R. Y. Tyrrell; 3 volumes have already appeared (Dublin and London). See Plutarch, *Life of Cicero*; Conyers Middleton, *History of the Life of Cicero* (1741); Abeken, *Cicero in Seinen Briefen* (1835), and an English version of the same (1854); W. Forsyth, *Life of M. T. Cicero* (2 vols., 1865); Lamartine, *Cicéron* (1852); Orelli, *Onomasticum Tullianum*; Drumann, *Geschichte Roms*, vols. v. and vi.; G. Boissier, *Cicéron et ses amis* (Paris, 1884). The most vivid and popular *Life of Cicero* is by Anthony Trollope (1880, 2 vols.). Revised by M. Warren.

Cicero, Marcus Tullius: the only son of the preceding; b. in 65 B. C. He is said to have been dissipated, indolent, and intemperate. In the year 49 he joined the army of Pompey, and received the command of a squadron of cavalry. Soon after the battle of Pharsalia (48 B. C.) he went to Athens, and studied philosophy under Cratippus. Having been appointed a military tribune by Brutus in 44 B. C., he defeated C. Antonius, and did good service in the Macedonian campaign. By the favor of Octavius (Augustus) he became consul in the year 30, and was governor of Asia (Syria) in 29–28. The year of his death is unknown.

Cicero, Quintus Tullius: a brother of Cicero the orator; b. about 102 B. C. He was elected prætor for the year 62, after which he officiated as governor of Asia for three years, and returned to Rome in 58 B. C. In Asia, however, he gave great offense to both the Greeks and the Romans by the violence of his temper and the corruption and licentiousness of his favorites. He was appointed in the year 55 legate (*legatus*) to Cæsar, whom he attended in an expedition to Britain, and in 54 he commanded a legion in Gaul. In the civil war he took arms against Cæsar, but he made his peace with him in 57 B. C. He was proscribed by the triumvirs, and killed in 43 B. C.

Cicognara, chĕe-kōn-yaa'răă, Leopoldo, Count da: an Italian antiquary and writer on art; b. in Ferrara, Nov. 17, 1767. He was for many years president of the Academy of Fine Arts in Venice, and was a friend of Canova. His chief work is a *History of Sculpture from the Renaissance of that Art to the present Century* (3 vols., 1813–18), which is highly esteemed. He wrote a *Life of Canova* (1823). D. Mar. 5, 1834.

Cicu'ta: the Latin name of the *Conium maculatum* (hemlock); a poisonous plant which was used at Athens as means of capital punishment. This is the plant which is popularly called cicuta in the U. S. and Europe. (See Conium.) Cicuta is also the name of a genus of umbelliferous plants which are poisonous. The *Cicuta maculata* (spotted cowbane) grows in swamps in the U. S. Its root is a very deadly poison. Other equally poisonous species grow in the U. S. and in Europe.

Cid, more originally **Mio Cid**: a surname of the celebrated national hero of the Spaniards, Ruy (Rodrigo) Diaz de Bivar, most likely bestowed upon him by the Moorish population of Valencia (derived from the Arabic *Sid-y*, My Lord). A descendant of one of the noblest Castilian families, the Cid was born at Bivar, near Burgos, about 1040. From 1063–73 he served as captain of King Sancho II. in his wars with Aragon, Galicia, and Navarre. In 1074 he married Ximena, daughter of Diego, Count of Oviedo. Being

banished by his sovereign, Alfonso VI., in 1080, he became a bold guerrillero, serving Christian or Moor as seemed most profitable to himself, and being equally dreaded by both. During this border warfare he received the surname of *Campeador*, the champion. It was in the service of a Moorish sovereign, King Mostain of Saragossa, that the Cid, about the year 1087, began those invasions of the territory of Valencia which led to his conquest of that city in 1094. He maintained himself as master of Valencia until his death in July, 1099. The Cid is the central figure of the earliest epic poetry of Spain that we possess. The oldest and most important epic poem celebrating his triumphs is the *Poema del Cid*, composed about the middle of the twelfth century in the Spanish epic verse of fourteen syllables, and telling in its first part the exploits of the hero after his banishment by Alfonso VI.; in the second the taking of Valencia and the (unhistorical) marriage of his daughters with the infantes of Carrion; and in the third the treason of the infantes, the Cid's triumph over them, and the second marriage of his daughters with the princes of Navarre and Aragon. While in this poem the Cid is represented to us as a mediæval vassal loyal to his sovereign, he appears as the leader of the rebellions nobles in the *Cronica rimada*, composed about half a century later, and is entirely unlike the historical character in the part he plays in the ballad and the drama, such as e. g. Guillen de Castro's play, *Las mocedades del Cid* and in Corneille's *Le Cid*. The best treatise on the Cid is Dozy's work *Le Cid, d'après de nouveaux Documents* (Leyden, 1860). A critical edition of the *Poema*, such as is required by the condition of the text, is still wanting; the text is published in vol. xv. of Rivadeneyra's *Biblioteca de Autores Españoles*, and by Vollmöller (Halle, 1879). A good French translation, with notes and a vocabulary to the Spanish text, is that by Damas Hinard, *Poème du Cid* (Paris, 1858), and an English rendering, with an able introduction, that of John Ormsby, *The Poem of the Cid* (London, 1879). The *Cronica rimada* was published by Francisque Michel at Paris in 1846, republished by F. Wolf at Vienna in 1847, and by Duran in his *Romancero General* (2d ed. 1882), vol. ii., appendix iv. Critical editions of the ballads of the Cid are by Duran in the *Romancero General*, vol. ii., and especially by Carolina Michaëlis de Vasconcellos, *Romancero del Cid* (Leipzig, 1871). HENRY R. LANG.

Cider [from O. Fr. *sidre*: Ital. *sidro*: Span. *sidra* < Lat. *sicera* = Gr. σίκερα, from Heb. *shēkār*, strong drink]: a beverage made in several countries from the juice of apples. After gathering, the apples should be kept under cover until they are thoroughly ripe. If left in the air rain will wash from them certain organisms which are of importance for the purpose of causing fermentation of the juice after it is expressed. Various devices are employed for the purpose of expressing the juice, the most common being a large wooden roller running by horse-power in a sort of trough. The juice first formed (sweet cider) is turbid. This is placed in casks and allowed to ferment at a temperature not exceeding 40° F. The sugar contained in the juice is thus converted into alcohol and carbonic-acid gas. After the liquid begins to clear up on account of the interference with the fermentation due to the accumulation of alcohol, it is drawn off and kept at a lower temperature, when a further fermentation takes place. Good cider contains from 8 to 10 per cent. of alcohol, and from 2 to 3 per cent. of sugar. It may be mentioned that the presence of malic acid in cider distinguishes it from wine. I. R.

Ciene'ga [Sp. *cienaga*, a quagmire, deriv. of *cieno* < Lat. *caenum*, mud]: a marshy tract situated on a slope otherwise arid. The term is widely used in California, Arizona, New Mexico, and Mexico. The occurrence of a cienega depends on the existence, not far below the surface of the ground, of a stratum impervious to water, by which an underground current is brought near the surface. It is thus closely analogous to a spring, and the two phenomena grade into one another. A well dug in a cienega will always find a supply of water, and cienegas have proved serviceable in directing exploration for artesian water. See E. W. Hilgard, *Cienegas of Southern California*, Bulletin Geological Society of America, vol. iii., 1891. G. K. G.

Cienfuegos: a town of Cuba. See the Appendix.

Cieza, thēē-ā'tha: a town of Spain; in the province of Murcia, near the river Segura, on a railway, 26 miles N. W. of Murcia. It has manufactures of coarse linen cloth. On the opposite side of the river are remains of an ancient Roman town. Pop. about 11,000.

Cie'za de Leon', PEDRO, de: Spanish soldier and historian; b. at Llerana, Estremadura, 1518. He went to America, probably in 1534, and served in Panama and New Granada until 1547, when he went with Gasca to Peru. He traveled extensively in that country and Charcas, with the special object of collecting material for his history, which he had commenced in 1541. Much important information was obtained from the Inca Cayu Tupac of Cuzco, a descendant of Huayna Ccapac. He returned to Spain about 1552, and died at Seville in 1560. His *Crónica del Peru* consisted of four parts, the first giving a description of the country, the second embracing the history of the Incas, and the remainder the conquest and civil wars. Of these, part i. was published at Seville 1553, part ii. in 1873, and the third book of part iii. in 1877. Other portions are known in MS., but some is lost. There are English translations of parts i. and ii. Cieza de Leon is by general consent one of the best and most reliable authorities on early Peruvian history.

HERBERT H. SMITH.

Cigar, or **Segar** [*segar* is the older Eng. spelling, *cigar* that of this century; Fr. *cigare*, Span. *cigarro*, Ital. *sigaro*, with change of gender from Lat. *cica'da*, locust, probably so named from resemblance in color and form between the roll of tobacco and the body of the cicada]: a small roll of tobacco-leaves for smoking. The cigars of Havana are the most highly prized, but those from Manila, usually called cheroots, are also excellent. The manufacture of cigars in the U. S. is an important industry. For the outer part or wrapper of a cigar the tobacco raised in the Connecticut valley is considered the best, from its fine elastic quality. See TOBACCO.

Cignani, chēēn-yaa'nee, Count Cavalier CARLO: painter; b. in Bologna, Italy, May 15, 1628; pupil of Albani, under whom he worked. He was director of the Painters' Academy of Bologna; knighted by the Duke of Parma; was considered one of the best painters of his day and school, and has left frescoes and other works in the palaces and churches of Piacenza, Parma, and Forli, where he decorated the cupola of the duomo. D. in Bologna, Sept. 6, 1719.

W. J. STILLMAN.

Cigoli, chēē-gō'lēē, FRA LUDOVICO CARDI, da: painter and architect; b. in Cigoli, near Florence, in 1559; pupil of Allessandro Allori, Sante Tite, and Buontalenti. He worked after A. del Sarto, Correggio, and Baroccio. His best painting is a *Martyrdom of S. Stephen*, in the Uffizi Gallery in Florence. He designed a façade for S. Maria del Fiore, which was probably the classical one, which was destroyed by the Medici. D. in Rome, 1613. W. J. STILLMAN.

Cil'ia [Lat. plur. of *cilium*, eyelid, eyelash]: the hairs which grow from the margin of the eyelids. The term is more usually applied to microscopic filaments which project from animal membranes, and which are endowed with quick, vibratile motion. Cilia are distinguished from pseudopodia by their permanence, and from flagella by their smaller size and association in groups; although practically a flagellum is a large, single cilium. In vertebrates cilia occur upon the epithelium of the mucous membrane of various organs; their movements are apparently independent of the nervous system, and will continue long after the animal is dead. Among minute invertebrates, such as the ROTIFERA and INFUSORIA (*q. v.*), cilia are present in definite tracts, and serve by the rapid vibration as organs of locomotion, or to create currents by which particles of food are brought within reach. The embryos of many of the lower animals are also frequently provided with cilia by means of which they move about.

In BOTANY cilia are long hairs situated on the margins of vegetable bodies.

In ENTOMOLOGY fringes of hairs, such as are found on the legs of some beetles, are termed cilia. F. A. LUCAS.

Cilia'ta: an order of INFUSORIA (*q. v.*).

Cilic'ia (in Gr. Κιλικία): an ancient division of Asia Minor; bounded N. by Mt. Taurus, E. by Mt. Amanus, S. by the Mediterranean, and W. by Pamphylia. The surface is partly mountainous, and partly occupied by fertile plains adjacent to the sea. The chief river was the Cydnus. The principal towns were Tarsus, Soli, Seleucia, Mallus, and Aphrodisias. The ancient Cilicians were distinguished for maritime enterprise and also for piratical habits. In early ages Cilicia was an independent kingdom. It was afterward a part of the Persian empire, and was reduced to a Roman province in the time of Pompey. It coincides nearly with the Turkish division of Adana. Among the eminent natives of Cilicia

were St. Paul, Chrysippus the Stoic philosopher, and Aratus the poet.

Cima, chee'mă. Giovanni Battista da Conegliano: b. 1460; one of the most charming and earnest of the early Venetian painters; a native of the town of Conegliano, at the edge of the Venetian Alpine country, the landscape of which had a strong and delightful influence on his art. His early manner of painting had, according to Cavalcaselle, a tendency to the Lombard art, and showed also the influence of Antonello da Messina. Like the other Venetians, he passed from tempera to oil soon after coming to Venice, where he fell under the teaching of Bellini, from whom, however, he differs not only in the general feeling for subject, but also in that for color. He devoted himself to the saints, and reaches a high degree of expression of that serenity which we are in the habit of considering the characteristic of the purely religious schools. He carried the elaboration of the details of his figures and landscape to a height remarkable even then, and a portion of one of his landscape backgrounds has been made famous by Ruskin, who spent many days in copying it. He was not, however, naturalistic, the details of his landscape being always invented in the studio. Most of his work is to be found at Venice. The picture named by Ruskin is *St. John the Baptist*, in the Church of the Madonna del Orto, Venice. (See *Modern Painters*, vol. i. and vol. iii.) This picture was at one time in the Venice Academy. Other celebrated pictures are a *Baptism of Christ*, in the Church of St. John in Bragola, Venice, and a *St. Helena with the Cross*, in the same church; a *Virgin and Child*, in the National Gallery in London; a *Virgin and Child*, in the Louvre. D. about 1520. W. J. Stillman.

Cimabue, chĕe-mă-boo'ă, Giovanni: b. in Florence about 1240; d. about 1302. Cimabue is noted as the restorer of painting, and, as his contemporaries were thrown into the shade by the want of the contemporary recognition he enjoyed, he retains that position in popular tradition. The famous mention of him by Dante has had perhaps more effect on the reputation he has maintained to our day than he merited. He did not redeem art from a state of barbarous rudeness, as is generally supposed, but took the Byzantine art of his predecessors and teachers and carried it a little further; but he was only one of a great number of painters who were all affected by the same awakening which was the result of the new political and intellectual life of Italy, partly due to the influx of learned men and letters from Constantinople. Sienna was not in the least behind Florence at the time, but as most of the Siennese school has perished, and the glory of Giotto, Cimabue's pupil, came up before the world through the literary activity of Florence with advantages that Sienna never enjoyed, and also partly because the greater wealth of Florence and her domination of the other Tuscan cities gave her almost the monopoly of the best art, Sienna never felt permanently the effect of the Renaissance as her greater rival did. Cimabue probably only innovated by the adoption of a gayer, more natural, and more attractive scheme of color than the Byzantine, and perhaps by a somewhat more minute and faithful painting of his accessories. The Byzantine painters had certain conventional tones for all things, and prescribed attitudes for their subjects, and they seem to have regarded the effects of age on the older work as necessary to the reverence required for religious painting. These Cimabue probably abandoned, and he at the same time, as we see at Assisi, tried new ways of painting, not always fortunate, and he certainly did not always follow the prescriptions of Byzantine art. But the idea that he ever attempted to revert to nature in the modern sense of the word is unfounded. He followed the archaic treatment, working without nature and following the archaic types. The comparison with the nearly or quite contemporary work at Sienna shows that the growth of art had not been confined to one part of Italy, and Cimabue's work is often very difficult to distinguish from the earlier Byzantine and from that of his contemporaries. Madonnas of his may be seen in the galleries of Florence, the Louvre in Paris, and the National Gallery of London. His *Virgin and Child*, which had great celebrity, is an altar-piece in the Pucellai chapel of the S. Maria Novella church of Florence. His work may also be seen in Assisi, and a mosaic in the cathedral of Pisa. W. J. Stillman.

Cimarosa, chĕe-mă-rō'să, Domenico: musical composer; b. in Aversa, kingdom of Naples, Italy, Dec. 17, 1749; studied eleven years at the musical institute of Naples; in 1772 produced in Naples two comic operas, the renown of which led to an invitation to Rome, where, in 1774, he put on the stage the humorous *Italian in London*. He pursued his art in Naples, Rome, Florence, and other Italian cities, composing cantatas, sacred and comic operas, and church music, but little of his work of this period has survived. In 1787 he went to St. Petersburg as a court musician, and four years later to Vienna, where he produced his masterpiece, *Il Matrimonio Segreto* (The Secret Marriage). Returning in 1793 to Naples, he placed on the stage his *Le Astuzie Feminili* and *L'Olimpiade*; engaged in the republican agitation while the French troops were in Naples; was condemned to death on the return of the Bourbons; escaped to Venice, where he died Jan. 11, 1801. His works are remarkable for originality and spirit.

Cim'bri (in Gr. Κίμβροι): a warlike people of ancient Europe whose origin is involved in obscurity. They were regarded as Germans by Cæsar and Tacitus, whose opinion has been adopted by most moderns. H. Müller and other writers suppose that they were Celtic, and that Cimbri is another form of *Kymri*, which is the native name of the Welsh. In 113 B. C. the Cimbri and the Teutones issued from the north part of Germany, crossed the Eastern Alps, and invaded the territory of the Romans, whom they defeated in battle. They afterward moved across the Rhine, and pillaged part of Gaul. The Cimbri and Teutones gained another victory over the Romans in the year 109. Within a period of six years they defeated four consuls and routed five Roman armies, so that great consternation prevailed at Rome. They invaded Spain in 104 B. C. In 102 B. C. Marius defeated the Teutones at Aquæ Sextiæ (Aix), in Gaul. The army of the Cimbri at the same time invaded the north of Italy by a different route, and gained a victory over the Roman consul Catulus near the Adige. The infantry of the Cimbri had shields fastened together with chains. The two Roman armies were then united under the joint command of Catulus and Marius, who gained a great victory over the Cimbri near Verona, or, as some place it, near Vercellæ (Vercelli), in July, 101 B. C. It is said that more than 100,000 Cimbri were killed in this battle. The Cimbri in the time of Tacitus lived near the North Sea, and in Jutland, which was called the Cimbric Chersonese. See Pullmann's *Die Cimbern* (1870).

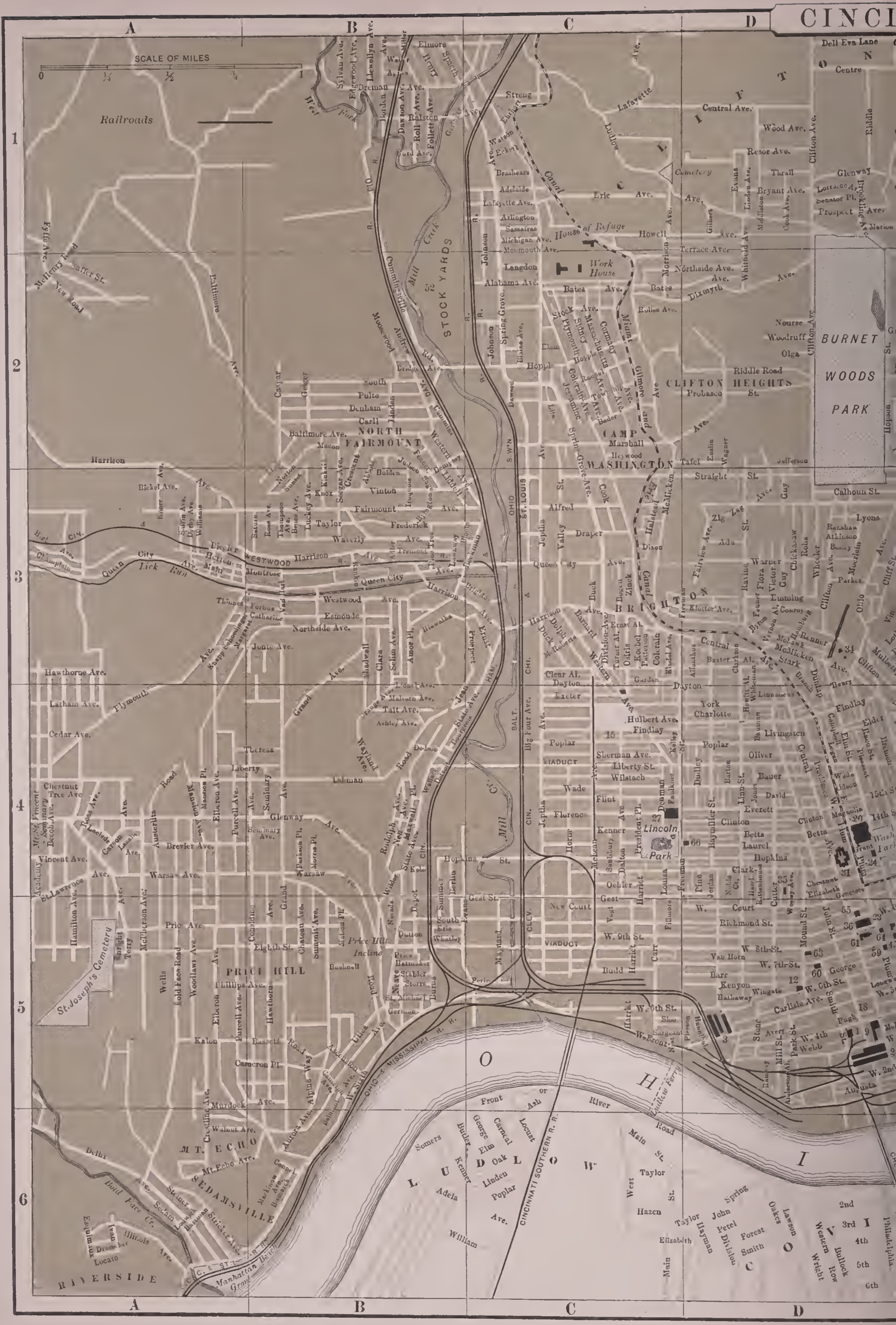
Cimme'rians (in Gr. Κιμμέριοι): originally a mythical people living on the confines of the world, where they were shrouded in mist and cloud, untouched by the rays of the sun; hence the proverbial expression "Cimmerian darkness." There were the groves of Persephone, the entrance to the dank house of Hades, and there is a rock (Mt. Taurus), "and the meeting of two roaring waters" (between the Sea of Azof and the Euxine Sea). The historical Cimmerians inhabited the Tauric Chersonesos (Crimea) and the country E. of the Straits of Kertch ("Cimmerian Bosporos"). They gave place to the Scythians, who in turn were banished by the Greek colonists. J. R. S. Sterrett.

Cimo'lian Earth (in Gr. γῆ Κιμωλία): a kind of earth which the ancients used to obtain from the islands Cimolus and Siphnus in the Cyclades. It was sometimes used in medicine, but was especially employed instead of soap in washing clothes. It appears to have been a variety of steatite or soapstone.

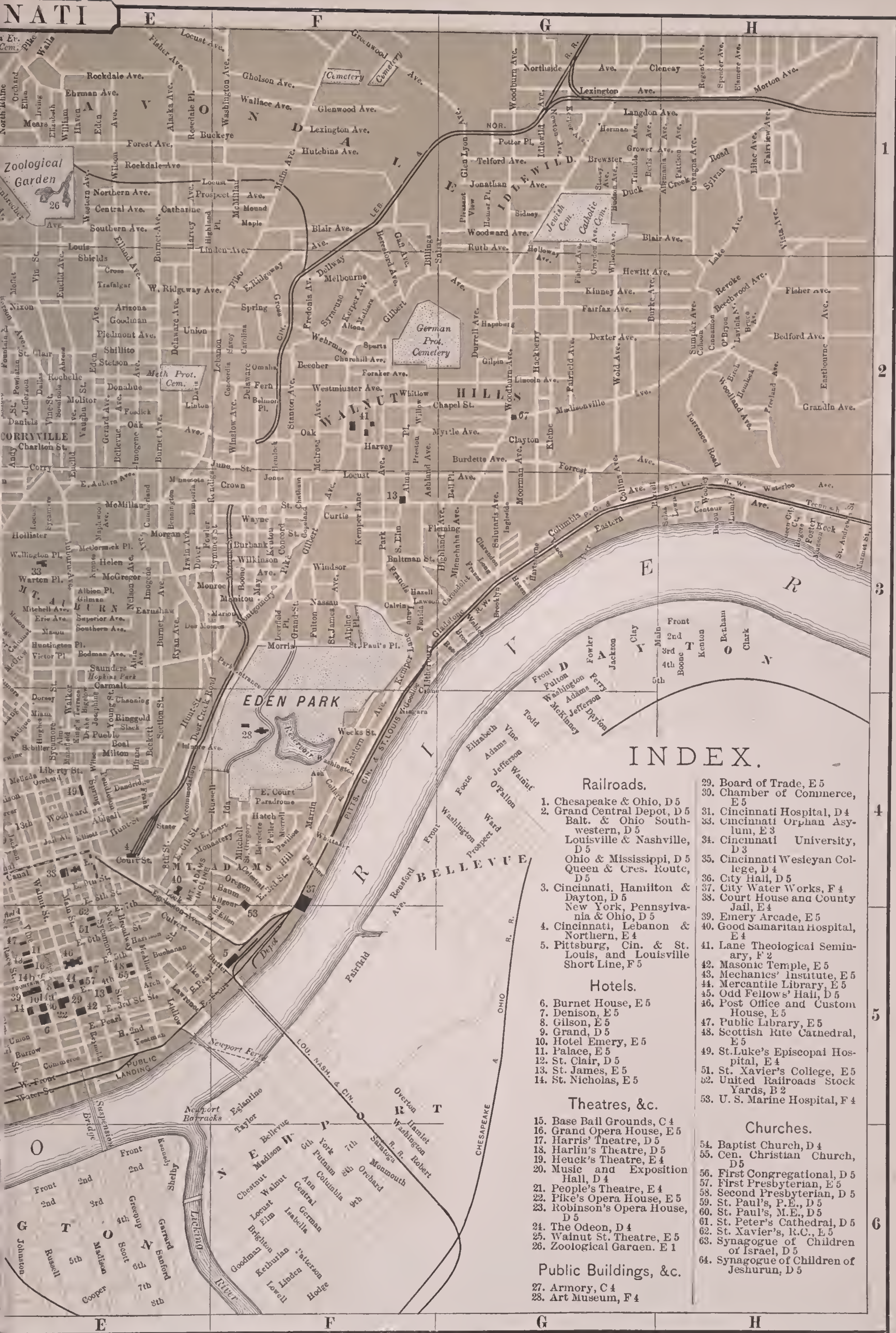
Ci'mon, or **Ki'mon** (in Gr. Κίμων): an Athenian commander and statesman; b. about 502 B. C.; a son of Miltiades who commanded at Marathon. He served with distinction at the great battle of Salamis, 480 B. C. Cimon and Aristides commanded the Athenians, who, co-operating with the other Greek armies, prosecuted the war against Persia in 476 B. C. Soon after this date he became commander-in-chief of the allies, who preferred him to the Spartan Pausanias. He defeated the Persians on the Strymon, and in 466 gained a great naval victory at the mouth of the Eurymedon. He was for some time the most prominent statesman of Athens, and a rival of Pericles. Cimon improved Athens by planting trees and building walls to the Piræus. In 461 B. C. he was banished by ostracism, but he was permitted to return in 456. He obtained command of a fleet in 449, and besieged Citium, in Cyprus, where he died in the same year. He was a conservative in politics. See Plutarch, *Life of Cimon*; Cornelius Nepos, *Cimon*; Grote, *History of Greece*; Thirlwall, *History of Greece*.

Cinaloa: same as Sinaloa (*q. v.*).

Cinchona, sin-kō'na: a genus of trees of the family *Rubiaceæ*, from many of the species of which is derived the bark



CINCI
SCALE OF MILES
Railroads
STOCK YARDS
NORTH FAIRMOUNT
CLIFTON HEIGHTS
CAMP WASHINGTON
BRIGHTON
BURNET WOODS PARK
PRICE HILL
MT. ECHO
SEDAMSVILLE
RIVERSIDE
St. Joseph's Cemetery
Lincoln Park
Work House
House of Refuge
Cemetery
Mill Creek
Canal
OHIO RIVER
LUDLOW
COVINGTON
CINCINNATI SOUTHERN R. R.
OHIO & MISSISSIPPI R. R.
Harrison Ave.
Queen City
Westwood
Warsaw Ave.
Glenway Ave.
Eighth St.
Spring Grove Ave.
Central Ave.
McMicken
W. Front
W. 6th St.



INDEX.

Railroads.

1. Chesapeake & Ohio, D 5
2. Grand Central Depot, D 5
   Balt. & Ohio Southwestern, D 5
   Louisville & Nashville, D 5
   Ohio & Mississippi, D 5
   Queen & Cres. Route, D 5
3. Cincinnati, Hamilton & Dayton, D 5
   New York, Pennsylvania & Ohio, D 5
4. Cincinnati, Lebanon & Northern, E 4
5. Pittsburg, Cin. & St. Louis, and Louisville Short Line, F 5

Hotels.

6. Burnet House, E 5
7. Denison, E 5
8. Gilson, E 5
9. Grand, D 5
10. Hotel Emery, E 5
11. Palace, E 5
12. St. Clair, D 5
13. St. James, E 5
14. St. Nicholas, E 5

Theatres, &c.

15. Base Ball Grounds, C 4
16. Grand Opera House, E 5
17. Harris' Theatre, D 5
18. Harlin's Theatre, D 5
19. Heuck's Theatre, E 4
20. Music and Exposition Hall, D 4
21. People's Theatre, E 4
22. Pike's Opera House, E 5
23. Robinson's Opera House, D 5
24. The Odeon, D 4
25. Walnut St. Theatre, E 5
26. Zoological Garden. E 1

Public Buildings, &c.

27. Armory, C 4
28. Art Museum, F 4
29. Board of Trade, E 5
30. Chamber of Commerce, E 5
31. Cincinnati Hospital, D 4
33. Cincinnati Orphan Asylum, E 3
34. Cincinnati University, D 3
35. Cincinnati Wesleyan College, D 4
36. City Hall, D 5
37. City Water Works, F 4
38. Court House and County Jail, E 4
39. Emery Arcade, E 5
40. Good Samaritan Hospital, E 4
41. Lane Theological Seminary, F 2
42. Masonic Temple, E 5
43. Mechanics' Institute, E 5
44. Mercantile Library, E 5
45. Odd Fellows' Hall, D 5
46. Post Office and Custom House, E 5
47. Public Library, E 5
48. Scottish Rite Cathedral, E 5
49. St. Luke's Episcopal Hospital, E 4
51. St. Xavier's College, E 5
52. United Railroads Stock Yards, B 2
53. U. S. Marine Hospital, F 4

Churches.

54. Baptist Church, D 4
55. Cen. Christian Church, D 5
56. First Congregational, D 5
57. First Presbyterian, E 5
58. Second Presbyterian, D 5
59. St. Paul's, P.E., D 5
60. St. Paul's, M.E., D 5
61. St. Peter's Cathedral, D 5
62. St. Xavier's, R.C., E 5
63. Synagogue of Children of Israel, D 5
64. Synagogue of Children of Jeshurun, D 5

(sometimes popularly called Peruvian bark), from which are obtained the alkaloids quinine and cinchonia. Cinchona-trees are indigenous to South America from 10° N. lat., to 19° or 20° S. lat. They are found chiefly on the eastern slope of the central chain of the Andes in Bolivia and Peru, and it is stated that the climate which is most favorable to their growth is characterized by a rainy season lasting for nearly nine months, the mean annual temperature being pretty low—about 55° F. The tree is distinctly a mountain tree, and does not grow in the valleys. It is an evergreen, from 40 to 80 feet in height, with laurel-like opposite leaves and fragrant flowers. The *Cinchona calisaya* is an exceedingly handsome tree generally found at an altitude of 5,000 to 6,000 feet. Any cinchona bark which will yield a quantity of alkaloid amounting to 5 per cent. can be used for medicinal purposes, but half of this quantity of alkaloid should be quinine. No less than thirty-six species of cinchona bark are known, but comparatively few of them (about six) yield the required amount of alkaloid. From the barks of these six species may be derived not only the alkaloid quinine but five other alkaloids, two of which are artificial. These alkaloids are divided into two series, known as the quinine and cinchonine series. In the quinine series we have quinine, quinidine, and quinicine. In the cinchonine series we have cinchonine, cinchonidine, and cinchonicine. It is the quinicine and cinchonicine which are artificial alkaloids. Cinchona bark also contains kinic and kinovic acids. At the present time most of the cinchona bark is derived from cultivated trees, since it has been found that by the cultivation of the trees and the careful collection of the bark a greater percentage of quinine can be obtained. The largest amount of cultivated cinchona bark comes from Bolivia. The cinchona-tree is also grown for its bark in Java and in India, and cinchona plantations have been started in Western Africa, in Mexico, Central America, and in the Straits Settlements. The chief use of cinchona and its alkaloids is in the treatment of malarial infection. Originally introduced to the world at large for this purpose as an anti-malarial by the Countess of Chinchon, it was afterward taken up by the Jesuits and for a certain length of time was called "Jesuits' bark." Up to within a few years the employment of this drug in malarial fever was purely empirical, but owing to the studies of Laveran, a French army surgeon, and of Marchiafava and Celli in Italy, Osler, Councilman, and others in the U. S., it has now been determined, first, that malarial fever is always due to the presence of what is known as the malarial germ in the blood, and, second, that quinine cures malarial fever by destroying these micro-organisms. Owing to its exceedingly bitter taste it is best administered in pill form, but this very bitter property makes it also a valuable bitter tonic in cases where the mucous membranes and nervous system of the human body are below par. In addition to being employed for malarial fever it has also been found to be a destroyer of the amœba coli, a micro-organism producing certain forms of dysentery, and it is therefore employed as a specific remedy in amœbic dysentery. It is also used for the purpose of breaking up colds in their early stages. With the object of increasing the power of the uterine contractions during parturition it is usually given in the dose of 20 or 30 grains dissolved in water. In pneumonia in children it is particularly useful, seeming to possess some specific influence, and it has also been found of value in certain cases of whooping-cough. Quinine itself is rarely employed, being nearly always in the form of a salt, such as the sulphate of quinine, the hydrochlorate, the bisulphate, the hydrobromate of quinine, or some similar combination of an acid with the alkaloid. Of these, the best combination is the hydrochlorate and the bisulphate, owing to their solubility, but the sulphate of quinine is the preparation which is most widely employed, purely as the result of custom. Similarly, the other alkaloids of quinine are rarely employed except as salts, and of these only the cinchonine and cinchonidine are used in medicine, as a rule generally in the form of the sulphate. They are only about quarter as strong as is the alkaloid quinine in combating malarial fever. When taken in large quantity the symptoms which are produced are known as "cinchonism." These symptoms consist chiefly in ringing in the ears, dizziness, perversions of taste and smell, a sense of fullness in the head, sometimes frontal headache, and in rare cases even complete blindness, which fortunately is usually only temporary. Deafness is also quite common from full doses, and in persons who are already partially deaf permanent deafness may be produced by this drug. Cinchona bark or any of its alkaloids should not be taken by patients suffering from inflammation of the stomach, or of the bladder, or the meninges of the brain, or by epileptics.

H. A. Hare.

Cincinnati: chief city of the Ohio valley; situated on the northern bank of the Ohio river in Hamilton co., O., the extreme southwestern county of the State of Ohio. It is midway between Pittsburg and Cairo, in lat. 39° 6′ 30″ N. and lon. 84° 24′ W.; 764 miles from New York, 610 miles from Washington, and about 300 miles from Chicago and St. Louis. It stands in the geographical center of a region, 200 miles in diameter, the most fertile in the world. It is from 500 to 900 feet above the sea-level. Low-water mark in the Ohio river is 432 feet above the sea, and the highest hills in the city are 475 feet higher. It is chiefly built upon two plateaus nearly surrounded by hills, but it now extends over the neighboring highlands where most of the fine residences are located. The first plateau is about 65 feet above low-water mark, the second rises from 50 to 100 feet higher. The neighboring hills, pierced by ravines, rise from 150 to 300 feet above the upper plateau. The semicircle of hills comes close to the river above and below the plain, the distance between the ends of the semicircle being about 2½ miles. Access to this inclosed plain is chiefly by the narrow river-valley and by the spacious valley of Mill creek, which extends northward by gentle elevations, with a width of more than ½ mile in the narrowest part. This open gateway through the hills decided the location and growth of the city. It was from the first an easy approach for highways, canals, and railroads, and in later years affords room for the overflow of the city's population and business. If the encircling hills had been closed at that point there could have been no city where Cincinnati now stands.

Area, Plan, Divisions, and Streets.—Cincinnati has an area of about 36 sq. miles, and was regularly laid out upon the plan of Philadelphia. This regularity, however, disappears beyond the original site, and the streets conform largely to the course of the ravines and the contour of the hills. The streets are generally 66 feet wide, and the principal ones are paved with granite or asphalt, others with bowlders or macadam. The city on the hills is singularly picturesque and beautiful—perhaps beyond any other on the continent. A population of 75,000 in that region gives room for lawns and spaces, and the effect is heightened by hills and ravines, so that it has every appearance of a well-kept park, and from many points the view of country and forest and river adds greatly to the interest and beauty. The front of the city extends about 14 miles along the river, while northward from the river the average width is about 3 miles, but it extends up the Mill creek valley about 5½ miles. It is nearly surrounded on all sides by cities and villages. Opposite in Kentucky are the cities of Covington and Newport, and the villages of Ludlow, Bellevue, and Dayton. To the northward in Ohio are the villages of Oakley, Norwood, Reading, St. Bernard, Winton Place, and College Hill. These nearly inclose the city, and in some places form extensive angles and projections within her territory. It has two extensive parks, namely, Eden and Burnet Woods, upon the hills, and seven smaller ones among the denser population in the plain below. The great cemetery is Spring Grove, lying on the western slopes of the Mill creek valley, 6 miles from the river, and containing about 600 acres. It is famous among great cemeteries for beauty of situations and elegance of landscape gardening.

Buildings, Monuments, etc.—The most notable public buildings are the U. S. building for post-office, courts, etc., constructed entirely of brick, iron, and granite, at a cost of $5,000,000; the city hall, completed in 1893, a substantial, spacious, and elegant structure, costing $1,500,000; the Music Hall, mainly a gift from Reuben Springer, with a seating capacity of 5,000; the Chamber of Commerce building, one of Richardson's last designs; the County Court-house, the Cincinnati College, the Ohio and Miami Medical Colleges, the Public Library, the Central Union R. R. Dépôt, the Masonic Temple, the new Odd Fellows' building, the Scottish Rite Cathedral, the City Hospital, and the noble Art Museum in Eden Park. Among theatres, the Pike, Grand Opera-house, and Walnut Street are very creditable. Elegant private residences are numerous. The general character of the buildings from the first was plain and substantial. During the most rapid growth of the city, from 1840 to 1860, many miles of plain brick structures were erected. In later years these have given an unfavorable impression of the city architecture. No Chicago fire came to remove them, and later

growth did not demand their demolition. They are now giving way to stately and permanent buildings, of the most substantial construction. Conspicuous examples of this renaissance may be seen in the United Bank building, the buildings of the First and Second National Banks, the Neave building, the New Odd Fellows' Temple, the Chamber of Commerce, the Union Trust building, and many others.

One railway bridge, two bridges for railway and highway purposes combined, and two used exclusively for highways, none less than ½ mile in length, span the Ohio river.

The Tyler-Davidson fountain, the gift of Henry Probasco, erected on Fifth Street, surrounded by an esplanade, is the most striking and elaborate monument in the city. The statue of Garfield delivering his inaugural address and the equestrian statue of Gen. William Henry Harrison are notable works of art. In Spring Grove Cemetery there is an impressive monument erected to the memory of the Ohio volunteers who died during the civil war. St. Peter's Cathedral contains a beautiful altar of Carrara marble, and an altarpiece, *St. Peter Delivered*, by Murillo.

Institutions, etc.—Cincinnati contains 260 churches, representing every phase of Christian belief and custom. The most notable buildings are St. Peter's Cathedral, St. Francis Xavier's church, the Second Presbyterian, St. Paul's Episcopal, St. Paul's Methodist, and the First Presbyterian, which has the distinction of the loftiest spire in the West, 285 feet high. There are 17 hospitals, namely, 1 extensive City Hospital, 1 U. S. Marine Hospital: 4 are private enterprises for profit, and 11 are supported by private charity.

There are 370 building and loan associations organized under the laws of the State, which take the place of savings-banks. There are about 1,000 societies and associations, social, benevolent, and commemorative.

There are 3 public high schools, 49 district schools, and 4 intermediate schools, with 151 male and 828 female teachers, and 44,423 pupils enrolled. The cost of the public free schools in 1833 was $10,073.83; in 1842 the cost was $26,878.22; in 1852 it was $103,712.92; in 1862 it was $212,294.46; in 1872 it was $764,027.03; in 1882 it was $859,397.12; in 1892 it was $814,333.42; and in 1900 it was $897,110.41.

In addition, there are now forty parochial schools, with instructors and pupils numbering about 15,000.

There are five Roman Catholic colleges and six academies. The McMicken University, which originated in a bequest of Charles McMicken now amounting to $600,000, has been further endowed from the annual revenues of the city, and is rapidly growing into an important institution of learning. New buildings have been erected in Burnet Woods Park, where the city has set apart 30 acres for a site. The aim is to crown the free-school system with a completely equipped university. The College of Music is very largely attended, and has a large number of instructors.

The Ohio Mechanics' Institute has long been a great educational force in the city. It owns an ample building, with library, lecture-hall, and school-rooms. It maintains courses of lectures specially devoted to the mechanic arts, and a night-school with 700 pupils, where instruction is given in the rudiments of science, mathematics, architecture, and kindred subjects.

The Art School, in connection with the museum, which contains many fine paintings, statues, and other works of art, is attended by hundreds of students. It is perhaps the most liberally endowed of all the private institutions of the city, due to Joseph Longworth, Charles West, David Sinton, and Reuben Springer.

The Zoölogical Garden is situated near the northern boundary of the city. It covers 60 acres of picturesque hills and ravines, and is well stocked with wild animals, birds, etc. It originated with the public spirit of Andrew Erkenbrecher.

The principal libraries are the Public Library, with 212,262 books and 33,867 pamphlets; the Young Men's Mercantile, with 50,000 volumes; the Law Library, with 8,000 volumes; the library of the Historical Society, with a large number of rare books, pamphlets, manuscripts, etc.; and the library of the Mechanics' Institute.

Among municipal, benevolent, and penal institutions are the city infirmary, the workhouse for punishment of misdemeanors and violations of city ordinances, the House of Refuge for incorrigible or homeless boys and girls, and an extensive hospital. Besides these, there are supported by private charity many orphan asylums, protectories, and homes for boys and girls, for fallen women, for widows, and for old men.

The city has one police court with a single judge for the trial of minor offenses, and five justices of the peace. There is also a superior court with three judges, which has jurisdiction only of civil causes arising within the city. It is intended to expedite the hearing of causes arising in commercial business.

The court of common pleas, with seven judges, has jurisdiction in county and city, in cases both civil and criminal. A circuit court, with three judges, hears appeals, second trials, etc.

Government, Finance, etc.—The city is divided into thirty wards, each of which is a civil division for choosing officials.

The government of the city has much of the so-called "federal" plan. The mayor is elected every three years, and is not eligible for re-election. He appoints a board of review, six members, with authority to examine and supervise city officers and fix rates of taxation; and a board of elections, four members, which appoints all election officers, and conducts the elections and canvasses returns. He also appoints the prosecutor of the police court. He is the chief of police, with powers similar to those belonging to an officer of the army—to discipline and command, but not to appoint or discharge. There is a board of four police commissioners, appointed by the Governor of the State. The mayor nominates all officers of the police force, and with the approval of the board appoints them. Police officers hold during "good behavior," and can only be removed or punished upon charges and a hearing by the board. They must pass a medical and a literary examination before appointment. A board of service, chosen by popular vote, consisting of five members, has charge of the streets, waterworks, city infirmary, and parks.

The judge of the police court and auditor of the city are elected by the people. The board of legislation consists of one member from each ward, one half elected each year, who serve for two years. There is no other legislative body.

Commerce, etc.—By the Ohio river the city is in convenient commercial relations with the entire Mississippi valley. The river navigation is of the first importance, because it brings the vast coal, iron, and timber regions of the Alleghany hills to the city's wharf. These materials of manufacture float to Cincinnati at trifling expense. The Government has expended large sums wisely and skillfully in deepening and clearing the river's channel, and now maintains throughout its entire length a system of lights which serve as a safe guide for navigation.

The vigorous growth of railway facilities has apparently reduced the importance of river transportation. But the figures show an enormous tonnage by river each year. During the year ending Aug., 1900, Cincinnati alone received by river about 3,000,000 tons of coal, nearly 200,000 tons of manufactured iron and steel, more than 500,000 tons of pig iron, 20,000 barrels of salt, 31,000,000 square feet of lumber, and 31,000 tons of other crude merchandise. The general use of barges has reduced the cost of river carriage, and enables the steamboats which traffic with Cincinnati to handle this great volume of business.

The city is also a railway center, every important railway system having lines passing through it. Its inland situation precludes it from foreign commerce, but its location in the most productive portion of the U. S., with its ample means of communication, must always make it a most important center of domestic trade.

The traffic in 1900, which included almost every article of trade, made an aggregate in receipts of $350,000,000, and in shipments of $375,000,000.

There are 13 banks, with an aggregate capital of $9,918,000, and clearings in 1900 amounting to $795,593,750.

It is, however, chiefly a manufacturing city. Its industries ran in this direction at an early date. The distance from any source of supply and the convenience of all sorts of materials made manufacturing profitable, and there was a steady and increasing demand from the growing regions lying south and west.

According to the census of 1900 it had 175 manufacturing industries, with 5,200 establishments, engaging $89,886,796 capital, employing 90,000 hands, paying out $45,000,000 annually in wages, using materials to the value of $90,000,000, and producing merchandise to the value of $200,000,000. The total population was 326,000, so that the preponderance of manufacturing is readily seen.

The municipal debt by the census of 1890 was $24,737,611. Of this amount $18,000,000 is the cost of the Cincinnati

Southern R. R., built wholly by the city and now yielding an annual rental of nearly a million dollars. The remainder of the debt is mainly for parks, public buildings, and street improvements. The assets of the city are largely in excess of the debts.

History.—Cincinnati was settled in Dec., 1788 (probably the 28th), on land bought from the U. S. Government by John Cleves Symmes. The land had been looked over by its proprietors on Sept. 22, 1788, and a decision reached to call the place Losantiville, a pedantic name signifying the town opposite the mouth of the Licking. Judge Symmes laid out another city at the junction of the Ohio and Great Miami rivers, but a great flood in the spring of 1798 made unavailable the sites of several great cities, and the decision of the military authorities to build Fort Washington at the mouth of Mill creek aided in making Losantiville the center of settlement. In 1790 Hamilton County was organized by Gen. St. Clair, who was a member of the Society of the Cincinnati, and who changed the name of the settlement, also making it the county-seat. For ten years or more it was a village of log cabins, peopled by idlers and dissolute frontiersmen, and in 1800, when the village was organized, the population numbered only 750. In 1802 a "young ladies' school" was opened and in 1814 the Lancaster Academy, which later became Cincinnati College. An energetic population, first from New Jersey, and later from Pennsylvania, Virginia, Maryland, and Kentucky, laid sound foundations; in 1815 the first steamboat from New Orleans reached Cincinnati, and in a few years a wide commerce was made possible. In 1819 a city charter was received; the city became a manufacturing center and an important distributing-point, and its growth continued steadily until 1860. At that date the area of the city was 7 sq. miles. From 1845 to 1860 there was a large German immigration, and six or seven wards are still known as German, though the great majority of the "Germans" now living in the city are native-born. The civil war (1861–65) seriously interfered with the development of the city, chiefly by the destruction of its trade with the Southern States. In 1870 the area of the city was increased by the addition of adjoining villages, embracing an area of 17 sq. miles. In 1895 another addition of 11 sq. miles was made, including the villages of Riverside, Westwood, Clifton, Avondale, and Linwood. The period since 1865 has been distinguished by advance in art, architecture, music, and educational institutions, and under these influences a very composite population is slowly becoming homogeneous.

Population, etc.—In 1795, 500; (1810) 2,300; (1820) 9,603; (1830) 24,831; (1840) 46,338; (1850) 115,436; (1860) 161,044; (1870) 216,239; (1880) 298,000. By the census of 1890 the resident population within the city limits was 296,908, and in 1900, 325,902. The surrounding villages and cities contain about 100,000 people. Like New York, Cincinnati will always have her census population reduced by the overflow into an adjoining State. D. W. McClung.

Cincinnati Group: in geology, one of the formations representing the Silurian period in Southwestern Ohio, Southeastern Indiana, and Northern Kentucky. It consists chiefly of calcareous shale with intercalated layers of limestone, and these have yielded a large fossil fauna. The celebrated Blue Grass region of Kentucky acquires its peculiar soil from the disintegration of these rocks. G. K. G.

Cincinnati, Society of the (named from the old Roman Cincinnatus, who returned from victory to his farm): a patriotic order founded in the Verplanck House, near Fishkill, N. Y., on May 13, 1783, by officers of the Revolutionary army. It was organized to perpetuate the remembrance of the war and "the mutual friendships formed under the pressure of common danger." Membership included only officers who had served for three years and the eldest male descendants of officers who had been killed. The society has been perpetuated by the election of the eldest male posterity of a deceased member to the vacancy caused by his death. During 1783 societies were organized in each of the thirteen States, and representatives from these convened in a congress in Philadelphia in 1784. Washington was asked to hold the office of president-general until that convention. He did so, and was then chosen to the office and held it until his death. The hereditary clause in the original constitution caused much adverse criticism for its aristocratic tendencies, and at the congress in 1784 a revised constitution with that feature left out was adopted. This failed to receive a majority ratification from the State societies, and the original constitution is still in force. Meanwhile a society of French officers who had served in the American army was organized in France. One by one the State societies disbanded or became dormant until 1881, when only those of Massachusetts, New York, New Jersey, Pennsylvania, Maryland, and South Carolina remained, and an original membership of over 1,500 had fallen to 315. Since then State societies in Rhode Island, Connecticut, and France have been revived. The general society meets every three years, and in 1893 met in Boston. The present membership is now (1896) over 500. The French society was dispersed by the revolution of 1792.

Cincinnato, chĕen-chĕe-naa'tō. Romolo: a Florentine painter; b. 1502; pupil of Salviati, who was the pupil of Andrea del Sarto. He went to Spain in the service of Philip II., and died there (1502). He left a son there named Diego Romolo, also a painter, who died in 1626.

Cincinna'tus, Lucius Quintius [so called because he wore his hair in long curling locks, Lat. *cincinni*]: an eminent Roman patriot and dictator; b. about 519 B. C.; belonged to the patrician order. He cultivated a small farm with his own hands, and was regarded as a model of pristine virtue and simplicity of habits. About 458 B. C. he became consul. According to Smith's *Dictionary*, he was illegally appointed consul suffectus in 460 B. C. He was appointed dictator two years later, and gained a victory over the Æqui; resigned the dictatorship in sixteen days, and returned to his farm on the Tiber bank. In the year 450 he was an unsuccessful candidate for the office of decemvir. He was chosen dictator in 439 B. C., to oppose the machinations of Spurius Melius, accused of treason. Much of what is related of him by Livy is now thought to be legendary.

Cin'eas (in Gr. Κινέας): Thessalian orator and negotiator. He became a confidential minister of Pyrrhus, King of Epirus, who, in 280 B. C., sent Cineas to Rome to negotiate a treaty of peace or alliance. His artful and plausible speeches were frustrated by Appius Claudius, and his mission was a failure. D. about 270 B. C.

Cinematograph: See Vitascope.

Cinerary Urn [*cinerary* is from Lat. *cinera'rius*, pertaining to ashes (*ci'nis, ci'neris*)]: a jar or other receptacle of a durable kind used to contain the ashes of a dead body which had been burned. Among the Etruscans these urns were frequently of terra-cotta modeled in the form of a small house, and some information concerning the architecture of the periods has been obtained from these; others were boxes decorated with external reliefs of great richness. The Romans adopted this custom, but began before the fall of the republic to use cinerary urns of stone, sometimes in the form of square boxes and sometimes like covered vases. Urns containing ashes of the poor were placed in niches in large public structures provided for the purpose. See Columbarium.

Cin'na, C. Helvius: a Roman poet and a friend of Catullus; perhaps the same as the Cinna whom Vergil compliments in his ninth eclogue. He wrote an epic poem in the Alexandrine manner, called *Smyrna*, of which only a few lines are extant. He was killed in 44 B. C. by a mob of Cæsar's adherents, who mistook him for another Cinna, an accomplice of Brutus.

Cinna, Lucius Cornelius: Roman patrician; partisan of Marius in the civil war between Marius and Sulla. He became consul in 87 B. C., while Marius was in exile and Sulla was conducting a campaign in Asia. By an effort to reinstate Marius he provoked a violent conflict, and was driven out of Rome, but he and Marius soon returned with an army and obtained the mastery in that capital. They massacred many friends of Sulla. Cinna was re-elected consul as a colleague of Marius, who died in 86 B. C. Afterward he usurped the consulship for himself and his creatures; raised an army and marched to oppose Sulla, who was returning from Asia, but was killed by his own mutinous soldiers in 84 B. C. His daughter Cornelia was married to Julius Cæsar.

Cin'nabar [from Gr. κιννάβαρι, a word of Persian origin, *zingafr*]: the mercuric sulphide, composed, when pure, of 86·2 per cent. of mercury and 13·8 per cent. of sulphur. It occurs in rhombohedral crystals and also in the granular and massive states. Cinnabar is the principal ore of mercury, and while it is found in many localities the deposits have commercial value only in a few countries. Conspicuous among these are Spain, whose Almaden mines are controlled by the Rothschild family; Austria, with the ancient Idria mines; and California, with the New Almaden, the

New Idria, and other mines. The maximum production of the California mines, 79,395 flasks at 76½ lb., was reached in 1877. In 1893 the world's production of quicksilver was estimated at 105,644 flasks. Vermilion is a pigment, made in the dry way by mixing 8 parts of sulphur and 42 parts of mercury and distilling the product thus obtained. The sublimate is ground, treated with caustic soda, washed, and dried. C. K.

Cinnamon: a drug and flavoring mixture derived from the inner bark of shoots of *Cinnamomum zeylanicum*, a tree some 20 to 30 feet in height, with branches mostly horizontal or drooping. Most of the cinnamon of commerce is obtained from Ceylon, although other sources are largely drawn upon. Chief among these is China, from which immense amounts of cinnamon are annually exported. Cinnamon bark has also been artificially cultivated in Java, in the Cape de Verde Island, in Brazil, in a number of the West India islands, and in Egypt. As with many other drugs, the quantity of its volatile oil depends very largely, indeed, upon the character of the soil in which the tree grows, the climate, and the mode of culture to which it is exposed. The presence of sunlight and shade also influence the development of the oil in the bark. The bark was collected at one time from trees which were growing wild, but the Dutch, recognizing its value, first introduced the practice of cultivating the tree. In commerce the Chinese cinnamon bark is called cassia. Ceylon cinnamon occurs in long cylindrical pieces looking like quills, the smaller quills being placed inside the larger ones. Sometimes these are as long as 3 feet. Chinese cinnamon is of a darker color than the best Ceylon cinnamon, and is more rough and dense. Besides these and the other forms of cinnamon which we have mentioned, there is a variety called Saigon cinnamon, which has now become official in the U. S. Pharmacopœia. Little is known concerning the trees from which this bark is derived. Its introduction into commerce is comparatively recent, but it seems to be increasing in quantity from year to year. It appears in commerce in the shape of unscraped quills about 6 inches long and ½ inch in diameter. Their thickness varies from $\frac{1}{12}$th to $\frac{1}{8}$th inch. The inner surface is quite dark brown in color, somewhat striated, and granular. The taste is sweet, decidedly aromatic, slightly astringent, and when the bark is ground into a powder it yields a darker-colored mass than does the Chinese cinnamon. The odor which is given off by all of these barks depends upon the presence of a volatile oil known as the *oil of cinnamon*, which is a warm aromatic liquid possessing a taste which is very peculiar. Besides this volatile oil, cinnamon bark contains tannic acid as its chief ingredient. It is one of the best of the various aromatic oils employed in medicine, and seems to possess certain antihæmorrhagic powers when administered internally in cases where there is a tendency to an oozing hæmorrhage. The dose varies from 1 to 5 drops. Upon the nervous system it acts as a feeble sedative. In the gastro-intestinal tract it tends to stop fermentation and decrease flatulence. The oil of cinnamon is also largely employed in the preparation of what is known as cinnamon water, which is used as a pleasantly flavored vehicle to carry more powerful drugs. H. A. H.

Cinnamon Bear: a reddish-brown or yellowish-brown variety of the black bear (*Ursus americanus*). The name is occasionally applied to small varieties of the grizzly bear.

Cinnamon-stone, or **Essonite**: See GARNET.

Cino da Pistoia, chee'nō-dăă-pĕĕs-tō'yăă: an Italian poet; b. in Pistoia, 1270 or earlier; d. in 1336 or 1337. He belonged to the noble family of the Sinibuldi, and was educated for the career of jurisprudence. He studied at Bologna, and here, in 1314, he completed his commentary on the first nine books of the *Codex Justinianus* (*Lectura in Codicem*), receiving soon after (Dec. 9, 1314) the degree of doctor. He had already before this (1307) received the honor of an appointment as judge in Pistoia, but had been obliged to go into exile, owing to the defeat of the party (the Bianchi) to which his family belonged. He taught jurisprudence with extraordinary success at several universities (Treviso, 1318–21; Siena, 1321–26; Perugia, 1326–33; Florence, 1334). He is chiefly known to us, however, as a poet. Dante (*De Vulg. Elog.* xiii) called him one of four persons excellent in the vulgar tongue; and elsewhere we have evidences of the admiration and friendship felt for him by the great Florentine. To him, among others, was sent a copy of Dante's first finished sonnet (*Vita Nuova*, son. i.), and he answered it with a sonnet of his own. He belonged, therefore to the poets of the "*dolce stil nuovo*," as Dante called it; and he has a certain importance as having continued this style somewhat further into the fourteenth century than did his fellows. Some have essayed to find in him the precursor of Petrarch. The latter did, indeed, upon Cino's death write a sonnet to his memory, and he several times speaks of him with admiration; but it is difficult to trace any spiritual relationship between the two. The name of the lady most celebrated by Cino is by him given as Selvaggia, and she had in the fourteenth century almost the fame of Beatrice and Laura. Who she was has never been satisfactorily made out, though a certain Selvagia dei Vergiolesi, whose father was leader of the Bianchi in Pistoia, has since the seventeenth century at least been mentioned in this connection.

BIBLIOGRAPHY.—Luigi Chiappelli, *Vita e opere giuridiche di Cino da Pistoia* (Pistoia, 1881); Bindi e Fanfani, *Le Rime di Cino da Pistoia ridotte a miglior lezione* (Pistoia, 1878); A. Bartoli, *Storia della Litteratura italiana*, vol. iv.
A. R. MARSH.

Cinq-Mars, săńk'maars', HENRI COIFFIER DE RUZÉ, Marquis de: son of Marquis d'Effiat, marshal of France; b. in 1620; came to the court in 1639 as a *protégé* of Richelieu, who intended to make him the favorite of the king, in order to use him as a spy. The cardinal, however, mistook the young man. Cinq-Mars, proud, noble, and brilliantly gifted, had an ambition of his own, and a deadly hatred soon sprang up between the favorite and the minister. Cinq-Mars joined the Orleans party, a conspiracy was formed for the overthrow of Richelieu, and an alliance was concluded with Spain. Meanwhile the cardinal had watched the movement from the very beginning, and just as the conspiracy was ripe to enter into action he laid all its traitorous documents before the king, and had Cinq-Mars and his friend De Thou arrested at Narbonne June 13, 1642. In order to save himself, the Duke of Orleans confessed all, and Cinq-Mars was executed at Lyons Sept. 12, 1642. Alfred de Vigny has given a very interesting description of his life and character in his romance, *Cinq-Mars, ou une Conjuration sous Louis XIII.*

Cinque Cento, chĕĕn'kwăy-chen'tō [Ital., five hundred]: a term used by the Italians to designate the sixteenth century—that is, the years whose dates are one thousand five hundred and something. The same term is also applied in English to the literature and architecture of that period, either adjectively, as "the cinque cento-sculpture," or substantively, as "the arts of the cinque cento." By careful writers it is distinguished from the Renaissance, which is taken to have closed in Italy with the beginning of the cinque cento. R. S.

Cinquefoil, singk'foil [from an O. Fr. form of Lat. *quinquefolium*, five-leaved; *quinque*, five + *folium*, leaf: cf. Mod. Fr. *quintefeuille*]: a plant of the genus POTENTILLA (*q. v.*) and of the family *Rosaceæ*. Some of the species are shrubby, as in *Potentilla fruticosa*, but nearly all are perennial herbs, as *P. canadensis*, *P. argentea*, *P. palustris*, etc. Many of the species are quite ornamental, especially the exotic *P. nepalensis* and *P. atrosanguinea* from the Himalaya region, the first with rose-red and the second with brown-purple or crimson flowers. C. E. B.

Cinque Ports [M. Eng. *sink pors*, O. Fr. *cink porz* < Lat. *quinque portus*, five ports]: the English seaport-towns of Dover, Sandwich, Hastings, Romney, and Hythe, to which William the Conqueror granted important privileges. Winchelsea, Rye, and several minor towns with the name of Limb or Member were subsequently added to the original five ports. They are under the government of a lord warden. The Cinque Ports in early times were required to furnish at their own expense such shipping as the sovereign required for the public service. Up to the time of Henry VII. they supplied nearly all the ships and sailors that the state was in need of, and for a long period afterward they afforded considerable assistance to the permanent navy. The lord warden's civil jurisdiction ceased in 1835, but he still presides in the ancient court of Shepway, and appoints justices of the peace for the Cinque Ports. The official residence is Walmer Castle, Deal, and there the Duke of Wellington died, having been lord warden for twenty-three years. In 1891 the Marquis of Dufferin succeeded the late Right Hon. W. H. Smith, who had himself succeeded Earl Granville but a few months before. In 1895 the Marquis of Salisbury succeeded the Marquis of Dufferin.

Cin'tra, or **Sintra**: a town of Portugal, in Estremadura; on the slope of the Serra de Cintra; 14 miles N. W. of Lisbon (see map of Spain, ref. 17–A). It is remarkable for the picturesque beauty of its situation and its delightful climate. It has an ancient castle, originally occupied by Moorish kings and afterward by Christian sovereigns. On two hills are the Penha convent, now a royal residence, and a Moorish castle, and within the town is a palace. It is surrounded by summer residences. The Cintra convention of 1808, which aroused indignation in Great Britain, was a capitulation under which the French army in Portugal was landed in France with its arms and effects and without conditions as prisoners of war. Pop. 5,000.

Cinu'ra [from Gr. *κινεῖν*, move + *οὐρά*, tail]: a sub-order of insects. See THYSANURA.

Cione di Andrea: See ORCAGNA.

Ciparîu, TIMOTEO: a Roumanian writer; b. Feb. 21, 1805. He did much for the study of his native language and literature. Besides works on Poetics (1860) and Philosophy (1863), he published *Elemente de limba românâ* (Elements of the Roumanian Language, 2d ed. 1866); *Grammatica de limba românâ* (1870–77); *Crestomatia seu analecte litterarie* (1858). He edited also the Roumanian *Archives for Philology and History* (4 vols., 1870). D. Sept. 14, 1887. A. R. MARSH.

Cipher, or **Monogram**: an intermixture of letters, as the initials of a name; an arrangement of the initial letters of a person's name, used as a private mark by artists and others. In strictness, *monogram* is the character in which all the letters of one word are combined. The term is also applied to certain characters or arbitrary signs used in writing dispatches, etc., in cases where secrecy is desirable. See CRYPTOGRAPHY.

Circæ'a: a genus of herbaceous plants of the family *Onagraceæ*, having a corolla of two petals and two stamens. The *Circæa lutetiana* (enchanter's nightshade) is a native of Europe and the U. S., growing in damp woods. It bears small whitish flowers in racemes.

Circars, Northern: an obsolete subdivision of Madras presidency, British India, from the native word *circar*, a subdivision of a province. It was a coast district on the Bay of Bengal, granted to the French in 1757 by the ruler of the Deccan, overrun by Clive, ceded in 1766 to the East India Company, and permanently British since 1823.

Circas'sia: a geographical name applied to the northwestern part of the Caucasus region N. of the mountains; now in large part the Kuban territory of the Russian Government. The soil is fertile, and the climate cool and healthful. The forests are of luxuriant growth. Coal and iron abound. Area about 33,000 sq. miles.

The name Circassians has been widely applied to the mountaineers of the whole northwestern part of the Caucasus, of which the Russian form of name is Tcherkesses. In this large sense it included the Adighè, or Circassians proper, and the inferior but related tribes of Abkhasians who dwell in the S. E. as far as Mingrelia, and of Kabardans living on the north slopes of the mountains, in the valleys of the Kuban and Terek, and beyond. The Adighè, living on the northwestern end of the mountains and along the northeastern coast of the Black Sea under a half-patriarchal government, attracted the attention of mankind by their spirited defense of their independence against Russia. For fifty years they maintained resistance, and when in 1864 the Russians gained complete military occupation of their territory, 400,000 Circassians, including some of the Abkhasians (some say 500,000), forsook their old homes and migrated to Asia Minor, or to Bulgaria, where they added terrors to the massacres of 1877. The country they forsook was left almost a desert for 200 miles along the Black Sea coast from Sukhum Kaleh to Anapa. Those who remained seem completely pacified, have taken to farming, cattle-breeding, and fishing, are exempt from poll-tax, are strict Mohammedans, have abandoned predatory habits, are prosperous, and have considerable self-government, while serfdom is practically extinct. Originally there were fifteen Circassian tribes, with an estimated number of 600,000.

The language of the Circassians, like that of nearly all the races of the Caucasus, is apparently unconnected with that belonging to any other people. It is mainly agglutinative in structure. Among the Circassians previous to the Russian conquest there were three distinct ranks of the free people—namely, the princes, the nobles, and the peasants. Besides these there were the slaves, of whom many were prisoners taken in battle. They were the domestics of the princes and nobles, or were employed in cultivating the soil. The Circassians are handsome, strong, active, and temperate, and are characterized by self-dependence, courage, and prudence. They are also known for their custom of selling their daughters to the Turks and Persians.

Cir'ce (in Gr. *Κίρκη*): a sorceress of classic mythology; daughter of the Sun and Perseis, sister of Æetes, King of Colchis and Pasiphaë, wife of Minos; married and slew a Samaritan prince; fled to the island of Ææa, on the Italian coast. Ulysses stopped here on his way home from Troy, and his companions were transformed for their gluttony into swine, and placed among other victims of Circe's enchantments. He, guided by Mercury and fortified by an herb against her wiles, compelled Circe to restore his men; but he lingered a year in the island and had offspring by her. It is further told that she changed her rival, Scylla, into a repulsive shape to alienate Glaucus from her. The metamorphoses by Circe of Scylla and of Picus are celebrated by Ovid.

Circen'sian Games: See CIRCUS.

Circignani, cheĕr-cheĕn-yaa'neĕ, NICOLA: b. 1516; a Tuscan painter; pupil of Sante Tite. He painted at Orvieto and in the Vatican. His chief work is the cupola of S. Pudenziana. He has many remarkable works at Città di Castello, Umbria. D. in 1598. W. J. S.

Circle [from Lat. *cir'culus*, dimin. of *circus*, ring]: in geometry, a plane figure bounded by a curved line which is everywhere equally distant from a point within called the center. The curved line which bounds the circle is called the circumference. The distance from the center to the circumference is called the radius, and any two radii which together form a straight line constitute the diameter.

In the mechanic arts the ratio of the diameter to the circumference is assumed to be as 7 to 22, which is exact enough for many purposes, though the real ratio can never be exactly expressed by numbers. In ordinary mathematical work it is assumed to be as 1 to 3·14159265. William Shanks, a British mathematician, has carried out the decimal to 607 places. The diameter and circumference are in fact incommensurable, and it is conclusively demonstrated that the famous problem of "squaring the circle" can never be solved. See QUADRATURE OF THE CIRCLE.

The circle is one of the conic sections, as it can be formed by cutting a right cone by a plane parallel to its base. It may be regarded as an ellipse whose foci coincide with each other.

In astronomy, the term "great circle" is applied to those circles which divide the celestial sphere into two equal parts, as the equator and the meridian.

NINE-POINT CIRCLE, the circle which passes through nine points connected with a triangle, viz., the middle points of the sides of the triangle, the feet of the three perpendiculars let fall from the angles upon the opposite sides, and the middle points of the three lines joining the vertices of the triangle to the intersection of the three perpendiculars. Among its curious properties is that it touches the inscribed and the three escribed circles of the triangle.

The term "circle" is also applied to several astronomical instruments, of which a circle for measuring angles forms the most important part. Among these are the MURAL CIRCLE, MERIDIAN or TRANSIT Circle, REFLECTING CIRCLE, and REPEATING CIRCLE (*qq. v.*). Revised by S. NEWCOMB.

Circle, Mural: See MURAL CIRCLE.

Circle of Perpetual Apparition: a lesser circle of the celestial sphere; parallel to the equator; increases with the latitude of the place where the observer is stationed. All stars included in it are always above the horizon. These are called circumpolar stars.

Circleville: a city; capital of Pickaway co., O. (for location of county, see map of Ohio, ref. 6–E); on Cin. and Musk. Val. and Norf. and West. R. Rs., and on the Scioto river and the Ohio Canal; 104 miles E. N. E. of Cincinnati and 25 miles S. of Columbus. It has large pork-packing establishments, very large straw-board works, furniture, shoe, and agricultural-implement factories, and other industries. The streets are lighted by electricity, and there is an electric street railway. The city occupies the site of highly interesting ancient works, consisting of a circle and square, perfect in form, fully described in Howe's *History of Ohio*. The lands in the vicinity of Circleville are largely devoted to broom-corn culture, thus making it a leading

market for that article. Camp Charlotte, where Lord Dunmore encamped in 1774 and made a treaty of peace with Indians, is 7 miles S. E. of Circleville. Pop. (1880) 6,046; (1890) 6,556; (1900) 6,991. Editor of "Daily Herald."

Circuit [from. Lat. *circu'itus*, a going around; *circum*, around + *ire*, go]: in electricity, the path of the current; in magnetism, the path of the lines of force which constitute the magnetic field to which the lines in question belong. An electrical circle is "closed" when no portion of it offers an infinite resistance to the flow of electricity. It is an open circuit when any portion possesses so high a resistance as to prevent the passage of an appreciable current. The electrical circuit may be said to be made up of the lines of flow, each of which is a closed curve. No two lines come into contact at any point, and all of them are everywhere perpendicular to the equipotential surfaces. The total number of lines of flow in any circuit is at every part of it the same; but their distribution depends upon the specific conductivity of the material of which the circuit is composed.

The simplest case is that of a battery or dynamo sending a current through an external circuit composed of a uniform wire of a single metal. The circuit may be divided in two parts, that within the battery or within the armature of the dynamo (internal circuit), and the wire, which constitutes the external circuit. In such a wire the lines of flow will be parallel and evenly distributed throughout the metal. The current density, measured by the number of lines per unit of cross section, will be everywhere the same throughout the external circuit.

Circuits are, however, frequently of a much more complicated character. The current may be made to traverse the ground through a portion of its course, as in telegraphic circuits, etc., in which case the lines of flow will disseminate themselves through all neighboring portions of the earth's crust, following watercourses and whatever other paths offer themselves. The existence of currents flowing within the earth at great distances from the direct line between the terminals inserted in the ground has been repeatedly noted, but the principle already stated, that every line of flow is a closed curve, is a rigorous one; and every such line issuing from the positive terminal into the earth will be found to enter the negative terminal, however devious or indirect its path may have been. Where several distinct paths between two points are offered, the current will use them all, each one in direct proportion to its conductivity, or in inverse ratio to its resistance. E. L. Nichols.

Circuit: a division or district of a country or state at various places in which court is successively held by a judge or judges appointed for that purpose. Originally in England the judges of the courts at Westminster held their sittings only at that place, or wherever the king might be, but as early as the reign of Henry II. the kingdom was divided into districts or circuits which were visited, commonly twice in each year, for the trial of issues of fact, the issues of law being reserved for decision by the full court sitting in banc at Westminster. (See Banc and Nisi Prius.) The judges while traveling circuit were anciently called "justices in eyre" (deriv. of Lat. *iter*, *itineris*, journey). Essentially the same system is still preserved, and England and Wales are now divided into eight circuits, and Scotland and Ireland are divided in a similar way. In the U. S. the term is applied to a judicial district over which a Circuit Court (*q. v.*) has jurisdiction. Revised by F. Sturges Allen.

Circuit Court: the name of the principal inferior courts of the U. S. which, until the establishment of the circuit court of appeals in 1891, were next inferior to the Supreme Court. The U. S. are divided into circuits, and in the judicial districts of each circuit one of these courts holds its sittings. The court may be held by the chief justice of the U. S., one of his associates, a special circuit justice, or a district judge, or any two of them, sitting together. In general the circuit courts have original jurisdiction, both in law and equity, in civil cases involving sums of $500 or over, and in all criminal cases. They no longer have any appellate jurisdiction. The term circuit court is also applied in several of the States to certain courts of record having a general original jurisdiction, from whose decisions on questions of law an appeal lies to a superior court. See Courts.

Revised by F. Sturges Allen.

Circuit Court of Appeals: an appellate court of record of the U. S., established by act of Congress in 1891 (26 Stat. at Large, § 517) to relieve the Supreme Court of a share of its burdens. It consists of three judges, two of whom constitute a quorum, and is presided over by the chief justice or one of his associates, or by a circuit judge. One or more judges of the district courts may sit when necessary to make a full court. By this act the appeal which formerly lay from the district courts to the circuit courts is taken away, and all appeals must be taken to the Circuit Court of Appeals, except that in any case in which the jurisdiction of the court is in issue the question of jurisdiction may be certified to the Supreme Court, and an appeal may be taken directly to the Supreme Court, from final sentences and decrees in prize cases, in cases of conviction of a capital or otherwise infamous crime, in cases involving the construction or application of the U. S. Constitution, in any case in which the constitutionality of any law of the U. S. or the validity or construction of any treaty is involved, and in any case in which the constitution or a law of a State is claimed to be in contravention to a law of the U. S. The Circuit Court of Appeals has final jurisdiction in cases where the jurisdiction depends entirely upon the parties being aliens and citizens, or citizens of different States, and in cases arising under the patent laws, the revenue laws, the criminal laws, and in admiralty cases. It may, however, certify to the Supreme Court any questions or propositions of law concerning which it desires the instruction of that court, and the Supreme Court may require by *certiorari* or otherwise any case to be certified to itself for its review and determination. F. Sturges Allen.

Circular (Lat. *circularis*; Fr. *circulaire*): round, like a circle, circumscribed by a circle; ending in itself, as a paralogism in which the second proposition proves the first, and is proved by it. "Circular sailing" is the method of sailing by the arc of a great circle. (See Great-circle Sailing.) As a noun circular sometimes signifies a document addressed to a circle of persons or to persons having a common interest, as a circular letter.

Circular Functions: the inverse of the trigonometrical functions.

Circular Notes: See Letters of Credit.

Circular Numbers: numbers whose powers have their last digits the same as their own; such are numbers ending in 0, 1, 5, 6.

Circular Points at Infinity: the two imaginary points in which any circle intersects the infinitely distant right line in its plane.

Circulating (or **Recurring**) **Decimal**: a decimal in which certain digits are continually repeated. Thus, ·15723723 . . . . , *ad infinitum*, is a circulating decimal of which the figures 723 constitute the *recurring period*, called also the *repetend*.

Circulating Library: See Libraries.

Circulation of the Blood: In all animals, even the simplest and lowest, there is a movement, more or less regular, of blood, or of a fluid equivalent to it, furnishing material for the growth, repair, and sustenance of the body. Sponges, while living, have no closed *internal* circulation, but their nutrition and aëration are sustained by the incessant flow of the water in which they exist through their numerous pores. Other Protozoa (as the lowest group of animals is designated), as Rhizopoda, have, within their soft, jelly-like substance, cavities (vacuoles) which alternately contract and dilate, serving the purpose of circulation within their bodies and redistribution of their material. Animals a grade higher, as the Actinia (sea-anemone), have a free communication between the stomach and the general cavity of the body, from which, through fine ramifications to certain parts, the nutritious fluid is circulated, though never separated as true blood. In worms no distinct circulation of blood has been proven to exist. Cavities (*lacunæ*) there are, and in some, as the leech, vessels called *pseudo-hæmal* vessels, ramifying through the body and containing a fluid, generally red, but these always have a tubular communication with the exterior. In insects there is a dorsal segmented vessel, with valves between the segments, which conveys the blood forward by its rhythmical contractions. The blood, which is often colored, and contains corpuscles (though never colored, as in vertebrates, by the corpuscles), then flows into lacunæ, or spaces through the body, coming in contact with the air introduced by the tracheal tubes. Crustaceans, as the lobster, have a muscular heart, with six arterial branches, going to the head, stomach, liver, and posterior parts. Thence the blood passes through a number of lacunæ, and returns by a number of veins, which expose it.

in the *gills*, to the air before reconveying it to the heart. Thus the heart of the crustacean is *systemic*, not respiratory, in its mode of distribution of the blood. The oyster has a heart, not far from the muscle which closes its shell; its vascular system, however, is incompletely closed. In the cuttle-fish there is a strong systemic heart, with valves; it sends blood to all the organs except the gills. The blood returns into a contractile venous enlargement (*sinus*), which conveys it to the gills through from two to four branches or veins. Other sinuses then receive it, and these, being contractile, send it back to the heart. All invertebrates (animals without an internal skeleton) have, if any, a *systemic* heart, and only few of them have *colored* corpuscles in their blood.

Vertebrated animals always (except the anomalous *Amphioxus*) have blood containing both red and colorless corpuscles, the former of which give to it its color. In fishes the heart is branchial or respiratory. Consisting of an auricle and a ventricle, it receives venous blood from the body, and propels it, by four or five arched vessels, through the gills, whence it circulates, to be returned by veins to the auricle. In the eel, torpedo, and one or two other fishes, contractile venous sinuses assist this return.

In fishes generally it is supposed that the impulse of the heart suffices for the whole round of the circulation. More probably, however, this is supplemented by arterial, if not venous, propulsion, and by a power acting in the (intermediate) capillary region. All vertebrated animals have a closed circulatory system, consisting of a heart, arteries, capillaries, and veins. In all vertebrates there is, also, a portal system, composed of veins going from the digestive, and sometimes other, organs to the liver—in fishes to the kidney also—whence veins again convey the blood to the heart.

Reptiles and amphibia have a heart with three cavities—two auricles and one ventricle. Of the auricles, one receives blood from the lungs (except in the early stage of life of the frog and some other amphibia; and from the lungs and gills *both* in the perennibranchiate amphibia, as Proteus); and the other receives the blood from the body generally. These two kinds of blood (aërated, or arterial, and non-aërated, or venous) mingle in the single ventricle, whence they are redistributed to the lungs and all over the body by arteries. In the crocodile, however, a partition almost separates the two halves of the ventricle, thus approaching the arrangement in the higher animals.

Birds have four cavities—two auricles and two ventricles—making a completely double heart, always situated in the middle of the thorax or chest. One auricle receives the blood by large veins coming from the body generally. This auricle passes the blood into the connected ventricle, which sends it, by pulmonary arteries, to the lungs. Thence it returns, by pulmonary veins, to the other auricle, and this conveys it into its attached ventricle. That cavity then propels it through the aorta, or main arterial trunk, for general distribution over the body. In birds the portal venous system mainly connects the liver with the digestive organs; but a few of its veins communicate with the kidneys, posterior internal organs, and lower extremities.

All mammals (viviparous vertebrated animals which suckle their young) have a double heart, consisting of two auricles and two ventricles—a respiratory and a systemic heart conjoined. In man, for instance, the right auricle and ventricle constitute the respiratory or pulmonary heart—the left, the systemic; and after birth, although closely adherent together, no direct communication exists between them. In the dugong the two ventricles are partly separated by a deep notch. In the ox and many other ruminants a bony deposit strengthens the inter-ventricular wall. Only in man and some of the anthropoid (man-like) apes does the heart incline to the left side; in other animals it is usually median. This promotes the symmetry which is so especially important in swift-running animals, as the hound and deer, and in birds for flight.

The arrangement of the branches of the aorta differs in the several classes of vertebrated animals. Fishes have four or five aortic arches going to the gills. The lower reptiles have three aortic arches on each side; the higher reptiles, one on each side, descending over the roots of the two lungs to form together the abdominal aorta. Birds have only one—the right aortic arch, passing over the root of the right lung. In mammals, including man, there is only a single aortic arch, over the root of the left lung: this, giving off branches above, becomes in its descent the abdominal aorta. The manner of origin of the ascending branches (subclavian and carotid) of the aorta differs also, even among the Mammalia. In man it is least symmetrical, two arterial trunks passing upward from the aorta on the left side (left carotid and subclavian), while there is one (*arteria innominata*) only on the right, soon subdividing into two. The horse and ruminants have but a single aortic principal branch, which gives off all four of the carotid and subclavian arteries. The portal circulation in mammals is never connected with the kidneys.

A *rete mirabile* is a network of closely interjoining (anastomosing) arteries, which finally unite into a single trunk. Whales and other Cetacea (aquatic, fish-like mammals) have *retia mirabilia* connected with their intercostal arteries within the chest, evidently serving the purpose of reservoirs to retain and distribute aërated blood while the animal is submerged for a long time. There are also in the same animals venous plexuses or *retia*, for the detention, under like circumstances, of impure, non-aërated blood. Protective arrangements of the arteries exist in certain special instances, as the passage through the pelvic bones of the main artery of the hind part of the tail in the whale; of the great artery of the anterior extremity through the humerus or arm-bone of the lion; and of the corresponding artery through the coffin-bone (hoof-bone) of the horse. In all these cases vigorous action of the muscles in locomotion or prehension might unduly obstruct, at times, the flow of arterial blood but for such a provision, by which muscular or tendinous pressure upon the artery is prevented by its inclosure within body walls.

The circulation of the blood in man corresponds altogether (except in the unsymmetrical location of the heart and of some of the arterial trunks) with the mammalian type above described. In connection with the human circulation, however, some additional particulars may be here given.

Action of the Heart.—Being composed of peculiarly arranged muscular fibers, the heart, by its rhythmical contractions and relaxations, alternately empties itself and becomes filled with blood, in an adult man or woman, between seventy and eighty times a minute while at rest in health. From the right ventricle the venous blood (poured into it from the right auricle, which receives it from the great *venæ cavæ*) is sent through the pulmonary artery and its branches to the capillaries which ramify minutely throughout the lungs. These combine to form small veins whose union into larger trunks finally constitutes the four pulmonary veins, which empty the (now aërated or arterialized) blood into the left auricle. This conveys it into the left ventricle, whence it is impelled through the aorta, by the branches of which it becomes distributed all over the body in capillary networks, to return to the heart by means of the veins; all of which empty at last into the ascending and descending *venæ cavæ*. See HEART, ARTERY, CAPILLARY, and VEIN.

For the maintenance of this round of the circulation the *valves* of the heart are indispensable. Membranous and muscular valves (tricuspid and mitral) intervene between each auricle and its corresponding ventricle. Pocket-like (three-folded, semilunar) valves also exist at the mouths of the two great arteries which convey blood from the heart; namely, the pulmonary artery from the right ventricle and the aorta from the left ventricle. When the auricles are contracting, the (tricuspid and mitral) valves between them and the ventricles are open, allowing the blood to flow through. The auricles being emptied and the ventricles filled, the latter then contract, and at the same time, and in the same act, close the auriculo-ventricular valves; so that the blood is forced onward through the two arteries above named (pulmonary artery and aorta). While the ventricles are contracting (this being called the *systole*), the heart is spirally twisted, shortened, changed in form from a flattened to a round cone, and thrust slightly forward against the space between the fifth and sixth ribs, below the left nipple. This quite perceptible movement is the impulse of the heart. No power other than that of elasticity has been proved to exist in the dilatation (*diastole*) of the cavities of the heart. The immediate cause of the systolic contraction is most probably the irritability resident in the heart's muscular and nervous tissues, acting under the stimulus of the blood. It is also placed under the modifying influence of the nervous apparatus connected with the brain and spinal cord by branches of the pneumogastric nerves and fibers running through the sympathetic nerves. Why the action of the heart should be so regularly rhythmical is not known. With

some (especially cold-blooded) animals the heart has been found to contract for some minutes, or even hours and days, after its removal from the body, and sometimes when entirely deprived of blood.

Of the *sounds* of the heart, audible when the ear is placed over it against the chest, the first (longest and loudest) is explained principally by the closing, with vibration, of the auriculo-ventricular valves during the systole of the ventricles and the sound produced by the contraction of the muscular fibers. Other minor causes are the impulse of the heart, the rush of blood into the great arteries. The second sound has been shown experimentally to be caused by the closure, *after* the systole, of the pocket-like (semilunar) valves at the mouths of the aorta and pulmonary artery.

Arterial Circulation.—Since the arteries contain, in their middle coat, a portion of (smooth, pale, involuntary) muscular as well as elastic tissue, this must have an important influence upon the blood-movement. The fact that the relative amount of muscular tissue is greatest in the smallest arteries, which are farthest from the heart, suggests their adaptation to the purpose of supplementing the action of the heart in propelling the blood through the capillaries, as well as to act by dilating or contracting in modifying the blood-supply to the various parts. After death the arteries are always found to have emptied themselves, by their last contraction, into the veins. The value of the muscular fibers in propelling the blood is also supported by the apparent need of such an arterial power to complete the circulation commenced by the merely branchial (not systemic) heart in fishes, and by the fact that in acephalous (born without a head) children the heart is found to be absent, so that the circulation in them must have been arterial and capillary only; as well as by the proof that during early embryonic life every human being is likewise without a heart, the blood-movement then depending on the blood-vessels alone. Notwithstanding these and many other obvious reasons in favor of such a view (which was accepted by the distinguished John Hunter and Sir Charles Bell), the more common opinion among physiologists has been, for many years, that the office of the muscularity of the arteries is of a "stop-cock" or "flood-gate" nature, opposing a graduated resistance to the impulse given to the flow of blood by the heart. Certainly these vessels, by their change in caliber brought about by the muscular element, have to do with the regulation of the changing supply or determination of blood to various parts of the body at different times. This variation we see in blushing; in the erectile tissues and organs; in the effect of friction or mustard, etc., upon the skin; in the increased flow of blood to the jaws during the time of dentition in infants, to the ovaries during ovulation, the uterus in gestation, the male reproductive organs of some animals at certain periods, and the antlers of the deer during their annual new growth. In all these variations the vaso-motor nerves and centers have an important influence.

Capillaries.—Having but a single elastic coat, without muscularity, these very (microscopically) minute vessels simply adapt themselves to the blood that passes through them. Yet besides the transudation of lymph or modified blood-plasma *from* them for the nutrition of the tissues, and the absorption *into* them of waste materials, a force is probably added to the forward movement of the blood in the capillary region. This may occur in two ways, both of which are common to animals and plants. One is capillary attraction—i. e. the attraction of fine tubes for liquids in which they are immersed, such as is observed in inanimate (metallic or glass) tubes or porous bodies, as well as in living plants and animals. The other is the "vital affinity," or attraction of nutrition, exercised by the tissues toward materials present in the blood, and withdrawing them constantly from the current, thus making room, by diminution of resistance, for its onward flow. The volume of the capillary system in man is about 300 times that of the arteries.

Venous Circulation.—On account of the distance traversed by the blood (passing as it does through the capillary ramifications) before it reaches the veins, and their greater aggregate volume (three times that of the arterial system), as well as the obtuseness of the angles made generally by their branches with the main trunks, and the various other factors which offer resistance to the blood-current in the arteries and capillaries, the flow of the blood is much slower through the veins than through the arteries. Veins have, as the arteries have not, valves along their course, opening only toward the heart. By these the propulsive power is economized, and, on account of their influence also, the effect of movement during exercise upon the veins always favors the blood-movement toward the heart. Inspiration, by causing a condition of negative pressure within the thoracic cavity, tends to promote the return of venous blood to the heart. Forced expiration has an effect the reverse of this, but by increase of pressure upon the heart and aorta it favors the expulsion of the blood through the arteries.

The velocity of the movement of the blood through the arteries averages from 12 to 20 feet in a second; in the capillaries, about 2 inches in a minute; in the veins, from 6 to 12 feet in a second. Experiments prove that the whole round of the circulation is accomplished in a little less than half a minute during rest and health.

The discovery of the circulation of the blood, as now understood, was made by Dr. William Harvey in 1619, first published by him, however, in 1628. He was *partially* anticipated by Servetus, Realdus Columbus, and Cæsalpinus; almost entirely so by Paolo Sarpi, whose claim in this respect has been generally overlooked. The discovery was completed by the demonstration (with the aid of the microscope) of the blood corpuscles and the capillaries, between 1658 and 1687, by Swammerdam, Malpighi, and Leeuwenhoek. See, on the circulation, Foster's or Landois's *Treatises on Physiology.* Revised by EDWARD T. REICHERT.

Circulating Medium: See MONEY.

Circulation of Sap in plants: It was formerly supposed by botanists, and is yet popularly believed, that higher plants possess a nutrient fluid, the sap, which ascends and descends by regular paths, after the fashion of the blood in higher animals. This is now known to be erroneous. See BOTANY, *Physiology of Larger Plants*, and PHYSIOLOGY, VEGETABLE.

Circumcision [from Lat. *circumcī'sio*, a cutting round: *circum*, around + *cæ'dere*, cut]: the removal of the foreskin of males. This practice comes down from the earliest times. It is depicted upon a temple of Karnak, in Egypt, and was certainly known to Abraham (Gen. xvii. 7–14). It was practiced by the Indians and native tribes of North and South America, among the Kaffir and other Negro tribes of Africa, in Australia, and in the South Sea islands. It is to-day universally observed by the Jews, by the Mohammedans, and by the Coptic and Abyssinian Christians. It can not be traced back to any one land as originating it, nor is there any satisfactory explanation of its origin; perhaps it should be referred to the general connection between expiation of offenses and shedding blood. But however or where the practice originated, it certainly must have quickly recommended itself, and is to-day advocated by some physicians on the score of health, for it promotes personal cleanliness, and also renders less the likelihood of venereal poisoning. It was formerly considered to increase the fruitfulness of the male. With the Jews circumcision was performed on the eighth day of the child's life, but Mohammedans usually circumcise between the eighth and twelfth year. Both make quite an occasion of the act, inviting company and giving an entertainment proportional to their means. The operation is painful and in the case of non-infants even dangerous. The operators are not surgeons, nor necessarily priests. The parts are commonly healed up in a few days. In the reign of Antiochus Epiphanes the attempt of circumcised Jews to undo their circumcision was made (1 Macc. i. 15; Josephus *Antiq.*, xii. 5, 1); so later the attempt is alluded to by Paul (1 Cor. vii. 18) and by the Roman poet Martial, and described by Celsus (book vii., chap. xxv.). It does not seem to have been very successful. In the Bible the word "circumcision" is used figuratively to express a change of heart. The earliest Christians being Jews, naturally considered it necessary that the Gentile converts should enter the Christian Church by the rite of circumcision. But Paul saw clearly how detrimental such a requisition was, and the Council of Jerusalem (A. D. 50) formally absolved the Gentiles from it. In the Mohammedan world, female circumcision is practiced, which consists in the removal of the clitoris. In Arabia there are female professional circumcisers. See P. C. Remondino, *History of Circumcision* (Philadelphia, 1891).

Circumference [from Lat. *circumferen'tia*, circuit; *circum*, around + *ferre*, carry]: a curved line which incloses a plane area, and is synonymous with periphery. It is applied especially to the curved line formed by a circle, and its length bears a certain constant ratio to the diameter. (See CIRCLE.) The term perimeter is used to designate the length of the bounding lines of a plane area inclosed by several straight lines, as a square or polygon.

Circumflex [from Lat. *circumflexus*, bent about; *circum*, around + *flec'tere*, bend; a translation of the Gr. περισπώμενος (σπάω), drawn around]: in grammar, a character or accent originally denoting a rise and fall of the voice on the same long syllable, marked in Greek ~, or ^, and in Latin ^.

Circumnavigation [from Lat. *circumnaviga're*, sail around; *circum*, around + *naviga're*, sail]: literally, a sailing round: usually, the act of sailing round the globe. The first person who circumnavigated the earth was Sebastian del Cano, a lieutenant of Magellan, in 1519. (See MAGALHÃES, FERNÃO, de.) Sir Francis Drake sailed round the globe in 1577. Among the other celebrated navigators who performed this voyage was Capt. James Cook (1768–71).

Circumpolar Stars [*circumpolar* is from Lat. *circum*, around + *polus*, from Gr. πόλος, axis]: stars which revolve within the circle of perpetual apparition, and appear to move around the pole, and complete their diurnal circles without setting. The number of stars so circumstanced increases with the latitude of the place, or, in other words, with the elevation of the pole above the horizon of the observer.

Circumstantial Evidence: See EVIDENCE.

Circumvalla'tion [from Lat. *circumvalla're*, surround with a rampart; *circum*, around + *vallum*, rampart]: in fortification, an intrenchment or series of defensive works erected by a besieging army, facing outward from the place invested or besieged, is called a line of circumvallation. It consists of a line of field-works, sometimes connected by a parapet or a rampart. It is designed to defend the besieging army against an attack from a hostile army operating in the rear.

Circus [Lat., *a circle*, a building for races, public spectacles, etc.; cf. Gr. κρίκος, κίρκος, ring]: in Roman archæology, an open space for the display of physical contests and sports, especially chariot-racing. Originally a circus was the open space with a level area and hillsides, or rude buildings affording the only means of accommodating spectators, but wooden seats were used from early times. It is stated that no stone seats were used even in the famous Circus Maximus, S. of the Palatine Hill, before the time of Julius Cæsar. The perfected plan of the circus was probably settled about this era. The general shape was long with parallel sides and from four to five times as long as wide, with one end rounded to a half circle. The other extremity, which was that from which the chariots started in the race, was shaped into a segmental curve, the center of which was taken arbitrarily within the arena. The chariots were supposed to have an equal chance at starting because all were equidistant from this point. The arena was divided by a low wall running lengthwise, but not parallel to either side. This arrangement was to allow the race-course to be wider at the start than at the finish. The seats were arranged in steplike rows, rising one above the other, a great circus having perhaps fifteen or eighteen such rows. The emperor's or state box was placed near the point of finish of the races, that is to say, on the left hand of a spectator looking from the starting-place. The low wall which divided the arena was called the *spina*, and this was early made into a platform 10 or 12 feet broad and adorned with obelisks and pieces of sculpture. The chariots had each a chamber called *carcer*, in which chambers they remained till the moment of starting, when a rope was dropped from before them, or the doors suddenly opened at a signal. Under the empire the circuses of Rome were adorned in the richest manner with stately architectural screens and arcades, sculpture, flagstaffs and trophies, and abundant use of colors and gold. The Circus Maximus remained the largest, but that of Caligula and Nero, which stood on the Vatican Hill where is now the sacristy of St. Peter, that of Hadrian, the Circus Flaminius and others, were perhaps as rich in their architecture and appointments as the first named. The circus of Maxentius, situated outside the walls of Rome on the southeast, still remains partly erect, but all those within the walls have entirely disappeared. The Circus Maximus is stated to have accommodated 350,000 spectators. The Circus Maxentius, though very much smaller, is nearly 1,600 feet long and 260 feet wide; while the spina, which can be perfectly traced from end to end and which of course determines the length of the race-track, is 890 feet. According to this measurement each lap of a chariot near the middle line of the track would be as nearly as possible half a mile long. A similar lap in the Circus Maximus must have been much greater, perhaps 4,000 feet. R. S.

Cirencester, sis'e-tér (anc. *Corinium*): a town of England, in Gloucestershire; on the river Churn, and on a branch of the Great Western Railway; 89 miles by rail W. N. W. from London (see map of England, ref. 12–G). It has an agricultural college, several hospitals, and manufactures of carpets, woolen cloths, and cutlery. Canute held a council here in 1020. Cirencester partly occupies the site of *Corinium*, an ancient Roman town 2 miles in circuit. Pop. (1891) 7,441.

Cirillo, cheē-reēl'lō, DOMINICO: b. at Grugno, in the kingdom of Naples, 1734; d. at Naples, 1799; studied medicine; visited Great Britain and France; was appointed Professor first of Botany, afterward of Medicine, in Naples; wrote a number of books and treatises which enjoyed a great reputation in their time. When, in 1799, the French under Championnet entered Naples and the Parthenopean republic was established, Cirillo was elected a member of the legislative assembly, and acted as its president. As soon, however, as the French left Naples, King Ferdinand returned, and by the aid of the British he compelled the republicans to surrender. Cirillo was sentenced to death, and, as he refused to ask for mercy, was hanged, Aug., 1799.

Cirrhop'oda: the CIRRIPEDIA (*q. v.*).

Cirripe'dia [Lat. *cirrus*, curl + *pes*, *pedis*, foot]: an order of *Crustacea*, sub-class *Entomostraca*, known by the common name barnacles. They are incapable of locomotion, as they are fastened by their head-ends to some foreign body. They have usually a multivalve calcareous shell, six (more rarely four) pairs of curled bifid feet, no heart, sexes united in the same individual, and in their development they pass through nauplius and cypris stages. (See CRUSTACEA and ENTOMOSTRACA.) As they can not go in search of their food, they create currents in the water by their feathery feet which bring small organic particles to the mouth. In some there are present complementary males, the object of which is to prevent close fertilization. All barnacles are marine; the large parrot barnacle (*Balanus psittacus*) of Peru is used as food, but most forms acquire their economic importance from the fact that they become attached to ships, and there act as a drag upon their progress.

The goose barnacles (*Lepadidæ*) are attached by an elongate stalk, while the body hangs down in the water. These forms derive their common name from the old myth of the Middle Ages that they gave birth to the barnacle goose. Frequently in the goose barnacles calcareous shells are absent, the body being enveloped in a leathery tunic.

The acorn barnacles (*Balanidæ*: see BALANUS) are always provided with calcareous valves, which are directly attached to some foreign object without the intervention of a stalk. The valves on the free surface can be opened and the feet protruded to obtain the food. Some forms have strange habitats: thus *Tubicinella* occurs in the skin of sharks, *Coronula* on whales, and *Chelonobia* on the tortoise-shell turtle. The more common forms encrust rocks, piles, etc., between and below tide marks.

The root barnacles (*Rhizocephala*) afford wonderful instances of DEGENERATION (*q. v.*). Thus in their young stages they are free-swimming, and much like the young of other *Entomostraca*. They soon become attached to the abdomen of crabs, and then gradually lose their eyes, legs, abdomen, and alimentary canal and degenerate into a double-walled sac. From one side grows out a root-like process which penetrates the body of the crab, branching between the viscera and muscles. Through this the fluids of the host are absorbed and used as food by the parasite. The body becomes converted into a mere sac of eggs, the space between its two walls serving as a brood-chamber. J. S. KINGSLEY.

Cir'rus (plu. **Cirri**) [Lat., curl, lock, fringe]: in botany, a tendril, a spiral and filiform appendage of climbing plants. It twines around such objects as occur in the vicinity, and thus obtains support for the stem, which is too weak to support itself in an erect position. The cirrus is a modified leaf, or in some cases is an elongation of the midrib of a pinnate leaf.

In a meteorological classification of clouds, a thin fleecy cloud floating in the sky at a great elevation, and called mare's tail, or curl-cloud. See CLOUDS.

Cis: a Latin preposition meaning "on this side": is often prefixed to the names of rivers or mountains to form adjectives; as Cisalpine, "on this side of the Alps"; Cispadane, "on this side of the Po." These terms are used with reference to Rome.

Cisal'pine Republic: an Italian state, founded by Napoleon Bonaparte in 1797, and recognized by Austria in the Treaty of Campo Formio. It included Lombardy, the Venetian territory W. of the Adige, the legations of Bologna, Ferrara and Romagna, the duchy of Modena, Mantua, Rovigo, etc., covering an area of over 16,000 sq. miles, with a population of 3,500,000. It was taken by the allies in 1799, but regained by Bonaparte in 1800. It received the name of Italian Republic in Jan., 1802, and chose Bonaparte as president. In Mar., 1805, it became the kingdom of Italy, with Napoleon as king and Eugene Beauharnais as viceroy, and it continued as such till 1814, when its territories were divided.

Ciscauca'sia: one of the two general divisions of Caucasia. Area, 86,030 sq. miles. It contains the government of Stavropol and territories of Kuban and Terek. Pop. 2,673,601.

Cisco: town (founded in 1881); Eastland co., Tex. (for location of county, see map of Texas, ref. 3–G); on Tex. Cent. and Tex. and Pac. R. Rs.; 155 miles from Waco. Cisco is situated near the center of the great undeveloped coal and iron belt of Texas, in a fine farming and stock-raising region. Here is a large nursery for Southern shrubs, flowers, and fruits, ice-factory, roller-mills, cotton-gins, and water-works. Fine building-stone is found in the vicinity. Pop. (1890) 1,063; (1900) 1,514.

EDITOR OF "ROUND-UP."

Cisleitha'nia: since 1867 the usual, though not official, collective name of that part of the Austro-Hungarian monarchy which is situated this side (as viewed from Vienna) of the river Leitha. It embraces all the German crown lands, Istria, Dalmatia, Galicia, and the Bukovina; in general, all the provinces not appertaining to the Hungarian crown. See TRANSLEITHANIA.

Cis'padane Republic: a former state of Italy; was organized by the French after the battle of Lodi in 1796. It was bounded on the N. by the river Po (anc. *Padus*), and comprised Módena, Reggia, Bologna, and Ferrara. In 1797 it was merged in the Cisalpine Republic.

Cis'platine Republic and **Province**: See URUGUAY.

Cis'rhenane Republic: a name selected in 1797 for the projected confederation of the German towns situated W. of the Rhine. The project was not carried into execution, because the peace of Campo Formio transferred the entire left bank of the Rhine to France.

Cissam'pelos [Gr. κισσάμπελος, a plant which climbs like the ivy (κισσός), and has fruit like the vine (ἄμπελος)]: a genus of woody climbing plants of the Moonseed family (*Menispermaceæ*), natives of tropical regions in both hemispheres. It is of importance on account of the species *C. pareira*, a native of Brazil, which is one of the sources of a common adulterant of the drug known as PAREIRA BRAVA (*q. v.*).

Cissey, sĕ'say', ERNEST LOUIS OCTAVE, de: general and senator; b. in Paris, Dec. 23, 1810; educated at school of St.-Cyr 1830; distinguished himself in Algiers and the Crimea; became a general of division 1863; shared in the events attending the investiture and capitulation of Metz; served against the Commune in the siege of Paris in Mar. and Apr., 1871; was Minister of War from July, 1871, to Aug., 1876. D. in Paris, June 15, 1882.

Cis'soid of Di'ocles [*cissoid* is from Gr. κισσοειδής, ivy-like; κισσός, ivy + εἶδος, appearance]: a curve invented by the Alexandrian mathematician Diocles, with a view to the solution of the problem of the duplication of the cube, or the insertion of two mean proportionals between two given straight lines. It may be regarded as the pedal of a parabola with respect to the vertex; in other words, it is the locus of the vertex of a parabola which rolls upon an equal parabola, so that corresponding points of the curves always coincide with their point of contact. It is also the inverse of a parabola with respect to its vertex.

Cistercians, or **Bernardines** [Cistercian is from *Cistercium*, the modern Cîteaux, formerly Cisteaux, in Côte-d'Or, France, 160 miles S. E. of Paris, the site of their first abbey]: an order of monks and nuns, established in 1098 by Robert of Champagne, who had been abbot of the Benedictine monastery in the forest of Molesme, but who, desiring a stricter rule, induced twenty of his monks to accompany him, and they chose a desert spot given over to wild beasts and overgrown with brambles for their site. The next year Robert returned to Molesme, and the remaining monks became discouraged, for, notwithstanding the vigorous administration of Stephen Harding, who is esteemed the second founder of the order, it did not flourish. Its austerities repelled and many considered them too severe. But they were the attraction which in 1113 induced BERNARD (*q. v.*), son of a Burgundian nobleman, and thirty companions to join it. The rank and size of the company and the enthusiasm of Bernard soon gave the order fame. It was necessary in two years to send Bernard forth to found a new monastery, which was established at Clairveaux. Inside of forty years there were 500 abbeys of the order, in the thirteenth century 1,800. The Cistercians originally wore a brown habit, but Stephen Harding adopted a white one, at the alleged suggestion of the Virgin Mary, to whom he solemnly dedicated the order. They were addicted to contemplation, and so chose "lonely valleys and sequestered nooks" for their sites. They slept little and worked hard; fasted from Sept. 14 to Easter; never ate meat, fish, eggs or grease, and rarely used milk. Their churches were noticeably bare. They had seventy-five monasteries and twenty-five nunneries in England when Henry VIII. dissolved the monasteries. The ruins of their abbeys at Furness, Tintern, and Woburn in England, and the still more famous ruins at Melrose in Scotland, attest their greatness. But the order is now practically dead. S. M. J.

Cistern [from Lat. *cisterna*, subterranean reservoir, deriv. of *cista*, box]: a tank constructed for holding water. Where the supply of water is uncertain, or where rain-water is used, every house requires a cistern. A cistern in the top of the house is usually constructed of wood, and generally holds less than 1,000 gallons, which is sufficient to supply a family only two or three days. Larger cisterns are excavated in the earth, and have masonry walls which are cemented. The cylindrical form is the best, as the earth excavation and the amount of masonry are then the least for a given capacity. Cistern water collected from the rainfall is usually good if the roof be thoroughly clean before the water is allowed to be admitted and if the cistern itself be emptied and scrubbed once a year. A cistern should not be placed within 20 feet of a cesspool, and it is better if the distance between them is greater yet. Charcoal is often thrown into cisterns under the idea that the water will be rendered purer, but its utility is doubtful unless applied in the shape of a mechanical filter connected with the pump.

MANSFIELD MERRIMAN.

Cistus: the rock-roses; a genus of plants, the type of the family *Cistaceæ*; comprises several species which are natives of the Levant and Southern Europe, and are cultivated for the beauty of their flowers. The *Cistus creticus* and a few others yield the resinous balsamic substance called gum labdanum. The cistus of the English poets is the rock-cist (*Helianthemum*), a genus of which there are four British and several American species.

Citadel: an especially strong part of a fortress, as in a fortified town; a separately inclosed and defended place, which may be held after the surrender of the rest of the place. Thus when William III. of England besieged Namur in 1695, the town surrendered Aug. 4, after a month's siege, but the citadel had to be besieged separately, and did not surrender until Sept. 1, and after an assault had been repulsed with great slaughter.

Citation, in law: 1. A summons issued by a court of competent jurisdiction directing a person to appear before it. The service of the citation gives the court jurisdiction over the parties cited or summoned. The citation is chiefly used in England in the ecclesiastical courts, and in the U. S. in surrogate or probate courts, whose jurisdiction corresponds in part to that formerly exercised by the English ecclesiastical courts, and in the U. S. Supreme Court in practice on writs of error. 2. A reference to precedents or authorities in support of a proposition of law. F. S. A.

Cîteaux, formerly **Cisteaux**, sĕe'tō' (anc. *Cistercium*): a hamlet of France, in Côte-d'Or; about 10 miles S. S. E. of Dijon (see map of France, ref. 5–H). Here was a celebrated monastery of the Cistercian order founded in 1098. Remains of the magnificent buildings of this monastery are still visible. See CISTERCIANS.

Cithæ'ron (in Gr. Κιθαιρών), **Mount**, now **Elatea**: a famous mountain-range of Greece; on the boundary between Attica and Bœotia; was covered with forests. The highest summit rises 4,620 feet above the level of the sea. It is often mentioned by ancient classical poets.

Cith'ara (in Gr. κιθάρα): a stringed musical instrument of the ancient Grecks and Romans; resembled a guitar or harp. Derived from this word, or cognate with it, are the English *guitar*, *cithern*, and *zither*.

Cities of Refuge: the six of the forty-eight Levitical cities to which the involuntary homicide might flee, and might live safe from the avenger of blood till the death of the high priest released him from this quasi-captivity (Num. xxxv. 6, 13, 34; Deut. xix. 1–10; Josh. xx.). There were three on each side of Jordan, as nearly as possible opposite each other. On the east side: 1, Bezer, not yet identified; 2, Ramoth-Gilead, probably Remiun; 3, Golan, now Jaulan. On the west side: 1, Kedesh, now Kedes; 2, Shechem, now Nabulus; 3, Hebron. The road to them was plainly marked and kept open. There is no biblical instance of their use.

Citizen [Anglo-Fr. *citeseyn*, modified form of Old Fr. *citeain* (Mod. Fr. *citoyen*) : Ital. *cittadino* : Span. *ciudadano* < Lat. **civitata'nus*, a deriv. of *civitas*, replacing *civis*]: a resident in a city; in free states one who has the elective franchise and may take part in legislative or judicial deliberations. In the Greek city-states and in early Rome citizenship was restricted at the outset to members of certain old houses (*phylæ*, *gentes*), which seem to represent the earlier clans that founded the state, perhaps by invasion and conquest. These houses gradually lost their predominance. The other free inhabitants of the city were first admitted to the same private rights as the ruling class, and finally to full political and religious equality. The household, not the clan, became the basis of the state. All free members of a citizen family were citizens; not only the wife and the children born in wedlock, but the adopted child and the enfranchised slave, since the latter as "client" was still a member of the family.

With the extension of Roman power the area of Roman citizenship was gradually widened. It was conferred upon the leading families in friendly cities, and later upon whole communities. Before the end of the republic nearly all the Italians were citizens, not merely of their own municipalities but of Rome. Roman citizenship, however, was still regarded as urban, not imperial. Each new citizen family was enrolled in one of the Roman wards (*tribus*), and the citizen's political rights could be exercised only at Rome.

The chief value of citizenship in the ancient world lay in the fact that all private rights were "civil" rights; that the non-citizen had no rights. He enjoyed legal protection only through the mediation of a citizen or through treaty. In the development of the Roman world-state this principle was modified: at first, by granting to favored allies a limited, non-political citizenship; and, finally, by working out for all the subjects of Rome a new body of law (*jus gentium*), which gave ample protection to person and property. (See Roman Law.) At the end of the republic the chief value of Roman citizenship lay in the privileges accorded to citizens in criminal procedure. Under the empire, when citizens were stripped, first, of all political rights, and afterward of all special privileges, citizenship lost all value. Its extension by Caracalla to all the free inhabitants of the Roman world had only the effect of making certain special taxes general.

Municipal citizenship remained of importance because of the burdens it imposed. It was acquired by birth, by naturalization, and by residence. He who was by birth a citizen of one town and by residence a citizen of another had to bear the burdens of both.

Citizen: in modern law, a person who owes an indefeasible allegiance to a state or nation, and who is entitled to certain rights and privileges which appertain to freemen. This view prevailed at a date as early as the time of Bodin (A. D. 1576), who defines a citizen to be "a free subject holding of the sovereignty of another man." (Knolles's translation, A. D. 1606.) Citizenship, in this sense, is not to be confounded with the elective franchise or the holding of offices of government. Children, the insane, and the non-voting classes in general are citizens. The same writer says: "They are to be called citizens that enjoy the rights and privileges of the state. This is to be understood according to the condition and quality of every one; the nobles as nobles, the commons as commons, the women and children in like case according unto the age, sex, and condition, and deserts of every one of them. . . . It may be well said that special privileges make not a man a citizen, but the mutual obligation of the sovereign to the subject, to whom, for the faith and obeisance he receiveth, he oweth justice, counsel, aid, and protection which is not due unto strangers."

The subject may be further considered under the following general divisions: I. The mode of becoming a citizen; II. The obligations, rights, and privileges of a citizen with special reference to the Constitution of the U. S.

I.—1. The leading mode of acquiring citizenship is by birth in the country or under a state of allegiance. Birth in the country confers citizenship without reference to the citizenship of the parent, who at the moment of birth owes at least a local allegiance, and, though an alien, is temporarily a subject, except in the case of foreign ambassadors and ministers. This rule would apply in the U. S. to the case of persons, though in a foreign country, who were in the U. S. army, as their allegiance would be due to the U. S. On this same principle the children of U. S. ambassadors and ministers born abroad are citizens.

2. A more difficult question is as to the citizenship in the U. S. of children born abroad of U. S. parentage. It should be noted in the discussion of this question that allegiance is twofold—perpetual and local. When a citizen of the U. S. goes to a foreign country, he can not by his own act put off his citizenship. He is still subject to laws of his own, and can, according to modern views, still be governed by its criminal legislation. "The power to tie and bind the subject can not be tied down to places." It would seem on principle that as the mutual obligation from which citizenship springs still exists, his child would still be a citizen, though not born within the territory of the state to which allegiance is due. Lord Bacon, who would naturally look upon this subject with the eye of a philosopher, plainly took this view. In his famous argument concerning the *post nati* in the time of King James I., he said: "If a man look narrowly into the law on this point, he shall find a consequence that may seem at the first strange, but yet can not be well avoided; which is, that if divers families of English men and women plant themselves at Rouen or at Lisbon, and have issue, and their descendants do intermarry among themselves, without any intermixture of foreign blood, such descendants are naturalized to all generations, for *every generation is still of liege parents*, and therefore naturalized; so as you may have whole tribes and lineages of English in foreign countries." (Harg., *State Trials*, 81.) If this broad proposition should be attended with any evil consequences, they could be corrected by suitable legislation. The strictly legal authorities are, however, hopelessly in conflict. The proposition that the foreign-born children of citizens are aliens is argued with great force and power by Mr. Horace Binney in his well-known article on the *Alienigenæ of the United States* (2 *Am. Law Register*, 193, A. D. 1854). An outline of his argument is that there are no early legal decisions affirming the citizenship of such persons, but that, on the other hand, the preamble to an early statute on this subject (25 Ed. III., stat. 2) of the year 1350, the language of text-writers, such as Lord Coke, Jenkins, and Blackstone, the expressions of authors of digests, such as Comyns and Mr. Bacon, all point to the fact that the persons in question are aliens. The argument is legal and based upon authorities, and does not enter into the philosophy of the subject as depending on the doctrines of allegiance. Opposed to this view of Mr. Binney is a carefully considered case in the New York court of appeals (*Ludlam* vs. *Ludlam*, 26 New York R., 356). This case maintains that the statute of 25 Ed. III., ch. 2, above referred to, was simply an affirmation of already existing law, and that the common law proceeds solely upon the doctrine of allegiance, which does not depend upon locality and place, and can not be confined within boundaries. It holds that the true test of the allegiance of the child is parentage, that it is transmitted from the father to the child, and that, accordingly, the state may claim allegiance from the children of its citizens wherever born. These doctrines are supported by a reference to *Calvin's Case*, 7 Coke R., 1, in the sixth year of James I., and other authorities. The doctrine of this case appears to be based on sound principles of political philosophy, whatever view may be taken of the result of the legal decisions. The discussions of this subject by various writers led to the following important enactment by Congress in Feb., 1855: "Persons heretofore born, or hereafter to be born, out of the limits and jurisdiction of the U. S. whose fathers were or shall be at the time of their birth citizens of the U. S., shall be deemed and considered, and are hereby declared to be, citizens of the U. S.: Provided, however, that the rights of citizenship shall not descend to persons whose fathers never resided in the U. S." If the theory of Mr. Binney be

correct, this statute conferred citizenship where it did not before exist; if that of *Ludlam* vs. *Ludlam* be sound, then it restricted the rights of the foreign-born descendants of citizens, perhaps unnecessarily.

3. *Citizenship by Naturalization.*—An alien may be made a citizen by the act of a state or a nation co-operating with his own act. Sometimes this citizenship is complimentary or honorary; usually it is attended with true, or intended, renunciation of foreign citizenship. The question thus recurs whether a person can by his own act put off his citizenship. The doctrine of the common law was that natural-born subjects can not be absolved from allegiance to their sovereign without his consent. At one time the courts of the U. S. asserted the same doctrine. But Congress has enacted that expatriation is a natural right of all persons. England no longer insists on the doctrine of indelible allegiance. The theory formerly held was this: the tie of allegiance creates reciprocal rights and duties; the state can not rightfully discard the citizen without just cause of forfeiture, nor can the citizen repudiate his obligations to the state without its consent. Assuming that mutual agreement is necessary to dissolve the relation of sovereign and citizen, the more difficult question is whether the agreement of dissolution can be *inferred* from the prolonged absence of the citizen, coupled with foreign naturalization, and the failure of the state, after notice, to reclaim him. The better opinion would seem to be that there must be some affirmative act of renunciation on the part of the state to which the allegiance is due, though there are weighty opinions to the contrary. For the purpose of settling perplexing and irritating questions that frequently arise, the U. S. have entered into treaties of naturalization with a number of foreign powers. (For details, see NATURALIZATION.) Naturalization may take place either by a mere law of a general nature, such as that which provides that every alien woman who marries a citizen of the U. S. shall be deemed and taken to be a citizen, or it may occur in special instances affirmative on the part of the individual to be naturalized. In the U. S. the power to naturalize is exclusively vested in Congress by a provision in the U. S. Constitution. There is an important provision concerning citizenship in the fourteenth amendment to the U. S. Constitution as follows: "All persons born or naturalized in the U. S., and subject to the jurisdiction thereof, are citizens of the U. S. and of the State wherein they reside." The precise effect of this provision has not yet been settled by judicial decision. It would seem, however, that it should not be construed by implication to deprive any person of citizenship who would possess it by common law, such as the children of ambassadors or other citizens born abroad. The ninth amendment would lead to this conclusion: "The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people." Citizenship at present, as will be shown hereafter, leads to important rights and privileges, of which it would be unjust to deprive any one entitled to them. The words "subject to the jurisdiction of the U. S." would exclude from citizenship the children of foreign public ministers and members of the Indian tribes, though Indians born out of the tribal organizations would seem to be citizens. Alien Chinese can not become naturalized citizens of the U. S., but a child born of Chinese parents within the limits and jurisdiction of the U. S. is a citizen.

Interesting questions concerning citizenship arise in case of the union of two separate nations, or of the division of a single nation into two separate states. The first of these cases was discussed with much acuteness and learning when Scotland and England were united under James I.; the second has been extensively considered by the courts, both in Great Britain and in the U. S., in connection with the latter's independence. *Calvin's case* (7 Coke's Reports), the leading English authority upon the whole subject, declared that the *post nati* (persons born after the union) of Scotland were natural-born subjects, and could inherit lands in England. In respect to the result of the revolt of the colonies opinions differ as to the time when the separation between Great Britain and the U. S. became complete, though they substantially agree as to the effect of the division. The U. S. view is, that the separation took place at the Declaration of Independence, July 4, 1776; the British, that it was consummated at the treaty of peace in 1783. Accordingly, a person born in Great Britain before July 4, 1776, who did not reside in the U. S. after that date, became, as to the U. S., an alien, as well as all his descendants. The effect of this rule is not to work a forfeiture of vested rights, and the real estate owned by a former citizen continued to be vested in him, though he could not, after the day named, acquire an indefeasible title to land.

II.—The provisions of the U. S. Constitution concerning citizenship have assumed great importance, growing out of the controversies concerning the legal condition or *status* of persons of African descent. The Constitution as originally adopted made no provision concerning citizens of the U. S., except an incidental direction that Senators, Representatives, and the Executive should be such citizens. There were, however, distinct clauses concerning the rights and privileges of the citizens of the several States, such as that the judicial power of the U. S. shall extend to controversies between a State and a citizen of another State, and between citizens of different States, and that the citizens of each State shall be entitled to all privileges and immunities of citizens in the several States. This last clause has led to much judicial discussion, some points of which will be noticed hereafter. Under the clause which provided that the judicial power should extend to controversies between citizens of different States, the question arose in the now famous case of *Scott* vs. *Sandford* (19 Howard's Reports, 39), whether an emancipated Negro could be considered as a "citizen of a State"; and it was decided that he could not be so regarded, and accordingly that he could not maintain an action on that basis in the Federal courts. It would seem to follow that he could not claim the benefit of the other constitutional provision respecting privileges and immunities. The division of public opinion occasioned by this decision, and the desire to settle by a positive rule the condition of the slaves emancipated by the thirteenth amendment to the Constitution, as well as that of the colored race in general, led to the fourteenth and fifteenth amendments, the provisions of which are now to be considered, as far as they affect citizenship. All persons born or naturalized in the U. S. are declared to be citizens of the U. S. and of the State in which they reside; and it is provided that "no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the U. S."; and also that the "right of citizens of the U. S. to vote shall not be denied or abridged by the U. S. or by any State on account of race, color, or previous condition of servitude." Though the condition of the colored race led to these amendments, their construction is not to be confined to it. It will be observed that the same words are here used as in the body of the Constitution—"privileges and immunities"—except that they are here declared to belong to "citizens of the U. S.," while there they appertain to "citizens of each State" in reference to the "several States." The meaning of the words "privileges and immunities" in the body of the Constitution has been, as already stated, much considered. They have been held to mean such privileges, etc., as are of a general nature, such as security to life and liberty, the right to acquire property, to have access to courts of justice, and freedom to pursue and obtain happiness and safety, with such restrictions as are necessary to the public good. Whatever guarantees upon these points a State accords to its own citizens, it must extend to citizens of other States. But the Constitution before the amendments gave no directions as to the mode in which a State should treat its own citizens, except in a few specially marked instances, such as the prohibition to pass bills of attainder and *ex-post facto* laws. In other respects the State was left to its own action toward its people. Under the amendments there is provision made for the privileges and immunities of citizens of the U. S. A momentous question now arises: Does this provision trench on the great power which has all along been vested in each State to regulate the conduct of its own citizens? Does Congress under it have the right to enter upon the once exclusive field of State legislation and the domain of State constitutions, and to override all its action as to privileges and immunities of citizens? This question came up for careful consideration before the Supreme Court of the U. S. in the very important case of the *Butchers' Benevolent Association* vs. *The Crescent City Live Stock Company* (A. D. 1872). The State of Louisiana had granted an exclusive right to the latter company to engage in the business of slaughtering cattle within a certain district, including the city of New Orleans. It was claimed by the plaintiffs, who had been engaged in the same business, and who were by the act prohibited from following it, that the law created a

monopoly, that its exclusiveness was contrary to the spirit of free institutions, and that it was opposed to this provision of the U. S. Constitution. It was, however, considered by the court that there is now a clear distinction between citizens of the U. S. and citizens of a State—that there may be persons of the former class who are not members of the latter, and that the constitutional amendment is solely applicable to privileges and immunities of citizens of the U. S., *as such*; and that accordingly the clause does not refer to such regulations as the State may make for *its own* citizens, though they may also fill the character of citizens of the U. S. If it be asked what scope there is in this construction for the amendment, the answer is that the court does not seek to lay down any abstract rule on the subject, and will decide questions as they arise. Some instances of its application may be suggested, such as the right to visit the seat of government to assert a claim or to seek its protection; to freely approach its seaports, sub-treasuries, land-offices, and courts of justice; to be protected on the high seas; to assemble and petition for the redress of grievances; to invoke the privilege of the writ of *habeas corpus*; and freely to change the residence from one State to another. These appertain to citizens of the U. S. in general. It was decided by the same court that a claim to practice law in a State by one of its citizens (Mrs. Bradwell) did not come within the phrase "privileges and immunities" of a citizen of the U. S. It is a matter of congratulation to all who desire to see the equilibrium of forces between the general government and the States properly preserved that the court was able to see its way clear to a somewhat rigorous construction of the clauses of this amendment. The effect of the fifteenth amendment has not been settled by the courts, but its object is well known. It of course abrogates all State law or constitutional provisions creating distinctions among citizens of the U. S. as to the exercise of the right of suffrage based upon race and color, and for ever prevents the introduction of them either through the action of the States or the general Government. The right of citizenship under the U. S. Government is different from that under the State. (*Slaughter-house cases, 16 Wallace, 36.*) The U. S. and State Governments being distinct from each other, each has citizens of its own whose rights within its jurisdiction it is bound to protect. The right to vote is not a necessary incident of citizenship.

Revised by Henry Wade Rogers.

Citlahua, or **Citlahuatzin**: See Cuitlahua.

Citric Acid [*citric* is from Lat. *citrus*, citron; Gr. *κίτρον*]: an acid which occurs very widely distributed in nature in many kinds of fruit, as well as in the roots and leaves of some plants. It is found alone or with little malic acid, as the uncombined acid, in lemons and cranberries. Together with malic acid it is found in gooseberries and huckleberries. Further, it occurs in sugar beets, in tobacco, in acorns, and in the spring sap of grape-vines. It is prepared on a large scale from lemon juice. This is allowed to ferment, then neutralized with lime, the solution filtered, and the calcium citrate decomposed with sulphuric acid. One hundred pounds of lemons yield 5 lb. of citric acid.

Citrine: See Quartz.

Citrine Ointment: See Mercury, Medicinal Uses of.

Citron [viâ Fr. from L. *citrus* = Gr. *κίτρον*]: fruit of *Citrus medica*, one of the orange tribe, and now held by most botanists to belong to the same natural species as the lemon and the sour lime. The species was named *medica* by Linnæus upon the supposition that it came from Media, but its origin is now traced much farther east. The fruit is like an exaggerated lemon and covered with prominent humps. It sometimes weighs several pounds. The rind is very aromatic, and is used for the making of conserves. The mildly acid juice is employed in the flavoring of liquors. The citron makes a handsome small tree, with oblong or oval, acute, and short-petioled leaves, the petiole being either winged or wingless. The name citron is also used for a variety of watermelon, the rind of which is used, like that of the true citron, for preserves. This watermelon is characterized by a medium-sized, very hard, inedible fruit, which has a small and firm white core. This fruit thrives throughout the U. S.

Citronel'la (Fr. *citronelle*): a perfume prepared from the *Melissa officinalis*, or common Balm (*q. v.*); also a liquid prepared in Barbados from the rind of the citron, and used in France for flavoring the best brandies. The name *citronelle* is also given in France to the common southernwood (*Artemisia abrotanum*). The term citronella is, however, chiefly applied by perfumers at present to an oil exported from Ceylon. It is the product of *Andropogon schœnanthus*, a kind of grass.

Citron-melon: See Watermelon.

Citrus, kit'roos, but more commonly sit'rŭs [Lat., from Gr. *κίτρον*, citron, *κιτρέα*, citron tree]: a genus of evergreen trees and shrubs of the family *Rutaceæ*, natives of tropical India, but long cultivated in all warm climates. Few species are now recognized by most botanists, but these have given rise to many strongly marked varieties, which by some are regarded as species. The orange, *C. aurantium*, the lemon, *C. limonum*, lime, *C. limetta*, shaddock or grapefruit, *C. decumana*, kumquat, *C. japonica*, and the Seville or bitter orange, *C. vulgaris*, are the commonly recognized species. The leaves of all these species, while apparently simple, are really compound, as shown by their jointed petioles. All species abound in a volatile oil, which is used in medicine and the manufacture of perfumery. C. E. B.

Cittadella, chit-tăă-del'lăă, Alfonso: portrait-painter; b. 1487; pupil of Nicolo di Puglia at Bologna. He is said to have introduced a new and improved style of portrait-medallion, modeling from nature. He made the portraits of the contemporary Medici and of Charles V. He worked in clay and wax as well as in color. D. in 1536. W. J. S.

Città-della-Pieve, -pĕĕ-ay'văy: a town of Italy; province of Perugia; 23 miles W. S. W. of city of Perugia (see map of Italy, ref. 5–E), the native place of the eminent painter Perugino. Pop. 8,000.

Città di Castel'lo (anc. *Tiberinum*): a town of Italy; province of Perugia; on the Tiber, about 28 miles N. W. of Perugia (see map of Italy, ref. 5–E). It has a cathedral, several palatial mansions, and Gothic structures. Pop. 25,000.

Città Vecchia, -vek'kĕĕ-ăă (i. e. Old City): a city of Malta; 6 miles W. of Valetta; on a limestone hill in which extensive catacombs were excavated at a remote period (see map of Italy, ref. 11–F). It has a large and handsome cathedral. It was called *Medina* by the Saracens, who occupied it for some time. Pop. 7,000.

City [from O. Fr. *cité*: Prov. *ciutatz*: Ital. *città*: Span. *ciudad*: Portug. *cidade* < Lat. *ci'vitas* (*civtas*), *-ta'tem*]: a large town, especially one incorporated with special privileges. As early as the thirteenth century the word city was applied in England to important boroughs such as London and Leeds. Under the Norman kings the episcopal sees began to be removed to the chief borough or "city" of the diocese, as in France, and the term city came to be used specifically to designate a borough which was the seat of an episcopal see, and in the reign of Henry VIII. the boroughs in which new bishopries were established were created "cities." This title has been generally conferred on nearly all the places to which new bishopries have been assigned in the nineteenth century; but a number of boroughs which are not episcopal sees have had it conferred upon them by royal authority. In Scotland and Ireland the word has had a somewhat parallel usage. In Canada a city is a municipality of the highest class, and is separated from the jurisdiction of the county council. In the U. S. the term is specifically applied to municipalities which are governed by a mayor and board of aldermen, or other similar body, and in which there is no general deliberative assembly of the citizens, or "town council." In some of the U. S. cities are classified according to their population for purposes of legislation. See Municipal Government.

Revised by F. Sturges Allen.

City Island: an island and village situated in Long Island Sound, a few miles E. of New York city, to which it was annexed in 1895 (see map of New York, ref. 7–B). It has a number of the public institutions of New York, and shipbuilding and oystering industries. Pop. (1880) 989; (1890) 1,206; (1900) not returned separately.

City Point: port of entry of Prince George co., Va. (for location of county, see map of Virginia, ref. 6–H); on the James river, at the mouth of the Appomattox, 10 miles by railroad E. N. E. of Petersburg. This point, being a good landing, was seized by the troops under Gen. Butler in his movement up the James, May, 1864, and later, June, 1864, became the headquarters of Gen. Grant after his passage of this river; and during his subsequent operations against

Petersburg and Richmond was the principal dépôt of supplies for his army. Pop. (1880) 484; (1890) 409; not returned separately in 1900.

Ciudad Bolivar: See Bolivar.

Ciudad de Cura: See Cura.

Ciudad de las Casas: See San Cristobal.

Ciudad de los Reyes: See Lima.

Ciudad Guzman, or **Zapotlan el Grande**: a city in the south part of the state of Jalisco, Mexico; 4,300 feet above the sea (see map of Mexico, ref. 7–F). Pop. (1891) 23,205. The place is growing rapidly. At present it is reached by diligence from Guadalajara. H. H. S.

Ciudad Porfirio Diaz: See Porfirio Diaz.

Ciudad Real, thĕe-ōō-dăad'răy-aal': a province of Spain; intersected by the river Guadiana, and bounded S. by Sierra de Morena. Area, 7,840 sq. miles. Capital, Ciudad Real. Pop. (1887) 292,291.

Ciudad Real (city of the king): a town of Spain; capital of the province of same name; situated on a plain about 5 miles S. of the Guadiana and 105 S. of Madrid by rail (see map of Spain, ref. 17–F). It has several fine churches, monasteries, and a large hospital founded by Cardinal Lorenzand. The nave of the parish church is a magnificent Gothic structure. Here are manufactures of linen and coarse woolen fabrics and an annual mule-fair. This town was the headquarters of the Hermandad, or Holy Brotherhood, founded in 1249 for the suppression of robbery. Pop. 13,365.

Ciudad Rodrigo, -rod-ree'gō: a fortified town of Spain; on the river Agueda, here crossed by a fine bridge; about 90 miles S. W. of Salamanca (see map of Spain, ref. 14–D). It has a Gothic cathedral founded in the twelfth century, and a citadel. During the Peninsular war it was considered an important point as a key of Spain on the west. It was invested and taken by the French general Massena in July, 1810. The army of the Duke of Wellington assaulted and took this place, with 150 guns, Jan., 1812. For this achievement the Spanish Government gave him the title of Duke of Ciudad Rodrigo. Pop. (1887) 8,330.

Ciudad Victoria: a Mexican city; capital of Tamaulipas; in the southwestern part of the state (see map of Mexico, ref. 5–H). It is beautifully situated, at the base of high mountains in a rich and well-watered valley. Sugar-cane is largely grown in the vicinity. Pop. (1889) 8,000.

Civet [from Fr. *civette*: Ital. *zibetto*, from Arab. *zabād*]: a name applied to a pale-yellow or brownish substance, about the consistency of honey, secreted by the anal glands of several carnivorous mammals of the genus *Viverra* and family Viverridæ (*q. v.*). Upon exposure to air the civet thickens, acquiring the consistency of lard, and becomes darker. When pure it has a strong, unpleasant musky odor, but when diluted, say 1 part of civet to 1,000 of alcohol, the unpleasant quality disappears. It is still in great vogue as a perfume in the East, but in Europe it is used not so much on account of its own odor, but because when combined with other perfumes it has the property of increasing and preserving their quality. The civet of commerce comes mostly from Northern Africa and Southern Asia and the adjoining islands. It is prepared for market by removing the hairs, washing, and drying. When pure it is worth from $10 to $12 per ounce, but, on account of its value, it is frequently adulterated with lard or butter. The animals which furnish civet are also known as civets, or civet-cats. They are kept in confinement and the secretion removed with a small spoon once or twice a week. The most common species, and most important commercially, is the African civet, *Viverra civetta*, which is found from North Africa southward to the latitude of Fernando Po. It is from 3 to 4 feet in length, including the tail, and 10 or 12 inches high. The fur is rather harsh, and along the center of the back is quite long, and can be erected to form a crest. The general color is a brownish gray; there is a dark line down the center of the back, and the upper parts of the body are marked with numerous rows of black spots. The legs and greater portion of the tail are black, there is a black patch about each eye, and two or three black stripes run obliquely downward and backward from near the ear. The upper lip and sides of neck are whitish. The pupil of the eye is round even in a strong light, the toes are short, and the claws partially retractile. The Indian civets *Viverra zibetha* and *V. tangalunga* are somewhat smaller and lack the dorsal crest. They are found in India, China, and the large islands of the coast of Southern Asia. The rasse (*Viverricula malaccensis*) is a much smaller animal, likewise inhabiting Southern Asia and the adjoining islands, whose civet is used by the Javanese. While kept in confinement these animals can scarcely be called domesticated, for, with the exception of the zibeth, *V. zibetha*, they are cross and treacherous. As a recompense for this, the secretion of the glands is greatest when the animals are irritated. Care is taken in removing the civet to have the creature in a cage so narrow that it can not turn around. The civet-cat of Mexico and the Southwestern U. S. is the cacomixl. See Bassaris. F. A. Lucas.

Civetta, chĕe-vet'tăa, otherwise **Heinrich von Bles**: b. in Bovines, near Namur, Belgium, 1480; d. probably in Liége, 1550. A Dutch painter who lived in Venice, where he painted a strange inferno in the ducal palace. His most noted picture is one of a peddler asleep while monkeys rifle his pack. He was known as Civetta from the habit of painting an owl in his pictures. W. J. S.

Civil Action: an action which is instituted for the recovery of private or civil rights, or of compensation for their infraction.

Civil Damage Acts: laws giving to husbands, wives, children, parents, guardians, and others who have sustained injury in person, or property, or means of support by any intoxicated person, or in consequence of the intoxication of such person, a right of action against any person who has by selling or giving away intoxicating liquors caused the intoxication in whole or in part. In some of the States this right of action is also given against the owners of the premises on which the intoxicating liquors are sold. The right of action is not restricted to cases where the dealer made the sale himself, but it extends to cases of sales made by his agent even against his explicit instructions. The liquor-dealer's license to sell is not a defense to the action, as liability under the acts does not depend on whether the sale was lawful or unlawful, or on any question of negligence.
Henry Wade Rogers.

Civil Death: in law, the cessation or loss of one's civil rights and capacities so that he becomes, as it were, dead in law while the physical life remains; or the state of a person who is separated from civil society and has lost his civil rights. Civil death may arise from various causes, such as abjuring the realm, entering into a monastery, banishment, etc. In Great Britain it arose where a man by act of Parliament was attainted of treason or felony. Formerly in the case of one entering a monastery and becoming a monk his next heir succeeded to his estate. In some States of the U. S., as in New York, the sentence of a criminal to imprisonment for life causes civil death and nullifies an existing marriage. F. Sturges Allen.

Civil Engineer: a term originally used in contradistinction to military engineer, meaning a person whose profession was the planning and construction of roads, bridges, machinery, river improvements, etc., for the uses of the general public and not for the special purposes of warfare. The term is still sometimes used in this sense in Europe, but civil engineering is often held to include all branches of engineering, even those purely military and naval. In the U. S. this latter use of the term is not obsolete; for instance, the constitution of the American Society of Civil Engineers provides that "a member shall be a civil, military, naval, mining, mechanical, electrical, or other professional engineer, an architect, or a marine architect." There is also a tendency, which is seen especially in some schemes for classifying books, to omit the word "civil" entirely, and subdivide the various branches of engineering into mechanical, hydraulic, sanitary, bridge engineering, etc. See Engineering.

According to the usage most prevalent in the U. S., a civil engineer is a person whose profession is the planning or construction of works which promote inland transportation for the public benefit. The word transportation is here used in a very broad sense, and includes the moving of water in pipes, and of sewage in sewers, as well as of freight and passengers on roads and railroads. Under this definition civil engineering includes surveying, or the measurements necessary for making the plans, the construction of vessels, street railways, railroads, canals, sewers, and methods of water-supplies, as also the improvement of rivers and harbors. The word works, used in the above definition, does not include prime motors, machines, or machinery, although such must be necessarily used by the civil engineer in his

operations, and it does not include mining, metallurgical, or electrical plants. MANSFIELD MERRIMAN.

Civilian: in popular usage, a person whose pursuits and employment are civil—i. e. one neither in the army nor in the navy. As a legal term, it denotes a man learned in the civil or Roman law. In England the term is applied particularly to a member of the college of doctors of law practicing in the ecclesiastical and admiralty courts, in which the civil law is recognized. Revised by F. STURGES ALLEN.

Civi'lis, CLAUDIUS: an heroic chief of the Batavi who served for many years in the Roman army. When Vespasian and Vitellius were contending in civil war for the imperial throne, the adherents of the former induced Civilis to make a feigned demonstration of hostility to the Romans, in order to detain in Gaul the Roman army, which was inclined to fight for Vitellius. Having raised a large army, Civilis revolted in earnest in 69 A. D., was joined by many Germans, and defeated the Romans in several battles. In 70 A. D. he was defeated by Cerealis, a general of Vespasian. Tacitus states that negotiations ensued between Cerealis and Civilis, but his history here ends abruptly.

Civilization [deriv. of *civilize*, from Fr. *civiliser*, from a deriv. of Lat. *civi'lis*, civic, civil, polite]: In popular use the meaning of this word is twofold; it is sometimes employed to describe a process and sometimes a condition. As a process it means the act of elevating or developing from a savage or semi-barbarous state to a state of intelligence, order, and refinement. As a condition it means the state of a people with whom intelligence is cultivated, manners are refined, the industries are active, and the arts are prosperous. In the first sense it aims at, and in the second it consists of, a highly and harmoniously developed condition of the individual man and of a state of society that is conducive to the most favorable relations of the individual man with his fellow-man. As a condition it is the sum of intelligence and well-being in the various gradations of society. Formerly the doctrine was not unfrequently held that mankind has degenerated from a loftier and happier condition to the present state of moral and physical degradation. Recently, however, this theory has been almost universally abandoned, and in its place the belief has come to prevail that the civilization of the present day is the result of a long and tedious process of evolution from barbarism. Various theories of the methods by which this result has been accomplished are entertained. The most elaborate attempt that has ever been made to discover the principles which govern the development of civilization is that of Henry Thomas Buckle, whose *History of Civilization in England*, though left incomplete, formulated certain laws and principles which it was the object of the work to establish. These principles, as given in the first volume of the work, may be presented in an abbreviated form, as follows: 1. The metaphysical dogma of free will rests on an erroneous belief in the infallibility of consciousness. 2. It is proved by history, and especially by statistics, that human actions are governed by laws as fixed and regular as those which rule in the physical world. 3. Climate, soil, food, and the aspects of nature are the principal causes of intellectual progress. 4. The great distinction between European and non-European history and civilization is the fact that in Europe man is stronger than nature, while elsewhere nature has been stronger than man. 5. Human progress has been due not to moral agencies, which are stationary, and which balance one another in such a way that their influence over any long period is neutralized, but to intellectual activity, which has been constantly varying and advancing. 6. Religion, literature, and government are, at the best, but the products, and not the cause, of civilization. 7. Civilization progresses with the advance of skepticism—that is to say, the disposition to doubt and investigate—and with the opposition of credulity, or the protective spirit—that is to say, a disposition to maintain without examination established beliefs and practices. These positions have been critically examined by several historical writers, the most cogent being the examination of Johann Gustav Droysen, in the first chapter of his *Grundriss der Historik*. Droysen holds the positions of Buckle to be untenable. Another very important work on the history of civilization is Laurent's *Études sur l'Histoire de l'Humanité*, in the eighteenth and last volume of which the author sums up his beliefs. He holds that there is a plan which extends through and directs human affairs, and which has accomplished its ends through physical and moral forces; that this plan did not originate with matter; that it was not the work of chance; that it is not merely a cause without an effect; and that it must therefore be the work of a Supreme and Infinite Intelligence. The author reviews Bossuet's theory of the miraculous government of Providence: the antique fatalism of Vico; the fatalism of chance by Voltaire and Frederick II.; the fatalism of climate in Montesquieu; the fatalism of nature in Herder; of race in Renan; of revolution in Thiers; of pantheism in Hegel; and of positivism in Comte and Buckle. But the best-known analysis of civilization is that of Guizot, in his *History of Civilization in Europe*. In this work the author has explained and commented upon the facts that have influenced civilization from the fall of the Roman empire to the French Revolution with a penetration and a clearness that have never been surpassed. He does not recount facts, but contents himself with making their significance known. The advance of civilization, in his belief, consists of the development of the individual and the development of the social condition. Its essential feature, therefore, is progress. He does not attempt to trace the development of the individual, but limits himself to the work of making known the great laws which dominate the evolution of society. The church, the crusades, the feudal system, the free cities, monarchy, in short all the prominent institutions of the Middle Ages, pass under his review. But he nowhere discloses his personal beliefs. Throughout the work there reigns a severity and serenity of method which conciliate all sympathy and respect. Especially noteworthy is his treatment of the crusades and the Reformation. Another French writer, M. de Gobeneau, in his *Essai sur l'inégalité des races humaines*, has also attempted to analyze the forces which have tended to the development of civilization. On many points he takes issue with Guizot. Civilization he regards as a chain of facts and ideas; and the characteristic difference between civilization and barbarism he declares to be in the fact that the one estimates at its true value the difference between the material need and the moral needs of man, while the other does not. With barbarism the physical needs dominate; but with civilization the multitude forces itself to seek by specific means the preponderance of moral considerations. In this way intelligence is promoted and manners are refined. The author thinks that climate and soil have much less to do with the development of civilization than has commonly been supposed; and he cites in proof of his belief the fact that for centuries the natives of America had the most magnificent opportunities presented to them without result. The most essential factor is the aptitude of race to avail itself of the opportunities afforded by its environment. Besides the writers who have occupied themselves mainly with what may be regarded as the philosophical evolution of civilization, a still larger number have endeavored to trace the development of it as a record of facts. In this kind of writing the Germans, in the works which they call *Kulturgeschichte* (i.e. culture history) have been especially pre-eminent. There is scarcely a period in the history of the human race on which, by the thoroughness of their investigations, they have not thrown important light. As it is impossible here to analyze even the most important of the numerous works on this subject, a list of the most noteworthy books is all that can be given.

AUTHORITIES.—Sir John Lubbock's *Prehistoric Times, as Illustrated by Ancient Remains*, and *The Origin of Civilization*; John Ferguson McLennan's *Studies in Ancient History* (Primitive Marriage); Sir Henry S. Maine's *Ancient Law*, also his *Village Communities in the East and West*; Lewis H. Morgan's *Ancient Society*; Edward B. Tylor's *Researches into the Early History of Mankind*, also his *Primitive Culture*; Henry Alexandre Wallon's *Histoire de l'Esclavage dans l'Antiquité*; Fustel de Coulanges's *Ancient City*; Guizot's *History of Civilization in Europe*, also his *History of Civilization in France*; F. Laurent's *Études sur l'Histoire de l'Humanité*; Klemm's *Allgemeine Geschichte der Menschheit*; Wachsmuth's *Allgemeine Kulturgeschichte*; Draper's *History of the Intellectual Development of Europe*; Kolb's *Kulturgeschichte der Menschheit*; Honegger's *Grundsteine einer Allgemeinen Kulturgeschichte*; Hellwald's *Kulturgeschichte in ihrer natürlichen Entwickelung*.

C. K. ADAMS.

Civil Law: See LAW, THE CIVIL.

Civil List: the sum allotted for the annual expenses of the crown in countries having monarchical governments. The term is of English origin, going back to the reign of Charles II., who was assigned a revenue of £1,200,000 by

Parliament. An absolute sovereign needs no civil list, since he disposes of the entire revenues of the state at will; but in constitutional monarchies a fixed sum is assigned by Parliament, usually at the beginning of the reign, to be paid annually for the support of the royal family in proper dignity. It may be voted year by year, but this is mere formality. The impression sometimes prevailing that the sums paid on account of the civil list are raised directly from taxation is erroneous. The ruling families have always possessed large hereditary estates, the incomes from which were as rightfully their own as those of any other landed proprietor. They have turned the revenues from these hereditary domains into the public treasury in return for a fixed annual allowance. The civil list of the Queen of England amounts to less than the incomes of previous sovereigns. By 1 and 2 Vict., c. 2, it is established that during her Majesty's reign all the revenues of the crown shall become part of the Consolidated Fund. The Queen is allowed an annual allowance of £385,000, of which the Lords of the Treasury are directed to pay yearly £60,000 into her Majesty's privy purse; to set aside £231,260 for the salaries of the royal household; £44,240 for retiring allowances and pensions to servants; and £13,200 for royal bounty, alms, and special services. The Queen has also the revenues of the duchy of Lancaster, from which she received £50,000 in 1890. The heir-apparent to the crown has an annuity of £40,000, and receives in addition the revenues from the duchy of Cornwall. Under George I. the crown revenues amounted at times to £1,000,000. The civil list of Napoleon III. was 25,000,000 francs. In the German states the expenses of the sovereign and their families are chiefly met by the income from hereditary estates. The Emperor of Austria has a civil list of 9,300,000 florins (about $3,800,000). Up to within a recent period the Kings of Prussia enjoyed the whole income of the state domains, amounting to about $5,000,000 a year. In 1820 and again in 1850 this was reduced, but in 1859 was increased 500,000 thalers, in 1868 1,000,000 thalers, and Feb. 20, 1889, 3,500,000 marks. The total income now is something like $4,000,000, but it is dependent on the revenue derived from the domains and forests. The King of Saxony has a civil list of 2,940,000 marks (about $750,000 a year). The former royal domains, consisting chiefly in extensive forests, became the property of the state in 1830. The civil lists of some other monarchies are: Belgium, 3,300,000 francs; Greece, about $250,000; Italy, 14,250,000 lire (about $2,800,000, the greater part of the private domains of the king having been given up to the state in 1848); Japan, 3,000,000 yen (the yen being equivalent to the silver dollar of the U. S.); the Netherlands, 600,000 guilders (about $2,500,000); Portugal, 571,000 milreis (a milreis equals about $1); Spain, about $2,000,000; Sweden and Norway, about 2,000,000 kronor (nearly $600,000); Denmark, 500,000 rigsdalers (about $300,000). The president of France has 600,000 francs, with an additional allowance of 600,000 francs for expenses. The Emperor of Russia has an enormous revenue from the crown domains, which consist of more than 1,000,000 sq. miles of cultivated land and forests, but the amount is not made known, as the crown domains are considered the private property of the imperial family. C. H. THURBER.

Civil Service and **Civil Service Reform**: In its comprehensive sense, the civil service of a nation, state, or city embraces the whole body of officers who manage the civil affairs of its government. It could hardly include a person employed only as a laborer for the government, but it is very difficult in some cases to decide whether a person employed and paid by the government is an officer or simply a laborer. The whole public service of civilized states is in three great divisions—the civil, the military, and the naval. Yet it is not easy in every instance to decide whether an officer should be classed in the military or in the naval service, as he may serve in both. So various officers have both civil and military functions. The President of the U. S. is the head of one of the great branches of the civil service, but he is also commander-in-chief of the army and navy, and of the militia of the several States while in the actual service of the nation. The position of governors is analogous. The functions of the Secretary of War and those of the Secretary of the Navy are in part, but not wholly, civil. Office in every part of the public service is a trust the authority and functions of which should be executed at all times under a sense of both moral and legal obligation, solely for the public good, and therefore not in the interest of any party, faction, family, or individual. The duty to be faithful, efficient, and economical in every public office is as absolute as it is in any private station.

The civil service, under enlightened forms of government, is separated into three branches—the legislative, the judicial, and the executive.

1. We need not stop to notice the lower grades of officers in towns and villages, where legislative, executive, and in some degree judicial, functions are united in the same officer. The legislative branch is essentially representative. Everywhere—in theory, at least—it represents opinions, and, in greater or less degree, interests and property also. In republics it is also especially representative of numbers and localities; and in monarchies, of classes, of the state Church or religion, and of hereditary privileges. This representative function of legislators and the duty of adapting the laws of a people to their varied and changing interest and opinions make the views, interests, and, to some extent, the residence of candidates for legislative offices an important part of the proper tests of fitness for the places they seek. Such considerations also point to popular elections as the best means of selecting such officers. But in the U. S. different considerations should prevail in the selection of the clerks and other subordinates of the houses of Congress and of State legislatures. The functions of these subordinates, from the secretaries and chief clerks down to the copyist and the messengers, are in no sense representative. They owe no duty to members of one party that they do not as much owe to members of the other party. To make them partisan workers for the dominant party is to mistake their functions and to practice despotism. That knowledge of form and of details which such subordinates have learned by long practice is particularly valuable to new members, and greatly facilitates the business of legislative bodies; yet nearly all State legislatures and both houses of Congress, as well as almost every municipal council, are in the habit of treating these subordinate places as so much party patronage, to be grasped at the cost of long, angry, sometimes ignominious, controversies. It is plain that their selection should depend solely on their capacity for advancing the business portion of that work. There are various officers—of which presidents, governors, and in a degree mayors, are examples—whose functions are in their nature both legislative and executive. Their duty of approving or vetoing bills is in kind wholly legislative. It is for this reason, and for the further reason that they are to carry out in their executive sphere the general policy approved by the people in their selection, that these offices also are properly made elective. It is plain that representative officers would soon cease to be such if their terms were made long, and officers whose functions are both legislative and executive should also be given a fixed term, though it should be longer than that of officers who are solely representative. In close analogy to presidents and governors, in some of their duties, are the heads of departments (generally members of the cabinet) and councils of appointment. Being the confidential advisers of the chief executive, they need to have his confidence and to share his views in regard to the execution of the policy to which he is pledged. Their political opinions therefore are important tests of their fitness, and their terms of office should not be longer than that of the chief.

2. The judicial branch of the government is in no proper sense representative. A despot may make it such to intrench his despotism; an aristocracy may make it such to add strength to class privileges; a party in a republic may make it such to perpetuate its power and reward its adherents. In each case it is a prostitution of judicial functions and a calamity to the state. It is too much to expect that judges who feel the need of conciliating voters for re-election at the end of a short term will carry the scales evenly between a humble citizen who can control no vote but his own and a great corporation, or a great politician, who can control many hundreds. In the U. S it has been but the natural fruit of a short-term elective judiciary that clerks and other court officers have become a part of the spoils of party victories in many of the States and cities. And this is the view which has been causing so many of the States to retrace—in part, at least—their disastrous advances in the direction of a short-term partisan judiciary.

3. In the executive department is found the vast majority of those civil officers by whom the Government is carried on. There are more than 150,000 in the civil service of the U. S. without including those of the grade of mere laborers. Aside

from the few of the higher grade already referred to, these officials are in no sense representative of either localities or opinions. There were 67,668 postmasters in 1892, with tens of thousands of clerks and carriers under them, engaged in receiving, forwarding, and delivering the public mails, and in the collection, care, and transmission of postage-money and postal orders. In the whole country there is not a branch of private business to which, upon a true view of its nature and interests, party politics are more foreign or in which business-methods are more essential than they are to the proper discharge of the functions of the post-office department. In the other six executive departments of the Federal Government, as in this, official life is graded from the central authority down to the porters and the doorkeepers. An organization quite analogous exists in the executive department of the States, and, in some degree, of the cities. None of these latter officials is representative. In every grade it is their duty to obey the legal instructions of their superiors, and to do their work in the same manner whichever party is in power. With rare exceptions, they are doing work the success and the utility of which depend upon its being done wholly upon business principles. The bias of proscriptive party views and of active affiliation with the managers of politics is almost inevitably a hindrance to the well-doing of the public business. Men thus placed in office are apt to feel it a duty, and are sure to feel it a matter of personal safety, to work for their benefactors. From such a view of the matter the step was but a short one to the practice of collecting an annual rent from such subordinate—under the name of political assessments upon salaries—for the purpose of paying the expenses of parties and great politicians. From that stage the next step to the making of salaries excessive that they might bear heavy assessments was easy and natural. The system which thus made offices perquisites, tens of thousands official servile partisans, and their salaries the source of a vast corruption fund for carrying elections, has long been known as the "spoils system." But little developed before Jackson's time, that system first found a distinguished apologist in Senator Marcy, of New York, who, commenting on patronage in a speech in the Senate in 1832, said, especially of New York politicians, who had enforced the system most extensively, "*They see nothing wrong in the rule that to the victor belong the spoils of the enemy.*" In that State a spoils system began to appear early in the nineteenth century. It was developed in the vindictive war waged by Tammany Hall on the Clintons, and it was spread over the State by the "Albany Regency," established in 1818 by Martin Van Buren. Thence it spread to the Federal Government during Jackson's administration. During the first forty years of constitutional Government in the U. S. the general feeling was that to remove from office, except for cause, was a tyrannic outrage, and the whole number of instances of such removal amounted to only about 1,700.

In England, when Parliament became the greater power in the Government, its members demanded their share of the spoils of the offices. A patronage secretary was created for its apportionment, and regular accounts were kept with members of the places they had filled. Political assessments were not exacted, because the offices were sold for a full price at the outset.

The practice, where it has prevailed, has absorbed the time needed for legislation, has weakened the sense of responsibility on the part of the executive, has impaired confidence in legislative bodies, has foisted incompetent supernumeraries upon the public treasury, has prevented the investigation of abuses, and has tended in many other ways to corruption alike in party politics and in official life. It has been in the great departments and offices and in the populous cities that the evils of this system have been most developed. In the Treasury Department at Washington, for example, there are about 3,500 officials. In the post-office at New York city there are nearly 3,000, and in the customs service there the number is more than 1,600. The head of a small office can easily learn the character and capacity of all who seek places, and of all who serve under him; but it is quite otherwise in the great offices and departments. He can not there know the qualifications of one in ten of those who are pushed for places.

More than fifty years ago it was found necessary in Great Britain to aid the appointing power by requiring an examination as to the capacity and the attainments of the applicant before his appointment was decided upon. These first examinations—known as *pass*-examinations—defeated the most incompetent. They were upon subjects which those in the offices needed to understand. But such examinations allowed the monopoly of access to them to remain with the dominant party. Only one person was examined at a time, and the recommendation of persons of influence in that party was a condition of being examined at all. That British precedent was the basis of the acts of Congress of 1853 and 1855 (see U. S. Rev. Stat., § 164), by which such examinations were made the condition of an appointment to any place in the four great classes of clerkships at Washington. These examinations were the first practical steps toward what is now designated *civil service reform*.

These pass-examinations in Great Britain led to a general system of competitive examinations, or, in other words, to examinations open to all apparently qualified irrespective of recommendations and of political opinions. Thus the Government was able to ascertain and select the best for its service. Competitive examinations did more than this. By allowing every one so qualified to present himself, and by giving the appointments to those who showed the highest excellence, the applicant acted independently, and practically *put himself into the public service*. Arbitrary and partisan patronage in that service was thus in great measure extinguished. This was the second great step in civil service reform.

Great Britain has for more than a generation enforced competitive examinations for the selection of her administrative officials in British India. In 1870 she made these examinations general for the home offices; so that very few mere pass-examinations are left. Her larger post-offices, her customs-offices, and nearly the whole of her executive service, with no small part of her military and naval service, have by these means been taken out of party politics and official favoritism, and placed on a basis of personal merit. See Eaton's *Civil Service in Great Britain*.

Between 1872 and 1874 President Grant, aided by a clause in an appropriation bill (now section 1,753 of the Revised Statutes of the U. S.), enforced a system of competitive examinations in the departments at Washington. He appointed a civil-service commission to take charge of them. They brought superior persons into the public service, and were rapidly suppressing the evils of patronage. For this reason they encountered the hostility of many members of Congress, who saw they could no longer effectively promise places for votes or foist their dependents upon the public treasury. A special message of President Grant in Apr., 1874, setting forth the beneficial results of these examinations, requested an appropriation for continuing them—a request repeated in his next annual message. Congress in 1874 and 1875 refused all appropriations. Competitive examinations, as a consequence, were suspended. The old pass-examinations were renewed; congressional patronage again flourished. But there was a large class of citizens who condemned this action of Congress, and an agitation of the subject began.

Competitive examinations were, however, established by President Hayes at the post-office and the custom-house at New York city, and they were continued there by Presidents Garfield and Arthur. The beneficial results there obtained and the growth of the reform sentiment of the country led to the passage of the Civil Service Act by Congress on Jan. 16, 1883. This act contains stringent provisions for the suppression of political assessments, and provides for a system of competitive examinations. The act has already arrested the grosser abuses connected with political assessments. Under it President Arthur appointed a civil-service commission, and approved and promulgated a series of civil-service rules. Since July 16, 1883, these rules have been enforced, and all places in that part of the civil service to which the act (at first) and the rules extend have been filled by those who have stood highest in the competitive examinations. These places were at first in number a little more than 14,000, of which 5,652 were in the departments at Washington, 2,573 were in the 25 custom-offices, and the residue were in the 23 post-offices to which the act and the rules applied. The parts of the service thus brought within the act are designated *the classified civil service*. The customs districts therein embraced are those in which there are as many as fifty clerks, but the President has the authority to extend the rules to smaller offices. The service classified under the act, and to which it and the rules apply, now embraces the executive departments at Washington, the department of labor, the fish commission, and the civil-service commission, all customs districts, all free delivery post-offices,

the railway mail service, and the Indian school service, including altogether about 80,000 classified and 102,000 unclassified places. Most of the unclassified positions are held by fourth-class postmasters, of whom there are more than 71,000.

The State of New York enacted a civil-service law similar to that of Congress, May 4, 1883, under which a State commission has been appointed. A like law and commission were established a year later in Massachusetts. The system in New York has not given complete satisfaction, owing to its not being thoroughly carried out, save in one or two places, notably Buffalo, where it has worked admirably. Competitive examinations are now enforced as qualifications for admission to the civil service of those States and their large cities. DORMAN B. EATON.

Revised by THEODORE ROOSEVELT.

Civil War of the United States: See CONFEDERATE STATES.

Civitali, chĕe-vĕe-taa'lĕe, MATTEO: b. in Lucca, Italy, in 1435; a barber of Lucca who studied in Florence and became a sculptor in his thirtieth year. His master is not known. He made the monument of Pietro da Noceto, the statue of St. Sebastian, the fine pulpit, the altar-piece of S. Regulus, two kneeling angels of the Chapel of the Sacrament, and especially the "Tempietto" or eight-sided marble shrine for the famous "Volto Santo," a cedar-wood crucifix said to have been brought miraculously to Lucca in the year 780. All these works of sculpture and decorative architecture are in the Cathedral of Lucca. He was called to Genoa, where he executed six fine statues for the cathedral. His figure of *Faith* is in the Uffizi Gallery at Florence. He was also an architect, and did much to improve the buildings of his native city. D. in 1501. W. J. STILLMAN.

Civita Vecchia, chee'vĕe-taa-vek'kĕe-aa (i. e. Old City; anc. *Centum Cellæ* and *Trajani Portus*): a city and fortified seaport of Italy; province of Rome; 36 miles W. N. W. of Rome by railway (see map of Italy, ref. 6–D). It is inclosed by walls and well built, has a large church, an arsenal, a theater, a lighthouse, and a castle founded in the reign of Julius II. The harbor was constructed by the Emperor Trajan, and is formed by two large moles, and a breakwater which protects shipping from a heavy sea. It was destroyed by the Saracens in 812, and rebuilt under Pope Leo IV. on the return of its former inhabitants. Pop. about 13,000.

Civoli, chee'vō-lĕe, LUDOVICO: Italian painter; b. in Cigoli, Tuscany, in 1559; d. in 1613; a pupil of Alessandro Allori, though he seems to have formed his style on studies of Michael Angelo, Correggio, and Andrea del Sarto. He became insane either on account of the persecutions of his enemies or because he was poisoned by a corpse after which he modeled. His mental alienation lasted for three years. After a prolonged visit to Lombardy he settled in Florence, and there he spent most of the remainder of his life. His masterpiece is an *Ecce Homo*, which was taken by Napoleon to France and placed in the Louvre, but after 1815 was returned to the Grand Duke of Tuscany. In Rome are *The Holy Apostle Curing the Lame*, in the Church of St. Peter; *The Conversion of St. Paul*, in the Church of St. Paul; *The History of Psyche*, painted *al fresco* in the villa Borghese, etc. He also painted the cupola of the chapel of St. Paul in the Church of Santa Maria Maggiore, but an ill-chosen disposition of the perspective spoiled the picture, and the painter died from chagrin.

Clackman'nan: the smallest county of Scotland; area, 48 sq. miles. It is bounded S. by the river Forth and N. by the Ochil Hills. It consists chiefly of the romantic valley of the North Devon. The soil is partly fertile. Coal, ironstone, copper, sandstone, and greenstone are found here. The chief articles of export are coal and iron. Clackmannan and Kinross together return one member to Parliament. Capital, Clackmannan. Pop. (1891) 28,433; (1901) 31,991.

Clackmannan: capital of the county of same name; on the river Devon, near its entrance into the Forth; 9 miles E. of Stirling (see map of Scotland, ref. 11–G). This town is noted for its ale. King David Bruce, whose ruined tower still stands near by, resided here in 1330. Pop. 3,600.

Cladocera, kla-dos'e-ra [from Gr. κλάδος, sprout + κέρας, horn]: small entomostraca with few segments; the second antennæ used for swimming, and the body inclosed in a bivalve shell. Most of the species live in fresh water. *Daphnia* is the best-known genus.

Claf'lin, LEE: a distinguished philanthropist of Boston, Mass.; b. in Hopkinton, Mass., Nov. 19, 1791. He acquired wealth in the manufacture of shoes, and bestowed munificent gifts of money upon the Wesleyan academy at Wilbraham, Mass., the Methodist university at Middletown, Conn., and the Boston Theological Seminary. D. in Boston, as the result of an accident, Feb. 23, 1871.

Claggett, THOMAS JOHN, D. D.: first Bishop of Maryland; b. in Prince George's co., Md., Oct. 2, 1742; graduated at the College of New Jersey (Princeton) 1762, and studied theology with his uncle, the Rev. John Eversfield, D. D.; ordained deacon Sept. 20, 1767, and advanced to the priesthood Oct. 11 in the same year, by the Bishop of London. His whole ministry was spent in his native State. He was consecrated bishop in Trinity church, New York city, Sept. 17, 1792 by Provoost of New York, assisted by Seabury of Connecticut, White of Louisiana, and Madison of Virginia. This was the first consecration of a bishop in the U. S., and the lines of succession of the English and Scottish Churches united in it. Bishop Claggett was a chaplain of the U. S. Senate in 1800. D. at Croom, Md., Aug. 2, 1816. Every bishop of the Protestant Episcopal Church traces his succession to Bishop Claggett. W. S. PERRY.

Clai'borne, Clayborne, or **Cleborne**, WILLIAM: b. in Westmoreland, England, about 1589; was the second son of Sir Edmund Cleburne, of Cleburne Hall, Westmoreland; was appointed by Charles I. his secretary of state for the dominion of Virginia Mar. 4, 1626, and treasurer of Virginia for life Apr. 6, 1642. He discovered, purchased, and planted Kent island in 1631, under a Scotch signet commission granting trading privileges with the Indians, and owned a large portion of the land upon which Annapolis now stands, as well as great estates in Virginia. He battled for his rights against Lord Baltimore, who claimed jurisdiction under his charter, and twice reduced the island of Kent by arms. Claiborne had secured the representation of Kent in the Virginia House of Burgesses, but, failing to maintain his claims, he purchased other islands in the Chesapeake which proved to be within Maryland bounds, and he contended in support of his ventures with varying success until 1651, when he withdrew into Virginia, and was appointed by Parliament a commissioner for the reduction of the colonies. He subdued Virginia, overturned the Calvert government, and restored religious tests, which excluded Roman Catholics from franchise. Cromwell did not sustain his operations and restored the Calverts. After the restoration the court neglected his petitions, and he sank into retirement upon his Virginia estates. Recent investigations into colonial history prove him to have been the victim of court favoritism, injustice, and misrepresentation. He has been styled "the champion of Virginia" and the "evil genius of Maryland." D. in Virginia about 1676.

Claim [from O. Fr. *claime*, connected with *clamer*, claim < Lat. *clama're*, call out, cry]: a demand of a right; the act of demanding from another person something due; a right to claim or demand; a title to any debt or privilege. The term is sometimes applied to the thing claimed, as land or other property. In law, claim is a challenge of interest in anything that is in possession of another, or at least out of the possession of the person who claims it.

Claims, Court of: a court of the U. S. for the relief of those persons who have claims against the Government. Before the year 1855, when this court was established, such claims could be settled only by act of Congress, as a sovereign power can be sued only by its own consent. It is a court of law, without equity powers, and consists of five judges (appointed by the President by and with the advice and consent of the Senate), two of whom constitute a quorum for the transaction of business, but three of whom must concur to render a judgment. It has a single annual session, beginning on the first Monday in December, held in Washington, D. C. Its decisions are not final as against the Government, for Congress may refuse to make appropriations to meet the claims allowed. In practice this seldom happens, and the effect of the court is to remove a vast number of private bills from the congressional calendar, and to subject claims to legal proof. (See COURT.) The COURT OF PRIVATE LAND CLAIMS (*q. v.*) was established in 1891. Revised by F. STURGES ALLEN.

Clairaut, clā'rō', ALEXIS CLAUDE: geometer; b. in Paris, France, May 7, 1713; d. there May 17, 1765. When only twelve years old he read a paper on curves of double cur-

vature before the Academy of Sciences, and in his eighteenth year he was admitted as a member of that institution. He accompanied Maupertuis to Lapland in order to measure a degree of the meridian, and on his return he published his celebrated treatise on the figure of the earth (1743). That, however, which made him most famous was his prediction of the return of Halley's comet in 1759.

Clairin, clā′răñ′, GEORGE JULES VICTOR: figure and portrait painter; b. in Paris, Sept. 11, 1843; pupil of Picot and Pils; second-class medal, Salon, 1885; second-class medal, Paris Exposition, 1889; Legion of Honor 1888. His pictures of incidents in Spanish history are brilliant in color, and he has painted some very good portraits. He painted a series of decorative panels in the buffet of the Grand Opera-house, Paris. Studio in Paris. W. A. C.

Clairon, clā′rōñ′, CLAIRE JOSEPHE LEGRIS DE LA TUDE: French actress; b. at Saint-Wanon de Conde, in Flanders, in 1723; d. in Paris, Jan. 18, 1803. She was educated in Paris, and so precocious were her passion and her talent for the stage that in her thirteenth year she made a brilliant *début* as soubrette in the Théâtre Italienne. In 1743 she made her *début* as Phèdre in the Théâtre Français, and from that period down to 1765 she represented all the tragic characters of Du Belloy, Saurin, Marmontel, Voltaire, and the other dramatists of the time. She was put in prison for some insignificant insubordination, and she declared that she would never tread the stage again unless she received due satisfaction; but no satisfaction was ever offered, and she remained in retirement. During the Revolution she lost her fortune, and died in very straitened circumstances. Her *Memoirs* appeared in 1799.

Clairvaux, clār′vō′: a village in the department of Aube, France; about 10 miles above Bar-sur-Aube; stands on the left bank of the river Aube, and is noteworthy as the site of the famous Cistercian abbey of Clara Vallis (see map of France, ref. 4–G). This was founded in 1115 by St. Bernard, who was its abbot till his death in 1153, and who threw such a glory over the place that in 1143 the kingdom of Portugal extravagantly declared itself a fief of the abbey of Clairvaux. It afterward became famous for the architectural merits of its church. During the Revolution the convent was closed, and the vast buildings are now turned into a prison. See Ruskin's *Præterita*.

Clairvoy'ance [Fr., deriv. of *clairvoyant*, clear-sighted; *clair*, clear + *voyant*, seeing]: The power by which persons in a mesmeric state are supposed to be able to see concealed things or to see what is happening at a distance. Hitherto the nature of spirit has been discussed theologically and metaphysically. Its scientific investigation has been considered either impracticable or undesirable. In this borderland between the known and unknown ignorance and charlatanism have held high carnival. Science, purely material, is entirely occupied with matter and its inherent force, and beyond the retort and crucible has no place for spirit. Belief in spiritual being outside of physical existence is superstition. The mention of a fact bearing in that direction provokes a smile of scornful pity. When the oil is exhausted the flame no longer burns; when the fuel is spent the fire goes out; when the instrument is destroyed the music is not heard; when the complex co-ordination of conditions called a living being is subverted, life, intelligence, spirit, are no more. Such are the illustrations of material science. The spiritual realm has remained unknown, or rather its existence has been denied.

These reflections are rendered pertinent by the consideration that whatever else of pretense and folly be blown away, the central fact of clairvoyance remains undisturbed; and clairvoyance is a supersensuous perception depending on the spiritual nature of man, without which it would be impossible. In the present state of psychological knowledge the facts are ill-observed, loosely recorded, and theories out of place. The world of spirit, to which "foree" furnishes the key, perhaps may at some future time broaden into as wide a field as the physical world now presents. Superstition will then have no place for concealment. Ghosts, witchcraft, visions, trances, ecstasy, and the innumerable phases of spiritual phenomena will be co-ordinated, the chaff blown away, the vital facts preserved, and a true science of the soul, based on accurate observation and discriminating research, founded.

The existence of a somnambulic or sleep-walking state, induced by unknown causes and accompanied by peculiar phenomena, is generally admitted. It is also admitted that a state similar to, if not identical with, these can be induced by artificial means, usually by fixing the attention, in gazing intently into a "magic mirror" or "crystal," repeating formulæ, by incantations, fasting, drugs, or by an operator making what are termed magnetic passes. The interference of a second person is not essential, and perhaps without exception distorts the result. This admission by no means indorses the theories which have sprung fungus-like therefrom, of mesmerists, biologists, magnetists in an endless array, best known by their barbarous terminologies.

The trance or clairvoyant state has been observed in all ages and among all races of mankind—Chinese, Hindus, Turks, as well as Christians. It has in seasons of great religious excitement become epidemic, the devotee falling in convulsions, becoming cataleptic, and after hours, days, or even months of apparent death, awakening with mind overwrought with visions of the strange world in which it had dwelt during its apparent unconsciousness. The records of clairvoyance are as old as history. If prophecy, the "clear-seeing" of the future, be its fruit, the prophets and sages of the past were all more or less endowed with this gift. Socrates and Apollonius predicted and were conscious of events transpiring at remote distances. Cicero mentions that when the revelations are being given some one must be present to record them, as "these sleepers do not retain any recollection of them." Pliny, speaking of the celebrated Hermotinus of Clazomenæ, remarks that his soul separated itself from the body and wandered in various parts of the earth, relating events occurring in distant places. During the periods of inspiration his body was insensible. The day of the battle of Pharsalia, Cornelius, a priest of renowned piety, described, while in Padua, as though present, every particular of the fight. Nicephorus says that when the unfortunate Valens, taking refuge in a barn, was burned by the Goths, a hermit named Paul in a fit of ecstasy cried out to those who were with him, "It is now that Valens burns!" Tertullian describes two women celebrated for their piety and ecstasy; that they entered that state in the midst of the congregation, revealed celestial secrets, and knew the innermost hearts of persons. St. Justin affirms that the sibyls foretold events correctly, and quotes Plato as coinciding with him in that view. St. Athenagoras says of the faculty of prescience that "it is proper to the soul." Volumes might be readily filled with quotations like the foregoing, showing that clairvoyance has been manifested and received as a truth by profound thinkers in every age. Swedenborg, Zschokke, and Davis are not peculiarities of modern times, but are repetitions of Socrates, Apollonius, and countless other sages who deeply impressed their personality on their times.

Perhaps for purposes of investigation the artificially induced mesmeric state has advantages over the spontaneous, which presents itself at undeterminate times, although its spontaneous exhibition is more reliable in its results. Its natural manifestation requires a finely developed nervous system. It is not always, though at times it may appear to be, the result of disease. The more perfect the health the more reliable the results. The visions produced by disease, like those by drugs, bear to true clairvoyance the same relations that the dreams of indigestion do to those of refreshing sleep.

Clairvoyance must be regarded as a peculiar state of the mind, in which it is in a greater or lesser degree independent of the physical body. It presents many gradations from semi-consciousness to profound and death-like trance. However induced, the attending phenomena are similar. The condition of the physical body is that of deepest sleep. A flame may be applied to it without producing a quiver of the nerves; the most pungent substances have no effect on the nostrils; pins or needles thrust into the most sensitive parts give no pain; surgical operations can be made without sensation. Hearing, tasting, smelling, feeling, as well as seeing, are seemingly independent of the physical organs. The muscular system is either relaxed or rigid; the circulation impeded in cases until the pulse becomes imperceptible; and respiration leaves no stain on a mirror held over the nostrils.

In passing into the clairvoyant state the extremities become cold, the brain congested, the vital powers sink, a dreamy unconsciousness steals over the faculties. There is a sensation of sinking or floating. After a time the perceptions become intensified. We can not say the senses, for they are of the body, which for the time is insensible. The mind sees without physical organs of vision, hears without

organs of hearing, and feeling becomes a refined consciousness which brings it *en rapport* with the intelligence of the world. The more death-like the condition of the body the more lucid the perceptions of the spirit or mind, which for the time owes it no fealty. If, as there is every reason to believe, clairvoyance depends on the unfolding of the spirit's perceptions, then the extent of that unfolding marks its perfection. However great or small this may be, the state itself is the same, differing only in degree, whether observed in the Pythia of Delphic oracles, the vision of St. John, the trance of Mohammed, the epidemic catalepsy of religious revivals, or the illumination of Swedenborg or Davis. The disclosures made have also a general resemblance, but they are so colored with surrounding circumstances that they are extremely fallible. The tendency of the clairvoyant is to make objective the subjective ideas he has acquired by education—if a Christian, to see visions of Christ; if a Moslem, of Mohammed—somewhat as dreams reflect the ideas of wakefulness. Yet there is a profound condition which sets all these aside, and the mind appears divested of all physical trammels, and to come in direct contact with the thought-atmosphere of the world. Time and space have no existence, and matter becomes transparent.

If there is an independent spiritual existence after the death of the physical body, the clairvoyant in this independent stage closely approximates to that existence. It may be an open question whether the spirit leaves the body and actually visits the remote places it describes, or gains such knowledge by intensity of perception that annuls space, as it does time, in its retrospection and prevision. The many authentic instances of "double presence" which have been observed lead to the former conclusion.

Baron Reichenbach, in his *Dynamics*, has investigated the sensitiveness of the clairvoyant to refined emanations of force, and Denton, in his *Soul of Things*, has carried the investigation still further, though in a somewhat similar direction. The field is broad as the spirit of man, and its threshold has been scarcely crossed. Clairvoyance is no miraculous power, but an inherent faculty, a foregleam in this life of the next spiritual life. For if man exists as a spirit after the dissolution of the physical body, his present life is that of a spirit clad in flesh, and should manifest some of the characteristics of the next untrammeled condition.

HUDSON TUTTLE.

Clakama: See CHINOOKAN INDIANS.

Clam: a name variously applied, according to locality, to many bivalve mollusks of different genera. The common clam of the New England coast is *Mya arenaria*, a species ranging from South Carolina to the Arctic Ocean, and found on the northern coasts of Europe and Asia, as well as on the shores of Japan and Alaska. In the U. S. it is of considerable importance as an article of food, and it is extensively used for bait, while vast shell heaps along the New England coast testify to the extent to which it was for centuries eaten by the Indians. Very curiously it is not used for bait in Europe. The Little Neck clam of New York is *Venus mercenaria*, known in New England as the quahaug or hard clam. It derives its specific name from the fact that the Indians of the Eastern U. S. used the purple margin of the shell for making the dark wampum. The great clam of the northwest coast of America, *Lutraria maxima*, is a staple article of food for the coast tribes of Indians, who dry large numbers for winter's use, a practice pursued in earlier times by Eastern tribes with *Mya arenaria*. *Glycimeris generosa*, the giant clam of the U. S. Pacific coast, attains a weight of 5 or 6 lb., and resembles a *Mya* which has so outgrown its shell that the soft portion is not wholly covered. This species lives in moderately deep water, rarely occurring above extreme low-water mark. The term giant clam is also applied to *Tridacna gigas*, the largest of bivalves, whose shells attain a weight of 250 lb. each, and are sometimes used in Roman Catholic churches to contain the holy water. This huge mollusk is a native of East Indian seas. Its flesh is edible, and the natives of the Caroline islands use pieces of the shell for axes. The various species of fresh-water mussels, or *Unios*, are popularly termed fresh-water clams in the U. S.

F. A. LUCAS.

Clamato'res [plur., from Lat. *clama'tor*, one who cries out]: a division of *Insessores*, or perching birds, distinguished by the arrangement of the muscles of the lower larynx or syrinx. There is usually but one pair of intrinsic muscles, never so many as four pairs, and these are attached to the middle of the half rings of the bronchi, an arrangement termed mesomyodian. The group is named in contrast to the *Oscines*, or singing birds, which have a more complicated singing apparatus.

F. A. LUCAS.

Clan [Gaelic, *clann*, offspring, family, stock]: a body of kindred larger than a household and smaller than a tribe, and recognizing relationship in only one line of descent—i. e. either through the mother or through the father, but never through both. In English usage the word "clan" specifically means the kinship organization of the Scottish Highlanders. Corresponding terms in other languages are the Roman *gens*, the Greek *γένος*, the Arabic *hayy*, the Irish *sept*, and the North American Indian *otem* (*totem*). In ethnology it has become necessary to have a general name for the gentile organization wherever found, and by common consent the word "clan" has been adopted for this purpose.

The earliest type of the clan is the totem-kin, the best examples of which are found among the North American Indians. The group of kindred takes its name from some class of natural objects, usually a species of plant or of animal—e. g. the hawk, the turtle, or the bear—which is superstitiously regarded, and from which the group is supposed to be descended. Relationship is metronymic—i. e. it is traced only through mothers. A woman's sons and daughters and the sons and daughters of her daughters belong to her clan, but the children of her sons belong to the clans of their mothers. A later form of the clan is patronymic—i. e. relationship is traced only through fathers. Hebrew, Arabian, Grecian, Roman, German, and Celtic clans were patronymic in the earliest historical period, but there is much evidence to prove that originally they were metronymic.

A clan is essentially a juristic organization. Its members are under obligation to avenge one another's injuries. They have common rights and duties, among which marital rights and obligations are of the first importance. A man may not marry his clanswoman. Therefore no clan is self-perpetuating, and a tribe accordingly comprises two or more clans whose members intermarry. A clan usually has a judicial officer and a chief or military officer. See SOCIOLOGY, TOTEMISM, and TRIBE.

FRANKLIN H. GIDDINGS.

Clanric'arde, MARQUESSES OF (1825): Barons Dunkellin (1543), Viscounts Burke (1629, Ireland), Barons Somerhill (United Kingdom, 1826).—ULICK JOHN DE BURGH, first marquess, K. P., P. C.; b. Dec. 28, 1802; ambassador to St. Petersburg 1835–40; Postmaster-General 1846–52; Lord Privy Seal 1857–58; succeeded his father, John Thomas, thirteenth earl, as Earl of Clanricarde July 27, 1808; d. 1874; succeeded by HUBERT DE BURGH CANNING, b. in 1832.

Clap, THOMAS, A. M.: Congregational divine; b. at Scituate, Mass., June 26, 1703; graduated at Harvard in 1722; pastor in Windham, Conn., 1725–40. He was installed president of Yale College in 1740 and held the office until 1766. His administration was disturbed by his controversies over the preaching of Whitfield and Edwards, but the college was improved in its charter, library, and buildings, through his exertions. He was an eminent natural philosopher and astronomer, and constructed the first planetarium made in America. He published *The Nature and Foundation of Moral Virtue and Obligation* (New Haven, Conn., 1765); a *History of Yale College* (1766); *Nature and Motion of Meteors* (1781); and other works. D. in New Haven, Conn., Jan. 7, 1767.

Clap'perton, HUGH: captain; traveler and explorer of Africa; b. at Annan, Dumfriesshire, Scotland, in 1788; entered the British navy as a lad and rose to be a lieutenant. In 1823 he accompanied Dr. Oudney and Denham in an expedition to Lake Chad. Having returned to England in 1825, he soon renewed the enterprise, with the naval rank of commander, in company with Richard Lander and others. His chief object was to discover the course of the Niger. He entered Africa at the Bight of Benin and penetrated to Sokoto, where he was detained nearly a year by the sultan. He died near that place Apr. 13, 1827. See R. Lander, *Records of Captain Clapperton's Last Expedition* (1830).

Claque [Fr., clap of the hand; also the body of *claqueurs*]: in French theatrical language, an organized body of men posted among the audience to applaud the actors. At all times such hired applause has been used; it is on record as having existed under the Roman empire, but the modern institution in Paris dates from the beginning of the nineteenth century, and was completely organized before 1830. The leader of the band (*chef de claque*) is paid either by the director of the theater or by an actor, or both, and his business

is to select those parts of the play which will best allow of warm applause, and to start it at the right moment. The use of the *claque* is defended by some persons of good reputation as a means of supporting and encouraging the performers at difficult times and so helping them to do their best.

Clarac, Charles Othon Frédéric Jean Baptiste, de French antiquary and artist; b. in Paris in 1777: in 1808 became tutor of the children of Murat, King of Naples, and had charge of the excavations at Pompeii. After visiting Brazil, where he made some fine sketches of tropical vegetation, he was in 1818 made curator of the Museum of Antiquities in the Louvre. Author of *Fouilles faites à Pompéi* (1818): *Musée de Sculpture* (6 vols., 1826–55). D. in 1847.

Clare: a maritime county of Ireland, in Munster; bounded N. W. by Galway Bay, E. and S. by the Shannon river, and W. by the Atlantic Ocean. Area, 1,294 sq. miles. The surface is mostly hilly; the soil of the valleys is fertile. This county contains many small lakes. The principal rock is carboniferous limestone. Coal, copper, lead, and marble are found here. The staple products of the soil are oats, potatoes, wheat, and barley. There are many cromlechs, abbey ruins, and round towers in the county. Capital, Ennis. Pop. (1891) 123,859.

Clare, John: "The Lincolnshire Plowman"; a self-educated English poet: b. at Helpstone, near Peterborough, July 19, 1793. He was a common laborer; was discharged for scribbling; inspired by Thomson's *Seasons*, wrote and published in 1821 two volumes of pastoral verse, which attracted much praise—*Poems Descriptive of Rural Life* and *The Village Minstrel*. His *Rural Muse* (1835), praised by Christopher North, is perhaps his best work. Died in great poverty in the lunatic asylum of Northampton, May 20, 1864. See J. L. Cherry, *Life and Remains of John Clare* (1873).

Clare, or **Clara**, Saint: a noble maiden of Assisi; b. in 1193; d. Aug. 11, 1253; canonized in 1255; festival Aug. 12. Enamored with "the sweetness of Christ," she fled to St. Francis and took refuge near his Portiuncula, refusing to return. Her three sisters followed her with other gentlewomen, and in 1212 the Nuns of St. Clare were organized as the first order of Franciscan nuns. It spread rapidly through Italy, and into France, Spain, Germany, and Bohemia. In 1220 a rule of strictest sort was given them by Cardinal Hugolin; in 1224 St. Francis wrote them a relaxed rule; Urban IV. about 1263 gave them a still milder observance. The convents separated on these rules, some adhering to the severe Hugolin requirements, others to those of St. Francis, but the most of them following the rule of Urban. The Capuchin reformation in the Franciscan order led many of the sisters, under the guidance of Peter of Alcantara, to establish the "Poor Clares of the Strictest Observance," who vow perpetual silence. The order is known also as "The Poor Clares," and their convents are for the most part occupied with the education of girls.

C. H. Thurber.

Claremont: town, on railroad; Sullivan co., N. H. (for location of county, see map of New Hampshire, ref. 8–D); about 48 miles W. by N. from Concord. It has manufactures of cotton and wool. Claremont junction is 2 miles farther W. Claremont township is bounded on the W. by the Connecticut river. It has paper-mills, a furnace, a water-wheel manufactory, a high school, and a library of 4,000 volumes. Pop. of township (1880) 4,704; (1890) 5,565; (1900) 6,498.

Clarence, Duke of: a name sometimes given to the younger princes of the royal house of England. The title was derived from Clare or Clarence (Lat. *Clarentia*) in Suffolk. Some authorities, however, say it was derived from Clarenza in the Morea, of which an English knight was duke during the crusades. The title was last conferred on Albert Victor, eldest son of Albert Edward, Prince of Wales. He was b. Jan. 8, 1864: educated at Trinity College, Cambridge, and Heidelberg: was engaged to Princess Victoria Mary of Teck, a remote cousin. Died at Sandringham, Jan. 14, 1892, on the eve of his marriage.

Clarencieux, or **Clarenceux**: one of the kings of arms in the English heraldic college. (See Heraldry.) The jurisdiction of this king of arms includes England S. of the river Trent. The title or name *Clarencieux* is supposed to be derived from the dukedom of Clarence during the reign of Edward IV., being a French form derived from the Latin Clarentius. *The arms of Clarencieux are Argent, the Cross of St. George, on a chief gules, a lion of England crowned, or*: that is to say, an escutcheon, of which the top part is red and the rest is silver, with the gold lion of England on the red and a red cross on the silver. The official residence of Clarencieux, as of the other kings of arms, is the Herald College in Queen Victoria Street, in the City of London.

Clarendon: town: capital of Monroe co., Ark. (for location of county, see map of Arkansas, ref. 3–E); on Ark. Mid. and St. Louis S. W. R. Rs., and on White river: 60 miles E. of Little Rock: has mills, cotton-gin, and wagon-factory. Pop. (1880) 400; (1890) 1,060; (1900) 1,840.

Clarendon: Rutland co., Vt. (for location of county, see map of Vermont, ref. 7–B); on Benn. and Rut. R. R.; 6 miles S. of Rutland. Clarendon has mineral springs, which are visited for the cure of kidney and skin diseases, etc. Pop. of township (1880) 1,105; (1890) 928; (1900) 915.

Clarendon, Edward Hyde, First Earl of: statesman and historian; b. at Dinton, Wiltshire, England, Feb. 18, 1609 (N. S.). He was educated at Oxford, but coming into the family estates he did not proceed to a degree, but studied law at the Middle Temple, London, under his uncle, Nicholas Hyde, who became chief justice. He was a member of the Long Parliament, which met in 1640, and he acted at first with the popular party, but the next year he became an adviser of the king, writing his ablest appeals to the country: but Charles I. concealed facts from him, and arrested members of Parliament without his knowledge. When the civil war broke out in 1642 he followed the wanderings of the court. In 1643 he was appointed Chancellor of the Exchequer and privy councilor. He accompanied Charles, Prince of Wales, to Scilly and Jersey in 1645–46, and then commenced his history. He represented Charles II. at Madrid for sixteen months from Nov., 1649, but could obtain no assistance. Then, in extreme poverty, he formed one of the petty, impotent court of Charles II. in exile, bearing the lofty title of High Chancellor. It was during this period that his daughter contracted a marriage engagement with the Duke of York which was fulfilled in Aug., 1660, the father seeming to be ignorant of it, and very indignant on learning of it. The marriage brought great suspicion of interested motives and obloquy on Clarendon, contributing not a little to his downfall. On the Restoration in 1660 Hyde became Prime Minister and Lord Chancellor of England, and in 1661 he was created Earl of Clarendon. He opposed popery, and was more moderate than many of the royalists, his policy being simply a reaction toward the legal conditions existing before the civil war. In Aug., 1667, he was removed from office and impeached by the House of Commons, and at the request of the king he took refuge in Montpellier, France. In 1673 he removed to Rouen, and abjectly begged permission to die in England; but his suit was denied, and there he died Dec. 9, 1674. He left a *History of the Rebellion in England* (1707); a *History of the Civil War in Ireland* (1721); an autobiography and other works. These have the merit of stately style, but are prejudiced and unreliable as history. A complete edition, with annotations by Bishop Warburton, was published at Oxford in 1826, but the latest edition is from the Clarendon Press (6 vols., Oxford, 1889). See *Life of Edward, Earl of Clarendon*, by himself (1759); T. H. Lister, *Life of Lord Clarendon* (3 vols., 1838).

Revised by C. K. Adams.

Clarendon, George William Frederick Villiers, Fourth Earl (of the Villiers family): b. Jan. 12, 1800; was the eldest son of the Hon. George Villiers, who was a son of the Hon. Thomas, Earl of Clarendon, and also a descendant of the first earl through the female line. He was sent as ambassador to Madrid in 1833, and succeeded to the earldom, in 1838, on the death of his uncle, John Charles, the third earl. In Spain he was influential in upholding Espartero's policy of constitutional government. In 1840 he became Lord Privy Seal in the Whig ministry, which he resigned in 1841. He was president of the Board of Trade in the new ministry formed by Lord John Russell in 1846, and was appointed Lord-Lieutenant of Ireland in 1847. He exhibited moderation, tact, and energy in the government of that island, which was then much agitated. Having been recalled in 1852, he entered the ministry of Lord Aberdeen in Jan., 1853, as Secretary of Foreign Affairs. He retained this office in the cabinet of Lord Palmerston, who became Premier early in 1855, and acquired a high reputation as a diplomatist. The French alliance and the success

of the Crimean war were indeed the results of his diplomatic skill. The Emperor Nicholas I. calculated that the alliance between France and England would not last three months, but it lasted three years; and at the Congress of Paris, 1856, Lord Clarendon's ideas succeeded. He resigned with his colleagues in 1858, but again became Secretary of Foreign Affairs in Nov., 1865. The Liberal ministers resigned in consequence of the defeat of the Reform bill in June, 1866. Lord Clarendon was appointed Secretary of Foreign Affairs by Mr. Gladstone in Dec., 1868. D. June 27, 1870.

Clarendon, Constitutions of: certain laws made by a general council (or parliament) of the English barons and prelates at Clarendon, in Wiltshire, in 1164, whereby King Henry II. checked the power of the Church, and narrowed the exemption which the clergy had claimed from secular jurisdiction. These ordinances, sixteen in number, defined the limits of the patronage and jurisdiction of the pope, and provided that the crown should be entitled to the election to vacant dignities in the Church. But the most characteristic of all the stipulations—that one which most pointedly indicated the new idea of the relation between State and Church which was dawning upon men's minds—was that concerning the exemption of the clergy from the secular jurisdiction. It was agreed that in criminal cases the clergy should be amenable to the common courts. Heretofore the clergy were judged and punished by ecclesiastical tribunals even for crimes in civil life. As those tribunals could not inflict death, the result was unpunished and therefore increased crime among the clergy. The Constitutions were unanimously adopted, and Becket, the primate, reluctantly signed them. But they were at once rejected by Pope Alexander III. when sent to him for ratification, not so much that they sought to bring guilty clerics to deserved chastisement, as that they infringed on acknowledged rights of the Church in the collation of benefices and dignities, and Becket thereupon retracted his consent, and imposed upon himself the severest penances. This, and the other measures adopted by the archbishop to vindicate the independence of the clergy, led to disputes between him and the monarch. (See Becket.) Notwithstanding the humiliation to which the king submitted after Becket's death, most of the provisions of the Constitutions of Clarendon continued permanent. See Stubbs's *Constitutional History*, and for text his *Select Charters*; cf. Schaff, *St. Thomas of Canterbury* in *Papers of American Society Church History* for 1892, pp. 16, *sqq.* Revised by J. J. Keane.

Clarendon Press: a celebrated printing and publishing establishment connected with Oxford University, England. It was founded in 1672, and took its name from the fact that the printing-house erected in 1711 was built from the profits arising from the sale of Clarendon's *History of the Rebellion*, of which work the university has a perpetual copyright.

Claret [O. Fr. *claret*, dimin. *clair*, clear, bright < Lat. *clarus*]: a name given in Great Britain and the U. S. to red French wines produced near Bordeaux (Fr. *vin de Bordeaux*). The French *clairet* signifies "pale wine."

Claretie, klăăr'tee', Arsène Arnaud, called Jules: French *littérateur*; b. in Limoges, Dec. 3, 1840. He has written an enormous quantity of books—novels, plays, criticisms, historical essays, etc. His *Pierrille* (1863) obtained the praise of George Sand, and his *Mlle. Cachemire* (1865) and *Un Assassin* (1866) raised for him favorable expectations in the public mind. His *Derniers Montagnards: histoire de l'insurrection de prairial, an III.* [1795] obtained Michelet's approval in 1867. A longer historical work is *Histoire de la Révolution de 1870–71* (2d ed., 5 vols., 1875–76). He has contributed biographies of Victor Hugo, Émile Augier, A. Dumas fils, Alphonse Daudet, Victorien Sardou, François Coppée, and several others to the series entitled *Célébrités contemporaines*. Since Oct. 20, 1885, he has been general administrator of the Comédie-Française.

A. R. Marsh.

Clarification: See Fining.

Clarinda: city; capital of Page co., Ia. (for location of county, see map of Iowa, ref. 7–E); on the Nodaway river; 62 miles S. E. of Council Bluffs. It has an asylum for the insane, and stock-raising and agricultural industries. Pop. (1880) 2,011; (1890) 3,262; (1900) 3,276.

Clarinet, or **Clarionet** (Fr. *clarinette*): a musical instrument, said to have been invented by Johann Denner, of Nuremberg, in 1690. It consists of a cylindrical tube, terminating in a bell, with eighteen holes in the side, half capable of being closed by the fingers and half by keys. The mouthpiece, which is provided with a single reed, is a conical stopper flattened on one side to form a table for the reed. The sounds of the instrument depend upon the vibration of the reed against the table. The fundamental scale consists of nineteen semitones, of which eighteen are produced by removing the fingers from the holes and lifting the keys, the lowest note being emitted through the bell. As one clarinet can not be played in more than one key, it is usual for the performer to have in reserve two other instruments in different keys.

Clarion, or **Clarin**: a small high-pitched trumpet, chiefly referred to in poetry; also the name of an organ-stop of the reed species, usually sounding *an octave higher* than the trumpet. It was formerly used as a bearing in heraldry.

Clarion: borough (incorporated Apr. 6, 1841); capital of Clarion co., Pa. (for location of county, see map of Pennsylvania, ref. 3–C); on Pittsb. and West. R. R., and on Clarion river; about 75 miles N. N. E. of Pittsburg. Here are churches of six denominations, large and excellent public schools, and the Clarion State Normal School. The borough is situated in a farming, lumbering, mining, and oil-producing region. Pop. (1880) 1,169; (1890) 2,164; (1900) 2,004.

Editor of "Democrat."

Clarion River: of Pennsylvania; rises in McKean County; flows nearly S. W. through Elk and Clarion Counties, and enters Alleghany river. Entire length about 130 miles.

Clark, Abraham: signer of the Declaration of Independence; b. at Elizabethtown, N. J., Feb. 15, 1726; became an attorney and surveyor; high sheriff of Essex County; member of the New Jersey committee of public safety; was chosen a delegate to the Continental Congress of 1776, and signed the declaration. He was re-elected six times to the Continental and twice to the Constitutional Congresses; member of the constitutional convention of 1787; very dominant in the New Jersey Legislature 1782–87. D. from sunstroke in Rahway, N. J., Sept. 15, 1794.

Clark, Alexander, D. D.: b. in Jefferson co., O., Mar. 10, 1834; educated in the common schools and by his father, a classical scholar. At the age of seventeen he became a teacher, and while so occupied started the *Schoolday Visitor*, which was afterward consolidated with *St. Nicholas*. In 1861 he was ordained a minister in the Protestant Methodist Church. He preached in Philadelphia and Cincinnati, and went to Pittsburg as pastor of the First Protestant Methodist church in 1866. In 1870 he was elected editor of the official papers of his denomination—the *Methodist Recorder* and *Our Morning Guide*—which position he held at the time of his death. He had a high reputation as an author, editor, and poet. Among his works are the *Old Log Schoolhouse* and *Workaday Christianity*. D. in Georgia, July 7, 1879.

Clark, Alonzo, M. D., LL. D.: physician; b. in Chester, Mass., Mar. 1, 1807; graduated A. B. at Williams College 1828; took degree of M. D. in College of Physicians and Surgeons of New York in 1835; was for a time Professor of Pathology and Materia Medica in the Vermont Medical College at Burlington; Professor of Physiology and Pathology in the New York College of Physicians and Surgeons from 1848 to 1855; chair changed to pathology and practical medicine in the same institution 1855–85; and dean of the faculty 1875–85. He was appointed physician to Bellevue and St. Luke's Hospitals, New York. In 1853 he was elected president of the New York State Medical Society. He published valuable professional papers. D. in New York city, Sept. 13, 1887.

Clark, Alvan, A. M.: b. in Ashfield, Mass., Mar. 8, 1804; an ingenious farmer's boy; became in youth an engraver for calico print-works at Lowell, Mass. He possessed native skill in portrait-painting, an art which he practiced with great success, but when over forty years his son George made a small reflecting telescope in which he became interested, and soon after he gave up his studio and engaged in the manufacture of astronomical instruments with his sons at Cambridgeport. He was the first American who successfully made large achromatic lenses. In this department and in the field of astronomical observation he won great fame at home and abroad. He invented a valuable double eyepiece for measuring small arcs, and made discoveries with

instruments of his own manufacture. D. in Cambridge, Mass., Aug. 19, 1887. See TELESCOPE.

Clark, ALVAN GRAHAM: astronomer; son of Alvan; b. in Fall River, Mass., July 10, 1832: partner with his father; received a Russian medal for the 30-inch refractor in the St. Petersburg Observatory; went with the solar eclipse expeditions of 1870 to Spain and of 1878 to Wyoming; resolved difficult double stars, receiving from the French Academy of Sciences the Lalande gold medal in 1862 for resolving the companion star of Sirius. D. June 9, 1897.

Clark, Sir ANDREW, M. D., F. R. S., LL. D.: physician; b. in Aberdeen, Scotland, Oct. 28, 1826; educated at Aberdeen and Edinburgh; settled as a physician in London; member of the Royal College of Physicians 1858, of which he became president 1888–90; created baronet 1883. D. in London, Nov. 6, 1893. He was the author of *On the Anatomy of the Lungs*; *On Tubercular Sputum*; *The Theory of Asthma*; *Renal Inadequacy*, etc.

Clark, CHARLES EDGAR: See the Appendix.

Clark, DANIEL: Canadian physician; b. at Granton, Inverness-shire, Scotland, Aug. 29, 1836; in 1841 arrived in Canada with his parents. He graduated M. D. at Victoria College in 1858; afterward took a course at Edinburgh University, and in 1864 became attached to the surgeon-general's department U. S. army. In 1875 he became superintendent of the Asylum for the Insane at Toronto, an office which he now holds; in 1891, at Washington, D. C., was elected president of the Association of Medical Superintendents of the American Institutions for the Insane; and is Professor of Psychology and Mental Diseases in Toronto University. He has published *Pen Photographs* (Toronto, 1873), and *John Garth*, a novel. NEIL MACDONALD.

Clark, DAVIS WASGATT, D. D.: bishop of the Methodist Episcopal Church; b. on the island of Mt. Desert, Me., Feb. 12, 1812; graduated at Wesleyan University in 1836; became distinguished as a preacher, editor, and author; was elected editor of the *Ladies' Repository* in 1852, which position he held twelve years. Became a bishop in 1864. He published an *Algebra* (New York, 1843); *Mental Discipline* (1848); *Man all Immortal* (Cincinnati, O., 1864); and other works. D. in Cincinnati, O., May 23, 1871.

Clark, EDWIN CHARLES: See the Appendix.

Clark, FRANCIS EDWARD, D. D.: founder of the Christian Endeavor Society; b. at Aylmer, Quebec, Sept. 12, 1851; studied at Kimball Union Academy; graduated from Dartmouth 1873; took the course of theology at Andover Theological Seminary; installed as pastor of the Williston Congregational church, Portland, Me., Oct. 19, 1876. Here he organized the first society of Christian Endeavor among the young people of his church Feb. 2, 1881 (see CHRISTIAN ENDEAVOR); accepted a call to the Phillips Congregational church of South Boston 1883; resigned the pastorate 1887 to accept the presidency of the United Society of Christian Endeavor and editorship of the *Golden Rule*, the official organ of the society. Dr. Clark resides at Auburndale, Mass. His wife, HARRIET E. ABBOTT, is also well known for her writings and efforts in the Christian Endeavor movement. C. H. THURBER.

Clark, GEORGE ROGERS: frontiersman; b. near Monticello, Albemarle co., Va., Nov. 19, 1752; d. near Louisville, Ky., Feb. 18, 1818; learned surveying, and at twenty years of age removed to the upper Ohio valley; in 1774 served against the Shawnees; in 1775 settled in Kentucky, then beginning to be disturbed by Indian raids instigated by the British. In 1776 he procured the organization of Kentucky as a county of Virginia, was appointed major of militia, and conveyed ammunition to Harrodsburg just in time to repel an Indian foray upon that post. In 1777 he projected a scheme for the conquest of Illinois, established a post at Corn island, opposite Louisville, surprised and took Kaskaskia and the neighboring French villages; marched on Vincennes and compelled the British commander, Hamilton, to capitulate in 1779; built Fort Jefferson, near the mouth of the Ohio; relieved Cahokia from an attack of British and Indians in 1780; invaded the Shawnee country and burned their villages; went to Virginia to arrange a campaign against Detroit, and while there ambuscaded a detachment of Benedict Arnold's invading army; defended the settlements around Louisville against Brant and his allies; in 1782 destroyed the Indian villages in the Big Miami valley. His operations were influential in preserving the country N. of the Ohio to the U. S. in the peace of 1783. Afterward Clark maintained the cause of the French against the Spanish in the Mississippi valley, but his fighting days were over. Neglected by his country, he passed his latter years in penury on Corn island. Died at the home of his sister. (See *Campaign in the Illinois, 1778–79*, Cincinnati, 1869.)—WILLIAM CLARK, his brother, the military commander of the Lewis and Clark expedition to Oregon, was b. in Virginia, Aug. 1, 1770; d. in St. Louis, Mo., Sept. 1, 1838. At fourteen he settled near Louisville; entered the army; removed in 1804 to St. Louis; commissioned by President Jefferson to join Lewis on his expedition to the mouth of the Columbia river; was Indian agent and brigadier-general for Upper Louisiana; Governor of Missouri 1813–21; superintendent of Indian affairs at St. Louis until his death.
C. H. THURBER.

Clark, GEORGE WHITEFIELD, D. D.: Baptist clergyman; b. at South Orange, N. J., Feb. 15, 1831; graduated at Amherst College in 1853, and at Rochester Theological Seminary in 1855; ordained Oct. 31, 1855, and became pastor of the Baptist church at New Market, N. J. In 1859 he accepted the pastorate of the First Baptist church at Elizabeth, N. J.; about 1868 became pastor at Ballston Spa, N. Y.; in 1873 at Somerville, N. J.; retired on account of health 1877; since 1880 has been doing literary work for the American Baptist Publication Society. In 1870, in New York, he published his *New Harmony of the Four Gospels*, and his *Notes on Matthew* in 1872; *Notes on Mark* (1876); *Notes on the Gospels of Luke and John* (1879); *Harmonic Arrangement of the Acts* (1884).

Clark, HENRY JAMES: naturalist; b. in Easton, Mass., June 22, 1826; graduated at the University of New York 1848; became a pupil of Asa Gray at the Cambridge botanical garden; graduated at the Lawrence Scientific School at Harvard 1854; assistant to Louis Agassiz till 1863, and also for three years adjunct Professor of Zoölogy at the Lawrence Scientific School; Professor of Natural Sciences in Pennsylvania State College, near Bellefonte, 1866–69; Professor of Natural History in University of Kentucky, Lexington, 1869–72; Professor of Veterinary Science in Massachusetts Agricultural College, Amherst, from 1872 until his death there July 1, 1873. He contributed to the Smithsonian publications, to the *Proceedings* of the American Academy of Sciences and Arts, and to other learned periodicals. Author of *Mind in Nature* (Cambridge, 1863) and of the *Mode of Development of Animals* (New York, 1865). See A. S. Packard, Jr.'s *Memoir* in *Biographical Memoirs of the National Academy of Sciences* (Washington, 1877).

Clark, Sir JAMES, Bart., K. C. B., F. R. S.: physician; b. at Cullen, Scotland, Dec. 14, 1788; studied medicine at Edinburgh. About 1826, after six years of practice in Rome, he settled in London, where he attained eminence as a physician. In 1829 he published an able work *On the Sanative Influence of Climate*. He was appointed physician in ordinary to Queen Victoria in 1837, and the next year made a baronet. His *Treatise on Pulmonary Consumption* (1835) is highly esteemed. D. June 29, 1870.

Clark, LABAN, D. D.: Methodist Episcopal minister; b. at Haverhill, N. H., July 19, 1778; began to preach in 1800. He was one of the founders of the Methodist Missionary Society and of the Wesleyan University at Middletown, Conn. (1831), and was for many years an able and influential preacher. D. in Middletown, Conn., Nov. 28, 1868.

Clark, LATIMER, C. E., F. R. S.: electrical engineer; b. at Great Marlow, Bucks, England, Mar. 10, 1822; commenced railway surveying 1847, and published a *Description of the Britannia and Conway Tubular Bridges*, on which he was engaged under his brother Edwin; entered the service of the Electric Telegraph Company 1850; undertook a long series of researches on the subject of underground telegraph wires 1853; announced the disturbance of the magnetic needles during the display of the aurora borealis 1857; became engineer to the Atlantic Cable Telegraph Company 1859; member of the Government committee to investigate the subject of submarine telegraph cables 1860; wrote on *Standards of Electric Measurements*, suggesting the now current names for electric units in 1861, and again in 1868 a work translated into French, Italian, and Spanish; superintended the submergence of some 50,000 miles of cable in all parts of the globe; originated "Clark's Standard Cell" as a standard of electro-motive force in 1873.
C. H. THURBER.

Clark, Lewis Gaylord: writer: b. at Otisco, Onondaga co., N. Y., in 1810. He was for many years editor of the *Knickerbocker Magazine*, about which gathered Irving, Bryant, Longfellow, and all the prominent literary men of the time. It was the precursor of the modern popular magazine. In 1859 this periodical ceased, and Clark found employment in the custom-house. His friends bought a residence for him at Piermont-on-the-Hudson, and there he died, Nov. 3, 1873. His only publications were the *Knickerbocker Skelch-book* (1850) and *Knick-Knacks* (1852). He was twin brother to Willis Gaylord Clark (*q. v.*).

Revised by C. H. Thurber.

Clark, Nathaniel George, D. D., LL. D.: Congregationalist; b. at Calais, Vt., Jan. 18, 1825; graduated at the University of Vermont 1845, and at Auburn Theological Seminary 1852; became a professor in the latter institution in 1853, and in Union College, New York, in 1863; and one of the secretaries of the American Board of Commissioners for Foreign Missions from 1865 to Oct., 1894. D. at West Roxbury, Mass., Jan. 3, 1896. His writings consisted chiefly of articles and reports relating to missionary subjects.

Clark, Thomas March, D. D., LL. D.: Protestant Episcopal Bishop of Rhode Island; b. at Newburyport, Mass., July 4, 1812; graduated at Yale in 1831, and at Princeton Seminary in 1835; received holy orders in 1836; held rectorships in Boston, Philadelphia, and Hartford; consecrated bishop in 1854. He was an efficient member of the Sanitary Commission, and a frequent contributor to popular literary periodicals. He was long the Episcopal leader of the Broad Church school in his Church. Besides his *Formation of Character* (1852) and *Primary Truths of Religion* (1869), he has published devotional books. Three of his brothers, Rufus Wheelwright (1813–86), George Henry (b. 1819), and Samuel Adams (1822–75), became prominent clergymen, and Rufus wrote many religious books.

Clark, Rev. William: See the Appendix.

Clark, William George: English man of letters; b. in Mar., 1821; educated at Trinity College, Cambridge; ordained in 1853, but resigned his orders in 1869, giving his reasons in the pamphlet, *The Present Dangers of the Church of England*; edited the first series of *Cambridge Essays* (1855); George Brinley's *Essays* (1858); and, in collaboration with others, the *Cambridge Shakespeare* (9 vols., 1863–66). In 1872 he published *Lectures on the Middle Ages and the Revival of Learning*. D. at York, Nov. 6, 1878.

C. H. Thurber.

Clark, Willis Gaylord: poet; b. at Otisco, N. Y., in 1810; was twin-brother of Lewis Gaylord Clark (*q. v.*). He wrote for the *Knickerbocker Magazine* a series of amusing articles called *Ollapodiana*. Among his poems is *The Spirit of Life* (1833). In the latter part of his life he was the chief editor of the *Philadelphia Gazette*. D. in Philadelphia, Pa., June 12, 1841. His *Literary Remains* were published in 1844, and a reissue of his collected poems in 1847.

Revised by H. A. Beers.

Clarke, Adam, LL. D.: Wesleyan divine and commentator; b. at Moybeg, Londonderry, Ireland, about 1762. He was educated at Wesley's Kingswood School, near Bristol; sent out by Wesley as an itinerant preacher in 1782; was president of the Wesleyan Conference in 1806, 1814, 1822; became eminent for his Oriental and biblical learning; held Arian views of Christ; published a *Bibliographical Dictionary* (6 vols. 12mo, 1802); *Bibliographical Miscellany* (2 vols., 1806); *Succession of Sacred Literature* (1807); *Commentary on the Bible* (1810–25, 8 vols; several later editions and reprints, e. g. New York, 1837, 6 vols.; New Testament portion condensed by Daniel Curry, 1883–84, 2 vols.; 2d vol. 1832); *Rymer's Fœdera* (1819); *Wesley Family*; sermons and miscellaneous works (13 vols. 8vo., 1836–37). Died of cholera at Bayswater, Middlesex, Aug. 26, 1832. See his autobiography and memoir (1833, 3 vols.); and *Life* by J. W. Etheridge (London, 1858; New York, 1859).

Revised by S. M. Jackson.

Clarke, Andrew, Sir: lieutenant-general in British army; b. at Southsea, England, in 1824; educated at Woolwich Military Academy; entered the corps of Royal Engineers June 19, 1844, in which he became a captain in 1854, lieutenant-colonel in 1867, full colonel in 1872, major-general in 1883, lieutenant-general in 1886; was acting secretary of the British Government in Van Diemen's Land 1851–52, and surveyor-general and chief commissioner of crown lands in Victoria 1853–58. In 1856 he became an executive councilor and member of the first cabinet in the latter colony. For his services in inaugurating the new governments in the young colonies, and for his sagacious administration during the excitement which followed the discovery of gold, he was created a Knight Commander of St. Michael and St. George. In 1863 he made an inspection of the African west coast colonies. In 1864 he was appointed director of the works of the navy under the Admiralty, and as such designed and executed the great docks at Malta and Bermuda, also the extensive new works at Portsmouth and the extension of the principal dockyards. For these services he was created a C. B. in 1869. In 1873 he was appointed governor of the Straits Settlements, including Penang, Singapore, and Malacca. In 1875 he relinquished this office, and became Minister of Public Works and member of the council of the governor-general in India. He was commandant of the Chatham School of Military Engineering 1881–82. In the latter year he went to Cairo to reconstruct its sanitary arrangements.

Clarke, Charles Cowden: author: the husband of Mary Cowden Clarke (*q. v.*); b. at Enfield, Middlesex, Dec. 15, 1787; became a bookseller in London in 1820; delivered lectures on dramatists and poets 1834–54. Among those published are *Shakespeare Characters* (1863) and *Molière Characters* (1865). Husband and wife jointly produced an annotated edition of Shakespeare's works (1869), now known as *Cassell's Illustrated Shakespeare*; the *Shakespeare Key* (1879); and *Recollections of Writers* (1878). D. at Genoa, Mar. 13, 1877. See his *Biography* by his wife (1887).

Clarke, Sir Edward George: See the Appendix.

Clarke, Frank Wigglesworth: chemist; b. in Boston, Mass., Mar. 19, 1847; graduated at the Lawrence Scientific School of Harvard in 1867, and was assistant in Chemistry at Cornell for a year. In 1873–74 he was Professor of Chemistry and Physics at Howard University, Washington, D. C., and in 1874 was called to the University of Cincinnati, where he remained until 1883. He then resigned to become chief chemist to the U. S. Geological Survey. He has published many articles on chemistry and allied subjects. His most important work is the *Constants of Nature*, in five 8vo pamphlets. Of late he has been engaged in work on the constitution of the natural silicates, and has contributed to the journals a number of valuable articles on this subject.

I. R.

Clarke, Hugh Archibald: Professor of Music in the University of Pennsylvania: b. in Toronto, Canada, Aug. 15, 1839; studied first under his father there and in the Canada University. In 1875 was appointed Professor of Music in the University of Pennsylvania, from which, in 1866, he had received the degree of Mus. Doc. Has been organist of several churches and leader of some societies in Philadelphia. His compositions include *Jerusalem*, an oratorio; overture and choruses to Aristophanes's *Acharnians*; a treatise on *Harmony*, instruction books for the pianoforte and organ, and songs and pianoforte pieces.

D. E. Hervey.

Clarke, Hyde: See the Appendix.

Clarke, James Freeman, D. D.: Unitarian preacher, editor, and author; b. in Hanover, N. H., Apr. 4, 1810; was settled in Louisville, Ky., 1833–40; was pastor of the Church of the Disciples in Boston, Mass. (organized especially for him), from 1841 until his death. Besides other works, he published *Service-book and Hymn-book for the Church of the Disciples* (Boston, 1844–56); *Christian Doctrine of Prayer* (1854); *The Hour which Cometh* (1864); *Orthodoxy: its Truths and Errors* (1866); *Steps of Belief* (1870); *Ten Great Religions* (1871; vol. ii. 1883); *Self-culture* (1880); *Events and Epochs in Religious History* (1881); *Anti-Slavery Days* (1884); *The Ideas of the Apostle Paul* (1884). D. in Boston, June 8, 1888. His *Autobiography* (which extends only to 1840), *Diary, and Correspondence*, edited by Dr. Edward Everett Hale, appeared in Boston (1891).

J. W. Chadwick.

Clarke, John: physician and preacher and one of the founders of Rhode Island; b. in Suffolk, England, Oct. 8, 1609. He was educated as a physician and practiced in London; joined the Puritans and emigrated to Massachusetts, landing at Boston Nov., 1637, but was driven to Rhode Island in 1638, and in the same year founded the first Baptist church at Newport. This church claims to be older than the first church at Providence, and therefore the first of that faith in the New World. Clarke visited England in company with Roger Williams (1651), and in 1663 ob-

tained from Charles II. the charter which secured civil and religious liberty to Rhode Island. He did not return till 1664, as he acted as agent of the colony in England. Callender, in his history of that State, classes Clarke with the ablest projectors and legislators of that commonwealth. While he was pastor at Newport he preached once at Lynn, Mass., for which he was imprisoned and fined £20, under the act of Nov. 15, 1644. D. in Newport, R. I., Apr. 26, 1676. Cf. Callender, *Historical Discourse*, in vol. iv. *Collections of Rhode Island Historical Society*.

Clarke, John Sleeper: comedian; b. in Baltimore, Md., in 1835. He first appeared as Frank Hardy in *Paul Pry*, at the Howard Athenæum in Boston in 1851, played at the Chestnut Street theater, Philadelphia, Aug. 28, 1852; became leading comedian and in 1858 joint lessee of the Arch Street theater. In 1865 he purchased, with his brother-in-law, Edwin Booth, the Walnut Street theater, Philadelphia. He went to London in 1867, and at the St. James theater made a hit as Major Wellington de Boots, which character he had played more than a thousand times in the U. S.; reappeared in New York in 1870 and in 1872; became proprietor of the Charing Cross theater, London. D. in London, Sept. 24, 1899. B. B. Vallentine.

Clarke, Mary Cowden: author; a daughter of Vincent Novello, the composer; b. in London, England, June 22, 1809. She was married in 1828 to Charles Cowden Clarke (*q. v.*). Among her works are *The Complete Concordance of Shakespeare* (1845), a work remarkable for completeness and accuracy, and *World-noted Women* (1857). She annotated an edition of Shakspeare in 1869. She also published novels, tales for children, *Shakespeariana* (1885), and a *Centennial Biographic Sketch of Charles Cowden Clarke* (1887). D. at Genoa, Jan. 12, 1898.

Clarke, Samuel, D. D.: philosopher and theologian; b. in Norwich, England, Oct. 11, 1675; educated at Cambridge. His Boyle lectures in 1704 and 1705 on the *Being and Attributes of God*, *The Obligations of Natural Religion*, and the *Truth and Certainty of the Christian Religion* (6th ed. 1725), brought him great fame. They were in answer to Spinoza, Hobbes, and other freethinkers. He was the successor of Locke among English metaphysicians. He became in 1706 chaplain to Queen Anne and rector of St. James, Westminster, London, 1709. In 1712 he published *The Scripture Doctrine of the Trinity*, on which point his opinions were Semi-Arian. He defended the Newtonian philosophy against Leibnitz, with whom he corresponded. The correspondence was published in 1717. His edition of Homer, with a Latin version and notes (1729, 12 books, completed by his son, 1732) was extensively used by students. D. May 17, 1729. See his *Life* by B. Hoadley, prefixed to his *Sermons* (10 vols., 1731) and his *Works*; and one by William Whiston (1730; 3d ed. 1748). Revised by S. M. Jackson.

Clarke, Samuel Fessenden: naturalist; b. in Geneva, Ill., June 4, 1851; graduated at the Sheffield Scientific School (Yale), 1878; assistant to U. S. Fish Commission 1874–75; biological assistant at Johns Hopkins University 1879–81; Professor of Natural Science at Williams College 1882; has written monographs on hydroids and amblystoma, and *The Development of a Double-headed Vertebrate* (1880).

Clarke, William Horatio: See the Appendix.

Clarke River, or **Flathead River**: rises in the Rocky Mountains, in the west part of Montana. It flows northwestward, traverses the northern part of Idaho, and enters Washington. Near the northern boundary of Washington it enters the Columbia. Length about 650 miles. Gold is found near this river in Montana.

Clarksburg: town; capital of Harrison co., West Va. (for location of county, see map of West Virginia, ref. 6–H); on Balt. and Ohio and other R. Rs., and on the Monongahela, at the confluence of the West Fork river and Elk creek. It is in a coke and coal region, and has fine U. S. and county buildings, two academies, water-works, gas-works, electric light, steam flouring-mills, large woolen-factory, extensive sawmills, etc. Pop. (1880) 2,307; (1890) 3,008; (1900) 4,050.

Editor of "Telegram."

Clarkson, Robert Harper: Protestant Episcopal bishop; b. in Gettysburg, Pa., Nov. 19, 1826; graduated from Pennsylvania College, Gettysburg, 1844, and went to the theological school of St. James College, Hagerstown, Md., from which he received a diploma in 1848; was soon after appointed rector of St. James Episcopal church, Chicago, and held that position until 1865, when he removed to Omaha as missionary bishop of Nebraska and Dakota; in 1870 was chosen diocesan of Nebraska. He was instrumental in establishing about fifty Episcopal churches in his diocese, and was for about twenty-five years trustee of the Racine and Neosho colleges, in Wisconsin. D. in Omaha, Neb., Mar. 10, 1884.

Clarkson, Thomas: philanthropist; b. at Wisbeach, in Cambridgeshire, Mar. 28, 1760. He was educated in St. John's College, Cambridge, where he wrote in 1786 a Latin prize essay on the question, *Is Involuntary Servitude Justifiable*. He was so deeply interested in that subject that he resolved to devote his life chiefly to the abolition of the slave-trade and the relief of the oppressed. He became an associate of William Dillwyn, George Harrison, and other members of the Society of Friends, who had previously formed themselves into an anti-slavery committee. Mr. Wilberforce cooperated, and was the chief advocate of the cause in Parliament. Clarkson diligently collected and diffused information about the slave-trade. Their efforts excited violent opposition, and were several times defeated in Parliament, but finally an act to abolish the slave-trade was passed in Mar. 25, 1807. He published in 1808 *The History of the Abolition of the Slave-trade*. In 1823 he was chosen president of the Anti-Slavery Society, and devoted himself to the extirpation of slavery in the West Indies, which was accomplished in 1833. D. in Playford Hall, near Ipswich, Sept. 26, 1846. See his *Life* by T. Taylor (London, 1839).

Clarksville: city (founded in 1780); capital of Montgomery co., Tenn. (for location of county, see map of Tennessee, ref. 5–E); on Louisville and Nashville R. R.; 100 miles N. E. of Memphis and 50 miles N. W. of Nashville. The city is built upon a peninsula formed by the Cumberland and Red rivers, which unite their waters N. W. of the city. It has elegant churches, fine public schools, water-works, gas-works, electric lights, and street cars. It is the seat of Southwestern Presbyterian University, and of an academy for girls. It is situated in the center of the large "dark-tobacco" growing district of Tennessee and Kentucky, and is one of the largest tobacco-markets in the U. S., the tobacco-trade being its chief source of prosperity. Here are also large bending-works, flouring-mills, and lumber-mills. There are in the surrounding region large lumber-forests, and in the immediate vicinity rich and accessible iron-ore deposits, once mined. Preparations for working the disused mines have now (1893) been made. Steamboats navigating the Cumberland river touch at Clarksville daily. Pop. (1880) 3,880; (1890) 7,924; (1900) 9,431.

Editor of "Progress Democrat."

Clarksville: town; capital of Red River co., Tex. (for location of county, see map of Texas, ref. 2–J); on Texas and Pacific R. R.; 20 miles from Red River. The town is situated in a rich farming region, and is one of the leading cotton-markets of Northern Texas, 27,000 bales of cotton having been marketed in 1891–92. Here are good schools and numerous churches. Pop. (1890) 1,588; (1900) 2,069.

Editor of "Times."

Clark University: an institution of learning situated at Worcester, Mass.: chartered in Jan., 1887; opened in Oct., 1889. It is devoted exclusively to post-graduate work. It not only does not receive undergraduates, but does not do undergraduate work. This gives it a unique position in the country. Great prominence is given to original investigation which creates the material of culture distributed by colleges and lower schools. It thus occupies a position intermediate between most universities and special institutes for the most advanced work. It does not cover the whole field of human knowledge, but confines all its efforts to a few related branches, which it strives to make as perfect as possible. These are mathematics, physics, chemistry, morphology, anatomy, physiology, neurology, psychology, anthropology, and pedagogy. Each of these subjects is represented by a chief instructor, who conducts a systematic course and instigates and guides research.

Mr. Jonas G. Clark, the founder, and his wife, have provided a system of fellowships and scholarships for thirty meritorious students, ranging in value from $200 to $600. A system of docentship has been established for young men who have done work which marks a distinct advance beyond the doctorate, and who wish to engage in research. They are not assistants, are expected to do some teaching, are entirely independent, and their relations are directly with the president.

The buildings are, so far, three in number: the central

building is 204 feet by 114, is four and a half stories high, and has 90 rooms; another, a chemical building, contains 68 rooms. The grounds consist of an 8-acre lot and three smaller lots, all located about 1½ miles W. of the railway station.

It is the desire of the founder that the highest academic standards be here forever maintained; that special opportunities be offered for independent research; that to this end the instructors be not overburdened with teaching or examinations; that all available experience, both of the U. S. and of older countries, be freely utilized; and that new measures and even innovations, if really helpful to the highest needs of science and culture, be no less freely adopted. He chose Worcester as the seat of the new foundation because its location is central among the best colleges of the East, the work of which he desires to supplement by an institution devoted to the training of professors.

L. N. Wilson.

Clary: a gray hairy annual plant (*Salvia sclarea*), of the *Labiatæ* or Mint family, native of Southern Europe, now somewhat cultivated in the U. S. for its leaves, which are used for seasoning. It grows to the height of 2 feet or so, and bears oblong obtuse leaves and spikes of small red flowers, whose broad bracts are red and very showy. The foliage has also been used in domestic medicine. C. E. B.

Class [from Fr. *classe* < Lat. *classis*, a division or class of the Roman people, what is called together or proclaimed, deriv. of *cala're*, proclaim; cf. *calen'dae*, *intercala'ris*. Some regard *classis* as loan-word from Greek (Dor.) κλᾶσις, deriv. of καλέω, summon]: in natural history, a large group of plants or animals formed by the union or association of several orders. Classes, orders, families, genera, and species are common to all methods of classification. The term *class* is also used to denote a portion of society separated from other portions by some distinction of rank, fortune, or more intrinsic qualities.

Classic, or **Classical** [from Lat. *classicus*, of the highest rank or order: deriv. of *classis*; see Class]: pure, refined; conformed to the best and most perfect standard; also pertaining to the ancient Greek or Latin authors, or rendered famous by association with ancient writers, as "classic ground." The ancient Roman people were divided into six classes, and the persons of the first or highest class were called *classici*. Hence the term came to signify the highest and purest class of writers in any language, though formerly it was applied only to the most esteemed Greek and Latin authors. The epithet "classical," as applied to ancient writers, is determined less by the purity of their style than by the period at which they wrote. The classical age of Greek literature begins with Homer, the earliest Greek writer whose works are extant, and extends perhaps to the time of the Roman emperor Antonine, but signs of decadence appeared about 300 B. C. The Latin classical period is shorter; its earliest writer is Plautus, and it ended about 200 A. D. Some critics, however, include Claudian, who was born about 365 A. D., among the classics.

Classical Learning: See Humanism.

Classis [Lat., a class]: in the Reformed Churches in America and in Holland, a church court corresponding to the presbytery in Presbyterian churches. It is composed of the elders delegated by the consistories (the governing body of each church), one from each, of the pastors and all the ministers in a certain district. The classis hears appeals from the consistories, and appeal from the classis is to a particular synod. The classis also confirms and dissolves pastoral connections, ordains and deposes ministers, sends 2 ministers and 2 delegates to the synod and 3 ministers and 3 delegates to the general synod.

Clatsop: See Chinookan Indians.

Claude d'Abbeville: French Capuchin missionary and author; b. at Abbeville. His secular name was Fermin Foullon, and he took the name Claude when he entered the Capuchin order in 1601. In 1612 he went with other Capuchins to establish a mission at Maranhão, Brazil, then a French colony. Returning in 1614, he published his *Histoire de la Mission des Pères Capvcins en l'Isle de Maragnan* (Paris, 1614; Portuguese translation, Maranhão, 1874), a work of the highest value, not only as a history, but for the minute account given of the Tupinambas Indians. The narrative of Yves d'Evreux (*q. v.*) is properly a continuation of it. D. at Rnen, 1616. Herbert H. Smith.

Claude, klōd, Jean: Protestant theologian; b. in La Sauvetat, Southern France, in 1619: became pastor at Nîmes 1654, and of the Protestant church at Charenton, near Paris, 1666. When the Edict of Nantes was revoked (1685) he removed to The Hague, where he died, Jan. 13, 1687. He was distinguished as a disputant. Among his works are *A Defense of the Reformation*, against Nicole (Quevilly, 1673; 4th ed. Paris, 1844; Eng. trans. London, 1815); *A Short Account of the Complaints and Cruel Persecutions of the Protestants in France* (n. e. Cologne, 1713; Eng. trans. 1686; n. e. 1708); and, best known of all, *Essay on the Composition of a Sermon* (Eng. trans. n. e. 1853). See his *Life* in French by De La Devèze (Amsterdam, 1687). Revised by S. M. Jackson.

Claude, Jean Maxime: genre and landscape painter; b. in Paris, June 24, 1824; pupil of Galland; second-class medal, Paris Exposition, 1889; Legion of Honor 1884. His pictures of hunting-parties and equestrians in the Paris and London parks are distinguished by their good taste and fine qualities of color. Studio in Paris. W. A. C.

Claude Lorrain: See Gelée, Claude.

Claudia'nus, Claudius: a Latin epic poet, whose birthplace is unknown, who went to Rome from Alexandria in 395 A. D., and gained the favor of Stilicho. His poems were so popular that a statue was erected to him in Rome by the senate and the emperor. Among his works are *The Rape of Proserpine*, *The Battle of the Giants*, and a *Eulogy of Stilicho* (De Consulatu Stilichonis). He probably did not survive the death of his patron Stilicho in 408 A. D. He had a fertile imagination, and is regarded as the last of the classical Latin poets. The best editions of his works are those by Jeep (2 vols., Leipzig, 1876–79) and T. Birt (Berlin, 1893). There is an English translation by Abraham Hawkins (London, 1817), but it is of slight merit.

Clau'dius, or, more fully, **Tiberius Claudius Drusus Nero**: the fourth Emperor of Rome; b. at Lugdunum (Lyons) in 10 B. C. He was a son of Drusus Nero and a nephew of the Emperor Tiberius. He was naturally infirm in body, and his education was neglected. He was lame and paralyzed, and by nature so diffident and timid that he was generally considered half imbecile, and by his family he was treated as an object of scorn. On the death of Caligula (who was his nephew) he was proclaimed emperor by the army in 41 A. D., and was unwillingly recognized by the senate, who preferred a republic. He began his reign with a show of clemency, but his wife, the infamous Messalina, acquired great power, which she abused by acts of cruelty. When she finally pushed her recklessness so far as to marry one of her lovers, Claudius had her put to death; but her successor, his niece Agrippina, was even worse. Claudius wrote several historical works, but they have all perished. He built a great aqueduct called Aqua Claudia, and successfully invaded Britain in person. He was poisoned in 54 A. D. by his wife Agrippina. See Suetonius, *Claudius*; Tacitus, *Annales*.

Claudius, Appius, surnamed Crassus: Roman patrician; decemvir in 451 B. C. He rendered himself infamous by an attempt to enslave and dishonor Virginia, whom he claimed the right to retain as the slave of one of his clients. Her father, unable to obtain redress from the courts, slew her and appealed to the army. A popular revolt expelled the decemviri, and Claudius was seized and imprisoned. According to Livy, he committed suicide. The story is rehearsed in Macaulay's *Lays of Ancient Rome*. See Arnold, *History of Rome*.

Claudius, Appius Cæcus: a Roman patrician who was censor about 312 B. C., and consul 306 and 295 B. C. He constructed the great road called Via Appia from Rome to Capua, and built the first great aqueduct which brought water from Tusculum to the city. In his second consulship he defeated the Samnites and Etrurians, and about 280 secured the rejection of the terms of peace offered by Pyrrhus. He became blind (hence his name Cæcus). He wrote a legal work and a poem. His daughter Claudia, a vestal virgin, is said to have proved her suspected chastity by drawing to land the stranded ship which brought an image of Vesta to Rome, although the men had not been able to release it.

Claudius, Marcus Aurelius, surnamed Gothicus: Emperor of Rome; b. in Illyricum in 214 A. D.; proclaimed emperor by the army on the death of Gallienus, 268 A. D., and their choice was ratified by the senate. He defeated the rebel Aureolus in the same year, and gained a victory over the Goths or Scythians in Servia in 269. D. at Sirmium, 270 A. D., and was succeeded by Aurelian.

Claudius, Matthias: b. in Rhinefeld, near Lübeck, Aug. 15, 1740; d. in Hamburg, Jan. 21, 1815; spent most of his life at Wandsbeck in a banking-office. He published the *Wandsbecker Bote*, a periodical, and afterward a collected edition of his works, verse and treatises (Hamburg, 8 vols., 1775–1812; 12th ed., 2 vols., Gotha, 1882); partial translation, *Claudius, or the Messenger of Wandsbeck and his Message* (London, 1859). Though not a theologian, he exercised great influence on the religious life of Germany by his quaint writings, half humorous and half sentimental. He attacked both the old barren orthodoxy and the new fashionable rationalism, and produced a deep impression. His *Life* was written by W. Herbst (Gotha, 1857; 4th ed. 1878; K. Gerok, Darmstadt, 1881).

Claughton, Thomas Legh, D. D.: Bishop of St. Albans; b. Nov. 6, 1808, at Haydock Lodge, Lancashire, England; educated at Rugby and at Trinity College, Oxford, becoming successively scholar, fellow, and tutor of the latter; graduated in 1831 as first in classics, having previously gained the chancellor's prize for Latin verse and the Newdigate prize for English verse. In 1836 he was appointed public examiner; married a sister of the Earl of Dudley; Professor of Poetry at Oxford 1852–57; consecrated Bishop of Rochester 1867, and translated to the newly constituted see of St. Albans 1877; he resigned in 1890. D. July 25, 1892. A son of the same name is canon of Worcester Cathedral. W. S. Perry.

Claus, klō, Émile: landscape and figure painter; b. in Vive-St.-Éloi, Belgium; contemporary; pupil Antwerp Academy; first-class medal, Paris Exposition, 1889. His pictures are cleverly painted and show much truth to nature. Studio at Astène, Belgium. W. A. C.

Clau'sen, George: figure and landscape painter; b. in England; contemporary; studied in France; associate member of Royal Water-color Society; second-class medal, Paris Exposition, for both oil and water colors, 1889. Studio at Cookham Dean, Berks, England. W. A. C.

Clausen, Henrik Nicolai: Danish theologian and liberal statesman; b. in the island of Laaland, Apr. 22, 1793. He became in 1820 Professor of Theology in the University of Copenhagen, and wrote, besides other works, *Romanism and Protestantism* (1825); *Popular Discourses on the Reformation* (1836); a commentary on the synoptical Gospels, and *Christian Dogmatics* (1867). In 1840 he was chosen a deputy to the States, and near the end of 1848 was appointed a member of the Cabinet. D. Mar. 28, 1877.

Clausewitz, klow'*se-vits*, Karl, von: a Prussian general and writer on war; b. in Burg, June 1, 1780. He served on the staff of the Russian army in 1813, and wrote an *Account of the Campaign of 1813* (1814); became a corps commander, director of the army-school, and then inspector of artillery. D. in Breslau, Nov. 16, 1831. His posthumous works were published in 10 vols. (1832–37; 3d ed. 1869). Of these the principal are *On War* (n. ed. Berlin, 1880) and the *Life and Character of von Scharnhorst*. See his *Life* by Schwartz (Berlin, 1877).

Clausius, klow'sĕĕ-oos, Rudolf Julius Emanuel: physicist, mathematician, and "thermodynamist"; one of the founders of the modern science of thermodynamics; b. in Köslin, Prussia, Jan. 1, 1822. He was educated in Berlin schools and in the university; was made privat-docent on graduation from the latter, and occupied the position in the Royal School of Artillery of instructor in Natural Philosophy. He at once became known as a mathematician by the publication of a number of papers on mathematical physics, a department in which he continued active throughout his life. He was called to the professorship in Natural Philosophy at Zurich in 1857, at the age of thirty-five. He went to the University of Bonn in the same capacity in 1869, and there remained until he died in 1888. His most remarkable work was done at Berlin from 1845 to 1850, in the construction of the science of thermodynamics upon the modern basis, the then recently admitted doctrine of the equivalence of heat and work as forms of energy-effect. Clausius in Germany and Rankine in Great Britain contemporaneously developed the fundamental "general equation of thermodynamics," which expresses the mathematical relations of heat and mechanical energy, and upon which they both proceeded to construct the whole theory of heat-engines, and to apply it to the "ideal case," in which only thermodynamic phenomena are considered. The partial condensation of steam at usual temperatures and pressures by thermodynamic action was discovered by both simultaneously in 1860, and the constancy of the two specific heats of gases predicted by Carnot and others was proved by them at about the same time. This work was all practically done before the close of the decade 1850–60, and in substantially the same manner by both. After going to Zurich, Clausius gave much time to the study of electrical and molecular physics. His greatest work, however, was that for which he shared honors with Rankine. Clausius was a member of many learned societies, was often decorated by the European Governments, and was an honorary member of the American Society of Mechanical Engineers. R. H. Thurston.

Clausson, klow'sōn, Peder: Norwegian author; b. Apr. 1, 1545; d. Oct. 15, 1614. By his translations of the old sagas he rendered great service to the history of Norway, indeed, one saga is extant only in his translation. In his *Description of Norway and Adjacent Islands* is to be found historical material of value. His language is remarkably pure and his style is vigorous and artless. R. B. Anderson.

Clausthal, klows'tăăl: a town of Germany; province of Hanover; on a hill 1,740 feet above the level of the sea, and about 56 miles S. S. W. of Hanover (see map of German Empire, ref. 4–E). It is the chief mining town of the Hartz, and has a mint, a mining academy, a gymnasium, and a valuable museum: also manufactures of camlet and other fabrics. Silver and lead are mined in the vicinity. Pop. (1890) 8,736.

Clavecin: See Bell-ringing.

Clavicle, or **Collar-bone**: a bone which, with the scapula and the head of the humerus, forms the shoulder. In man it is horizontal and immediately above the first rib, and articulates internally with the sternum or breast-bone, and externally with the acromion process of the scapula. Its office is to keep the shoulders apart, and to afford a fulcrum by which the muscles give lateral movement to the arm. Clavicles are absent in those mammals in which the fore limbs are used only for walking or swimming, such as the horse and seal; they are commonly present in mammals which use the fore limbs for climbing, digging, or flying, as monkeys, rats, and bats. Among carnivores the clavicles are absent or rudimentary, being largest in the cat family. In birds the clavicles are usually united with a third bone, the interclavicle, to form the furcula, or wish-bone; but even in this class of animals they may be separate, as in toucans and some parrots, rudimentary, as in the ostrich, or absent, as in the apteryx. Among birds of prey the clavicles are well developed, and serve to counteract the tendency of the pull of the pectoral muscles to draw the shoulders nearer together; but in a large proportion of birds the furcula is of little functional importance, and in some of the best flyers, swifts and humming-birds, the coracoid is practically the sole support of the wing. Among reptiles clavicles may be absent, as in serpents; in lizards they are firmly attached to the front of the breast bone, and aid in keeping the shoulders apart; in turtles they are so modified as to form the front part of the plastron or under "shell." Clavicles are present in the *Anura*, or tailless batrachia, absent in the *Urodela*, or tailed batrachia; they are apparently absent in fishes, or at least the parts so named very doubtfully correspond to the clavicles of other groups.

In man the ossification of the clavicle takes place sooner than that of any other bone, commencing the thirtieth day after conception; and at birth it is ossified in nearly its whole extent; but the sternal end is not complete till the eighteenth or nineteenth year. The clavicle in transcendental anatomy is considered to be the hæmapophysis of the atlas. F. A. Lucas.

Clavicor'nia, or **Clavicorns** [*clavicornia* is plur. of Mod. Lat. *clavicor'nis*, from Lat. *clava*, club + *cornu*, horn]: a group of beetles, so named from their club-shaped (clavate) antennæ. It comprises some water beetles and many land species, including most of the burying beetles (*Necrophaga*). F. A. L.

Clavigero, Francisco Xavier: Mexican historian; b. at Vera Cruz, 1731. He early entered the Jesuit order and taught rhetoric and philosophy in their schools, but devoted much of his time to the study of Aztec history and manuscripts. After the expulsion of his order from America (1767) he lived at Bologna, Italy, where he established an academy. His history of Mexico was written in Spanish, but translated into Italian and first published as *Storia Antica del Messico*

(Cesena, 1780). It treats of the Aztec period and conquest, and attained a wide and deserved popularity, being translated into English, German, and Spanish. The Abbé Clavigero also wrote a *Storia della California*, published after his death, which occurred at Bologna, 1787.

HERBERT H. SMITH.

Clavijo, klaă-vee'*khō*, RUY GONZALES, de: a Spanish traveler: d. in 1412; a native of Madrid; was sent by Henry III. as ambassador to Timur. He started from Seville in 1403, reached Samarcand viâ Constantinople, Trebizond, Tabreez, and Teheran, and returned in 1406. His itinerary was published at Seville in 1582, *Historia del gran Tamerlan e itinerario*, etc., and again in 1782. There is an English translation of the work by Clements Markham, published by the Hakluyt Society in 1860.

Clay: any fine-grained earth which is sticky when wet and coherent when dry. Clays differ widely in composition, but silica is usually the chief ingredient and alumina stands second. Minor components are water, iron oxide, lime, magnesia, and the alkalis. Classed as to origin, clays are (1) *sedimentary*, the finest sediments deposited by water; (2) *residual*, the material left after the removal by percolating water of the soluble parts of rocks, especially limestones; (3) *glacial*, the fine rock-flour ground up by glaciers and deposited in till. They are also variously named, according to their uses, as pottery, slip, porcelain, terra-cotta, brick and fire clay. Fire-clays, made into fire-bricks, crucibles, and other objects that must endure great heat, are composed almost wholly of silica, alumina, and water; slip clays, used in glazing pottery, are characterized by large percentages of lime and the alkalis.

Clays occur in every State of the Union, and in nearly every county, being so abundant that their immense importance is rarely appreciated. In 1894 the value of building-brick was $35,200,000; vitrified paving-brick, $3,700,000; drain-tile, $5,800,000; sewer-pipe, $6,300,000; and roofing-tile, terra-cotta work, etc., $8,200,000. See also SOILS.

Clay, CASSIUS MARCELLUS: statesman; b. in Madison co., Ky., Oct. 19, 1810. He graduated at Yale in 1832; opposed the annexation of Texas to the Union; advocated the abolition of slavery; made speeches in the Northern States in 1844 in support of Henry Clay as a candidate for the presidency. In 1845 he became the editor of the *True American*, an anti-slavery paper issued at Lexington, Ky. He was attacked by mobs, against which he defended himself bravely in several bloody conflicts. He served as a captain in the Mexican war (1846–47); supported J. C. Fremont in 1856, and Abraham Lincoln in 1860; became a major-general of volunteers in Apr., 1862; resigned Mar. 11, 1863; was minister to Russia 1862–69; subsequently he became a Democrat, although he advocated Blaine's election in 1884. In 1877 he was tried for killing a Negro servant who had threatened his life, and was acquitted of the crime charged. See Horace Greeley, *The Life, Memoirs, Writings, and Speeches of Cassius M. Clay* (2 vols., Cincinnati, ed. of 1886).

Clay, CLEMENT CLAIBORNE: b. in Huntsville, Ala., in 1819; son of a U. S. Senator, C. C. Clay (1789–1866), who was for many years a prominent official of the U. S. and of Alabama. The younger Clay became a lawyer in 1840, a judge in 1844; was U. S. Senator from Alabama from 1854 to 1861, where he advocated extreme States-rights views. In the latter year he entered the Confederate Senate; was also a secret agent of the Confederacy in Canada 1864. After the war he fled to Canada, but surrendered himself to the U. S. on being accused of complicity in the murder of President Lincoln. After a short imprisonment he was released in Apr., 1866, and returned to the practice of his profession. D. in Huntsville, Jan. 3, 1882.

Clay, FREDERICK: musician; b. in Paris, Aug. 3, 1840, of English parents temporarily residing there; educated in Paris and Leipzig. With few exceptions his compositions were entirely for the stage, and include a number of operettas and musical dramas. He wrote two cantatas, *The Knights of the Cross* (1866) and *Lalla Rookh*, for the Brighton festival of 1877. Among his songs the one entitled *She Wandered Down the Mountain Side* was exceedingly popular. D. in London in Nov., 1889. D. E. HERVEY.

Clay, HENRY: lawyer, orator, legislator, and statesman; thrice a candidate for President, and once very nearly elected; b. near The Slashes, in Hanover County, not far from Richmond, Va., Apr. 12, 1777. His father was a poor Baptist preacher, who died in 1782; his mother—a woman of noble character and fervid piety—married again ten years afterward, and migrated to Kentucky, leaving this son (the fifth of seven children) a clerk in a retail store in Richmond, which he soon left for employment as a copyist in the office of Peter Tinsley, clerk of the high court of chancery, whom he served four years, passing thence to the office of Robert Brooke, then attorney-general, afterward Governor. Licensed as a lawyer in 1797, though not yet of age, he followed his mother to Kentucky, opened a law-office at Lexington, and soon achieved a lucrative practice. Kentucky, separating from her parent, Virginia, soon called a convention to frame a State constitution, and young Clay publicly besought her to provide therein for a gradual abolition of slavery, but was sternly overruled, as he was half a century later, when, in the fullness of his fame, he renewed this counsel on the revision of the State constitution in 1849–50.

Kentucky strongly sympathized with her mother State in its opposition to John Adams's administration and its Alien and Sedition Acts, and idolized Jefferson, Virginia's oracle, for whom she cast her first presidential vote in 1800. Young Clay was one of her favorite orators in that excited canvass, and was first chosen to represent his county (Fayette) in the Legislature of 1803–04. Late in 1806, when scarcely eligible, he was chosen by the Legislature of his State to fill a vacancy in the U. S. Senate caused by the resignation of Gen. John Adair. His term expired with his first session, but he had already made his mark as a champion of the policy of internal improvement by the construction of roads, bridges, etc. He was again chosen to the Legislature in 1807, and elected Speaker of the House. He now proposed that each member should clothe himself wholly in fabrics manufactured in the U. S., which was stigmatized by Humphrey Marshall as the project of a demagogue—language which led to a duel wherein both parties were slightly wounded. At the session of 1809 Clay was again chosen to fill a vacancy in the U. S. Senate—this time for two years. In Aug., 1811, he was elected to the House, and on the first day of his service was chosen its Speaker—an extraordinary proof of his ability and popularity. This Congress, in June, 1812, declared war against Great Britain, Clay being one of its foremost advocates, as he remained throughout the struggle, until dispatched to Europe by President Madison as one of the negotiators of peace—a service which he rendered at Ghent with eminent ability. Returning to his country in Sept., 1815, he was received as a victor, and, having been re-elected to the House in his absence, he was rechosen Speaker without opposition. He had been conspicuous in defeating the recharter of the first Bank of the U. S. in 1811; he was equally active and influential in promoting the charter of the second in 1816. He was now, as he had been, a champion of protection to home industry, and of national internal improvements; and he was foremost in effecting the compromise whereby Missouri was admitted as a slave State, on condition that all Federal territory north of lat. 36° 30′ should be consecrated to free labor. Having favored in 1816 an increase of the pay of members of Congress from $8 per day to $1,500 per annum, Clay was formidably opposed in his next canvass by John Pope, afterward Jackson's Governor of Arkansas Territory, but saved his seat by a vigorous effort.

In 1824 five candidates were started for President—William H. Crawford, of Georgia, who had the caucus nomination; John Quincy Adams, of Massachusetts, then President Monroe's Secretary of State; Gen. Andrew Jackson, of Tennessee, then a U. S. Senator; John C. Calhoun, of South Carolina, then Secretary of War; and Henry Clay, of Kentucky, then Speaker of the House. Calhoun soon withdrew, and was made Vice-President by pretty general consent, while Jackson, Adams, and Crawford (no one having a majority) were the three highest on the electoral vote, which compelled the House to choose between them. Clay, having received the votes of Kentucky, Ohio, and Missouri only, with four of those cast from New York, was four votes behind Crawford, and so could not be voted for in the House. He and his friends cast their votes for Adams, electing him by the vote of thirteen States, to seven for Jackson and four for Crawford. Adams made Clay his Secretary of State; whereupon a cry of "Bargain!" was raised, and Gen. Jackson was at once proposed for next President. He was elected over Adams, and Calhoun was again chosen Vice-President. At the next choice of President (1832) Clay was run against Gen. Jackson, and was badly defeated by him. He had just been returned to the U. S. Senate, in which he played a lead-

ing part for many years ensuing, especially in the tariff compromise of 1833, whereby a conflict with South Carolina was averted, and in resistance to the new financial policy propounded by Van Buren in 1837, whereby the treasury was to be divorced from all connection with banks and their notes. Clay was again a candidate for President, before the first Whig national convention, held at Harrisburg in Dec., 1839, but Gen. Harrison was nominated and triumphantly chosen. His death and Tyler's course brought Clay forward as the unanimous choice of his party in 1844, when a desperate effort was made to elect him, but without success, James K. Polk, of Tennessee, carrying both the great States of New York and Pennsylvania by a handful of votes, when the vote of New York alone would have elected Clay. The annexation of Texas and the resulting war with Mexico were fruits of this election.

Mr. Clay's name was once more, and for the last time, presented to the Whig national convention of 1848, but Gen. Taylor was nominated over him and elected. Clay had in 1842 bidden farewell to the Senate, but was persuaded to return to it after 1844, and bore a leading part in effecting the slavery compromise of 1850. He returned to Washington from Kentucky for the last time near the close of 1851, and was soon prostrated by disease, under which he gradually sank until his death, June 29, 1852.

Mr. Clay will be permanently remembered as the leader in promoting what was then considered a high protective tariff. In 1824, in one of the most elaborate and effective speeches of his life, he presented a brilliant array of arguments which still pass current among advocates of high protection. He succeeded in having his doctrine denominated the "American System" in distinction from the "Foreign System," though Daniel Webster pointed out that the views advocated by Clay were an abandonment of American methods, and an adoption of the methods that generally prevailed in Europe. But the phrase succeeded as a party cry, and the bill was carried. In the course of this discussion, and in those that followed, Clay showed on the one hand a masterful grouping of facts and principles, a plausibility of reasoning, a fervor of imagination, and a brilliancy of diction; while on the other he showed superficial research, a disinclination or inability to reason out his propositions to their ultimate conclusions, and a willingness to satisfy himself with half knowledge. Again, in 1832, Clay appeared as the champion of a tariff bill designed to sweep away the "tariff of abominations" of 1828. For the purpose of expounding his policy and bringing his party into line, he called together a caucus of the Whig members of the Senate and the House. Here he laid down the law in a manner which John Quincy Adams, in his *Memoirs*, describes as "courteous, but exceedingly peremptory and dogmatical." The object of the proposed revision was primarily to get rid of the great surplus brought into the treasury by the law of 1828. Clay proposed to sweep away the duties on articles not coming into competition with U. S. products, and preserving the duties on all others. One of his speeches in the Senate on the subject ranks among his greatest successes. Though the bill was carried, it failed to accomplish the desired result. The surplus was not materially reduced, and one year later Clay proposed and carried a bill for the gradual reduction of duties to a maximum of 20 per cent.

Though not successful as an aspirant to the presidency, he was a gallant party chief, an admirable orator, a skillful legislator, wielding unequaled influence, not only over his friends, but even over those of his political antagonists who were subjected to the magic of his conversation and manners. See *The Life and Speeches of Henry Clay*, compiled and edited by Daniel Mallory (New York, 1844; 5th ed. 1857); *Life and Times of Henry Clay*, containing his speeches and correspondence, edited by Calvin Cotton (6 vols., New York; rev. ed. 1865): *Life of Henry Clay*, by Carl Schurz (American Statesman Series, 1887).

Revised by C. K. Adams.

Clay, Henry, Jr.: son of the orator and statesman of the same name; a military officer and lawyer; b. Apr. 10, 1811, in Ashland, Ky.; graduated at West Point 1831; resigned Nov. 1, 1831; counselor-at-law 1833–46; member of the Kentucky House of Representatives 1835–37; and lieutenant-colonel Second Kentucky Volunteers in the war with Mexico 1846–47; engaged at Buena Vista, where, while gallantly leading a charge of his regiment, he was mortally wounded, and in that condition lanced to death Feb. 23, 1847.

Clay, James B.: brother of Henry Clay, Jr.; b. in Washington, D. C., Nov. 9, 1817; *chargé d'affaires* to Lisbon 1849; elected to represent his father's district in Congress 1857; espoused the Confederate cause. D. in Montreal, Canada, Jan. 26, 1864.

Clay Center: city; capital of Clay co., Kan. (for location of county, see map of Kansas, ref. 4–G); on Union Pac. and Ch., Rk. I. and Pac. R. Rs., and on the Republican river; about 125 miles W. of Leavenworth. The city has large plow-works, and other smaller factories. Abundant water-power is furnished by the Republican river. Pop. (1880) 1,753; (1890) 2,802; (1900) 3,069. Editor of "Times."

Claymore, sometimes spelled **Glaymore** [from Gaelic *claidheamhmor*, a broadsword]: a heavy two-handed sword used by the Highlanders of Scotland. It had a crossguard with curved guillons. The name was also given in the eighteenth century to a basket-hilted broadsword.

Clay Slate: See Slate.

Clays, Paul Jean: marine-painter; b. in Bruges, 1819; pupil of Gudin, Paris; second-class medals, Paris Expositions, 1867 and 1878; officer of Legion of Honor 1881; order of Leopold of Belgium. He is a prolific painter, and his pictures are agreeable in color. Studio in Brussels.

W. A. C.

Clayton: capital of Barbour co., Ala. (for location of county, see map of Alabama, ref. 6–E); on Cent. R. R. of Ga.; 75 miles S. E. of Montgomery; in a fruit and grain growing district. Pop. (1880) 761; (1890) 997; (1900) 998.

Clayton, John: botanist; b. in Fulham, Middlesex, England, in 1686; emigrated to Virginia in 1705, where for over fifty years he was clerk of Gloucester County. He wrote on the natural history of Virginia. Linnæus and Gronovius published in 1739 a *Flora of Virginia, Exhibiting Plants which J. Clayton has Collected*. D. Dec. 15, 1773.

Clayton, John Middleton, LL. D.: statesman; b. in Sussex co., Del., July 24, 1796; graduated at Yale in 1815; studied law, which he practiced in Delaware, and gained a high reputation. He was elected a Senator of the U. S. in 1829, joined the Whig party, and was re-elected to the Senate in 1835, but resigned two years later to become chief justice of his native State. In 1845 he was again chosen to represent Delaware in the national Senate, and in Mar., 1849, he became Secretary of State in the cabinet of President Taylor. He negotiated with the British Government the Clayton-Bulwer Treaty in 1850. Having resigned on the death of President Taylor in July, 1850, he was chosen a U. S. Senator for six years (1851–57). D. in Dover, Del., Nov. 9, 1856.

Clayton, Powell: U. S. Senator; b. in Bethel, Delaware co., Pa., Aug. 4, 1833; was before the civil war a lawyer of Leavenworth, Kan. In 1861 he became lieutenant-colonel of the Fifth Kansas Cavalry, and afterward a brigadier-general, serving with ability, chiefly in Arkansas; honorably mustered out Aug., 1865. He was Governor of Arkansas 1866–71, and in the latter year was chosen U. S. Senator for six years. Appointed U. S. minister to Mexico 1897.

Clayton-Bulwer Treaty: a treaty concluded between Great Britain and the U. S., and signed in Washington Apr. 19, 1850. It related to the establishment of a communication between the Atlantic and Pacific Oceans by means of a ship-canal across the Isthmus of Panama, and consisted of nine articles, the contracting parties declaring that they would not erect fortifications on the banks or in the vicinity of the proposed canal; that they would not assume dominion over Nicaragua, Costa Rica, the Mosquito coast, or any part of Central America. Opposite and contradictory constructions having been placed upon this treaty by both Governments, another, called the Dallas-Clarendon treaty, was signed in London Oct. 17, 1856. But, as objections to it were raised on both sides of the Atlantic, it was ultimately rejected. The commencement of the Panama and the Nicaragua ship-canals again brought the Clayton-Bulwer treaty into discussion. The Government of President Arthur contended that the first seven articles of the treaty related solely to a concession for opening the Tehuantepec interoceanic route, obtained from Mexico; that they were applicable to no other route; that, for the sake of inviting British capital to the work, the U. S. at the time were willing to concede some of the rights they had acquired under the Mexican grant; but that this condition had not been realized, and that the changed condition of the U. S. since 1850

had diminished, if it had not entirely removed from consideration any advantage to be derived from that source; and that the British occupation of Balize constituted a violation of the treaty stipulations. It further contended that the eighth article provided only for future negotiations in case new interoceanic routes were opened, and that the earlier articles, now grown obsolete, could not apply to these new conditions. These contentions failed to receive the acquiescence of the British Government, and the dispute is in an unsettled and unsatisfactory state.

Clayto'nia [named in honor of John Clayton, the botanist], or **Spring-beauty**: a genus of American and Asiatic flowers of the family *Portulacaceæ*. These beautiful flowers open in early spring, and are common in most of the U. S., one species being found in Alaska. The tubers of the *Claytonia tuberosa* are eaten in Siberia. Some of the species are naturalized in Europe.

Clazom'enæ (in Gr. Κλαζομεναί): a Greek city of Ionia; situated on a bay of the Ægean Sea, near Smyrna; was the birth-place of Anaxagoras.

Clean'thes (in Gr. Κλεάνθης): Stoic philosopher; native of Assos, in Asia Minor; a disciple of Zeno, whom he succeeded as head of the Stoic school (260 B. C.). He is the author of a much-admired hymn to Zeus preserved in Stobæus, *Eclogæ*, lib. i., 2, 12.

Clearfield: borough; capital of Clearfield co., Pa. (for location of county, see map of Pennsylvania, ref. 4–D); on Pa. and Beach Creek R. Rs., and on the West Branch of the Susquehanna river. It has a public park, an academy, a machine-shop, foundry, fire-brick, and lumber manufactories, etc. It is an agricultural and coal-mining district. Pop. (1880) 1,809; (1890) 2,248; (1900) 5,081.

Clearing-house: an institution set up by persons or corporations engaged in some particular department of trade or finance for convenience in settling accounts and effecting exchanges.

The New York Clearing-house.—The clearing-house system was first established in London about the beginning of the nineteenth century. The three great clearing-houses of London are the Bankers' Clearing-house, the Stock Exchange Clearing-house, and the Railway Clearing-house. The system was introduced into the U. S. by the banks of the city of New York, which established the New York Clearing-house by organizing an association and commencing operations on Oct. 11, 1853. Clearing-houses have since been established in the cities of Boston, Philadelphia, Chicago, St. Louis, Hartford, Providence, Baltimore, Cincinnati, San Francisco, Pittsburg, New Orleans, Louisville, Milwaukee, Detroit, Memphis, Richmond, Cleveland, Indianapolis, Kansas City, New Haven, Columbus, Peoria, Lowell, Worcester, Springfield (Mass.), Syracuse, St. Joseph, Norfolk, St. Paul, Portland (Me.), Minneapolis, Buffalo, Galveston, Houston, Denver, Omaha, Nashville, Dallas, Portland (Ore.), Fort Worth, Duluth, Washington, D. C., Lexington, Salt Lake, Rochester, Tacoma, Topeka, Grand Rapids, Sioux City, Seattle, Los Angeles, Wilmington, Lincoln, Des Moines, Waco, Birmingham, Chattanooga, Wichita, New Bedford, Fall River, Charleston, Spokane, Helena, and a few other places.

There were, May 1, 1892, in the city of New York ninety-five banks, with an aggregate capital of $67,322,700 and a surplus of $69,972,500, many of them situated at remote distances from others. Each in its daily dealings receives large amounts of bills of, and checks on, other banks, so that at the close of the day's business every bank has in its drawers various sums thus due it by other banks. It is in like manner itself the debtor of other banks, which have during the day received its bills and checks drawn upon it. Before the establishment of the clearing-house it was necessary for each bank every morning to make up its account with every other bank, and to send its porter to present the bills and checks so received to the debtor banks for payment. The balances of their indebtedness were adjusted by payments in gold, which became so laborious, dangerous, and complicated that the balances were settled only weekly, on Friday, instead of daily—a course that induced much evil. This was obviated by the clearing-house system, through which the settlements are so simultaneously and almost instantly effected that the transactions adjusted through it have amounted in one day to the enormous sum of $295,821,422.37, in adjusting which the exchanges were settled in the space of an hour. The establishment of the clearing-house system closed 2,500 bank ledger accounts, with numerous daily entries in each: enabled the banks to settle every day with each other without delay or loss through the clearing-house, they now having no direct business with each other except through that medium; and with comparatively little trouble brought each officer into intimate and friendly relations with the others, thus enabling them by united action to aid and strengthen each other in times of excitement and financial danger, and to exert by their combined power a salutary influence upon the banking business of the country at large.

It is doubtful if without the aid of the banks of the city of New York the U. S., upon the breaking out of the civil war in 1861, could have raised the loans necessary to carry on the war in time to prevent the success of the enemies of the Union. It is certain that without the Clearing-house Association the banks could not have furnished the funds which at once established the credit of the Government, and enabled it, by the restoration of confidence, to negotiate its bonds to the enormous amount of over $2,000,000,000. During those exciting times the machinery of the clearing-house worked with regularity and exactness; the banks, united as one, daily equalized their resources, and presented to the world a most important as well as practical proof that in "union is strength."

The panic of 1873 was only checked by similar action, as also in May, 1884, the experience of the war enabling the banks to act with such promptness in combining their entire resources by the use of over $25,000,000 loan certificates as to sustain themselves against a panic, the serious results of which were greatly modified by their action.

From Oct. 11, 1853, to May 1, 1892, a period of thirty-eight years and seven months, the total transactions of the N. Y. clearing-house amounted to the sum of $1,015,343,101,754.53, an average of $85,791,559.08 per day for the entire period. The largest average daily transaction for any one year was for that ending Oct. 1, 1899, amounting to $189,961,029. The present daily average is about $175,000,000. Of this vast business so exact and complete is the system that no difference of any kind exists in any of its books or accounts; neither has a loss occurred from its organization to the present time.

During the war the Government issued "certificates of indebtedness" bearing interest, which were found to be desirable as a reserve for the banks. Accordingly, an arrangement was made for the issue of special certificates bearing interest, and available only to banks being members of the Clearing-house Association, and which were recognized in the National Banking Act of 1864 as part of the lawful reserve for a national bank. The principal of these certificates was made payable on demand in legal-tender notes at the office of the assistant treasurer of the U. S. in New York, and the interest to the manager of the clearing-house and chairman of the clearing-house committee jointly. This interest was payable semi-annually. The certificates were made available by a vote of the association for the settlement of balances at the clearing-house, and were so used, thus changing daily the amounts held by each bank, and frequently (by the presentation of them by individual banks to the U. S. treasury for payment) changing the aggregate amount issued. The interest was collected and disbursed to the several banks by the clearing-house regularly every six months, and each bank received the exact amount of interest due it, notwithstanding the amounts held by it for the whole period had changed daily.

The apparent intricacy of the calculations necessary to arrive at such results troubled some of the banks in other cities, which were desirous of availing themselves of the privileges offered by the use of these certificates; and in one or two instances committees were sent to New York to ascertain the process of computation in use, the simplicity of which, when explained, not only astonished them, but confirmed them in the opinion of the usefulness of an institution capable of adjusting with so much ease calculations which, at first sight, appeared so difficult. The largest amount of clearing-house certificates in use in the city of New York at any one time was $36,000,000.

The clearing-house is located at No. 14 Pine Street, the building being owned by the association. The clearing-room is provided with a continuous line of desks, sixty-four in number, one for each bank, each desk bearing the name and number of the bank by which it is occupied; the banks being numbered according to the date of their organization, the oldest (the Bank of New York) being No. 1. Each bank

is represented every morning by two clerks—one a messenger, who brings with him the checks, drafts, etc., that his bank has received the day previous upon the other banks, which are called the "exchanges," and are assorted for each bank and placed in envelopes. On the outside of each envelope is a slip on which are listed the amounts of the various items which it contains. These envelopes are arranged in the same order as the desks for the several banks. The messengers, sixty-five in number, take their places in a line outside of the line of desks, each opposite the desk assigned to his bank, while on the other side of the desk is a clerk with a sheet containing the names of all the banks arranged in the same order, with the aggregate amounts his messenger has against each bank.

The hour for making the exchanges or general delivery is 10 A. M. Just previous to that time the manager takes his position at an elevated desk and calls the house to order. At a signal from a bell struck precisely at ten o'clock, each messenger moves forward to the desk next his own, and delivers the envelopes containing the checks, etc., for the bank represented by that desk to the clerk on the inside, together with a printed list of the banks in the same order, with the amount opposite each bank. The clerk receiving it signs and returns it to the messenger, who immediately passes to the next desk, delivering the exchange for the bank represented by that desk, and so on until he has made the circuit of the room and reached his own desk, the starting-point, having delivered to each bank the exchanges he had for it, and consequently delivering his entire exchanges for all the banks. Every other messenger does the like, the whole moving on at the same time. In other words, each messenger has visited every bank and delivered to each everything his bank has received the day previous from it, taking a receipt for the same, consequently the entire exchanges are delivered; while each clerk upon the inside has of course received from every other bank the amounts each had against his bank. This operation occupies exactly ten minutes, and accomplishes what could not otherwise be done in less than six or eight hours.

Besides the saving of time gained by this method, each bank is enabled to know the exact balance for or against it at once, as the clerks, after receiving the envelopes containing the checks, etc., immediately enter from the slips, upon their own sheets, the aggregate amount from each bank; the difference between the total amount they have received and the total amount brought by them being the balance either due to or from the clearing-house to each bank.

The messengers then receive from their several clerks the various envelopes containing the exchanges, and return to their banks, reporting their condition, debtor or creditor as the case may be. The clerks then report to the assistant manager the amount they have received, they having reported the amount each brought upon first entering the room. These amounts are entered in separate columns on what is termed a "proof-sheet," and if no errors have been made the manager, finding that both columns agree, announces that the "proof is made," and the clerks return to their respective banks. If, however, any error has been made by any of the sixty-four clerks, it is indicated on the proof-sheet, and the clerks are then required to revise and examine their work; and not until every error has been discovered and corrected are the clerks allowed to leave.

The clerks are allowed thirty-five minutes after the delivery of the exchanges to enter, report, and prove their work. If any errors are discovered after that time, fines are imposed for each error, which are collected monthly by drafts on the banks fined.

Various and ingenious methods are resorted to for discovering errors, and the manager, from long experience, generally is enabled to anticipate the nature of the error, whether in entry, footing, or transposition, and thereby facilitate its discovery by applying at once the best method of examination. When it is remembered that there are sixty-five sheets, each containing 130 entries, in all 8,450 entries, the difficulty in discovering where the error is in the shortest possible time is apparent.

The entire business of the morning is usually accomplished in one hour. The debit banks are required to pay to the manager in legal-tender notes or coin, previous to half-past one o'clock the same day, and the credit banks receive immediately after that hour the amounts due by or to them respectively, thus by one process settling exactly the entire transactions of all the banks of the day previous.

A record is kept of the daily transactions of each bank, and a statement of the loans, specie, legal tenders, deposits, and circulation made weekly to the manager of the clearing-house, so that the movement of each bank can be determined and its condition pretty accurately estimated. Its other records and statistics are most complete and valuable for reference by bank officers. No other clearing-house in the U. S. approaches that of New York in importance; but almost every large city has an institution of the same kind. The figures for the leading clearing-houses of the U. S. for the year ending Dec. 31, 1900, were as follows:

	Millions of dollars.		Millions of dollars.
New York	52,634	Omaha	579
Chicago	6,799	Cleveland	565
Boston	6,180	New Orleans	556
Philadelphia	4,677	Detroit	427
St. Louis	1,688	Louisville	424
Pittsburg	1,615	Providence	326
Baltimore	1,084	Milwaukee	298
San Francisco	1,029	Buffalo	259
Cincinnati	795	Washington	259
Kansas City	775	St. Paul	247
Minneapolis	579	Denver	216

Returns from these and a number of others of less importance show a total for the whole country of $86,160,587,352. To a great extent New York acts as a general clearing-house for the whole country, drafts of one section on another being liquidated through New York; while each of the other clearing-houses simply does a local business of greater or less importance.

Even more commanding than the position of New York in the U. S. is that of London in England. The London clearing-house was established in 1775. The Bank of England did not join it till 1864. The clearings have of late years not averaged quite as large as those of New York. For the details of its management, see Bagehot's *Lombard Street*. In France and Germany the system of payment by check is not so well developed as in England and the U. S., and clearing-houses have not made much progress.

Railway Clearing-house.—In the sale of through tickets, or in payments for through freight, one road will often receive money from the public for work performed by another; and a system of mutual liabilities is created, not unlike those which arise when one bank handles drafts on another. The British Railway Clearing-house was devised to settle accounts of this kind. First established in 1842, it was incorporated in 1850, and now regulates the through traffic accounts of practically the whole railway system of the United Kingdom. There have been similar attempts in the U. S., but none quite so successful. By far the best is that of the Southern Railway and Steamship Association, which was organized in 1873, and established a clearing-house in 1875, under the able suggestions of Albert Fink. This clearing-house, located at Atlanta, now settles the through traffic accounts of all the lines S. of the Potomac and Ohio, and E. of the Mississippi, as well as those of the connecting steamship lines.

A similar extension of the principle of clearings resulted in the establishment of a *Stock Exchange Clearing-house* in New York, in May, 1892, to prevent the necessity of numerous transfers of stock from hand to hand. Matters are settled by a combination of stock balances and cash balances, both being very small in proportion to the aggregate of business done.

A. T. Hadley.

Clearing Nut: the seed of a small tree (*Strychnos potatorum*) of the *Loganiaceæ* or Nux Vomica family, and native of India. It has ovate, pointed leaves, black edible fruits about as large as a cherry, each containing a single seed. The popular name refers to its reputed remarkable property of clearing muddy water. It is said that when the seeds are rubbed on the inside of a vessel the muddy water afterward put into it soon becomes cleared.

C. E. B.

Clear Lake: in Lake co., Cal.; is 112 miles N. of San Francisco, and is nearly 24 miles long. The width varies from 2 to 6 miles. It is surrounded by a picturesque region which is frequented by tourists and hunters. Deer, bears, panthers, and foxes abound here. Fish of various kinds are found in this lake.

Cleaveland: See Cleveland.

Cleaveland, Moses: founder of Cleveland, O.; second cousin of Parker Cleaveland; b. in Canterbury, Wind-

ham co., Conn., Jan. 29, 1754; became a lawyer, but was also a captain of sappers and miners during the closing years of the Revolutionary war. He was one of a company which purchased for $1,200,000 from Connecticut the land in Ohio reserved to the State by Congress and known as the Western Reserve. In 1796 he led a party of surveyors and pioneers to the present site of Cleveland, laid it out in building lots, and his companions named it for him. The name of the city was abbreviated to its present form in 1830 by the publisher of the first newspaper there, who needed room in his headline. The founder died in his native town, Nov. 16, 1806.

Cleaveland, Parker, LL. D.: mineralogist and chemist; b. in Rowley, Mass., Jan. 15, 1780; graduated at Harvard, 1799; studied law; tutor in mathematics at Harvard 1803–05. In 1805 he was chosen professor in Bowdoin College, and in all the fifty-three years of his connection with the institution missed on his own account only three recitations. His admirable work on *Mineralogy and Geology*, which earned for him the title of "father of American mineralogy," was published in two volumes in 1816, and passed to a second edition in 1822. He was dean and Professor of Chemistry of the medical school organized at Bowdoin in 1821. D. in Brunswick, Me., Oct. 15, 1858.

Cleburne: town; capital of Johnson co., Tex. (for location of county, see map of Texas, ref. 3–H); on Tex., Gulf, Col., and Santa Fé R. R.; 4 miles from Nolan river and 15 miles from the Brazos river; 28 miles from Fort Worth and 56 miles from Dallas. The town has nine churches, good public schools, college for girls, handsome public buildings, an ice-factory, mills, and other industries, and water-works. The chief industry is agriculture. Pop. (1880) 1,855; (1890) 3,278; (1900) 7,493.

Editors of "Enterprise."

Cleburne, Patrick Ronayne: a Confederate general; b. in County Cork, Ireland, Mar. 17, 1828; ran away from college and enlisted in the British army; served three years and then removed to Arkansas, where he was a lawyer before the civil war. He enlisted as a private in the Confederate army, and rose to the command of a corps; commanded a division of the Confederate army at the battle of Stone River, which ended Jan. 2, 1863, and at Chickamauga in September of that year distinguished himself by his defense of Ringgold Gap. He was killed at the battle of Franklin, Tenn., Nov. 30, 1864. He was a daring and popular officer, and he instituted the Order of the Southern Cross.

Cledo'nius: a grammarian of the fifth century, who taught at Constantinople. His grammatical treatise, which is in reality a commentary on the celebrated work of Donatus, is printed in vol. v. of Keil's ed. of the *Grammatici Latini*.

Cleef, Johann. van: Flemish painter; b. in Vanloo in 1646: a pupil of Gaspar de Crayer, after whose death he was commissioned to finish the cartoons for the tapestries of Louis XIV. His paintings are numerous in Brabant and Flanders. D. in Ghent, 1716.

Clef [from Fr. *clef*, key < Lat. *clā'vis*, key: Gr. κλείς]: a character placed on the musical staff, by which the names of the notes are fixed. There are three clefs—viz.: the G or *treble* clef (on the second line); the F or *bass* clef (on the fourth line); and the C clef, which is placed on the fourth line for the *tenor*, and on the third line for the *alto*. The C clef was also formerly used for the soprano voice. It was written on the first line of the staff. The G and F clefs are now in most general use, both in vocal and instrumental music. And though a tenor part with the G clef is really an octave out of place, yet this is understood by the singer.

Cleisthenes: See Clisthenes.

Cleitus: See Clitus.

Clem'atis [from Gr. κληματίς, deriv. of κλῆμα, branch of a vine]: a genus of about 100 species of herbaceous or soft-wooded, mostly climbing plants, of the family *Ranuncutaceæ*, mostly confined to the temperate regions. They have opposite leaves, valvate sepals, minute petals or none, and hairy or feathery styles. There are many species native to North America, among which are *C. virginiana* E. of the Rocky Mountains, and *C. tigusticifolia*, from the Great Plains westward, both high climbers with profuse foliage and very numerous, large clusters of white flowers. These are admirably adapted for covering arbors, trellises, screens, etc., for which purpose they are much used under the name of virgin's bower. Two similar European species, *C. flammuta* and *C. vitalba*, are also much grown, the latter bearing in England the name old-man's-beard and traveler's-joy. The single flowered species have been greatly modified under cultivation, the flowers being greatly enlarged and much changed in shape. This is especially the case with *C. florida* from Japan, *C. lanuginosa* from China, etc. C. E. B.

Clémenceau, klā'maăn'sō', Eugène: b. at Mouilleron-en-Pared, in the Vendée, Sept. 28, 1841; studied medicine at Nantes and Paris, and began to practice as a physician in the eighteenth arrondissement (Montmartre) of Paris in 1865. His popularity soon became unbounded. On Sept. 4, 1870, he was elected mayor of the arrondissement, and Feb. 8, 1871, he was elected member of the National Assembly. Unable to prevent the execution of the generals Lecomte and Clement Thomas, Mar. 18, 1871, and to bring about a reconciliation between the Commune and the Versailles government, he resigned his position as mayor. In the National Assembly he voted for the continuation of the war. Elected a member of the Chamber of Deputies, Feb. 20, 1876, he took his seat on the extreme left, and was the acknowledged leader of the radical republican party. He pronounced in favor of full and general amnesty; was one of the 363 deputies belonging to the united Left who refused to give the cabinet of Broglie a vote of confidence; was also a member of the committee of eighteen charged by the republican majority with watching the proceedings of the anti-parliamentary cabinet, and with directing the resistance against them. He was defeated in the general election of Sept., 1893, and has not since sat in the chamber. Editor of *La Justice*, a radical journal.

Clem'ens: Bishop of the Frisians. See Wilibrord.

Clemens, Hon. Jeremiah: politician; b. in Huntsville, Ala., Dec. 28, 1814; became a lawyer in 1834; distinguished himself in State politics and in the affairs of Texas in 1842. He served with distinction in the Mexican war, was rapidly promoted in the army, and became colonel in 1848. He was U. S. Senator from Alabama 1849–53. He held office under the Confederacy, though not a warm friend of the Southern cause. D. in his native town, May 21, 1865.

Clemens, Samuel Langhorne, A. M. (better known as *Mark Twain*): a humorist; b. at Florida, Mo., Nov. 30, 1835. "Mark Twain" was the *nom de ptume* of Capt. Isaiah Sellers, who furnished river news for the New Orleans *Picayune*. He died in 1863, and Clemens took up his *nom de ptume*. He became a journalist in Virginia, Nev., in 1862, and subsequently followed the same profession in San Francisco and in Buffalo, N. Y. Since 1867 he has resided mainly at Hartford, Conn. Author of *The Jumping Frog* (1867); *The Innocents Abroad* (1869); *Roughing It* (1872); *Adventures of Tom Sawyer* (1876); *A Tramp Abroad* (1880); *The Stolen White Elephant* (1882); *The Prince and the Pauper* (1882); *Life on the Mississippi* (1883); *Huckleberry Finn* (1885); *A Yankee at King Arthur's Court* (1890); *Joan of Arc* (1896); and, with C. D. Warner, a story, subsequently dramatized, called *The Gilded Age* (1874). Revised by H. A. Beers.

Clemens Romanus: See Clement I.

Clem'ent of Alexandria (Lat. *Titus Flavius Clemens*, or *Clemens Alexandrinus*): an eminent Father of the Christian Church; supposed to have been a native of Athens, and originally a pagan. B. about 150, he passed the greater part of his life at Alexandria, where he became a disciple of Pantænus, a Christian philosopher, and his successor as head of the famous catechetical school, and acquired a high reputation for wisdom and virtue. Origen was one of his pupils. He was ordained a presbyter, and in 202 A. D. retired to Palestine to escape persecution. Clement was more addicted to speculative philosophy than most of the Fathers of the Church. Among his extant works (written in Greek) are *Pædagogus* and *Stromata* (Gr. Στρωματεῖς), which is a medley of religious thoughts, anecdotes, and maxims of philosophy. Time and place of his death are unknown. His works are translated in *Ante-Nicene Fathers* (New York, Christian Literature Company, vol. ii.). See the special treatises upon him by J. Kaye (London, 1835; n. e. 1890); J. H. Reinkens (Breslau, 1851); C. E. Freppel (Paris, 1866).

Clement I. (or **Cle'mens Roma'nus**): the earliest of the Apostolic Fathers; a bishop, accounted by Roman Catholic writers as fourth in the order of succession at Rome. Origen (254) identifies him with the Clement of Phil. iv. 3, but this may be only a conjecture. Irenæus (202) makes

him the third after the apostles Peter and Paul, Linus being the first, and Cletus (or Anacletus) the second. Eusebius says he died in the third year of Trajan, "having for nine years superintended the preaching of the Divine word." Accordingly, he presided over the Church from 91 or 92 to 100 or 101 A. D. His Epistle to the Corinthians (Eng. trans., New York, Christian Literature Company, ed. *Ante-Nicene Fathers*, vol. i.), written about 95 A. D., consists of sixty-five short chapters, and in bulk is about one-half larger than St. Paul's First Epistle to the Corinthians. It used to be read in many ancient churches, but was not included in any of the ancient lists of authoritative books. Other writings ascribed to Clement are not his. (See CLEMENTINES.)—CLEMENT II.; a native of Saxony; elected pope in 1046 on the abdication of Gregory VI., through the influence of Emperor Henry III. He crowned the Emperor Henry III., and died in 1047. He was the first of the six German popes.—CLEMENT III.; a native of Rome; was elected pope in 1187. He pacified the citizens of Rome by allowing them to elect their own magistrates, while retaining the appointment of the governor of the city, and promoted the third crusade against the Saracens. D. in 1191. There was also an anti-pope of this title, who died in 1100. —CLEMENT IV. (GUY FOULQUES) was born in France. He succeeded Pope Urban IV. in 1265 through the patronage of Louis IX. of France; befriended the cause of Charles of Anjou in Naples; was a protector of Roger Bacon; kept the papal residence at Viterbo; d. in 1268.—CLEMENT V., POPE, was a Frenchman named BERTRAND DE GÔT. He was chosen pope in 1305, as successor to Benedict XI. To gratify Philippe IV., King of France, to whom he was subservient, he resided at Avignon, which became the capital of the popedom. This innovation gave much offense and caused a long schism in the Church. He suppressed in 1311 the order of Templars, promulgated the Clementine Constitution in 1313, and was the first pope to assume the threefold crown. D. in 1314, and was succeeded by John XXII.—CLEMENT VI. (PIERRE ROGER); b. at Limousin, in France; succeeded Benedict XII. as pope in 1342. He reigned at Avignon, the sovereignty of which he purchased from Joanna of Naples. The principal events of his reign were a dispute with Edward III. over ecclesiastical prerogatives in England, the excommunication of the Emperor Louis IV., and his attempt to reunite the Eastern and Latin Churches. D. in 1352, and was succeeded by Innocent VI.—CLEMENT VII. (ROBERT, COUNT OF GENEVA), ANTI-POPE; was Bishop of Cambray when in 1378 he was elected anti-pope in the time of Urban VI. With him began the great Western schism. D. in 1394.—CLEMENT VII. (GIULIO DE' MEDICI), a cousin of Leo X., whose principal minister and counselor he was. Unable to procure his own election on the death of his uncle, he secured that of Adrian VI. of Utrecht, in 1522, and on Nov. 14, 1523, succeeded him. At first he adhered to the Emperor Charles V., but after the battle of Pavia, alarmed at the imperial preponderance, he joined the Italian princes in a league with France. Tumults in Rome led him to invoke the protection of Charles, but as soon as he was relieved from peril at home he went back to the French alliance, which brought upon him the mercenary army of the Constable Bourbon, who sacked the city and held the pope in captivity for six months, 1527. Confronting the Reformation, he wished the emperor to proceed with vigor against the Lutherans, but at the same time evaded his demands for the assembling of a general council. The same embarrassments attended his procrastination in the case of Henry VIII.'s divorce from Catharine of Aragon. He feared to offend the emperor or to alienate the king, and by his vacillation allowed the breach between the English crown and the papacy to take effect, although he issued in 1534 a bull against Henry. His administration, irresolute and diplomatic, was disastrous to the papacy, and witnessed the withdrawal from its jurisdiction of Great Britain and Northern Germany. He died in 1534.—CLEMENT VIII. (IPPOLITO ALDOBRANDINI), POPE; a native of Fano, in Italy; was chosen in place of Innocent IX. in 1592. He annexed the duchy of Ferrara to the papal states; reconciled Henry IV. of France to the Church; resisted the influence of Spain upon the papacy; authorized the execution of GIORDANO BRUNO (*q. v.*) in 1600; had a reputation for prudence and ability. D. in 1605, and was succeeded by Leo XI.—CLEMENT VIII. (EGIDIO MUÑOZ), ANTIPOPE; canon at Barcelona; was in 1424, after the death of Benedict XIII., elected pope by three cardinals. His resignation in 1429 ended the great schism of the West.—CLEMENT IX. was born at Pistoja in 1600, and was chosen pope in June, 1667, as the successor of Alexander VII. D. in Dec., 1669, and was succeeded by Clement X.—CLEMENT X. (EMILIO ALTIERI) was a native of Italy. He was nearly eighty years old when he became pope in 1670. He died in 1676, and was succeeded by Innocent XI.—CLEMENT XI. (GIOVANNI FRANCESCO ALBANI) was born at Pesaro, in Italy, in 1649. He succeeded Innocent XII. in 1700, and in 1713 issued the famous bull *Unigenitus*, which condemned 101 propositions of Quesnel's work on Grace and Predestination. This bull was approved by the Jesuits and opposed by the Jansenists. Clement aided the Pretender in his effort to seize the British crown in 1715. D. in 1721. Innocent XIII. was his successor. (See Lafitau, *Vie de Clément XI.*, 1752.)—CLEMENT XII. (LORENZO CORSINI) was born at Florence in 1652. He became pope in 1730, as the successor of Benedict XIII.; was reputed by some writers to have become blind; was the first pope to condemn Freemasonry. He died in 1740, and was succeeded by Benedict XIV.—CLEMENT XIII. (CARLO REZZONICO) was born in Venice in 1693, and succeeded Benedict XIV. as pope in 1758. He offended the French and Spanish monarchs by impolitic attempts to assert his prerogative. He issued a bull in favor of the Jesuits, who had been expelled in 1767 from France and Spain. D. in 1769, and was succeeded by Clement XIV.—CLEMENT XIV. (GIOVANNI VINCENZO ANTONIO GANGANELLI), an eminent and learned pope; b. near Rimini in 1705. He succeeded Clement XIII., May 19, 1769. His election was accomplished after an exciting contest, influenced by the purpose of the European sovereigns to exclude from the papacy any friend of the Jesuits. His administration aimed at the reconciliation of ecclesiastical and secular interests, and, though he pursued this object with acknowledged purity and ability, his memory became in a large part of the Church the most obnoxious in the papal list. He issued the papal bull *Dominus ac Redemptor noster*, July 21, 1773, dissolving the whole order of the Jesuits, because of its lapse from its primitive purpose and its evil influence. He founded the Clementine Museum in Rome. D. Sept. 22, 1774, not without the suspicion of poison, detested by the Ultramontanes and deplored by his secular subjects. See Caraccioli, *Vie de Clément XIV.*, 1775; Theiner, *Geschichte des Pontificats Clements XIV.* (3 vols., 1853), which is very friendly, and charges that Clement's enemies have apparently caused the disappearance of important documents.

Clement, ARTHUR GALETTE, A. M.: educator of the blind; b. at West Bethany, N. Y., Dec. 31, 1854; educated at University of Rochester; appointed superintendent of New York State Institution for the Blind at Batavia, N. Y., 1883; author of *The Home Education of the Blind*, and other articles read before the American Association of Instructors for the Blind.

Clementi, klā-men'tēē, MUZIO: Italian pianist and composer; b. in Rome in 1752. He was patronized by Mr. Beckford, who took him to England about 1765. At the age of eighteen he composed his Opus 2, which is regarded as the basis on which the whole fabric of modern sonatas for the piano has been founded. He composed numerous sonatas and wrote the *Gradus ad Parnassum*, a series of 100 piano studies, a master-work which may be regarded as the foundation upon which the modern piano technique has been built up. D. at Evesham, Mar. 10, 1832.

Clem'entines, or **Pseudo-Clementines**: a name given to two writings, the *Homilies* and the *Recognitions*, falsely ascribed to Clement of Rome. They originated in Rome about the middle of the second century.

The name Clementines is also applied to that part of the canon law which was collected and published by Pope Clement V. (1305–14).

Cleom'brotus (in Gr. Κλεόμβροτος): a Spartan general; brother of Leonidas, who fell at Thermopylæ. He commanded the army in 480 B. C., after the death of Leonidas. He was the father of Pausanias, who defeated the Persians at Platæa.

Cleombrotus I.: King of Sparta; grandson of the preceding; began to reign in 380 B. C. He commanded the Spartans at Leuctra, where he was defeated by Epaminondas and killed in 371 B. C. He left two sons, Agesipolis II. and Cleomenes II.

Cleome'des (in Gr. Κλεομήδης): an ancient Greek astronomer whose native place and period are unknown. He

wrote a remarkable treatise on astronomy entitled *The Circular Theories of the Heavenly Bodies*, which is extant and has been printed. This contains several scientific truths, as the spherical figure of the earth and the revolution of the moon about the earth.

Cleom'enes, or **Kleomenes** (in Gr. Κλεομένης) **I.**: King of Sparta; succeeded his father, Anaxandrides, about 518 B. C. He liberated Athens from the domination of the Pisistratidæ in 510, but he afterward attempted to restore Hippias. He procured the dethronement of Demaratus, who had reigned jointly with himself. He died in 489 B. C., and was succeeded by his half-brother, the heroic Leonidas.

Cleomenes III.: King of Sparta, of the Agidæ line; a son of Leonidas II. He began to reign in 236 B. C., and resolved to restore the ancient Spartan virtue and discipline. He declared war against the Achæan League, and defeated Aratus at Megalopolis in 226 B. C. He put to death all the ephori except Agesilaus (who escaped), made a new division of land, and restored the old social system. Antigonus, King of Macedon, who was an ally of the Achæans, defeated Cleomenes at Sellasia in 222 B. C. Cleomenes fled to Egypt, and killed himself in 220 B. C. See Plutarch, *Cleomenes* and *Aratus*.

Cle'on, or **Kleon** (in Gr. Κλέων): an Athenian demagogue distinguished for his insolence and venality; was a tanner in his youth. He is first mentioned in history about 428 B. C. He was a leader of the democracy or lower classes. In 425 B. C. Cleon and Demosthenes conducted a successful expedition against Sphacteria. He commanded an army which was sent against the Spartan general Brasidas in 422 B. C. Cleon and Brasidas were both killed in the battle of Amphipolis, where the Athenians were defeated. His character is depicted with great exaggeration in Aristophanes's *The Knights*, and even the narrative of Thucydides is hardly just in this point.

Cleopa'tra (in Gr. Κλεοπάτρα): Queen of Egypt; a daughter of Ptolemy Auletes; b. in 69 B. C. She was distinguished for her personal charms, was richly endowed with mental gifts, and was mistress of the Greek and other languages. Her father dying in the year 51, left the throne to her in partnership with her brother Ptolemy. The latter deprived her of royal power, but Julius Cæsar interposed in 48 B. C., and restored her to the throne after her brother Ptolemy had been killed in battle. She captivated the affection of Cæsar, and accompanied him to Rome in the year 46, and bore him a son known as Cæsarion. After he had been killed in 44 B. C., she returned to Egypt. Soon after the battle of Philippi (42 B. C) she was summoned by Antony to appear before him in Cilicia, and sailed up the Cydnus. He was fascinated by her charms, and spent much time with her in Alexandria. Her fleet fought against Augustus at Actium, she being present, 31 B. C. She was the first to order a retreat on this occasion, and was eventually taken prisoner by Augustus, who intended to exhibit her in a triumphant procession in Rome. She died in 30 B. C. That she killed herself by the poison of an asp is now considered improbable. See Egypt, Ancient.

Cleopatra's Needles: two obelisks of red granite which formerly stood in front of the temple of Cæsar at Alexandria in Egypt. One of them now stands on the Thames Embankment in London, having been erected there in 1878. The other, which stands in Central Park, New York, was first erected, about 1600 B. C., at Heliopolis, a city of Egypt near the delta of the Nile, by Thothmes III., a famous Egyptian monarch, to commemorate his power. The obelisk is covered with hieroglyphics, each side having three perpendicular lines of them, the central one on each side referring to Thothmes, and the others to Rameses II., the supposed Sesostris; it was dedicated to the god Ra, or the Sun, and stood before the temple of Tun in Heliopolis till removed to Alexandria in Egypt, and set up there 23 B. C., where it remained till it was transported to New York in 1880, having been presented to the U. S. by Ismail Pasha, a former Khedive of Egypt. These obelisks bear their popular name, "Cleopatra's Needles," on account of a false tradition that they were brought to Alexandria in the time of Cleopatra. The one in New York is 69½ feet high, exclusive of the pedestal, 7 ft. 9 in. square at the base, and has a sharply pointed pyramidal top; weighs 196 tons, and is all in one piece. See Obelisk; also Gorringe, *Egyptian Obelisks* (New York, 1882).

Clep'sydra, or **Clepsy'dra** [from Gr. κλεψύδρα < κλέπτειν, steal, conceal + ὕδωρ, water]: an instrument formerly used by the Greeks and Romans for measuring time by the gradual flow of water through one or more orifices. In its simplest form it was a vessel of known capacity, from which the water escaped through several holes in the bottom. To remedy the defect of the gradually decreasing rate of flow, another kind was used, in which the water was maintained at a constant level, the time being measured by the amount of water that was discharged. See Clocks.

Clerc, Jean le: See Leclerc, Jean.

Clerc, Laurent: a celebrated deaf-mute; b. in La Balme, near Lyons, France, Dec. 26, 1785. When one year of age he lost his hearing as the result of an attack of scarlet fever. At the age of twelve he became a pupil of Abbé Sicard at Paris, and in 1805 was a teacher of deaf-mutes under that eminent instructor. He removed to the U. S. in 1816 with Gallaudet, and was one of the founders of the Hartford asylum for the deaf and dumb, which was opened in 1817. He was a laborious and successful teacher of deaf-mutes. D. in Hartford, Conn., July 18, 1869.

Clergy: the ministers of the Christian Church as distinguished from the laity. In Scripture the Greek word *Klēros*, from which our word clergy is derived, is frequently used in its literal sense for "lot." Jerome says the word was applied to the clergy either because the Lord is their lot or because they were chosen by lot, as Matthias was. As early as the second century the word was used to mean not only a lot, but also an office, and the person to whom it was allotted. The clergy are divided into many classes, as deacons, priests, and bishops. To these, which are of divine origin, were added, in time, other classes, such as cardinals, patriarchs, primates, and archbishops, all dignities of ecclesiastical institution. In churches which have monastic orders the clergy of all ranks who serve Christ in the world, and are not bound by any other vows or rule of life but such as the general laws of the Church impose on all the clergy, are called *secular* or *diocesan* clergy. Those who bind themselves to observance of the special rules of some monastic order or religious congregation are called *regulars*. In the Protestant churches generally the distinction between the clergy and laity is less marked than in the Roman Catholic Church.

Two important privileges have generally belonged to the entire body of the clergy: first, they were exempted from the jurisdiction of secular courts in criminal and civil causes; second, excommunication was incurred by any one who should strike cleric or monk. John J. Keane.

Clerk, John: a Scottish naval tactician; b. at Eldin about 1730. He is said to have been the inventor of the manœuver in naval tactics called "breaking the line." This plan was first tried by Lord Rodney in Apr., 1782, when he gained a victory over the French admiral de Grasse. Clerk published in 1782 an *Essay on Naval Tactics*. D. May 10, 1812.

Clerk to the Signet: See Writer to the Signet.

Clermont, or **Clermont-Ferrand**, kler'mōṅ' fer'raṅ': a city of France; capital of the department of Puy-de-Dôme; finely situated on an eminence 208 miles S. by E. from Paris, with which it is connected by a railway (see map of France, ref. 6–F). It is near a range of extinct volcanoes, and is surrounded by remarkable scenery. It has some manufactures, and a considerable trade with Paris in the products of the surrounding country. It has a Gothic cathedral of the thirteenth century, a college, a public library of 1,600 volumes, a theater, a normal school, and a botanic garden. Clermont occupies the site of the ancient capital of the Arverni, which was originally called *Nemosus*, and afterward *Augustonementum*. It became a bishop's see about 250 A. D. The great council in which the crusades originated was held here by Pope Urban II. in 1095. Clermont was the capital of Auvergne for several centuries. Pop. (1891) 45,083; (1896) 50,870.

Clésinger, Jean Baptiste Auguste: French sculptor; b. in Besançon, Oct. 22, 1814; best known for his *Woman Bitten by a Serpent* (1847), *The Gypsy Girl*, and his many busts and statues. D. in Paris, Jan. 7, 1883.

APPENDIX.

Bhamo, b'-mō', or **Bhanmo**: a decayed city of Burma; on the Irawadi; in lat. 24° 16′ N., 300 miles above Mandalay (see map of N. India, ref. 7–M). It is still a local capital and the seat of a considerable trade. Large caravans laden with silk and other goods arrive here from October to May. Large quantities of raw cotton are also exported from this place. It was formerly the chief town of a Shan principality. Pop. 2,500. See Anderson's *Expedition to Western Yunnan* (1871).

Biddle, George W.: lawyer; b. in Philadelphia, Jan. 11, 1818; graduated at Mt. St. Mary's College, Maryland; studied law and was admitted to the bar of Pennsylvania in 1839, and took up his practice in Philadelphia; besides holding many minor offices in Philadelphia, he was a member of the constitutional convention of Pennsylvania in 1873; he became the leader of the bar of the State, and was retained in most cases of importance in the Supreme Court of the State; represented the U. S. in the fishery disputes with Canada in the first administration of President Cleveland; member of American Bar Association; and for a term was chancellor of the Law Association of Philadelphia. Besides numerous legal papers, including *Contribution among Terre-tenants* (1863), *Lien of the Debts of a Decedent upon his Real Estate in Pennsylvania* (1864), *Retrospective Legislation* (1880), and others, he wrote translations of the *Greek Orations of Demosthenes and Æschines on the Crown* (1881). D. Apr. 29, 1897. F. Sturges Allen.

Bielshöh'le: a curious cave situated in one of the Hartz Mountains, called Bielstein, on the right bank of the river Bode, in the duchy of Brunswick, Germany. It was discovered in 1762, and in 1768 a passage was found by which it could easily be entered. The entrance is over 100 feet above the bed of the stream, and the cave is about 600 feet deep, with eleven main compartments, besides an upper cave. These contain a great many curious arrangements of stalactites and stalagmites. In the eighth division the stalactites have a singular resemblance to a great organ, and in the ninth the stalagmites look like the waves of a sea.

Bird, Arthur: pianist and composer; b. in Cambridge, Mass., July 23, 1856; studied in Berlin, Weimar, etc., under Haupt, Loeschhorn, and Liszt, 1882–85; conducted the Milwaukee Musical Festival in 1886. His compositions are mainly for the piano, but he has also written some works for orchestra and a number of songs. D. E. Hervey.

Birrell, Augustine: English public man and author; b. 1856: educated at Amersham Hall School and Trinity Hall, Cambridge; B. A. 1872; called to the bar, Inner Temple, 1875; became a member of Parliament in 1889; author of *Obiter Dicta*.

Blair, Andrew George: statesman; b. in Fredericton, N. B., Mar. 7, 1844; educated at the collegiate school, Fredericton, studied law, and was admitted to the bar in 1866; elected to the New Brunswick Assembly in 1878, 1879, and 1882; defeated the Hannington ministry in 1883 and was called upon to form a new cabinet, and retained the premiership until July, 1896, when he became Minister of Railways and Canals. He is president of the Royal Victoria Hospital, Fredericton, and a fellow of the Royal Colonial Institute.

Blair, John Insley: b. in Warren co., N. J., Aug. 22, 1802. At the age of eleven he began work in the store of a relative in Hope, N. J., and remained there until 1819, when he settled in Blairstown, N. J., in partnership in a country store until 1821, and afterward continued the business independently for forty years, establishing various branch stores in partnership with his brothers and brothers-in-law. Mr. Blair's business interests rapidly extended so as to include flour-mills, cotton manufacture, the marketing of country produce, the development of iron mines, and the building of railroads, in connection with his coal interests. Having carried through the building of the Delaware, Lackawanna and Western R. R. system, between 1860 and 1870 he extended his operations westward, building the first railroad across the State of Iowa, laying the foundations of the great Chicago and Northwestern system. In connection with his large railroad interests in the West Mr. Blair was always the friend of liberal education, giving freely lands for church and school purposes. Besides founding and liberally endowing Blair Presbyterial Academy, at Blairstown, N. J., he contributed largely to Princeton and Lafayette, besides other colleges, and was one of the trustees of Princeton since 1866. Descending from Scotch ancestry, Mr. Blair was always a stanch Presbyterian, and in politics an ardent Republican, and was in 1868 the candidate of that party for Governor of New Jersey. D. in Blairstown, N. J., Dec. 2, 1899.

Blanchard, Albert Gallatin: soldier; b. in Charlestown, Mass., Sept., 1810; graduated at the U. S. Military Academy; served on the frontier until 1840, when, as a first lieutenant, he resigned; was a merchant in New Orleans, La., 1840–46, and director of public schools there 1843–45. He served during the war with Mexico as a captain of Louisiana volunteers, re-entered the regular army as a major, and again resigned July 25, 1848, afterward teaching for a time in the public schools of New Orleans, then becoming a surveyor, and being connected with several railroad companies. He entered the Confederate army as a brigadier-general in 1861, and in 1862 he was accused of issuing an order urging the people to fire at the Union troops from behind trees, and to obstruct their progress in every possible way. After the war he was a civil engineer and surveyor in New Orleans. D. in New Orleans, June 21, 1891.

Bliss, Cornelius Newton: merchant and politician; b. in Fall River, Mass., Jan. 26, 1833; educated in public schools and an academy in Fall River and a high school in New Orleans; member of a commission firm in Boston, afterward in New York; chairman of Republican State committee of New York 1887–88; treasurer of national Republican committee 1892–96; appointed Secretary of the Interior Mar. 5, 1897; resigned Dec. 21, 1898.

Bliss, George: b. in Springfield, Mass., May 3, 1830; graduated at Harvard College in 1851; was associated with David A. Wells in the publication of the *Annual Scientific Dictionary*, after which he studied and traveled two years in Europe; returned to the U. S. and was admitted to practice law in Massachusetts and New York; in 1862 was paymaster-general of the State of New York; in 1862–63, as a representative of the Union League Club of New York, he organized the 20th, 26th, and 31st Regiments of the U. S. colored troops. Resumed the practice of law in 1866; in 1873 was appointed U. S. District Attorney for the Southern District of New York; in 1881–82 was the active counsel for the U. S. Government in the trial of the "Star Route cases." He has written or edited a number of legal works, including *Law of Insurance* and the *Code of Civil Procedure*, which have run through many editions, and has been an active contributor to magazines and newspapers, chiefly on political subjects. He drew the charter of 1873 of the State of New York, and has been active in drawing up and procuring the passage of many other papers affecting the laws of that State, including *Special and Local Acts Relating to the City of New York* and the *New York City Consolidation Act*. D. in Wakefield, R. I., Sept. 2, 1897. F. Sturges Allen.

Bloomfield-Zeisler, Fanny: pianist; b. in Bielitz, Austrian Silesia, July, 1866, but came to the U. S. when an infant; received her first musical instruction in Chicago, then studied five years under Leschetiszky in Vienna; made her

first public appearance in Chicago in 1876, when ten years old. Her real professional *début* was in Jan., 1884, in Chicago.

D. E. Hervey.

Bolton, Henry Carrington, Ph. D.: chemist; b. in New York city, Jan. 28, 1843; graduated at Columbia in 1862, and then studied chemistry in Paris under Wurtz and Dumas, in Heidelberg under Bunsen, in Göttingen under Wohler, and in Berlin under Hofmann. He received the degree of Ph. D. from the University of Göttingen in 1866. He was assistant in quantitative analysis in the Columbia School of Mines 1872–77, and during part of this time (1874–77) Professor of Chemistry in the Woman's Medical College of the New York Infirmary; Professor of Chemistry and Natural Science in Trinity College, Hartford, Conn., since 1877. Dr. Bolton was active in arranging for the celebration of the centennial of chemistry in Northumberland, Pa., the last home of Joseph Priestley, who discovered oxygen in 1774. Most of his important work has been literary. He is a member of the American Association for the Advancement of Science, and was its general secretary in 1878 and 1879, and vice-president of the chemical section in 1882. He was for several years corresponding secretary of the New York Academy of Sciences. He has contributed largely to scientific periodicals; has compiled several chemical works, including *Literature of Uranium* (1870; revised ed. 1886), *Literature of Manganese* (1877), and a *Catalogue of Scientific and Technical Periodicals, 1665–1882* (Smithsonian Institution, Washington, 1885); and is the author of *Student's Guide in Quantitative Analysis* (New York, 1879) and editor of several chemical text-books.

Book-plates: printed or engraved labels pasted within the front covers of books to denote ownership. The use of the book-plate dates back certainly to the last quarter of the fifteenth century. The earliest specimens known were made and used in Germany. They are rude woodcuts of the archaic type familiar to the student of engraving. About the year 1480 Friar Hildebrand Brandenburg and Younker Wilhelm von Zell gave books and manuscripts to the Carthusian monastery at Buxheim, and upon some of these they pasted heraldic devices recording the gifts. These are the earliest attested book-plates known to-day. The claim has been made, but not established, that book-plates were in use in Japan in the tenth century. Early in the sixteenth century the art of the book-plate received great impetus from Albert Dürer, who drew, if he did not actually cut in the wood, a number of undoubted book-plates. The first of these bearing a date was made for Hieronymus Ebner. It is dated 1516, and by its inscription, *Liber Hieronimi Ebner*, is clearly identified as a book-plate. Credit may properly be given to Dürer for making the book-plate what it is, for he transformed the crude drawing and rough woodcutting of his predecessors into an artistic design, ingeniously devised and skillfully engraved on wood or copper. Bilibald Pirckheimer, the Nuremberg jurist, and Dr. Hector Pomer, Provost of the Church of St. Laurence in the same city, had book-plates made by Dürer. In the Imperial Library at Vienna may be seen the original wood block of an armorial design for John Stabius, which was probably a book-plate. Bartsch ascribes it to Dürer. This measures 11 by 7½ inches. It is easy to be misled in looking over the armorial designs of Dürer and other German artists into believing that all of them were intended for use as book-plates; but there were other uses for heraldic prints, and there is need of investigation before accepting them as genuine book-plates. Coats-of-arms of many of the leading families of Nuremberg, as the Kress, Scheurl, Rieter, Haller, and Kurtz, continually come up among the early prints to torment and puzzle the collector. Among the celebrated German artists who made book-plates may be named Lucas Cranach, Hans Holbein, Hans Sebald Beham, Jost Amman, Hans Siebmacher, Hans Troschel, Wolffgang Kilian, Virgil Solis, Giles Sadeler. All along through the sixteenth and seventeenth centuries book-plates are numerous and of considerable merit as works of art. In the eighteenth century the most eminent engraver whose name appears on these small engravings is Daniel Nicolas Chodowiecki. The plates made under the supervision of Dürer seem to have been the first embellished with non-essential but highly artistic and desirable ornamentation. Ever since his day the ornamentation of the book-plate has been considered an important feature, and as this ornamentation conforms to the changing conditions, views, and tastes of the different nations, the student of book-plate art finds certain natural classifications ready to his hand. The early German book-plates as a rule are larger, bolder, and rougher than their successors in neighboring countries. Heraldry is seldom omitted, and allegorical features are common.

The earliest dated plate yet found in France was made in 1574, and was in the books of Charles d'Ailleboust, Bishop of Autun. It is a simple typographical label. The earliest dated armorial plate was engraved by Leonard Gaultier in 1611, and was for the library of Alexander Bouchart, Viscomte de Blosseville. French book-plates are not so numerous as the German, and the anonymous plates of the seventeenth and eighteenth centuries are difficult to identify. French heraldry is perplexing, as the early engravers did not conform to established rules with the regularity the collector deems commendable. There is considerable similarity between the early plates of Germany and France, but they are distinguishable by the marked differences in the heraldic devices of the two countries and by the manner of engraving. The French cut into the wood, while the German often cut in relief. The prints from these differently cut blocks are readily separated. French plates, as time went on, became more ornate than the German, resulting in a loss of dignity. Jacques Pieart, Isaac Briot, and Sebastien Le Clere in the seventeenth century, and J. Andran, Cochin *fils*, Collin *père*, Durand, Charles Eisen, Charles-Étienne Gaucher, Gravelot, Lonise Le Daulceur, B. Pieart, and Claude Roy in the eighteenth century, are among the most widely known French engravers who made book-plates. Probably the chief interest in the book-plates of France, among English-speaking collectors at least, centers in those used by the celebrities of the country. Men and women famous in state and court, in letters and art, used book-plates that are highly prized to-day.

Book-plates are found in all the continental countries, but the number is not large beyond the limits of Germany and France. Sweden began their use some years after Germany. Switzerland and Italy have plates dating very early in the seventeenth century, and Spain, Denmark, Russia and Austria, the Netherlands, and Norway contribute but few early examples.

It is in England that the book-plate has been most widely used, and the plates of that country furnish a most interesting field for investigation. England took the fashion from France, and was many years behind Germany. The early plates of England show an unmistakable French influence. It seems rather singular that the book-plate was so slow in getting into England. The sixteenth century is not known to have produced more than three examples, and none of an earlier period have been found. These three are the plate for the gift of books made by Sir Nicholas Bacon to the University of Cambridge (dated 1574), the one for Sir Thomas Treshame (1585), and one said to be in the Bodleian Library, dated 1518. In the seventeenth century, however, plates multiplied rapidly in England. Heraldry was the prominent feature of the design; and as English heraldry is governed by fixed rules, the student-collector is able to identify anonymous English plates with considerable precision. In the eighteenth century the number of plates is legion. The many changes in the ornamentation of the armorial device are called "styles." The first English plates with the full, elaborate mantling nearly surrounding the shield were called *Early Armorial* by Warren, whose nomenclature is universally accepted. Castle's subdivisions, *Tudoresque*, *Carolian*, and *Restoration*, serve to place these sixteenth and seventeenth century plates in closer chronological sequence. The *Early Armorial* style was prevalent up to about 1700, when the *Jacobean* came in. Plates in this style are rather stiff and formal in design, strongly resembling wood-carving in many ways. The arrangement is such that the two sides coincide in all details of outline and decoration. Columns, shells, fruit in inartistic, heavy clusters, flowers of a most unlifelike appearance, and mouldings and frames that seem to be copied from the furniture of the age, are used by way of ornament. This style gave way to the *Chippendale* about the year 1745. This is named after the famous London upholsterer and cabinet-maker, who about this time did so much for the artistic treatment of household furniture. Even so small a bit of property as the book-plate was influenced, and began to throw off the heaviness of its previous form, and to assume a lightness and grace that are most acceptable. The flowers on Chippendale plates look natural, the fruit bears more resemblance to the gift of Nature than to carved wood, the stiffness of the old frame gives place to an airy, light design, and the whole appearance of the plate

German—eighteenth century.

French—eighteenth century.

Italian—eighteenth century.

English—seventeenth century.

BOOK-PLATES.

English—carly nineteenth century.

English—late Chippendale.

American—eighteenth century.

American—eighteenth century.

BOOK-PLATES.

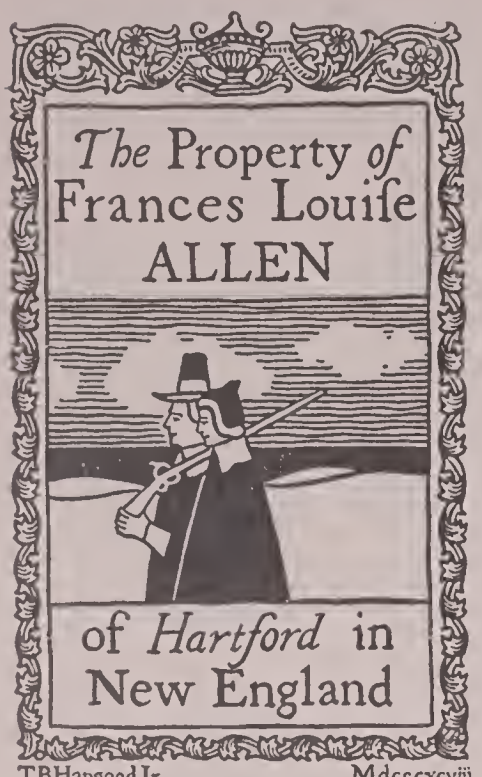
is altered. It is progressive, cheery, attractive. But the ornamentation of the Chippendale plate was overdone at length, and the style was succeeded about the year 1770 by the simple, severe designs known as the *Ribbon and Wreath*. This title quite clearly describes the style: it was merely the shield of arms inclosed in branches of palm tied with a bit of ribbon, something in the manner of the conventional victor's wreath. During the progression of all these styles the perfectly plain armorial plates were also in use. Gradually, too, the various styles known as the *Trophy*, *Library Interior*, *Book-pile*, and *Pictorial* were developed to suit the tastes of owner and designer. England has a great profusion of signed plates, Mr. Fincham's list (which includes a small proportion of Americans) giving over 1,500 different engravers and designers whose names appear on book-plates. Cole, Hogarth, Kirk, Marshall, Mountaine, Pine, Skinner, Strange, Vertue, Allen, Bartolozzi, Bewick, Cipriani, Lambert, Pye, Scott, Sherwin, and Yates are among the most widely known.

America took its book-plate styles from England. Undoubtedly the first plates in the U. S. came over already pasted into the books of some colonist bound for either the Southern or New England settlements. For some years the few that were used were made by British engravers. Early records show that orders were sent over to the London tradesmen by the wealthier colonists. The plates of William Penn, founder of the colony, and of Francis Page, of Virginia, are dated 1703, and are the earliest dated armorial book-plates used in the American possessions. Both of these were made in England. Page was a student at the Inner Temple when his was engraved; but Penn is described on his plate as *Proprietor of Pennsylvania*. There are several armorial plates used by colonists which bear dates previous to 1750, all of which are of English workmanship. The first American engraver to date a book-plate was Nathaniel Hurd, of Boston, whose charming plate for Thomas Dering is dated 1749. Dawkins made a plate for John Burnet in 1754, and Hurd engraved one for Benjamin Greene in 1757. The little group of native engravers on copper, self-taught in the art, are a most interesting subject of research. Nathaniel Hurd was the most prolific as well as the most artistic of them all. He made plates in the Jacobean, Chippendale, and Ribbon and Wreath styles. His patrons were from the first families of New England. Some thirty plates signed by Hurd are known and nearly a score more can safely be attributed to him. Joseph Callender, Amos Doolittle, Samuel Hill, Oliver Pelton, Paul Revere, and James Turner were New England engravers whose book-plates are rare and valuable. Very few plates by Paul Revere are known, and a print of the one he engraved for Epes Sargent (of which but three or four are known) sold at auction in Boston in 1895 for seventy-five dollars, the highest price, up to that time, ever paid for a single American book-plate. The plate of George Washington is naturally of peculiar interest, and not many copies are in the hands of collectors. The plate was engraved in England, and is not extraordinary in any way in itself. A very high value, however, is set upon the plate when pasted into a book once owned by Washington and having his well-known signature in its usual place on the title-page. This plate was once counterfeited, the fraudulent prints being used in an unsuccessful attempt to sell certain books as coming from Washington's library. The spurious prints are not so well executed as the genuine, and will not deceive if comparison is made. Probably the rarest American book-plate is the John Franklin, by James Turner. The New York and Southern group of engravers is headed by Peter Rushton Maverick, who came to this country from England about 1774. Nearly fourscore plates signed by Maverick are known, and about twenty more, though not signed, are considered his work. Other engravers in this group are Alexander Anderson (America's first wood-engraver), Henry Dawkins, Edwin Gallaudet, Abraham Godwin, Francis Kearney, William Rollinson, J. Smithers, James Trenchard, and John Vallance. Nearly all the American plates of the eighteenth century are armorial. Some few pictorial and a great number of typographical labels are known also. These printed labels were very common because inexpensive, and in the hands of an ingenious craftsman became quite ambitious, flowerets, ornaments, and various "sorts" being used in the composition. After the war of 1812 some American book-plates had guns, flags, trumpets, and other warlike emblems in their decoration. Although the use of the book-plate has never been entirely discontinued, it fell into general disuse toward the end of the first quarter of this century, and the plates from 1825 up to 1890 are few and of little merit, broadly speaking. Some individual book-collectors and some public libraries made use of engraved plates, but most of them are poor in design and in execution.

No general interest was taken in book-plates until the publication of Warren's *Guide*, in 1880, brought them sharply to the attention of bibliophiles. In the libraries and in many private collections numbers of book-plates were preserved in the old books they originally came in, and among a very limited number some notice was taken of them. When Warren was preparing his admirable book, he had the co-operation of such sterling book-lovers as the late Rev. T. W. Carson, of Dublin, and the late Sir Augustus Wollaston Franks, of the British Museum. Mr. Carson was, indeed, the ardent coadjutor of this pioneer, and without his continual encouragement and substantial aid the book probably would not have been written. One or two others, notably Henry Peckett, the Hon. Gerald Ponsonby, and Dr. Joseph Jackson Howard, were the only persons known to take a genuine interest in book-plates. Warren, who had no small poetic gift, and who was a thorough and painstaking student, made his book exceedingly interesting. Some years previous to this publication, namely in 1822 and 1823, *The Gentleman's Magazine* printed two articles on book-plates, and in 1837 the Rev. Daniel Parsons wrote at some length on the subject in the third *Annual Report* of the Oxford University Archæological and Heraldic Society. Following these, *Notes and Queries* had for a number of years references to book-plates. The paper by the Rev. Daniel Parsons showed considerable study and patient research. The first known collector of book-plates as such (for many examples found their way into the big collections of prints) was a Miss Jenkins, of Bath, who began collecting in 1820. Dr. J. J. Howard acquired her collection in 1837 and has been adding to it ever since. Probably the largest collection and one of the finest that have been gathered was owned by the late Sir A. W. Franks, who bequeathed it to the British Museum. It numbered well over 100,000 specimens. The collection Mr. Carson left numbered 32,000, and was sold in 1895 for £1,150. In January, 1897, Messrs. Puttick and Simpson held the first auction sale devoted to book-plates only, in their rooms, Leicester Square, London. The first volume of the *Western Antiquary*, edited by Mr. W. H. K. Wright, and published in 1881, contained an illustrated article on the book-plates of Francis Drake. In each annual volume of this magazine thereafter articles on the spreading hobby of book-plate collecting may be found. In 1890 the *Book-Plate Collector's Miscellany* was started as a supplement to the *Western Antiquary*, but within a year it was merged with the *Journal of the Ex Libris Society*, the official organ of the newly founded association of book-plate collectors. With the foundation of this society the present renascence of the book-plate may be said to have begun. When Warren's book found at length a good circulation among bookmen, a wonderful interest in book-plates sprang up, not only in England, but on the Continent and in the U. S.

In 1886 Mr. Laurence Hutton wrote articles for the *Book Buyer* on early American book-plates, and in the same year Mr. Richard C. Lichtenstein contributed a list of early New England and New York plates to the *New England Historical and Genealogical Register*. In 1881 the Rev. Joseph Henry Dubbs had reviewed Warren's book in the pages of Boston's *Literary World*. The late James Eddy Mauran, of Newport, R. I., and the late Henry F. Sewall, of New York, were the earliest collectors of book-plates on this side of the Atlantic. Mr. Mauran's collection numbered about 3,500 at his death in 1888. This collection had a most interesting history. A large part of it is now owned by Mr. H. E. Deats, of Flemington, N. J. The Sewall collection was sold at auction in 1896–97 along with the library Mr. Sewall left when he died. The first public exhibition of book-plates in the U. S. was made by the Grolier Club of New York in November, 1894. Since then the Rowfant Club of Cleveland (1895), the Caxton Club of Chicago (1898), and the Club of Odd Volumes of Boston (1896 and 1898), besides many smaller societies, together with booksellers and artists, have held exhibitions in many cities. In 1896 the Washington Book-Plate Society was founded. In 1897 it was made national and the name was changed to the American Book-Plate Society. Four numbers of an excellent quarterly were published in 1896–97. The publica-

tion was then discontinued and the society is now dormant. The first auction sale in this country devoted to book-plates alone was held by Messrs. C. F. Libbie & Co., in Boston, in February, 1897. From being an almost unconsidered trifle, the book-plate has come to exert a strong influence upon the price of books offered at auction, and the sale catalogues usually refer to the good plates in the books offered. The dealers in old books regularly mention the plates their stock contains in their periodical catalogues. In consequence of the recent revival of the book-plate, the collector now classes as "old" all plates made previous to 1880, and those dating before the present century are "early." The interest in the study of the plates of bygone years that Warren's book incited led naturally to the widespread adoption of the book-plate among the bookmen of today. Many fine plates have been made in the last decade, and the languishing arts of engraving and etching found in the new hobby unexpected encouragement. In England the best-known engraver is Mr. Charles W. Sherborn; the leading etcher is Mr. G. W. Eve. In the U. S. Mr. Edwin Davis French is the foremost engraver, Mr. W. F. Hopson leads as cutter in wood, and Mr. J. W. Spenceley is the best-known etcher.



American—present day.

The modern cheap methods of photographic reproduction may be held responsible for the great flood of book-plates the last few years have seen. The designs of greatest merit in this line have come from the studios of Mr. Edwin A. Abbey, Mr. R. Anning Bell, and Mr. Walter Crane in England, Mr. George Wharton Edwards and Mr. Thomas Brown Hapgood, Jr., in the U. S., and Herr Joseph Sattler in Germany. Hundreds of inferior designs are issued today which plainly show the debasing influence of so-called poster-art.

In addition to the Ex Libris Society, founded in London in 1891, which is thoroughly cosmopolitan in its membership, limited strictly to 500, there are two other societies of international importance. *Des Ex-Libris-Vereins zu Berlin* was established in 1891 and issues to members an illustrated quarterly magazine. The *Société Française des Collectionneurs d'Ex Libris* was organized in 1893. Its *Archives* are published monthly. The English society also issues a monthly journal.

The literature of the subject has grown very fast during the last eight years. Many privately issued monographs, now rare, and many articles in periodical literature would find mention in a complete bibliography. The works named below furnish, however, a fairly complete list of the authorities accepted by collectors. A. Ponlet-Malassis, *Les Ex Libris Français* (Paris, 1875); the Hon. J. Leicester Warren (the late Lord de Tabley), *A Guide to the Study of Book-Plates* (London, 1880); C. M. Carlander, *Svenska Bibliotek och Ex Libris anteckningar* (Stockholm, 1889); F. Warnecke, *Die Deutschen Bucherzeichen* (Berlin, 1890); Joannis Guigard, *Nouvelle Armorial de Bibliophile* (Paris, 1890); Henri Bouchot, *Les Ex Libris et Les Marques de Possession du Livre* (Paris, 1891); Egerton Castle, M. A., F. S. A., *English Book-Plates* (London, 1892); Walter Hamilton, *French Book-Plates* (London, 1892); W. J. Hardy, F. S. A., *Book-Plates* (London, 1893); Charles Dexter Allen, *American Book-Plates* (New York and London, 1894); Miss Norna Labouchere, *Ladies' Book-Plates* (London and New York, 1895); Walter Hamilton, *Dated Book-Plates* (London, 1896); Henry W. Fincham, *The Artists and Engravers of British and American Book-Plates* (London, 1897).

CHARLES DEXTER ALLEN.

Borodin, ALEXANDER PORPHYRJEVITCH: musician; b. in St. Petersburg, Russia, Nov. 12, 1834. He was Professor of Medicine and Chemistry in the Academy, and only an amateur musician and composer. He was president of the Society of Music-Lovers in St. Petersburg. His compositions include *Middle Asia*, a symphonic poem, two symphonies, several string quartets, some piano music, an opera, *Prince Igor* (MS.), and some church music. D. Feb. 28, 1887. D. E. HERVEY.

Borthwick, Rev. JOHN DOUGLAS, LL. D.: b. in Glencourse, near Edinburgh, Scotland, June 7, 1832; after a year's study in Edinburgh University became a teacher in Eastern Academy, Glasgow, and, beginning in 1850, taught in various Canadian high schools and academies; ordained a priest of the Church of England in 1866; was incumbent of St. Mary's, Hochelaga, twenty-five years; chaplain of the Montreal jail, and of the British troops in Canada until their withdrawal. He has written many books, including *A Cyclopædia of History and Geography* (1859); *The British-American Reader* (1860); *The Harp of Canaan* (1866); *The Battles of the World* (1866); *Every Man's Mine of Useful Knowledge* (1869); *The Dominion Geography* (1871); *The History of Scottish Song* (1874); *History of Montreal* (1875); *Borthwick Castle; or, Scenes from Scottish History* (1880); *Commercial Gazetteer of Montreal* (1885); *History of the Montreal Prison* (1886).

Bottome, MARGARET: b. in New York city, Dec. 29, 1828. She is president of the International Order of the King's Daughters and Sons, and of the women's branch of International Medical Missions; is associate editor of the *Ladies' Home Journal*, and contributes to religious magazines and papers on subjects affecting the lives of women; for about twenty-five years has given Bible readings in New York city homes. She has published *Crumbs from the King's Table*, *Seven Questions after Easter*, and *A Sunshine Trip to the Orient*.

Bourke, JOHN GREGORY: soldier and author; b. in Philadelphia, Pa., June 23, 1846; served as a volunteer private 1862–65; graduated at West Point and commissioned second lieutenant 1869; promoted first lieutenant May 17, 1876, and captain June 26, 1882; while engaged in campaigns against Indians wrote several ethnological treatises; was detailed for special duty in Washington, where he was connected with the Bureau of Ethnology; in 1892 rejoined his regiment, and was active in suppressing violations of neutrality laws on the Mexican border; did special service in the Latin-American Department of the Columbian Exposition in 1893; was president of the American Folk-lore Society in 1896. He wrote *The Snake Dance of the Moquis* (1884); *On the Border with Crook* (1886); *The Medicine Men of the Apaches* (1893); *The Folk Food of the Rio Grande Valley and of Northern Mexico* (1895). D. in Philadelphia, June 8, 1896.

Bovey, HENRY TAYLOR, D. C. L., LL. D.: b. in Devonshire, England, Mar. 7, 1852; educated at Cambridge; practiced as a civil engineer in England until 1877, when he became Professor of Civil Engineering and Applied Mechanics in McGill University, Montreal, Canada; afterward dean of the department of applied science. He was the founder of the Montreal Sanitary Association, and is a member of various societies of engineers. He is the author of *Applied Mechanics* (1883); *The Theory of Structures and Strength of Materials* (1892); *The Strength of Canadian Douglas Fir, Red Pine, and Spruce* (1895); *A Treatise on Hydraulics* (1895).

Boyle, DAVID: ethnologist; b. in Greenock, Scotland, May 1, 1842; went to Canada in 1856, and was apprenticed to a blacksmith, but became a teacher, and was for ten years principal of the public school at Elora, Ontario; formed a museum there which is one of the most important in the province; was instrumental in founding the Elora Mechanical Institute Library; discovered several important fossils; became a leading authority on the archæology of Ontario. He presented a valuable collection of Indian relics to the Canadian Institute of the Archæological Museum, of which he became curator in 1883. He had charge of the mineral exhibits from Ontario at the Cincinnati Centennial Exposition in 1888 and at the Imperial Institute, London, in 1892, and prepared the mineral and archæological exhibits of the province for the Columbian Exposition in 1893. He has done much educational literary work. Among his productions are *Notes on the Life of Dr. Joseph Workman* (1894);

Notes on Primitive Man in Ontario (1895); *The History of Scarboro', 1796–1896* (1896). Under the *nom-de-plume* of "Andrew McSparkle," he has for many years written in Scottish dialect for the *Scottish American*.

Boyton, Paul: nautical adventurer; b. in Dublin, Ireland, June 29, 1848. He served in the U. S. navy during the civil war, after which he was employed at submarine diving; served under Gen. Pedro Martinez in the revolution in Sonora, Mexico; was employed in the U. S. life-saving service on the Atlantic coast 1867–69; served with the French in the Franco-Prussian war 1870–71, after which he went to the diamond-fields in South Africa: re-entered the U. S. life-saving service, and remained until 1874, when he began his series of unique adventures of swimming and paddling long distances in the water. Dressed in a rubber suit of his own invention, he leaped from a vessel 40 miles off the coast of Ireland, during a furious gale, and reached the land after being nearly seven hours in the water. On May 25, 1875, he crossed the English channel in twenty-four hours. In Oct., 1875, he paddled on the Rhine from Basel, Switzerland, to Cologne, Germany—430 miles. Early in 1876 he went from Alton, Ill., to St. Louis, Mo., on the Mississippi, and from Bayou Goula to New Orleans, 100 miles, in twenty-four hours. In May, 1876, he went down the Danube from Lintz, Austria, to Budapest, Hungary, 460 miles, in six days. One of his longest trips was from Oil City, Pa., to the Gulf of Mexico, 2,342 miles, made in eighty days, suffering in the beginning from extreme cold, and toward the end from great heat. In 1880–81 he commanded the torpedo service of Peru, was captured by the Chilians and his execution ordered, but he escaped. His longest trip covered 3,580 miles, from the mouth of Cedar Creek, Montana, to St. Louis, Mo., and lasted from Sept. 17, 1881, to Nov. 20. His adventures have been described in a book entitled *Roughing it in Rubber* (1886).

Brandeis, Frederick: musician; b. in Vienna, July 5, 1835; studied music there under the best masters, including Carl Czerny; went to New York in 1849 and has since resided and practiced his profession there. He is a pianist and organist and has held many church positions, principally in Roman Catholic churches. He has composed much church music, many songs, part songs, and choruses, a great number of pieces for the piano, and some orchestral works, the most important of this last variety being his *Mary Stuart* overture. One of his most popular songs is *My Love is like a Red, Red Rose.* D. E. Hervey.

Brewer, John Hyatt: musician; b. in Brooklyn, N. Y., in 1856, and has always lived there; as a boy sang in several boy choirs in Episcopal churches; studied piano, organ, and theory under local teachers. His first organ position was in the Clinton Avenue Congregational church, Brooklyn; in 1881 he became organist of the Lafayette Avenue Presbyterian church, which position he still retains. He conducted the Cæcilia Ladies' Vocal Society. His compositions include church music, vocal music in various forms, and works for piano, organ, and orchestra. D. E. Hervey.

Brockway, Howard: musician; b. in Brooklyn, N. Y., Nov. 22, 1870. His first studies were with H. O. C. Kortheuer. In 1889 he went to Berlin, where he remained five years, studying composition and harmony with Otis B. Boise (*q. v.*) and Heinrich Barth. On Feb. 23, 1895, he gave a concert at the Berlin Sing Akademie with the Philharmonic Orchestra, Heinrich Barth, pianist, and Emmanuel Werth, violinist, at which his symphony in D major, ballade in G minor for orchestra, and sonata and cavatina for violin and piano were produced with great success. In addition to these his compositions include *Variations on an Original Theme*, ballade for piano, several piano pieces, and some others. D. E. Hervey.

Brodsky, Adolph: violinist; b. in Taganrog, South Russia, Feb. 21, 1851; began to play in public when nine years old in Odessa. A rich citizen sent him to Vienna, where he studied under Helmsburger, Laub, and Heimaly. In 1879 he became director of the symphony concerts in Kieff, and later appeared as a soloist in Paris, London, Moscow, and Vienna. Mr. Walter Damrosch engaged him as concert-master for the Symphony orchestra, but he remained only a short time. He went to Leipzig and later to England. Mr. Brodsky is also a fine chess-player. D. E. Hervey.

Bronx, Borough of the: one of the boroughs of the city of New York as constituted under the charter of Jan. 1, 1898. It consists of all that portion of the new city lying northerly or easterly of the borough of Manhattan, between the Hudson river and the East river or Long Island Sound, with the several islands not included in the borough of Manhattan. Pop. (1900) 200,507. For the new government, see New York, City of, in the Appendix.

Brooke, John Rutter: soldier; b. in Pottsville, Pa., July 21, 1838: entered the U. S. volunteer service as captain in the Fourth Pennsylvania in April, 1861, became colonel of the Fifty-third Pennsylvania Nov. 7, 1861, and was commissioned brigadier-general in 1864, "for distinguished services during the recent battles of the Old Wilderness and Spottsylvania Court-house." His brevet of major-general of volunteers dated from Aug. 1, 1864, and in 1867 he received the brevet of brigadier-general in the regular army. When the army was reorganized after the war he became colonel of the Thirty-seventh Infantry, was transferred to the Third in 1869, and was made colonel of the Thirteenth in 1879. He was again transferred to the Third Infantry, of which he was in command at Fort Shaw, Montana, till in 1888 he was made brigadier-general and assigned to the department of the Platte. Later he was for two years at St. Paul, in the department of the Dakotas. In 1898, when appointed major-general, his headquarters were at Chicago and his command was known as the old department of the Missouri. During the war with Spain he served in Puerto Rico, and at the close of the war was appointed Governor-General of Cuba.

Brotherhood of Andrew and Philip: an organization founded at Reading, Pa., in 1888, by Rev. Rufus W. Miller, pastor of the Second Reformed church, and based on the rules of the Brotherhood of St. Andrew. It is interdenominational, nineteen denominations now contributing to its membership, which amounts to about 14,000, spread over 32 States. The denominations represented are: the Presbyterian (North, South, and Canadian), Reformed (Dutch and German), Congregational, Methodist Episcopal, Baptist, United Brethren, Church of Christ, Methodist Protestant, United Presbyterian, Federal, Lutheran, Reformed Episcopal, Free Baptist, Progressive Brethren, Friends, and United Evangelical. The chapters in the U. S. number 462. The badge is a black silk button with a red and orange star woven on its face, and the letters B. of A. and P.; the colors are the tricolor of the continental churches during the Reformation. Any man can join the brotherhood by promising "to pray daily for the spread of the kingdom of Christ among young men, and to make an earnest effort, each week, to bring at least one young man within the hearing of the Gospel."

Brotherhood of St. Andrew: an organization exclusively of men in the Protestant Episcopal Church. "The sole object of the brotherhood is," in the words of the constitution of the society, "the spread of Christ's kingdom among young men, and to this end every man desiring to become a member thereof must pledge himself to obey the rules of the brotherhood so long as he shall be a member. These rules are two: the rule of prayer and the rule of service. The rule of prayer is to pray daily for the spread of Christ's kingdom among young men and for God's blessing upon the labors of the brotherhood. The rule of service is to make an earnest effort each week to bring at least one young man within hearing of the Gospel of Jesus Christ, as set forth in the services of the Church and in young men's Bible classes." Any body of young men in any parish, mission, or educational institution of the Protestant Episcopal Church united under the name of the Brotherhood of St. Andrew, with the approval of the rector or minister in charge, and whose members pledge themselves to the objects of the order, is entitled to become a chapter of the brotherhood, and as such to representation in its conventions, which are held annually. The convention appoints a council, which is charged with the executive direction of the general organization. The parent brotherhood was organized out of a young men's Bible class in St. James's church, Chicago, on Nov. 30, 1883, and the work was attended with such encouraging results that other parishes formed similar societies. There are now more than 1,200 active chapters in the U. S., with a membership of nearly 14,000 men. The brotherhood has extended to other lands, having in Canada 230 chapters and about 2,000 members; in Scotland, 10 chapters and 150 members; in Australia, 40 chapters and about 500 members; it has been established also in England, the West Indies, and South America. There is a junior department of the brotherhood.

Brotherhood of the Kingdom: an interdenominational organization of both sexes, composed of those who "believe in the kingdom of God on earth, and have united to establish that idea in the thought of the Church and to assist in its practical realization in the world." The qualifications for membership are: "Comprehension of the aims of the brotherhood, harmony with its spirit, expressed desire to cooperate with it."

Brounoff, Platon: musician; b. in Elizabethgrad, South Russia, in May, 1863. At the age of fifteen he entered the Musical Institute in Warsaw. In 1883 he received a scholarship at the Imperial Conservatory of St. Petersburg. Anton Rubinstein was one of his teachers. He came to the U. S. in July, 1891, and went first to La Porte, Ind., where he gave his first concert, but soon settled permanently in New York city, where he has since been a teacher, conductor, and pianist. He brought out his overture *Russia* at a public concert of the New York Manuscript Society in Chickering Hall, Dec. 15, 1897. This work was first performed some six years before, conducted by Rubinstein before the Czar of Russia. Mr. Brounoff has composed other music.
D. E. Hervey.

Brown, Thomas Edward: clergyman and educator; b. in Douglas, Isle of Man, in 1830; educated at King William's College, Isle of Man, and held a fellowship at Oriel College, Oxford; second master at Clifton College 1863-92. He contributed to reviews and other periodicals, and wrote many poems, chiefly in the Manx dialect. His published works are *Betsey Lee* (1873); *Fo'c's'le Yarns* (1881); *The Doctor and other Poems* (1887); *The Manx Witch and other Poems* (1889); *Old John and other Poems* (1893). D. in Clifton, England, Oct. 30, 1897.

Bucknill, Sir John Charles: alienist; b. in Market Bosworth, Leicestershire, England, in 1817; educated at Rugby, and studied medicine in University College, London, graduating in 1840. He was medical superintendent of the county lunatic asylum of Devon 1844–62, and then for four years was the Lord Chancellor's medical visitor of lunatics. He founded the *Journal of Mental Science* in 1853, and was one of the original editors of *Brain*. He was knighted in 1894 for his services in the volunteer movement started in 1852. He lectured and wrote on subjects of psychology and mental pathology, his works including *Unsoundness of Mind in Relation to Criminal Acts* (1857); *The Mad Folk of Shakespeare* (1859); *The Medical Knowledge of Shakespeare* (1860); *Notes on American Asylums* (1876); *Habitual Drunkards and Insane Drunkards* (1878); *Care of the Insane and their Legal Control* (1880). D. in Bournemouth, July 20, 1897.

Buisson, Ferdinand Édouard: publicist and educator; b. in Paris, Dec. 20, 1841; studied at Argentan and Saint-Étienne, completing his course in Paris. From 1866 to 1870 he taught in the academy in Neuchâtel, Switzerland. He returned to France in 1870, and in 1871 was made primary inspector by Jules Simon, a step which aroused great opposition on account of the stand taken by M. Buisson against teaching sacred history in the schools. Unable to retain his place, he retired to become secretary of the commission on the statistics of primary education. In 1873 he was sent as a delegate from the Ministry of Public Instruction to the Universal Exposition at Vienna; in 1876 he went to Philadelphia in the same capacity; and in 1878 he had charge of the pedagogical section in the Paris Exposition. Jan. 15, 1875, he was decorated with the cross of the Legion of Honor. In 1879 he was called by Jules Ferry, then Minister of Public Instruction, to the direction of primary instruction, a position that he has filled for many years in a notable way. In the important and far-reaching reforms in its educational system that have taken place in France since 1870, no one has borne a more worthy and laborious part than M. Buisson. His chief publication is a large *Dictionnaire de Pédagogie*, a monumental work, in addition to which he has written many official reports and valuable contributions to current educational discussions. His firm and manly stand in the Dreyfus agitation (1898–99) has won him international honor. C. H. Thurber.

Bull, John: soldier; b. in Providence township, Montgomery co., Pa., June 1, 1731. In 1758 he became captain in the provincial service, serving with the Pennsylvania and other troops under Gen. Forbes, and was at the taking of Fort Duquesne, also serving in the campaigns of 1759. During the war of the Revolution he was conspicuous as a member of the committee of inspection of his county in 1774, and as a member of the second provincial convention in 1775. During 1775 and 1776 he was colonel of the First Pennsylvania battalion of the continental troops. He was a member of the third provincial convention which framed the Pennsylvania constitution in 1776. Later he was chairman of the committee of inspection of Philadelphia County, and also a member of the Council of Safety of the State of Pennsylvania. Meanwhile he held various commands, and with the rank of colonel commandant had charge of the construction of the defenses at Billingsport. Subsequently he was colonel of the Pennsylvania State Regiment of Foot, and became adjutant-general of Pennsylvania in 1777. During 1777 and 1778 he was in command of the Second Brigade of the Pennsylvania militia, and held other offices of military or judicial character until the close of the war of the Revolution. Between 1780 and 1784 he settled on Opequan creek, Berkeley co., Va., where he remained until 1795, when he returned to his home in Northumberland. He was elected to the State Assembly of Pennsylvania from Northumberland in 1803, and in 1808 he was an unsuccessful candidate of the Federal party for Congress. D. in Northumberland, Aug. 9, 1824. Marcus Benjamin.

Bullions, Peter: clergyman and educator; b. in Moss Side, Perthshire, Scotland, in December, 1791; in 1810 entered the University of Edinburgh, and supported himself by teaching during the three years' course; studied theology, and came to the U. S. in 1817; in March, 1818, was ordained pastor at Argyle, N. Y., and resigned in 1824 because of ill health; became Professor of Languages in the Albany Academy, continuing until 1848; was pastor of the United Presbyterian congregation in Troy, N. Y., 1832–52, and again from 1853 until his death, in Troy, Feb. 13, 1864. He published many text-books, some of which were largely used in schools, passing through numerous editions. Among them are: *Principles of English Grammar* (1834); *Principles of Greek Grammar* (1840); *Analytical and Practical English Grammar* (1850); *Cicero's Select Orations* (1851); *Principles of Latin Grammar* (1853); *Latin Exercises* (1855); *Latin and English Dictionary* (1862). He also published a *Life of Alexander Bullions*.

Burck'hardt, Jakob: historian; b. in Basel, Switzerland, May 25, 1818; studied theology in Basel, and afterward studied in Berlin under Ranke and Franz Kugler; was Professor of the History of Art in the University of Basel for more than forty years. He published several works on the Italian Renaissance, among them being *Cicerone zu den Kunstwerken Italiens* and *Geschichte der Renaissance in Italien*. D. in Basel, Aug. 8, 1897.

Burmeister, Richard: pianist and composer; b. in Homburg, Germany, Dec. 7, 1860; studied under several teachers and finally under Liszt, becoming a pianist of the first rank. After making successful tours in his native country he went to New York, and settled there as pianist and teacher, appearing in many important concerts. He has composed much for the piano, including a concerto in D and a symphonic fantasia for orchestra, *Jagd nach dem Glueck* (the Hunt for Happiness), but he is chiefly notable for his rewritten versions of Chopin's F minor concerto and Liszt's *Concerto Pathetique*, which Liszt originally wrote as a pianoforte solo in 1850, and in 1867 rewrote for two pianos. Mr. Burmeister arranged the second piano part for orchestra. D. E. Hervey.

Burmeister, Willy: violinist; b. in Homburg, Germany, in 1869; studied first under his father and later for three years with Joachim in Berlin. Playing at concerts throughout Germany, he won a reputation for technical skill. He visited the U. S. for the first time in the autumn of 1898, and made his first appearance in a concert of the Boston Symphony Orchestra in Brooklyn on Dec. 14. D. E. Hervey.

Burnett, Peter Hardeman: jurist; b. in Nashville, Tenn., Nov. 15, 1807; was engaged in trading and the practice of law in Tennessee and Missouri for some time before 1843, when he went to Oregon. He was prominent in the organization of the Territorial government, was a member of the Legislature in 1844 and 1848, and became a judge of the Supreme Court, but soon resigned and went to California. Here he worked for a short time at mining, and then became agent for the Sutter family and estate at Helvetia. In 1849 he was active in the agitation for a State government, advocating its formation without waiting for congressional authorization, and openly opposed the U. S. military

government of the Territory. He became the first Governor, assuming the office before the admission of the State by Congress, in September, 1850. He resigned in 1851, resumed the practice of law, and in 1857–58 was a judge of the Supreme Court. He was president of the Pacific Bank of San Francisco 1863–80. He published *The Path which Led a Protestant Lawyer to the Catholic Church* (New York, 1860); *The American Theory of Government, Considered with Reference to the Present Crisis* (1861); *Recollections of an Old Pioneer* (1878); and *Reasons Why we should Believe in God, Love God, and Obey God* (1884). D. in San Francisco, Cal., May 16, 1895.

Burnham, Sherburne Wesley, M. A.: astronomer; b. in Thetford, Vt., Dec. 12, 1838; educated in Thetford Academy. He took up stenography as his profession, and during the civil war was a shorthand reporter at the army headquarters in New Orleans. While thus engaged he bought Burritt's *Geography of the Heavens* at an auction, and soon became so interested in the subject that he procured a small telescope. A few years later he went to Chicago, where he continued his shorthand reporting, while giving all his spare time to the study of microscopy and of astronomy. In 1869 Mr. Burnham ordered an $800 telescope with a 6-inch object glass, "as good as could be made." This he mounted himself in his back yard, and with it made the first of his many important discoveries of double stars. In the course of his discoveries he entered into correspondence with leading astronomers of foreign countries and soon became famous abroad, while at home his work was almost unknown. Gradually his work became recognized at home, and in 1876 he was appointed acting director of the Dearborn Observatory, Chicago. He assisted in the establishment of the Lick Observatory and made numerous important observations by means of its famous telescope. Several years later he was appointed to his present position as Professor of Astronomy in the Yerkes Observatory of the University of Chicago. Prof. Burnham has discovered and catalogued more double stars than were ever before discovered by any one observer. He is a fellow of the Royal Astronomical Society of England, and a member of the German Astronomical Society, and holds an honorary degree of M. A. from Yale. He has been for more than twenty years a contributor to English and European astronomical journals.

Burnham, William Henry, Ph. D.: educator; b. in Dunbarton, N. H., Dec. 3, 1855; graduated from Harvard University 1882; taught in Wittenberg College 1882–83, and Potsdam (N. Y.) Normal School 1883–85; was fellow, Johns Hopkins University, 1885–86; Ph. D., Johns Hopkins University, 1888; instructor in psychology, Johns Hopkins University, 1888–89; docent in pedagogy, Clark University, 1890–92; and instructor in pedagogy there since 1892. He has contributed numerous articles to the *Pedagogical Seminary*, *American Journal of Pedagogy*, *School Review*, and other educational journals. C. H. Thurber.

Butler, Charles, LL. D.: lawyer; b. at Kinderhook Landing, Columbia co., N. Y., Feb. 15, 1802; educated in the academy at Greenville, N. Y.; studied law with his brother, Benjamin Franklin Butler, and Martin Van Buren; was admitted to the bar in 1824, and opened a practice in Lyons, N. Y., but soon moved to Geneva, N. Y., and became assistant district attorney of Genesee County. In 1833 he went to Chicago, then called Fort Dearborn, and invested largely in land there, as he afterward did in the present city of Toledo, Ohio. In 1835 he settled in New York, where he successfully engaged in the adjustment of the State debts of Michigan, Indiana, and Illinois. He became very wealthy. He was one of the founders of Union Theological Seminary in New York, and from 1836 was a member of the council of the University of the City of New York. He was also a founder and officer of the Protestant Half-orphan Asylum of New York, and of the Westchester Temporary Home for Friendless Children. He received the degree of LL. D. from Wabash University and the University of the City of New York. D. in New York, Dec. 13, 1897.

Butler, Thaddeus J.: clergyman; b. in Limerick, Ireland, in 1833; ordained to the priesthood in Rome with his three brothers, came with them as missionaries to the U. S., and settled in Chicago. He was Professor of Theology in the seminary of St. Mary of the Lake, and secretary to the bishop and chancellor of the diocese. During the civil war, while serving as chaplain, he was captured by the Confederates and sentenced to be shot, but was discharged on parole, and returned to Chicago. Early in 1897 he was appointed bishop of Concordia, Kan., but died on July 16, the day before the one set for his consecration.

Cailletet, kāā'ye-tā', Louis Paul: engineer and physicist; b. in Chatillon-sur-Seine, France, Sept. 21, 1832; received his training as an engineer in the School of Mines in Paris, after which he practiced his profession in the extensive ironworks of his native province (Côte-d'Or). Cailletet has made extensive studies of the physical and chemical properties of iron, and it is upon this work and upon his investigations of the influence of high pressures upon gases that his reputation chiefly rests. During the winter 1877–78 he succeeded in liquefying nitrogen and oxygen, of which achievement he shares the credit with the Swiss engineer Pictet, who reported his results to the French Academy at the same meeting. The priority was given to Cailletet, because he had previously made a demonstration of his method privately before certain members of the academy. A sealed caveat fixed the date of his first successful experiment on Dec. 2. For an account of these experiments see articles Liquefaction of Gases and Liquid Air, the latter in Appendix to Vol. VII. Cailletet was elected a member of the French Academy of Sciences in 1884. E. L. Nichols.

Caldicott, Alfred James: musician; b. in Worcester, England, in 1842; pupil at the Leipzig Conservatory; organist of St. Stephen's church, Worcester, 1864; won prize for glees, Worcester Glee Club, 1878, and Huddersfield, 1879; received Mus. Bac. degree from Cambridge 1878; appointed professor in Royal Academy of Music, London, 1882. Among his well-known compositions are the *Widow of Nain*, oratorio (1881); *Rhine Legend*, cantata for female voices (1883); *Queen of May*, cantata, several operettas, many songs, glees, and other smaller pieces. D. Oct. 24, 1897. D. E. H.

Campana, Fabio: composer; b. in Bologna, Italy, in 1815, and received his musical education there; produced his first opera, *Caterina di Guisa*, in Leghorn, 1838, following with *Jannina d'Ornano* (Florence, 1842), *Luisa di Francia* (Rome, 1844), and *Giulio d'Este* (Milan, about 1850, or, according to another authority, Rome, 1841). After this he went to London and settled there, composing and teaching. He produced two operas during this period, *Almina* in 1860, and *Esmeralda*, performed first in St. Petersburg, Dec. 20, 1869, and in London, with Patti in the title *rôle*, June 14, 1870, and again at Homburg, 1872. He composed many successful drawing-room songs. D. in London, Feb. 2, 1882. D. E. Hervey.

Campbell, Bartley: dramatist; b. in Allegheny, Pa., Aug. 12, 1843; entered a law office in 1856, but left the study of law in 1858 and became a reporter for the Pittsburg *Leader*. In 1863 and 1864 he made Democratic political speeches. He founded the Pittsburg *Evening Mail* in 1868, and the *Southern Magazine* in New Orleans in 1869, and was official reporter of the Louisiana House of Representatives in 1870. In 1871 he wrote his first play, *Through Fire*, which was played for four weeks, and his second, *Peril*, a comedy of Long Branch, was produced in 1872, and soon followed by *Fate*, *Risks*, and *The Virginian*, the last being bought by Frank Mayo, who changed its name to *Van the Virginian*. In 1874 he wrote *Gran Uale*, in 1875 *On the Rhine*, and an adaptation of the German comedy *Ultimo*, which he called *The Big Bonanza*. Among his other plays were *Heroine in Rags* and *How Women Love* (the latter reconstructed as *The Vigilantes*), written in England in 1876; *Clio*; *Fairfax, or Life in the Sunny South*; *My Partner*, the first of his plays that was successful in New York; *The Galley Slave*; *Matrimony*; *The White Slave*; *My Geraldine*; *Siberia*; *Paquita*. D. in Middletown, N. Y., July 30, 1888.

Campbell, Charles: historian; b. in Petersburg, Va., May 1, 1807; graduated at Princeton in 1825; kept a select classical school in Petersburg 1842–55, and afterward was principal of the Anderson Seminary there. He was a member of the Virginia Historical Society. He contributed to the *Historical Register* and the *Southern Literary Messenger*, and edited the *Order-Book of Gen. Andrew Lewis in 1776* (Richmond, 1860). He published *The Bland Papers* (1840–43); *An Introduction to the History of the Colony* and *Ancient Dominion of Virginia* (Richmond, 1849; Philadelphia, 1859); *Some Materials for a Memoir of John Daly Burk* (Albany, 1868); and *Genealogy of the Spotswood Family*. D. in Staunton, Va., July 11, 1876.

Campbell, William Wilfred: poet; b. in Berlin, Ontario, June 1, 1861; educated at the University of Toronto and

in Cambridge, Mass.; ordained to the ministry of the Church of England in 1885; became rector of St. Stephen, New Brunswick, in 1888; retired from the ministry in 1891, and entered the civil service in Ottawa. He began at an early age to write short poems, at first for a village paper, afterward for the *Atlantic Monthly*, the *Century*, and *Harper's Magazine*. After his ordination he wrote poems on the lake region, from which he became known as the "Poet of the Lakes." His first volume was *Lake Lyrics and other Poems* (1889); others are *The Dread Voyage* (1893) and *Mordred* and *Hildebrand*, two tragedies (1895).

Canniff, William, M. D.: physician and author; b. in Thurlow, Ontario, in 1830; after graduation from Victoria University, Cobourg, Ontario, studied medicine at the Toronto School of Medicine, at the University of New York, and in England, where he served in the army medical department during the Crimean war; was Professor of Pathology and afterward of Surgery in Victoria University; during the civil war in the U. S. visited the hospitals in Washington, and was with the Army of the Potomac; then practiced in Toronto. In 1867 he read a paper on the British North American Indians before the International Medical Congress in Paris. He has been president of the Medical Society of the Canadian Institute, and of the Northwestern Emigration Society. Besides writing for the medical and the general press, he has published *A Manual of the Principles of Surgery* (1866); *A History of the Early Settlement of Upper Canada* (1869); *Canadian Nationality* (1875); *The Medical Profession in Upper Canada* (1894).

Cappa, Carlo Alberto: conductor; b. in Alessandria, Sardinia, Dec. 10, 1836, and came to the U. S. about 1860; joined the Seventh Regiment band of New York and became its leader in 1881, succeeding C. S. Grafulla. Under his direction the band gained great fame and was esteemed one of the best regimental bands in existence. He composed and arranged much for the band, and was continuously connected with it for thirty years. D. in New York, Jan. 6, 1893. D. E. Hervey.

Car'denas: a city in the province of Matanzas, on the northern coast of Cuba, 30 miles E. of the city of Matanzas. Founded in 1828. It lies at the head of a very spacious bay, and is sheltered from the northwest winds by the long and narrow promontory of Cape Hicacos. Steamers connect it with the other coast cities, and a branch railroad joins it with the central railroad system of the island. The chief center of the sugar industry lies in the fertile plains to the S. E., and Cardenas has long been largely engaged in the export of sugar and molasses. Manufactures of liquors, soaps, and cigars are carried on. Pop. (1899) 21,940. C. C. A.

Carhart, Henry Smith: physicist; b. in Coeymans, N. Y., Mar. 27, 1844; graduated at Wesleyan University, Middletown, Conn., in 1869. From 1873 to 1886 he was Professor of Physics in Northwestern University. Since 1886 he has been director of the laboratories of physics and electrical engineering and Professor of Physics in the University of Michigan. In 1889 he was one of the delegates from the U. S. to the Electrical Congress held in Paris, and in 1893 was a member of the Chamber of Delegates of the International Electrical Congress at Chicago. Prof. Carhart has paid much attention to electrical research, to the literature of which he has made numerous important contributions. His best-known work is on the electromotive force of standard voltaic cells. He is the author of the following books: *Primary Batteries* (Boston, 1891); *Physics for University Students* (2 vols., Boston, 1894–96); *Elements of Physics*, with H. N. Chute (Boston, 1895); *A Laboratory Manual of Physics*, with G. W. Patterson (Boston, 1898).

E. L. Nichols.

Carman, Bliss: poet and journalist; b. in Fredericton, Canada, Apr. 15, 1861. He was educated at the Fredericton Collegiate School, at the University of New Brunswick, at the University of Edinburgh, Scotland, and at Harvard; was office editor of *The Independent*, New York, 1890–92; was the first editor of the *Chap-Book* 1894; on the staff of the *Cosmopolitan* 1894; on the staff of the *Atlantic Monthly* 1895; studied law in Fredericton 1884–86, and was for a time engaged in civil engineering in Maine. His principal published works are *Low Tide on Grand Pré* (1893); *Songs from Vagabondia*, with Richard Hovey (1894); *Behind the Arras* (1895); *A Seamark* (1895); *More Songs from Vagabondia*, with Richard Hovey (1896); *Ballads of Lost Haven* (1897); *By the Aurelian Wall* (1898).

Carr, Frank Osmond: composer; b. near Bradford, England, Apr. 23, 1858; educated at Cambridge University, taking his B. A. in 1881, and receiving the degree of doctor of music in 1891. In 1887 he composed the music of a light opera, *Faddimir*, to a libretto by Mr. Arthur Reed Ropes, better known as Adrian Ross. In 1891 the same authors produced *Joan of Arc*, and in Oct., 1892, *In Town*. Dr. Carr also composed *Morocco Bound* and *Black-eyed Susan*. These were of the lightest kind of music-hall operettas. In 1894 he composed the music for W. S. Gilbert's libretto *His Excellency*, after the long partnership of Gilbert with Arthur Sullivan was dissolved. D. E. Hervey.

Carter, James Coolidge: lawyer; b. in Massachusetts, Oct. 14, 1827; fitted for college at Derby Academy, Hingham, Mass.; graduated at Harvard in 1850 with high honors, and at the Harvard College law school in 1853, in which year he was admitted to the bar in New York city, where he has been in active practice since. As a leader of the bar of New York State he is one of the most prominent men in its political and legal affairs; was counsel for the city of New York in the case of the people of the State of New York against William M. Tweed for the recovery of the moneys fraudulently taken under "the six-million-dollar credit"; was advocate for the U. S. Government in the Bering Sea arbitration at Paris. He is one of the most active and distinguished of the lawyers who have been foremost in movements looking to municipal reforms; was appointed in 1875 by Gov. Tilden a member of the commission to devise a form of municipal government for the cities of the State of New York. He is author of *The Proposed Codification of our Common Law* (1884), in which he opposes the codification of the laws of the State; of *The Provinces of the Written and the Unwritten Law* (1889); and *The Ideal and Actual Law* (1890), addresses noted for their learning and acumen. F. Sturges Allen.

Chabrier, shaă'bri-ā', Alexis Emmanuel: composer; b. in Ambert, department of Puy-de-Dôme, France, Jan. 18, 1841. He studied law, but finally devoted himself to music. His opera *Gwendoline* was produced in Brussels, Apr. 10, 1886, and *Le Roi malgre lui* in Paris, May 18, 1887. Among his other compositions are *Dix Pieces Pittoresques*, for piano, and *España*, an orchestral rhapsody on original Spanish airs. D. in Paris, Sept. 13, 1894. D. E. Hervey.

Chaffee, Adna Romanza: soldier; b. in Ohio, Apr. 14, 1842; enlisted when nineteen years old in the Sixth U. S. Cavalry. He served through the civil war, rising through the grades till he became lieutenant. He was wounded at Gettysburg and Chickamauga. He was with Gen. Crooke in Mexico in the campaign which resulted in the surrender of the Apache chief Geronimo and his band in 1885, and took part in most of the important Indian wars. For four years he was inspector-general on Gen. McCook's staff, with stations at Los Angeles and Denver. In the years 1894–96 he was instructor of cavalry tactics in the Fort Leavenworth school for officers, and June 1, 1897, became lieutenant-colonel of the Third Cavalry, and was made commandant of the cavalry school of instruction at Fort Riley, Kan. At the outbreak of the war with Spain he was commissioned brigadier-general of volunteers, and on May 8, 1898, was appointed colonel of the Eighth Cavalry. His brigade participated in the battle of El Caney, July 1, 1898, and for gallant conduct in that battle he was breveted major-general of volunteers, and was honorably discharged from that grade in Apr., 1899. On June 27, 1900, he was ordered to the command of the American forces in China, and on July 19 was appointed major-general of volunteers.

Chalmers, Mackenzie Dalzell, M. A.: lawyer; b. in Worcester, England, Feb. 7, 1847; educated at King's College and Trinity College, Oxford University, and became a barrister in 1867, and the same year entered the Indian civil service, in which he remained until 1872; was made revising barrister in 1881; a judge of the county courts in 1884; was appointed acting chief justice of Gibraltar in 1893, and a commissioner of assize in 1895; is a member of the statute law committee, and of the board of faculty of law of Oxford University, and also a law member of the viceroy's council in India. He has published *Local Government*; *Digest of the Law of Bills of Exchange*; *Digest of the Law of Sale*, and other works on legal topics. F. Sturges Allen.

Chamberlain, Alexander Francis, Ph. D.: b. in Kenninghall, England, Jan. 12, 1865; educated at Toronto University, Canada, and Clark University, Worcester, Mass.,

securing the degree of Ph. D. from the latter in 1892, and then becoming lecturer on anthropology therein. He has contributed many articles on anthropology and philology to the scientific press, and has published *Modern Languages and Classics* (1891); *Report on the Kootenay Indians* (1892); *Language of the Mississaga Indians* (1892); *The Mythology of the Columbian Discovery* (1893); *The Child and Childhood in Folk-thought* (1896).

Chamberlain, Jacob, M. D., D. D.: Reformed (Dutch) missionary; b. in Sharon, Litchfield co., Conn., Apr. 13, 1835; graduated at Western Reserve College, Hudson, Ohio, 1856, and at the theological seminary of the Reformed Dutch Church in New Brunswick, N. J., 1859, and the same year at the College of Physicians and Surgeons, New York city. In Dec., 1859, he went as a medical missionary to Southern India, and has resided in that country ever since, except during his three vacations in America, taken mainly in consequence of broken health. He was stationed first at Palamanair, but since 1863 at Madanapalli, both in the Madras Presidency. In each he has erected a hospital and dispensary. He enjoys great repute as a surgeon, but still more as a scholarly and devoted missionary. The language of his locality is Telugu, and into it he has translated the liturgy and hymns of his denomination. He also was chief collaborator on the Telugu translation of the Bible. He has written some widely circulated tracts in English.

S. M. J.

Chamberlain, Montague: ornithologist; b. in St. John, N. B., Apr. 5, 1844; in 1856 he began work in the office of a merchant, and afterward became a journalist; appointed assistant secretary in the office of Harvard University in 1889, recorder of Harvard College in 1890, and secretary of Harvard Scientific School in 1893. He contributed papers on ornithological subjects to various periodicals, including the *Auk*, of which paper he was for a time associate editor, and while acting as editor for the Nuttall Ornithological Club, Cambridge, edited *Nuttall's Handbook of the Birds of Eastern North America* (1892). Among his works are *Catalogue of Birds of New Brunswick*; *Catalogue of Mammals of New Brunswick*; *Catalogue of Birds of Canada*; *Systematic Table of Birds of Canada*; *Birds of Field and Grove*; and a revised and annotated edition of Hagerup's *Birds of Greenland*.

Chambers, Edward Thomas Davies: journalist and author; b. in Saffron Walden, Sussex, England, in 1852; went to Canada in 1870; after teaching for a few years established a newspaper called the *Progress* at St. Andrews, and later adopted journalism exclusively as his occupation, becoming chief editor of the Quebec *Daily Chronicle* in May, 1897. He has written many articles, chiefly relating to early Canadian history, the scenery and resources of Northern Quebec, and Canadian hunting and fishing. He was a war correspondent in the Northwest Territories in 1885. He is a prominent Freemason. Among his published works are *The Port of Quebec: its Facilities and Prospects* (1890); *The Haunts of the Ouananiche* (1891); *Quebec, Ancient and Modern* (1892); *Quebec, Lake St. John, and the Saguenay* (1893); *Chambers's Guide to Quebec* (1895); *The Book of the Ouananiche and its Canadian Environment* (1896).

Chaminade, shaă'mē'nad', Cecile: musician; b. in Paris, Aug. 8, 1861; studied entirely in that city. Being of a well-to-do family, she followed a musical career solely from the love of it. She lives in a beautiful country mansion a few miles outside of Paris, where she has a fine music-room fitted with every convenience and luxury, and where she receives her musical friends. She is a splendid pianist, and has won much fame as a composer. Her works are chiefly for the piano, but she has also written many songs and some small cantatas, which have been sung by choral societies with considerable success. D. E. Hervey.

Change-of-day Line: an imaginary line through the Pacific to indicate where it is convenient for the nations that the change in the calendar day shall be made; also known as the "change-of-date line," the "date-boundary," the "date-line," etc. As most navigators use the meridian of Greenwich as the initial meridian, it is convenient for them, sailing E. or W., to regard the meridian that is exactly opposite Greenwich on the other side of the world, the 180th, as the line on which the necessary change in day and date shall be made. But the line does not entirely coincide with the meridian, being drawn to the W. of it in order to give the Aleutian chain, a part of the U. S. territory, the same day as the U. S.; and again it swerves to the E. of the meridian, so as to give islands in the neighborhood of the Fiji group the same calendar day as Australia and New Zealand, with which they chiefly have business relations.

The meridians of longitude lying E. of a place have more advanced time in the day than that place, for the sun rises earlier there; the meridians lying W. have a less advanced time in the day, for the sun rises later there. If a person travels to the W. around the world, which is the direction opposite to that of the earth's revolution, he nullifies, as far as he is concerned, one complete revolution of the earth. In other words, he loses a day. If he travels E. around the world he has added one revolution to those the earth has made during its revolution. In other words, he has gained a day. He must add or subtract a day in order to make his reckoning agree with the calendar. The whole theory of the change-of-day line is to have this addition or subtraction performed in midocean, where sailors and travelers may record the change with the least embarrassment to themselves or others.

A difference of four minutes in time between two places corresponds to a difference of 1° in the longitudes of those places. A longitude difference of 15° between two places corresponds to a difference of one hour in time. If a person travels from any point in America exactly 180° of longitude, or half around the world to the E. or the W., he will find the time-difference between the place from which he started and the one he has reached to be twelve hours. The convenience of fixing a line where the calendar day shall change may thus be illustrated: Suppose it is Jan. 1, 8 A. M., at New York city, and that a man can instantly transfer himself E. to a place on the 180th meridian. He will find the date and time there to be Jan. 1, 8 P. M. Suppose a man starting W. from New York at the same instant reaches the place on the 180th meridian simultaneously, he will find the time there to be Dec. 31, 8 P. M. There are thus two determinations of time for the same place differing in day, month, and year, and yet both scientifically correct. The apparent discrepancy arises simply from the fact that the men reached their destination from opposite directions. Which of these dates should be assigned to the meridian? Convenience must dictate the answer, and it is easy to see which date should be used. The place lies in Asian or Australian lands or waters, and it is most convenient, therefore, that it should have the Asian date and time, which is Jan. 1, 8 P. M. Some maps show Samoa to the W. of the line, but on others this group is placed to the E. of it, with good reason. Samoa's business relations with Australia are insignificant. She has to do chiefly with the U. S., Germany, and England, and should have the calendar day of those countries.

The experience of the Spanish in the Philippine islands illustrates the inconvenience of ignoring the line. Their explorers reached the Philippines from Spanish America and took there their own calendar day. The Spanish settlers in the Philippines, therefore, had the calendar day of Spain and her American possessions. But in the Dutch and Portuguese possessions in the same waters the calendar time corresponded with the Asian day. As long as the Philippines traded only with Spanish America no embarrassment arose from the fact that their calendar differed from that of the surrounding regions of Asia. When, however, in the early part of this century, Spain lost all her possessions on the American mainland, the Philippines sought trade with their neighbors in Asia. Business relations with the Dutch and Portuguese showed that it was confusing to have a calendar day which differed from theirs. When it was Sunday at Manila it was a working day at Canton, Macao, and other regions all around the Philippines. Spain at last ended this source of confusion by dropping Dec. 31, 1844, out of the calendar. In the Philippines and the Ladrones the day after Dec. 30 was Jan. 1, 1845.

This is the method of changing the time when a ship crosses the line. If the vessel crosses from W. to E. the day is reckoned twice—that is, if it is April 6 when the line is crossed the following day is also counted as April 6. If the vessel crosses from E. to W. a day is dropped out; for example, if the crossing occurs on April 1 the following day is April 3. C. C. Adams.

Cheever, Henry Theodore: clergyman and author; b. in Hallowell, Me., Apr. 17, 1807; brother of George Barrell Cheever; graduated at Bowdoin College in 1834 and at

the Bangor (Me.) Theological Seminary in 1839. He visited the South Sea islands in the interest of the New York *Evangelist*, of which he was for several years associate editor, was pastor in various places, and secretary and agent for the Church Anti-slavery Society 1859–64. He published the following books of travel and biography: *The Whale and his Captors* (1849); *A Reel in a Bottle for Jack in the Doldrums* (1851); *The Island World of the Pacific* (1852); *Memoirs of Nathaniel Cheever, M. D.*, his father (1853); *Life and Religion in the Sandwich Islands* (1854); *Autobiography and Memorials of Capt. Obadiah Congat* (1855); *The Sea and the Sailor* (1855); *Short Yarns for Long Voyages* (1855); *Life and Writings of the Rev. Walter Colton, U. S. N.* (1856); *The Pulpit and the Pew* (1858); *Waymarks in the Moral War with Slavery* (1862); *Autobiography and Memorials of Ichabod Washburn* (1878); *Correspondences of Faith and Views of Madame Guyon* (1886). D. in Worcester, Mass., Feb. 13, 1897.

Child, Lydia Maria: author; b. in Medford, Mass., Feb. 11, 1802; daughter of a baker named David Francis; educated in the common schools and by her brother, Rev. Convers Francis, D.D. She began to write a novel when she was seventeen years old, which was published in 1821, entitled *Hobomok*. Soon after this she wrote another novel, *The Rebels, a Tale of the Revolution*. In 1826 she founded *The Juvenile Miscellany*, the first juvenile periodical in the U. S., which she managed for eight years. She was married to David Lee Child, a Boston lawyer, in Oct., 1828. Mrs. Child became active in the anti-slavery movement which started about this time, and wrote one of the first anti-slavery books, entitled *Appeal in Behalf of that Class of Americans Called Africans*, advocating immediate emancipation. In 1841 she and her husband became editors of the *National Anti-slavery Standard* in New York, continuing until 1844. She wrote a letter of sympathy to John Brown in 1859, and the correspondence arising from it with Gov. Wise and Mrs. Mason, of Virginia, was published in a pamphlet, of which 300,000 copies were circulated. Among Mrs. Child's other works are: *The First Settlers of New England* (1829); *The American Frugal Housewife* (1829; 33d ed. 1855); *The Mother's Book*, *The Girl's Own Book*, and the *Coronal*, a collection of verses (1831); *The Ladies' Family Library* (5 vols., 1832–35); *Philothea*, a romance of Greece in the days of Pericles (1835); *Flowers for Children* (3 vols., 1844–46); *Fact and Fiction* (1846); *The Power of Kindness* (1851); *Isaac T. Hopper, a True Life* (1853); *The Progress of Religious Ideas Through Successive Ages* (3 vols., 1855); *Autumnal Leaves* (1856); *Looking Toward Sunset* (1864); *The Freedman's Book* (1865); *Miria, a Romance of the Republic* (1867); and *Aspirations of the World* (1878). D. in Wayland, Mass., Oct. 20, 1880.

Child-study: the scientific study of children. The universal naïve observation of children, contributing as it does to our "knowledge of human nature," and leading as it does in the best cases to invaluable artistic insights, not only prepares the way for all more systematic child-study, but is likely to remain a principal source of our practical knowledge of child-life. Indeed, one important object of the child-study movement of the present day is to arouse and intensify interest in the natural history of childhood among mothers, teachers, and other persons who lack scientific training. Such observers are advised to keep notes of the spontaneous sayings and doings of children, generally with reference to some question or system of questions proposed by a psychologist.

Child-study in the more strictly scientific sense is historically an outgrowth of older biological sciences. The earliest and the best researches in this field are the work of men trained in anthropology, physiology, neurology, psychiatry, psychology, or other related science. The general aims, special problems, methods, and results of scientific child-study have developed in close connection with the development of these sciences, and they can not be rightly judged nor properly utilized if taken from the whole body of science of which they form an organic part.

The outline of subordinate topics here given follows the main lines which research has actually taken. Purely medical studies, anthropological studies of the primitive child, and, in general, studies whose interest is mainly theoretical rather than educational, are omitted.

The fact that in general the more fundamental functions develop early in life, and the consideration that the early life of the individual is possibly, in a measure, an epitome of the race-life, give special importance to the study of infants. Very careful and extended studies have been made of the first three years after birth. They cover almost every phase of physical and mental development, including the development of the senses, memory, imagination, and intellect (and in particular the development of language), of the emotions, and of impulsive, reflex, instinctive, imitative, and voluntary motions. See Genetic Psychology.

Study of School-children.—(*a*) *Anthropometrical.*—The task of anthropometry is primarily to determine the weight, size, and form of the human body, together with the causes of these characteristics; secondarily, to explain the functional characteristics associated with the foregoing. This task requires the weighing and measuring of many individuals varying in race, sex, age, and in social and geographical environment, and a statistical study of the results for the several classes to determine with precision the influence of varying conditions upon structural and functional development.

The fundamental importance of such an exhibition of human growth in connection with the causes affecting it, for all social and educational interests, is manifest. Among specific results of the large and classical researches in this field are the following: The rate of growth is not uniform, but varies with the season of the year and with age; and is characteristically different for different parts of the body, for boys and girls, for children of different race, conditions of life, etc. Along with these physical periodicities go fluctuations of mental vigor. If now we take into account the fact that the period of maximum growth is the period of maximum ability to resist disease, and also of greatest aptitude in the acquirement of skill, the importance of these results for physical and mental education must be apparent. Of quite particular importance in this connection are the curves of growth, of motor ability, and of disease during the period of adolescence.

(*b*) *The Senses.*—The extensive modern researches on the physiology and psychology of the senses have been for the most part confined to adult subjects. Of the studies made upon children most are chiefly of hygienic interest.

An examination of about 30,000 school-children has shown an alarming increase of myopia from grade to grade. Extensive studies on the lighting and seating of school-houses, on the paper and printing of text-books, and on the attitude in writing, all bear upon the correction of this evil. The hearing of about 20,000 school-children has been tested in various cities of Europe and America. One of twelve investigators reports about 2 per cent. of defectives; the others report from 13 per cent. to about 30 per cent. It is held by the best authorities that the frequency of partial deafness among school-children renders advisable expert examination of all school-children and special instruction for defectives. It has also been shown that nasal diseases which lead to a stoppage of nose-breathing seriously affect memory, power of attention, and so in general mental ability; that if such stoppage of nose-breathing continues, the child's mind is likely to be permanently stunted; that the removal of the obstructions is often followed by remarkable intellectual improvement; finally, that a considerable per cent. of children suffer in this way. Bresgen reports from his own practice 300 cases of cures of head-pressure, headache, migraine, asthma, hay fever, etc., through treatment of nasal diseases, and "demands that all children appearing to be of weak mind be examined by a specialist as regards nose, ear, and throat."

(*c*) *Motor Ability.*—The maximum rate and precision of voluntary movement and the general motor ability as shown in the performance of common movements have been studied with great detail. Sixty thousand school-children in Boston and many more in Europe have been observed with reference to stuttering. A chief practical outcome of these studies is to confirm and define the principle that the small muscles of the hand, eye, and vocal organs must not be overused early in life or in periods of special nervous excitability, under penalty of failing to secure proper training of these muscles, and under penalty of inducing nervous disease. It seems evident that rational physical training, manual training, art education, as piano-playing, drawing and the like, hand-work in the kindergarten, penmanship, especially in primary grades, and oral reading, should take account of these facts. It can not be claimed that teaching in these lines does so except in occasional cases, and there is evidence that this ignorance and neglect result in an increase of nervous diseases among school-children.

(*d*) *Central Processes.*—All the more intelligent current pedagogy emphasizes the importance of knowing the child's capacities, attainments, interests, aptitudes, and the development of these under existing conditions. Each of these fundamental points has been approached by studies upon children. The following is a bare statement of the more important studies: (1) *Endurance and Fatigue.*—Recent studies from several sciences emphasize the importance of well-conserved nervous capital for all the interests of life. Among the facts of practical importance are the following: The close relation between physical and mental endurance, the fluctuation of endurance with the time of day, season, age, nutrition, blood-supply, rate of growth, adjustment of tasks to individual capacity, and the fact that "continuously incomplete restoration" from fatigue leads to chronic fatigue and so to many forms of nervous and mental disease. Specific school studies in this field are Galton's statistics on signs of fatigue in school-children (as headache, loss of memory, thought-wandering, slowing reaction time); Burgerstein's test of the curve of mental fatigue in one hour's work, indicating that not more than forty-five minutes' work out of an hour should be required; and the statistics of school diseases, especially those of Hertel in Denmark and Key in Sweden, indicating dangerous overpressure in some schools. The most recent investigations of Kräpelin and Friedrich indicate that short periods of intense work are better for health and for the quality of work than long periods of less intense work. (2) *Memory Span.*—The memory span has been determined for each age from five to eighteen together with the range of individual variation. (3) *Apperceptive Capital.*—Many collections of children's vocabularies have been made, including one study of the color vocabulary of school-children. Tests have been made to determine the contents of children's minds on entering school. It is urged that primary instruction should be based upon knowledge gained by such studies. Studies exist upon children's ideas of sex and upon their religious and moral ideas which can not be summarized here. (4) *Practice.*—The rate of improvement with practice is not uniform, but it is first rapid and then gradually slower. Recent investigations indicate that in the acquisition of a certain skill, for example, in the learning of a language, there are occasional brief periods of rapid improvement preceded and followed by long periods of slight improvement. As the periods of rapid improvement differ for different functions, the teacher should know the practice-curve of the function sought to be developed. (5) *Aptitudes and Interests.*—Many authors have shown that minds are to be distinguished according to the sense whose impressions are apperceived, remembered, and employed with most aptitude and frequency. Visual, auditory, tactile, and motor types are distinguished. The important bearing of these special aptitudes upon the development of the mind and even upon one's philosophy has been shown. Most children are not exclusively or extremely of any one type, but there are many extreme individual cases, and these at least should be known as such by the teacher. Children's interests have been studied in a variety of ways. A study of the predicates chosen by children to describe familiar things indicates that young children are interested mainly in the motions and uses of things, only much later acquiring an interest in classifying things into larger groups. Children's drawings, their preferences among stories, their choice of future occupations, their collections, their plans for spending money, their æsthetic preferences, their imaginative creations, their plays, their lies, their secret languages, their rudimentary society, and the like have been studied both statistically on large numbers and by personal acquaintance, all of which help to sound the character and range of their mental and moral tendencies and the trend of change in these as they grow older.

In summing up the applications of child-study to education, it must be affirmed, in the first place, that many scientific studies of children have no immediate educational application whatever. Most of them were made, not by educators nor for educational purposes, but by scientists interested in the facts and laws of human development. To the scientists who believe that such work must lead to far more profound and just views of man's life than any one now has every such study is precious, as it is to the individual who has learned that the discovery of truth must often long precede any practical application thereof. To the unscientific teacher many of these studies must look like so many useless scraps. A recognition of these separate points of view should prevent much misunderstanding.

In the second place, it must be remembered that no sort of truth, whether philosophy, poetry, or science, is of much educational value except through persons who have thoroughly assimilated that truth. No sort of truth can get to the pupil in sealed packages. While, therefore, one thoroughly trained in scientific child-study would find what knowledge we now possess a valuable help in the decision of almost every question in the school, one without such training can be given comparatively few educational prescriptions. The most valuable practical suggestion that can be given teachers desiring help from child-study is accordingly to become students of children. The common-school teacher can be directed in doing this so far as to bring immediate advantages to the school, and the advanced student of pedagogy may secure training in scientific child-study. As regards the study of children's minds, it is almost impossible to give any other advice of importance. We already have from educational philosophies the maxim that we must know the apperception ability and tendency of children. But such maxims are only empty truisms unless, along such lines as above suggested, teachers actually study the children they have in charge.

Lastly, some of the hygienic outcomes of child-study may be put in the form of specific educational suggestions:

1. There should be expert medical examination of school-houses, grounds, equipments, programmes of required work, and methods of teaching in so far as these may affect the health of school-children.

2. All schools for the training of teachers should afford competent instruction and training on school hygiene.

3. School boards should cause the present teaching force to receive such instruction from resident physicians as will lead them to observe the more obvious symptoms of sensory, motor, or mental defect. Reliable diagnosis can not of course be made by untrained teachers. But careful attention, directed by such suggestions as a physician could give, would lead the teachers to discover in many cases the *fact* of defect, as defective eyesight or hearing, special liability to take cold, stoppage of nose-breathing; motor irregularities, such as the twitching of any muscles; useless habitual rhythms, such as tooth-grinding, stuttering, inability to perform common tasks, incoördination of movements when the eyes are closed, absence of iris light reflex, general muscular restlessness; signs of overfatigue in addition to the foregoing, such as unusual flightiness of attention, emotional depression, weakness of memory, slowness and difficulty in reasoning about common things, insistent ideas, unusual indecision, and the like. When such or any defects are known (*a*) the defectives of course will not be blamed or punished, as may possibly now in ignorance be done, for their inabilities; (*b*) they will receive special consideration in the assignment of seats and in the requirement of school tasks; (*c*) the attention of parents will be called to the defect, and the child may receive competent medical treatment.

4. Those who have authority to arrange school programmes should reconsider many exercises and requirements in the light of the fact adduced above touching fatigue. Eye-strain, due to bad light, bad print, faulty desks, faulty attitude in writing, or long-continued or precise use, accelerates the development of hereditary optical defects, as myopia, hypermetropia, astigmatism, etc., if it does not also cause such defects. Further, eye-strain, involving as it does long-continued contraction of the delicate muscles of the eye, is specially fatiguing to the corresponding nerve-centers and is proved to induce nervous disease. The literature of this subject is extensive, and includes quite specific directions from the highest authorities on school-lighting, books, desks, and programmes of work. These directions are much too extensive to be given here, but they are easily accessible. (See especially Cohn's *Hygiene of the Eye.*) Overfatigue of the nerve-centers controlling the hand may be induced by too long-continued or too precise work in writing, drawing, hand-work in the kindergarten, tool-work in the manual-training school, piano practice, or the like. This effect can be prevented by shortening such exercises, by not demanding a higher degree of precision in such work than can be attained by moderate effort, and by encouraging the use of the larger muscles wherever possible instead of the smaller. Finally, it is important to note that the acquirement of skill is not hindered, but facilitated, by having regard to these hygienic conditions.

BIBLIOGRAPHY.—*Infant-study*: See references given under GENETIC PSYCHOLOGY and PSYCHOLOGY. *Anthropomet-*

rical: Bowditch, *The Growth of Children* (Eighth, Tenth, and Twenty-second Reports of the Massachusetts State Board of Health); Boas, *Anthropological Investigations in Schools* (*Ped. Sem.*, 1891); Peckham, *The Growth of Children* (Sixth Report of the Wisconsin State Board of Health); Porter, *Physical Basis of Precocity and Dullness* (Transactions St. Louis Acad. of Science, 1893 and 1894). *The Senses*: Cohn, *The Hygiene of the Eye* (1888). *Motor Ability*: Bryan, *Development of Voluntary Motor Ability* (*Am. Jour. of Psychol.*, v., No. 2); Hartwell, *Report of Director of Physical Training* (Boston, 1891). *Central Processes*: Burgerstein, *Die Arbeitscurve einer Schulstunde* (Hamburg, 1891); Galton, *On Mental Fatigue* (*Jour. Anthr. Inst.*, 1888); Hertel, *Overpressure in the Schools of Denmark* (1885); Friedrich, *Ueber Arbeitsdauer und Arbeitspausen*, etc. (*Zeitschrift für Psychologie*, etc., xiii., p. 1); Rivers and Kräpelin, *Ueber Ermüdung u. Erholung* (in Kräpelin's *Psychologische Arbeiten*, i., 627); Key, *Schulhygienische Untersuchungen*, trans. by Burgerstein (1889); Bolton, *Memory in Children* (*Am. Jour. of Psychol.*, iv., 3); Hall, *Contents of Children's Minds on Entering School* (1893); Wolfe, *The Color Vocabulary of Children* (Studies, University of Nebraska, vol. i., No. 3); Berger, *Ueber den Einfluss d. Uebung*, etc. (Wundt's *Philosophische Studien*, vol. v., 170); Dresslar, *On the Psychology of Touch* (*Am. Jour. Psychol.*, vi., 3); Burnham, *Individual Differences in the Imagination of Children* (*Ped. Sem.*, ii., 2); *A Scheme for the Classification of Child-study* (*Ped. Sem.*, ii., 2); Chrisman, *Paidologie* (Jena, 1896), especially valuable for its bibliography, which covers every department of child-study. Periodical publications in this field are *Child-study Monthly* (Chicago, Ill.); *Studies in Education* (Stanford University); *Transactions of the Illinois Society for Child-study* (Normal, Illinois); *Pedagogical Seminary* (Worcester, Mass.).

WILLIAM L. BRYAN.

China: Seven new treaty-ports were added to the list between Dec., 1893, and Apr., 1898, making 32 in all. Shahshih, Suchow, and Hangchow were opened in 1896, under the stipulations of the treaty of peace with Japan; Yatung in 1894; Szemao in 1896, by treaty with France; Samshui and Wuchow in 1897, by treaties with Great Britain. Shahshih, on the Yang-tse river, 90 miles below Ichang, is a port for all the steamers plying between Hankow and Ichang, and has ten times the trade of the latter town. The junk trade between Shah-shih and many towns on the Yang-tse and its affluents is very large. Suchow is on the Imperial canal, province of Kiangsu, 50 miles W. of Shanghai, with which it has water communication. It is a center of a rich flat country where vast quantities of cotton, silk, rice, and other productions are raised, and is at the focus of canals extending in all directions. The chief product is silk. Hangchow, the capital of the Cheh-kiang province, stands at the head of the deep inlet S. of Shanghai. The poppy is extensively cultivated in the region around the city, which is also a center of silk-raising and manufactures. Wuchow (pop. 60,000) is at the eastern border of Kwangsi province, 200 miles W. of Canton, at the junction of the Kassia and West or Si-Kiang rivers. Wuchow is the limit of steamer traffic at present, and the rapids and rocks above may prevent steam-navigation farther up the stream. Samshui is 40 miles W. of Canton, at the junction of the West and North rivers. The West river, second only to the Yang-tse as an artery of trade, was opened to foreign commerce as far as Wuchow by the Chinese Government on June 3, 1897.

By imperial proclamation Yochow, Santuao, Chinwangtao, and Wusung were ordered open early in 1898. Yochow is a large trade center on the Yang-tse above Hankow. Santuao, Fukien province, is better known to foreigners as Simlah inlet. The entrance, 10 miles W. of Spider island, is 1¾ miles wide. An extensive junk trade along the coast is carried on. Chinwangtao is a coast town in the same neighborhood, and will serve as an outlet for the coal country behind it.

The harbor of Port Arthur and the adjoining bay of Talienwan, by agreement with the Chinese Government, were occupied by the Russians in the fall of 1897, and on Mar. 28, 1898, Russia secured a lease of these ports for twenty-five years with power of extension. A part of the harbor of Talienwan is to be open to the merchant marine of all nations, with the customs tariff of the Chinese treaty-ports administered and collected by Russian officials. China agreed later, on the demand of Great Britain, that no provinces tributary to the Yang-tse should be alienated. Great Britain thus secured a lease of the islands and waters of Weihai-wei for the same number of years and on the same terms as those of Russia at Port Arthur.

The Germans, by treaty with China, in Dec., 1897, secured a ninety-nine-year lease of the harbor and town of Kiao-Chau and the surrounding district on the southern coast of Shantung peninsula. The bay had been previously occupied (Nov. 14, 1897) by a German squadron. The area of the leased territory is 360 sq. miles, of which 215 sq. miles are embraced by the waters of the bay. The land area of the German sphere of interest, lying outside of and around the leased territory, is 2,790 sq. miles. The leased territory is entirely subject to the political and legal control of Germany. Within the sphere of interest Germany is at liberty to carry out any enterprises for the commercial and industrial development of the district, including the building of railroads. Now that the value of all the ports of the Gulf of Pechili has been impaired by sedimentation, the importance of Kiao-Chau Bay as a gateway to the interior is increased. It affords the best harbor on the coast of Northern China, and offers an excellent means for communication with the larger part of Shantung, one of the most densely peopled and richest regions of China, by means of minor river routes fit for a considerable junk traffic, and by the railroads yet to be constructed.

The Chinese Government on June 9, 1898, leased to Great Britain, for ninety years, territories on the mainland, opposite Hongkong, which were needed to assure the proper protection of the colony and also to provide for commercial expansion. The island of Hongkong had proved too cramped an area for the requirements of its immense and growing trade. The concession includes the whole of the peninsula opposite Hongkong as far as a line joining Deep Bay and Mirs Bay, and also the island of Lan-tao. The waters of both bays are included in the lease, but their northern shores are retained by China. The total area is about 200 sq. miles, all of which will be under British jurisdiction, except within the native city of Kau-lung, N. of Hongkong. China reserves the right to use the leased waters for her own ships, whether belligerent or neutral. Fifty years ago the place where Victoria stands on the island of Hongkong was a fishing village containing a few score of squalid huts. A city of 250,000 inhabitants now stands on this site, and its prosperity has grown out of the fact that Hongkong is the great commercial clearing-house of the Far East.

A demand by the French Government for the cession of a port at Kwang-chau-wan, on Lei-chau peninsula, N. of Hainan island, was conceded Apr. 5, 1898, and China gave to France the formal assurance that no part of the provinces of Kwang-tung, Kwang-si, and Yunnan would be ceded to any other power.

In Sept., 1898, the emperor issued a number of edicts proclaiming various far-reaching reforms in the financial management and the general administration of the central and provincial governments. These sweeping innovations, which were based upon European methods, did not meet the approval of the empress dowager and her powerful supporters. The emperor's new policy was wholly blocked by the empress dowager, who assumed charge of the Government and restored the regency which she had previously held. She immediately reverted to the old methods of government, banishing or beheading many of the more progressive statesmen, ordering a return to the ancient methods of study for examination for official rank, and issuing secret orders, late in 1899, to the governors of the maritime and Yang-tse provinces to resist with arms, without first looking to Peking for instructions, any occupation of territory on the part of the foreigners.

In Sept., 1899, U. S. Secretary of State Hay instructed the American representatives in England, France, Germany, Russia, Italy, and Japan to intimate to the governments to which they were accredited the apprehensions felt by the U. S. Government of the danger of complications arising between the treaty powers that might imperil the rights assured to the U. S. by treaty. The representations were made with the express reservation that the Government of the U. S. did not commit itself to any recognition of exclusive rights of any power within or control over any portion of the Chinese Empire under the agreements recently made by which Great Britain, Germany, and Russia claimed and conceded to each other the possession of spheres of influence or interest, particularly in respect to railroads and mining enterprises. Hoping to retain China as an open market for the world's commerce, with the object of remov-

ing dangerous sources of international irritation and thereby hastening united action by the powers at Peking to promote administrative reforms so greatly needed for strengthening the Imperial Government, in which it was believed that the whole western world was alike concerned, the U. S. Government requested the powers claiming spheres in China to declare their intentions with regard to the treatment of foreign trade in those spheres, and invited from each a declaration to the effect that it will in no wise interfere with any treaty port or any vested interest within any so-called sphere of interest or leased territory that it may have in China; that the Chinese treaty tariff of the time being shall apply to all merchandise landed at or shipped to all such ports as are within such spheres, unless they be free ports, no matter to what nationality they may belong, and that duties so leviable shall be collected by the Chinese Government; that the power approached will levy no higher harbor dues on vessels of another nationality frequenting any port in such sphere than shall be levied on vessels of its own nationality, nor any higher railroad charges over lines built, controlled, or operated in its sphere on merchandise belonging to citizens or subjects of other nationalities than are levied on similar merchandise belonging to its own citizens. On Nov. 30 Lord Salisbury wrote that Great Britain was prepared to make a declaration in the sense desired. Germany and Russia followed with similar replies. France responded Dec. 16; Italy Jan. 7; and the Japanese Government soon afterward. On Mar. 20 Mr. Hay sent a circular letter to the American representatives abroad, saying that all the powers concerned had accepted the proposals of the U. S., and that he would therefore consider their consent as final and irrevocable.

Meanwhile a greater force than even the government could control—urged on by the national sentiment against the occupation of Chinese territory by foreign nations, and the ignorance and superstitious hatred of the missionaries among the lower classes, who looked upon the "foreign devils" as bringing ill luck—was springing up in all parts of China. Two ancient secret societies—the I-Ho-Chuan, the League of United Patriots, and the Ta-Tao-Hwei, or Great Sword Society of Shantung, afterward united under the popular name of Boxers (Chuan also meaning fists, and athletic contests being practiced by its members)—under Prince Tuan, the father of the heir apparent, a favorite of the Empress Dowager and a radical anti-foreigner, secretly supported and encouraged by the court, were gaining recruits everywhere. The members took as their watchword the support of the Heavenly Dynasty and death to all foreigners, clothed their doings with mysterious and spiritualistic rites, and claimed and believed themselves to be invulnerable to bullet and sword. They exacted tribute from the native Christians, massacred those that refused to pay, and forced the local governors to stamp their edicts and proclamations. Their acts and depredations became so overt in the latter part of 1899 and the early part of 1900 that they called forth strong protests on the part of the foreign ministers in Peking, long before warned of the impending crisis by the missionaries in the interior. Following the murder of the Rev. Mr. Brooks, Dec. 31, 1899, a joint note was addressed to the Tsung-li-Yamen, the Chinese foreign office, calling for the abolition of the Boxer organization, with whom the imperial troops were already in secret co-operation; this was feebly replied to on Feb. 25 by the usual decree, openly condemning the excesses of the Boxers, but secretly praising them for their courage and patriotism. By the middle of May the situation had become so desperate that the ministers demanded an extra legation guard, and 450 marines from the battle-ships assembling at Taku were sent by way of Tientsin and arrived in Peking June 1. The same day the English missionaries Norman and Robinson were murdered 40 miles S. of Peking. The Boxers continued to pour into Peking, fraternizing with the regular soldiery, and destroying foreign property wherever found, and massacring hundreds of native Christians. On June 11 the Japanese Secretary of Legation, while setting out for Tientsin to inform his government of the situation, was killed by Chinese soldiers outside the city gates. The following day all communication with the outside world was cut off.

On June 9 came a call for more guards, and after a conference of the officers of the allied fleets the British Admiral Seymour with 1,486 men (915 British, 350 Germans, 104 Americans, 300 Russians, 158 French, 54 Japanese, 40 Italians, and 25 Austrians) left Tientsin on four trains for the relief of Peking. They succeeded in getting within 25 miles of the capital, but were there surrounded by Boxers and Chinese troops, the railroad torn up, and their communications with Tientsin destroyed. On June 17 they began their retreat down the Peiho, fighting for every inch of the way. June 22 they drove the garrison from the great Hsiku arsenal, and fortified themselves within rocket communication of Tientsin. They were relieved on June 25 by a column of Russian troops, and on the following day marched into Tientsin after destroying guns and war stores to the value of 40,000,000 taels. The expedition had lost 374 in killed and wounded.

On the night of June 17 the Taku forts opened fire on the allied fleets. The fire was returned, the American Admiral Kempff refusing to take part in the action, and after a hard fight the forts were captured and reduced. Steps were immediately taken to relieve the civilians and the small body of troops now shut up in the foreign quarter of Tientsin and exposed to the fire of the Chinese in the native city. On June 20 the expedition started, and on June 23 the combined force occupied the foreign city. On July 9 the attack on the native city began, and operations continued till the 14th, the hardest fighting occurring on the 13th, when the Americans and Japanese met with heavy losses, Col. Emerson H. Liscum, of the Ninth American Regiment, being killed at the head of his troops.

July 3 Secretary Hay had announced the attitude of the U. S. to be that of disinterested protection of its citizens and treaty rights, the promotion of permanent safety and peace in China, and the preservation of the Chinese Empire in its entirety. On the same day the Emperor of China appealed to the Mikado for intervention. July 17 a similar note was addressed to President McKinley, expressing in addition especial confidence in the U. S. The President replied on June 23, urging upon the Chinese Government to give a public assurance whether the foreign ministers were alive, and, if so, in what condition; to put them in immediate and free communication with their respective governments, and to remove all danger to their lives and liberty, and to place the imperial authorities in communition with the relief expedition, so that co-operation could be secured between them for the liberation of the legations, the protection of foreigners, and the restoration of order. If these objects were secured the Government of the U. S. believed that no obstacle would be found to exist on the part of the powers to an amicable settlement of all questions arising out of the recent trouble, and it proffered its friendly offices, with the assent of the other powers, to secure such a settlement on the fulfillment of these conditions. At the same time China addressed a note to the President of France, which was similarly replied to.

On the afternoon of Aug. 4 a relief column, 22,000 strong, left Tientsin for Peking. Of these, 12,000 were Japanese; 2,800 British; 2,400, under Gen. Chaffee, American; and over 3,000 Russians. They met with sharp skirmishing at Peitang, Yangtun, and Tungchau, but in most instances the Chinese offered very little resistance, and on Aug. 14–15 the allies entered Peking and relieved the legations. The Emperor, Empress-Dowager, and the Court escaped under escort to Taiyuen-fu, and finally to Singan-fu, Sept. 14, where the provisional government was established. Aug. 15 the Americans forced the Imperial City, and on Aug. 17 the allies marched through it in force. The subsequent military operations, with the exception of the Russian demonstration on the border of Manchuria, were chiefly punitive expeditions to the affected parts of the interior.

The relief of the legations was most timely. From June 12, when communications were cut off, the ministers and their families, the legation guards, missionaries, and many native Christians had been in a state of siege in the compound of the British legation. Provisions and ammunition were almost exhausted, and the besieging force growing more formidable every day. Baron von Ketteler, the German minister, while on his way to the Tsung-li-Yamen, was killed by a troop of Chinese soldiers on June 20, and after June 23 it was necessary to repel attacks upon the legation almost daily. The number of the defenders killed during the siege was 67, of wounded 160. Several attempts were made on the part of the Chinese to persuade the ministers to start for Tientsin under promise of armed escort, but the ministers, realizing the futility of such escort, even if the government were sincere in its offer, in each instance promptly refused. The first tidings of the besieged was Mr. Conger's cipher telegram of July 18, saying that they

were under shot and shell, and that only quick relief would save them from massacre.

Of the missionaries scattered through the northern provinces of China some few made their way to Peking or the more friendly southern provinces, but by far the greater number perished at their posts, many suffering degrading deaths, and torture and mutilation by the fanatical Boxers, abetted in some instances by the local authorities.

As soon as the allies were in full possession of the capital negotiations for peace began. Count von Waldersee, field-marshal in the German army, who had been unanimously chosen as commander-in-chief of the allies, arrived in Peking and took command of the forces. Li-Hung-Chang and Prince Ching were the peace commissioners on behalf of the Chinese Court. The terms as finally agreed upon and signed by the ministers Dec. 22, 1900, were as follows:

"During the months of May, June, July, and August of the current year serious disturbances broke out in the northern provinces of China, in which atrocious crimes unparalleled in history and outrages against the law of nations, against the laws of humanity, and against civilization, were committed under particularly odious circumstances. The principal of these crimes were the following:

"1. On the 20th of June, his Excellency Baron von Ketteler, while on his way to the Tsung-li-Yamen, in the performance of his official functions, was murdered by soldiers of the regular army, acting under orders of their chiefs.

"2. On the same day the foreign legations were attacked and besieged. The attacks continued without intermission until the 14th of August, on which date the arrival of the foreign forces put an end to them. These attacks were made by the regular troops, who joined the Boxers, and who obeyed the orders of the court emanating from the imperial palace. At the same time the Chinese Government officially declared, by its representatives abroad, that it guaranteed the security of the legations.

"3. On the 11th of June Mr. Sujyama, chancellor of the legation of Japan, while in the discharge of an official mission, was killed by regulars at the gates of the city. In Peking and in several provinces foreigners were murdered, tortured, or attacked by the Boxers and the regular troops, and such as escaped death owed their salvation solely to their own determined resistance. Their establishments were looted and destroyed.

"4. Foreign cemeteries, at Peking especially, were desecrated, the graves opened and the remains scattered abroad.

"These occurrences necessarily led the foreign powers to dispatch their troops to China to the end of protecting the lives of their representatives and nationals and restoring order. During their march to Peking the allied forces met with resistance from the Chinese army and had to overcome it by force.

"Inasmuch as China has recognized her responsibility, expressed regret, and evinced a desire to see an end put to the situation created by the aforesaid disturbances, the powers have determined to accede to her request upon the irrevocable conditions enumerated below, which they deem indispensable to expiate the crimes committed and to prevent their recurrence:

"I. (*a*) The dispatch to Berlin of an extraordinary mission headed by an imperial prince, in order to express the regrets of his Majesty the Emperor of China and of the Chinese Government for the assassination of his Excellency, the late Baron von Ketteler, minister of Germany. (*b*) The erection on the spot of the assassination of a commemorative monument, befitting the rank of the deceased, bearing an inscription in the Latin, German, and Chinese languages expressing the regrets of the Emperor of China for the murder.

"II. (*a*) The severest punishment for the persons designated in the imperial decree of Sept. 25, 1900, and for those whom the representatives of the powers shall subsequently designate. (*b*) The suspension for five years of all official examinations in all the cities where foreigners have been massacred or have been subjected to cruel treatment.

"III. Honorable reparation to be made by the Chinese Government to the Japanese Government for the murder of Mr. Sujyama.

"IV. An expiatory monument to be erected by the Imperial Chinese Government in every foreign or international cemetery which has been desecrated or in which the graves have been destroyed.

"V. The maintenance, under conditions to be determined by the powers, of the interdiction against the importation of arms as well as of materials employed exclusively for the manufacture of arms and ammunition.

"VI. Equitable indemnities for the governments, societies, companies, and individuals, as well as for Chinese who during the late occurrences have suffered in person or in property in consequence of their being in the service of foreigners. China to adopt financial measures acceptable to the powers for the purpose of guaranteeing the payment of said indemnities and the interest and amortization of the loans.

"VII. The right for each power to maintain a permanent guard for its legation, and to put the diplomatic quarter in a defensible condition, the Chinese having no right to reside in that quarter.

"VIII. The destruction of the forts which might obstruct free communication between Peking and the sea.

"IX. The right to the military occupation of certain points, to be determined by an understanding among the powers, in order to maintain open communication between the capital and the sea.

"X. The Chinese Government to cause to be published during two years in all the subprefectures an imperial decree: (*a*) Embodying a perpetual prohibition, under penalty of death, of membership in any anti-foreign society; (*b*) enumerating the punishments that shall have been inflicted on the guilty, together with the suspension of all official examinations in the cities where foreigners have been murdered or have been subjected to cruel treatment; and (*c*) furthermore, an imperial decree to be issued and published throughout the empire, ordering that the governors-general (viceroys), governors, and all provincial or local officials shall be held responsible for the maintenance of order within their respective jurisdictions, and that in the event of renewed anti-foreign disturbances or any other infractions of treaty occurring and which shall not forthwith be suppressed and the guilty persons punished, they, the said officials, shall be immediately removed and forever disqualified from holding any office or honors.

"XI. The Chinese Government to undertake to negotiate amendments to the treaties of commerce and navigation considered useful by the foreign powers, and upon other matters pertaining to their commercial relations, with the object of facilitating them.

"XII. The Chinese Government to determine in what manner to reform the Department of Foreign Affairs and to modify the court ceremonials concerning the reception of foreign representatives, in the manner to be indicated by the powers.

"Until the Chinese Government has complied with the above conditions to the satisfaction of the powers, the undersigned can hold out no expectation that the occupation of Peking and the province of Chih-li by the general forces can be brought to a conclusion."

On Jan. 13, 1901, the Chinese envoys were authorized to sign the joint note, and the carrying out of its provisions was at once begun. The question of indemnity was the longest debated, the powers deeming it impolicy to make an impossible demand. The amount finally determined upon, May 29, 1901, was 450,000,000 taels (about $315,000,000). Shortly afterward the withdrawal of the troops, with the exception of the guard provided for in the agreement, was carried out, and the Court announced its return to the capital in the early autumn.

In Mar., 1898, Mr. Archibald J. Little, a British merchant, conducted a large steam-launch from Shanghai to Chungking, the first steam-vessel to ascend the Yang-tse above Ichang. As there are rapids above that treaty-port, steamers to make headway must have sufficient power to propel them 15 knots an hour. Steamers may run to Chungking ten months of the year; the low stage of water during two months may render navigation then impracticable.

The present means of transport in China are wholly inadequate to opening up its enormous resources. The hostility of the Chinese Government long prevented the introduction of railroads, but less opposition is now offered, and about 401 miles of railroad were in operation in 1899. The line 80 miles long from Tientsin to Peking, opened in 1897, and destroyed by the Boxers in 1900, was one of the most profitable short railroads in the world. The road from Tientsin, the port of Peking, extended from Taku, at the mouth of the Peiho, N. E. to Shan-hai-kwan, where it crossed the Great Wall of China, and penetrated 30 miles farther

N.; about 210 miles were in operation at the beginning of the disturbances in 1900, most of which was destroyed. It is being extended N. to meet the eastern Chinese railroad which the Russians have secured permission to build through Northeast Mongolia, between the Trans-Siberian railroad and Vladivostok, for which the route is now being surveyed by Russian engineers. The first section of the important railroad that is to extend from Peking to Hankow was completed from the capital as far as Paoting-fu, about 80 miles. Concessions have been obtained by American and European contractors for building other railroads.

As the eastern part of China is largely denuded of trees, the native supply of lumber is very limited. The rapid growth of Shanghai, and particularly the building of large cotton-mills and silk filatures there and in other cities, have largely increased the import of timber during the past two years. Lumber is increasing in importance as an article of import from America, particularly the fine lumber from Oregon and Washington and red wood from California.

The most important building enterprise recently carried out in China is the vast rolling-mills and arsenals in the city of Hanyan, opposite Hankow. The plant covers about 70 acres, and is connected with the Yang-tse river by a railroad 1½ miles in length. The buildings are of brick with stone foundations, two of them covering an area of about 4 acres. The plant was erected under the auspices of the Viceroys of Hupeh and Hunan, and the intention is to manufacture ordnance, rails, machinery, small-arms, etc. Native artisans are being instructed by skilled workmen from Europe. The iron-mines from which metal for the manufacture of rails is to be obtained are near the Yang-tse, about 75 miles below this manufacturing plant.

C. C. Adams.

Chiniquy, shĕ'nĕ'kee', Charles Paschal Telesphore, D. D.: b. in Kamouraska, Quebec, July 30, 1809; educated at the Quebec Seminary, and ordained a Roman Catholic priest in 1833. He established the first temperance society in the province of Quebec, and traveled through the province in the interest of temperance. In 1851 he went to Chicago for the purpose of inducing immigration into Illinois, and soon founded a Roman Catholic colony at Ste. Anne, Kankakee co. In 1858 he left the Catholic Church, and took his congregation with him into the Presbyterian Church. Among his published works are *Fifty Years in the Church of Rome*; *The Priest, the Woman, and the Confessional*: *Papal Idolatry*; *The Church of Rome the Enemy of the Virgin Mary and of Jesus Christ*; *The Perversion of Dr. Newman in the Light of History, the Scriptures, Common Sense, and of His Own Declarations.* D. in Montreal, Canada, Jan. 16, 1898.

Choate, Joseph Hodges, LL. D.: lawyer; b. in Salem, Mass., Jan. 24, 1832; related to Rufus Choate, the orator; was educated at Salem, Mass.; entered Harvard and graduated in 1852; graduated at the Dane Law School in 1854; admitted to the bar of Massachusetts in 1855, and in 1856 removed to New York city, was there admitted to the bar, and has practiced there continuously since, having acquired a national reputation as an orator and pleader at the bar; was one of the Committee of Seventy which organized the combine against the Tweed ring, and was associated with Charles O'Conor in the trial and conviction of Tweed; was counsel for Gen. Fitz John Porter, who was restored to his military rank after several years of litigation; conducted the successful defense of Gen. di Cesnola in the libel suit arising out of the question as to the authenticity of the Cypriote antiquities presented by him to the Metropolitan Museum of Art. He conducted the litigation in which the U. S. income tax was declared unconstitutional. He is a member of the Union Club and the New England Society, and is a noted after-dinner speaker. He is an active Republican, and a leader in reform movements. He was appointed U. S. ambassador to Great Britain Jan. 19, 1899.

F. Sturges Allen.

Christian and Missionary Alliance: an organization whose objects are stated in its constitution to be "to bear witness to the Lord Jesus Christ in his fullness, to emphasize the baptism of the Holy Ghost, and to work for the evangelization of the neglected classes at home and abroad." It is "a fraternal union of Christians of all evangelical denominations, and in cordial sympathy with all branches of the Church of Christ." Founded in 1887, it was merged with the International Missionary Alliance in 1897, when the present name was adopted. Besides the older auxiliaries established in Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, California, Washington, and Georgia, new branches have been formed in Maine, New Hampshire, Vermont, Ohio, Maryland, Delaware, District of Columbia, North Carolina, South Carolina, Indiana, Michigan, Kentucky, Illinois, Minnesota, and Colorado, and the order has for some time been in operation in Canada; besides there are workers in England, Scotland, Ireland, Switzerland, Spain, Sweden, Norway, Germany, Russia, Turkey, Italy, Egypt, Palestine, India, China, Africa, and South America. Active members sign the following declaration of principles: "I believe in God the Father, Son, and Holy Ghost; in the verbal inspiration of the Holy Scriptures as originally given; in the vicarious atonement of the Lord Jesus Christ, in the eternal salvation of all who believe in him, and the everlasting punishment of all who reject him. I believe in the Lord Jesus Christ as my Saviour, Sanctifier, Healer, and coming Lord." The Missionary Institute, situated at Nyack, N. Y., is unsectarian, and is open "to all men and women called of God to engage in Christian work at home or abroad." Special attention is given, however, to the equipment of foreign missionaries and to securing their adaptability to the various fields of labor.

Christmas Island: a lonely islet of the Indian Ocean; 190 miles S. W. of Java, in S. lat. 10° 25′, E. lon. 105° 42′. The surrounding seas are of enormous depth, and soundings of over 6,000 feet are within 2 miles of its coasts. It was visited by a number of vessels from 1688 to 1890, but good anchorages were not found, and the island, which is only 12 miles long and 3 to 9 miles wide, was reported to be of little value. Later, however, valuable deposits of phosphate of lime were discovered, and about forty persons were living there in 1898, preparing to work the deposits. Substantial houses had been built, wells sunk, and fruit-trees and cocoanut-palms planted. The island is of limestone and coral formation, most of it densely covered with forest, with only five species of mammals (two rats, a shrew-mouse, and two bats), and the land-birds, except birds of passage and a small rail, are all peculiar to it. This isolated spot is of special interest as a place that has been uninhabited till now, and has therefore developed its flora and fauna without the interference of man. The fullest account of it is given by C. W. Andrews, in the *Geographical Journal*, Jan., 1896.

C. C. Adams.

Chronophotography: the art of recording photographically successive phases of a motion or the changes in an animated scene. The first step in the development of chronophotography was reached when the sensitiveness of photographic plates had been brought to the stage which permitted of exposures so brief that during the interval the body which is being photographed shall not perceptibly

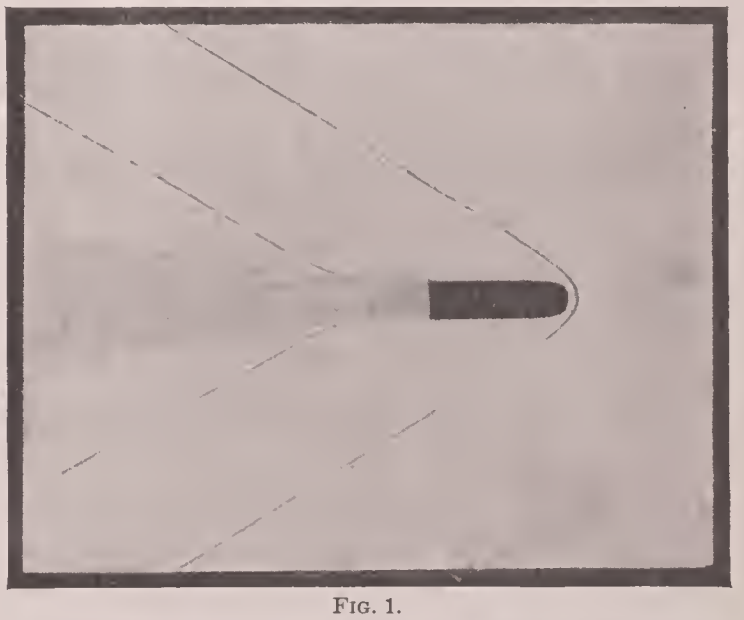


Fig. 1.

have changed its position. In the case of comparatively slow motions it is possible to construct shutters the action of which is prompt enough to fulfill this condition. In other cases, as in the photography of bullets in full flight from the muzzle of the gun, the exceeding brevity of exposure is obtained by the use of the electric spark, the duration of which can be reduced at will almost indefinitely.

The supplementing of ordinary vision by means of such instantaneous photographic records brings out many features that would otherwise long remain unsuspected. Fig. 1, which is reproduced from a drawing after a photograph taken by Boys, and is a view of a projectile from a modern rifle that has just left the gun, will serve to illustrate this fact. The picture shows the existence of waves sent off from a projectile that was traveling at a speed greater than that of sound-waves in air, and which are very much like the waves from the bow and stern of a vessel moving rapidly through water. It likewise shows the highly perturbed state of the atmosphere behind the projectile, like the wake of such a vessel. The exposure was obtained by means of an electric spark, the duration of which was about one-millionth of a second. Such photographs, instructive as they are, serve to record one instantaneous aspect only of the motion under investigation. Chronophotography consists in the production of a series of such views which follow one another at such intervals as will best serve to record all the important phases of the motion. To this end a number of different methods have been employed, each of which is especially adapted to the subject under investigation.

Continuous Exposure on a Fixed Plate.—The earliest example of this type, and probably of any kind of chronophotography, is due to Feddersen,* who in 1862 flashed the image of an electric spark across the face of a sensitized

Fig. 2.

plate by means of a lens and revolving mirror. He succeeded thus in securing photographs which showed the complex character of the discharge and its oscillatory nature. The achievement was the more remarkable when we consider the comparatively undeveloped state of the photographic art at that time, and the fact that it was necessary to use the old-fashioned wet plates. Fig. 2, which is a reproduction of one of the most remarkable of Feddersen's photographs, shows the oscillatory discharge from a battery of Leyden jars between tin spheres. The entire phenomenon recorded in this figure is completed within a few thousandths of a second. In many cases it is possible to obtain a trace representing the motion under investigation by simply attaching a small mirror to the moving body, and by reflecting a beam of light directly to the face of the plate. Merritt† has made in this way many interesting chronophotographs of the motion of a gyroscopic pendulum. One of these is reproduced in Fig. 3.

Fig. 3.

Continued Exposures on a Moving Plate or Film.—For many purposes, particularly in scientific work, chronophotography can be most easily reached by throwing the image of the moving body upon a plate which travels more or less rapidly through the field of view of the camera. The photographic image of a point at rest obtained in this way is a line drawn across the plate in the direction of its motion. All displacements of the points at right angles to the line of motion of the plate produce corresponding transverse displacements of the line that forms its image.

The scientific applications of this form of chronophotography are of two kinds: (*a*) The automatic registry of changes which occur so slowly that the direct observation of them becomes laborious. The continuous daily records of the fluctuations of thermometers and barometers are of this description. In such cases the image or shadow of the moving point is thrown upon a slowly moving strip of photographic paper of small sensitiveness. (*b*) The tracing of fluctuations too rapid to permit of direct observation with the eye. In such cases the plate or film is moved at a high velocity through the field of the camera, and motions the duration of which may amount to only a small fraction of a second are thus recorded in detail.

The motion of the plate through the field in this type of chronophotography is sometimes produced by mounting it in the form of a disk, and giving it a motion of rotation about an axis perpendicular to the face of the plate through its center. This is the method pursued by Crehore and Squier* in their *photochronograph*, an instrument for the study of the velocity of modern projectiles. In this interesting apparatus the projectile is made to break a succession of electrical circuits by penetrating screens placed in its path at given distances. A polarized ray of light on its way to the photographic plate passes through carbon bisulphide contained within the core of a coil traversed by the current. By an ingenious application of the rotatory power of this field upon the plane of polarization of the light-ray, the latter is prevented from reaching the plate whenever the circuit is interrupted. The form of record obtained is shown in Fig. 4, which shows the appearance of one of the plates after development. The broad undulatory circle is the trace of a spot of light passed through an aperture carried on the prongs of a vibrating tuning-fork. This serves as a time-marker. The tracing near the edge of the circle is produced by the polarized ray. The circuit is closed automatically just as the shot is fired. It remains closed until the first screen is reached, at which instant the passage of the light is instantaneously checked by the destruction of the magnetic field. This happens at each screen, and the angular distance between successive interruptions measured in terms of the time, as indicated by the tuning-fork tracing, makes it possible to compute the velocity of the projectile with great accuracy. See Photochronograph.

The number of problems in physics to which chronophotography by continuous exposure on a moving plate is applicable is very large. The slow movements of a magnetometer-needle, which records fluctuations of the earth's magnetism from day to day, may thus register by means of a spot of light thrown from a mirror on a moving strip of sensitized paper; or, on the other hand, the exceedingly rapid electrical oscillations occurring in the charge or discharge of a condenser may be recorded on a plate shot through the field of the camera at high speed. Fig. 5 shows such a tracing made by Millis† with the Hotchkiss‡ galvanometer, an instrument the tiny needle of which, suspended in the magnetic field by means of a quartz fiber so small as to be scarcely visible to the naked eye, oscillates many thousands of times a second. This needle carries a minute mirror cut from the thin cover-glass used in micros-

Fig. 4.

copy, and it is a spot of light reflected from it which makes the tracing shown in the figure. The undulating curve at the top of the figure is due to the motions of a tuning-fork which is used as a time-marker. The curve of greater am-

* Feddersen, *Poggendorff's Annalen*, 116, p. 132.
† Merritt, *Physical Review*, 4, p. 336.

* Crehore and Squier, *The New Polarizing Photochronograph*, New York, 1897.
† Millis, *Physical Review*, 3, p. 351; 4, p. 128.
‡ Hotchkiss and Millis, *Physical Review*, 3, p. 49.

plitude below is that which shows the rapid electrical surges in the circuit of the condenser.

The entire period during which the plate in such experiments is in the field is only a few hundredths of a second, and where it is desirable for any reason to extend the record for a longer time it is necessary to resort to the use of a moving film. A convenient form of camera for such purposes is shown in Fig. 6. It consists of the usual lens and camera-box, behind which, in place of the ordinary plate-holder, is a box containing a drum (D) on the periphery of which the sensitive film is mounted. This film is driven at whatever speed may be desired by means of an electric motor. A slit in the side of the box nearest the camera admits rays of light from the lens. This slit may be opened at the instant when the chronophotograph is to be begun, and it closes automatically after one revolution of the disk has been completed. The image of each point of light which falls on the film thus traverses a path the entire length of the latter.

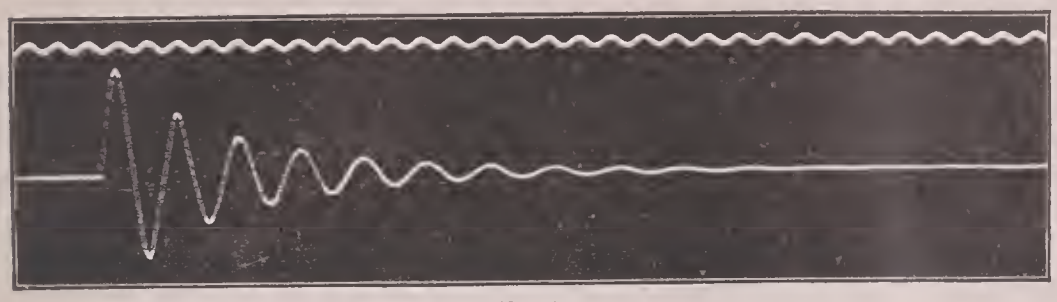


FIG. 5.

This instrument, which can be applied to a great variety of experiments, was used by Nichols and Merritt* in the photography of the manometric flame. The manometric flame, a gas-flame which is made to dance to the rapid vibrations of sound-waves, was devised by Koenig and used by him in a variety of important acoustical experiments. For many years the images of this flame were observed by gazing into a revolving mirror. Merritt,† in 1893, found it possible so to increase the brilliancy of the flame as to make chronophotographs of it practicable. Fig. 7 shows a portion of such a photograph cut from a film, the total length of which was 120 cm. The upper image is that of a flame thrown into vibration by the human voice which utters the rolling sound of the letter *r* (as we hear it when German is spoken). The film was moving with a velocity of 500 cm. per second, so that the time-interval comprised in the portion selected for illustration is about three-hundredths of a second. The brief interruption of the vibration of the flame shown near the center of the picture marks the instant when the tongue touches the roof of the mouth. It lasts about 0·006 second and is repeated about fifty times a second. It is this motion of the tongue which gives the rolling character to the sound. The lower image in Fig. 7 is that belonging to the vowel-sound *a* (flat), as in *slam*.

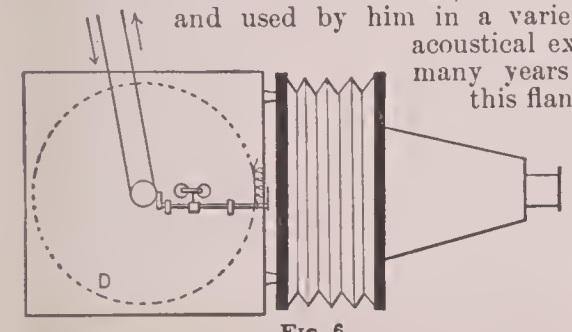


FIG. 6.

By means of this apparatus it is possible to take on a single film records of the movements of the flame during the utterance of a spoken word of three or four syllables or even of a short phrase. The flame records faithfully the thousands of complex undulations which the air undergoes in such a case.*

The apparatus just described has likewise been applied to the study of the movement of a vibrating string. If we look at such a string through a transverse slit so that only a single point or element of it can be seen, this point will be found to move up and down too rapidly to be followed by the unaided eye. If the image of this point be thrown on a photographic plate moving at right angles to the slit, or on the film mounted in the camera just described, that image will trace a curve which indicates precisely the character of the oscillation which the string is undergoing.

In this way Menzel and Raps† in Berlin made chronophotographs of numerous vibrating strings. On the plates used in their experiments it was, however, possible to get the record of only a few successive vibrations. By the use of the long film just described the entire history of the vibrating string, from the moment it is plucked or bowed until the undulation has died away, can be obtained. Such records show beautifully how the overtones which give the vibration its complicated character disappear before the fundamental tone, so that the clang varies continually as the sound fades away. Fig. 8, cut from two parts of the same film, shows these changes.

Still another interesting application of chronophotography on a moving plate is shown in Fig. 9. The subject is the extinction and rekindling of an electric arc. The arc having been properly focused, the plate was shot horizontally through the field of the camera at high speed. Its direction as seen in the figure is from left to right.

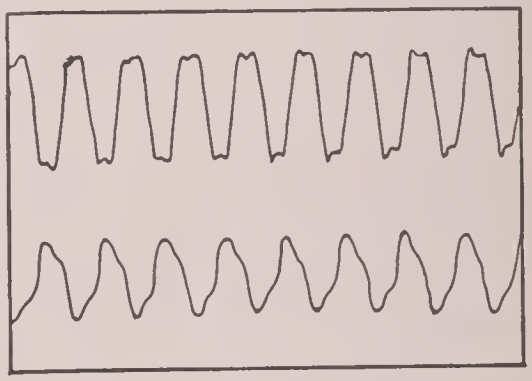


FIG. 8.

In the upper photograph the arc was fed by an alternating current and the exposure was made just as the current changed direction. The light fades away gradually, disappearing last in a region nearly midway between the two carbons, and reappears gradually as the current in the reversed direction is re-established. The horizontal trace of light running across the dark space at the bottom of the picture, but gradually fading out, is due to the tip of the previously positive and consequently hotter carbon.

The lower photograph shows the momentary interruption of a direct-current arc. The light of the arc remains longest in the immediate neighborhood of the positive (upper) carbon. When the circuit is closed again, at the extreme left of the picture, the restoration of the arc is very prompt. Chronophotographic studies of the arc-light have been made by Blondel,‡ McMynn,§ Crew and Basquin,‖ N. H. Brown,¶ and others. The illustrations given here are from the work

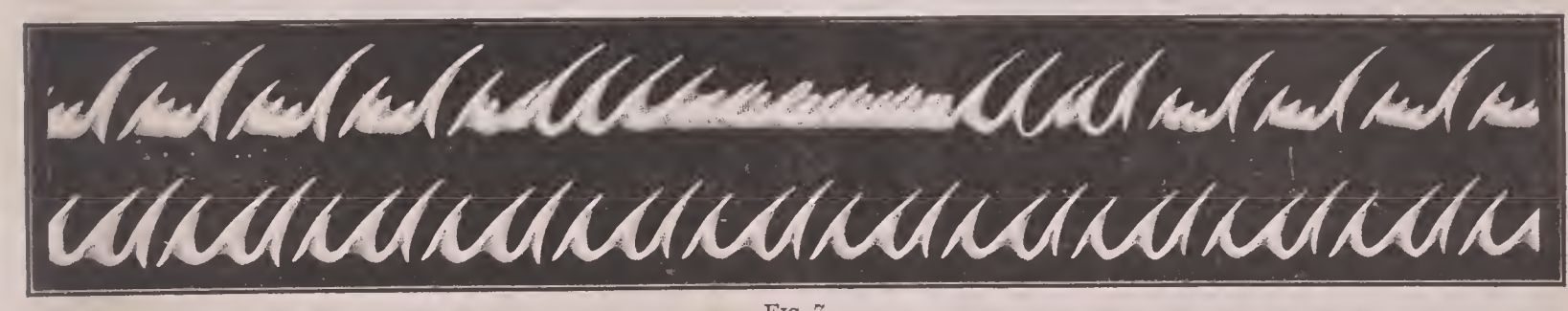


FIG. 7.

* Nichols and Merritt. *Physical Review*, 7, p. 93 (1898).
† Merritt, *Physical Review*, 1, p. 166.

* See, further, Nichols, *Nature*, vol. lix., p. 320 (1899).
† Krigar-Menzel and Raps, *Wiedemann's Annalen*, 44, p. 623.
‡ Blondel. *La Lumière Electrique*, 1891, p. 555.
§ McMynn, *American Institute of Electrical Engineers*, 1891, vol. viii., p. 214.
‖ Crew and Basquin, *American Academy of Arts and Sciences*, 1898, vol. xxxiii.
¶ Brown, *Physical Review*, 1898, vol. vii., p. 210.

of the last-named observer. See, further, the article ELECTRIC ARC, in which is shown (Fig 2) an earlier chronophotograph of the alternating arc.

Successive Instantaneous Exposures on a Fixed Plate.—This method was developed by Marey in Paris and extensively applied by him to the study of movement, particularly to the motions of men and of the lower animals. Fig. 10, which is a reproduction taken at a very early period in the development of chronophotography by Eakins,* will serve

FIG. 9.

to illustrate the application of this method to human motion. It shows successive figures of a jumping boy taken on the same plate. It is, however, to the study of the movements of a single point or of a group consisting at most of three or four points that this method is especially adapted. Marey made numerous studies by this method of the motion of bodies falling freely through space or thrown into the air. He likewise greatly simplified the study of the movements of the human body by attaching bright objects at the wrist, elbow, ankle, knee, etc., of the subject, who was clad in black, illuminating these so that their successive positions would be clearly brought out on the photographic plate. Strips of bright material on the dark clothing served to mark out the line of the limbs (see Fig. 11). The analysis of chronophotographs in which only these groups of points or of lines are shown is much simpler than where the entire body appears. For the numerous instructive and interesting results thus obtained the reader is referred to Marey's well-known work *Le Movement*,† in which his method is fully described and reproductions of a large number of chronophotographs are given. Fig. 12 will serve to illustrate one of the numerous applications of this method. It is from a study of the motion of the right arm of a man suffering from tremor of the hand. Metallic buttons were placed at the shoulder, at the elbow, and on the hand, and were connected by bright stripes. The subject was seated on a chair and told to rise at a given signal. The tremor is clearly brought out by the double row of dots along the path followed by his hand as he arose. It ceases altogether by the time he has reached

FIG. 10.

an upright position. For further details concerning this interesting application of chronophotography to pathology, see the volume on Muybridge's work, cited in a subsequent paragraph of this article.

Muybridge, who was one of the first to turn his attention to this method of chronophotography, made photographs on the Leland Stanford farm in California (1878) for the purpose of illustrating the various gaits of trotting horses. These photographs attracted universal admiration, and the investigation was taken up on a much more elaborate scale under the auspices of the University of Pennsylvania.

* See Marks, *The Mechanism of Instantaneous Photography; Animal Locomotion*, p. 9, Philadelphia, 1888.

† Translated by Pritchard under the title *Movement* (International Science Series, N. Y., 1895).

Successive Instantaneous Views on Separate Plates.—The overlapping of the successive images taken on a single fixed plate led naturally to the development of apparatus in which each exposure should have a free surface to itself. Muybridge, in his Philadelphia experiments, constructed a very extensive and intricate apparatus for this purpose. He used several batteries of cameras for fixed plates, with quick-moving shutters that could be operated electrically by the experimenter. One such battery consisted of twenty-four cameras for 4 × 5 plates. Two smaller batteries of twelve each were subsequently constructed, taking pictures 3 inches square. To describe the ingenious and elaborate electromagnetic devices by which these exposures could be made at the proper instant of time lies beyond the scope of the present article. Readers are referred to the report published by the University of Pennsylvania under the title *Animal Locomotion*.* The results of this work were published in a series of 781 folio plates, each consisting of a group of instantaneous photographs dealing with nearly every type of animal locomotion.

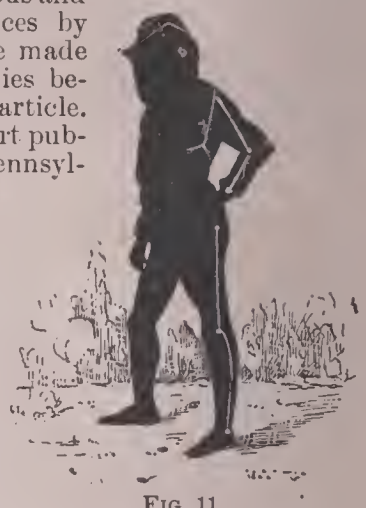


FIG. 11.

Marey, in France, has likewise devised many instruments for this sort of chronophotography, among them an ingenious form of camera known as the "photographic gun." This apparatus (see Fig. 13) was designed particularly for taking chronophotographs of birds in flight and of other rapidly moving objects. The lens is in the barrel of the gun, the breach of which contains the sensitive plate, cut into the form of a disk or octagon and mounted so as to revolve rapidly under the action of a spring when released by the trigger. Twelve exposures are made in one second with this instrument by means of a disk shutter, the opening in which gives an exposure of $\frac{1}{720}$ of a second. Another disk with twelve windows carries the sensitized plate with a properly interrupted motion, so that the plate is at rest during each exposure and is moving forward to a new position between times. The photographs taken with the gun were very small, but they sufficed for the study of the successive positions of the wings of flying birds and for a variety of other similar subjects.

Successive Instantaneous Exposures on a Moving Film.—It is to this type of chronophotography that the greatest amount of attention has been paid in recent years, and which in consequence has been most highly developed. It owes its present perfection to the demand for subjects for the various forms of the *animated-picture machine*, a device

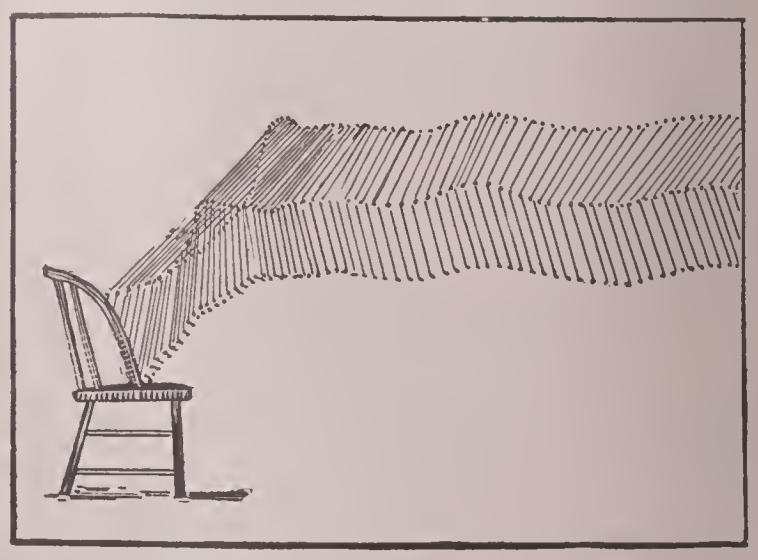


FIG. 12.

by means of which chronophotographs, projected upon a screen, may be viewed by many observers simultaneously.

Such machines are capable of many applications. Demeny, a pupil of Marey, for example, took chronophotographs of the moving lips of a speaker, and, making positives from these, projected them by means of an attachment to the lantern which he called the *photoscope*, for the instruction of

* See *Muybridge's Work at the University of Pennsylvania*, J. B. Lippincott & Co., 1878.

deaf-mutes in the reading of speech. Mach used the method to exhibit the growth of vegetation, for which purpose he photographed a plant daily throughout its life and then projected the pictures with sufficient rapidity to blend the effect by persistence of vision. The plant was thus made to appear to go through all the phases of growth and decline within the interval of a few minutes. The animated-picture machine has received a multitude of names. Jenkins,* in his recent volume on this subject, gives a list of more than one hundred.

All of these machines may be described simply as a form of magic lantern for the projection of chronophotographs on a screen. The successive pictures follow one another in the field at the rate of about twenty in a second. In most

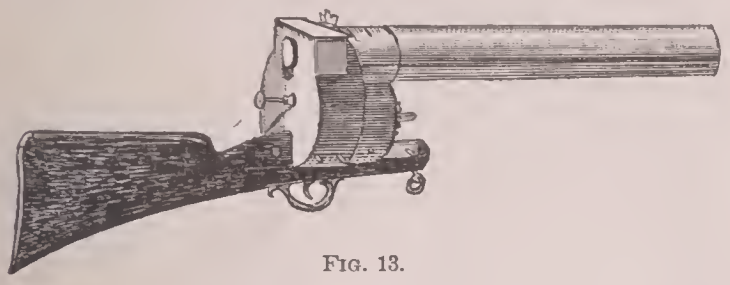


Fig. 13.

machines the film, or picture-ribbon, as it is called, is moved stepwise, the film remaining at rest during the passage of an open sector in a revolving disk which admits the light to the screen, and being shifted the proper distance to bring the next picture into the field during the intervening period of darkness. The usual size of the photographs on these picture-ribbons is about 2·5 cm. by 2 cm. This gives about twenty pictures to each foot of ribbon, and requires 1 foot of film for each second of time that the exhibition is to last. Picture-ribbons are usually made in lengths of 50 feet, but in certain instances where a prolonged scene has to be recorded the lengths run into thousands or even tens of thousands of feet.

Of instruments for the production and exhibition of picture-ribbons there are, in spite of the many names, only two types—that in which the motion of the film is stepwise and that in which it is continuous. The device most frequently employed to secure the rapid stepwise motion, by which the film is brought to rest for a very brief interval of time during which the exposure takes place and is then moved the precise distance necessary for taking the next picture without overlapping or loss of space, consists of a series of equidistant perforations, running along each edge of the film.

Fig. 14 shows a characteristic method of producing the step-by-step movement of the film, both in the camera and in the projecting apparatus. The film, which is perforated as described above, passes from one sprocketed drum (*a*), the teeth of which fit the perforations, downward behind a vertical clip, which holds it in place with slight pressure, and which contains a diaphragm through which the exposure is made. Thence it passes under a similarly constructed drum (*b*) which moves stepwise through the required angle and pulls the film with each motion in such a way as to bring the successive portions rightly centered into the field. There are numerous mechanisms for the purpose of producing with precision this rapidly interrupted movement which has to be repeated without hitch or failure at least twenty times a second.

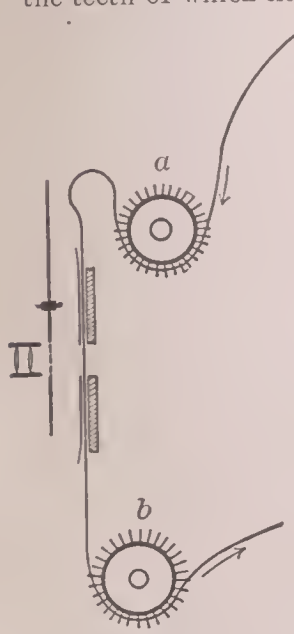


Fig. 14.

To take sharply defined pictures on a constantly moving film, which is necessary in the second type of machine, the exposure must either be of negligible length as compared with the velocity of the film, which with the rapid motions given in animated-picture machines is impracticable, or some device must be employed to prevent the blurring of the picture. The most successful device of this kind consists in moving the lens with a motion parallel to that of the film. The light from the object to the film then travels downward with the same speed as the latter, and there is no relative shifting of the image on the sensitive surface. In this way it is possible to obtain sharp pictures, the exposure of which is properly timed by the interposition of an adjustable slit. The camera for accomplishing this contains several lenses mounted on a disk and traveling with the same linear velocity as the film itself. Jenkins, who was one of the pioneers in the development of the art of producing chronophotographs for purposes of projection, constructed one form of camera in which there were fifteen such lenses. For further details see the article Vitascope; also the various authors cited in the foot-notes to the present article, especially the volumes *Animal Locomotion*, *Le Mouvement*, and *Animated Pictures*; also Woodbury's *Dictionary of Photography* and Jenkins's article on *Muybridge's Work*, *Photographic Times*, July, 1898, p. 292.

E. L. Nichols.

* Jenkins, *Animated Pictures*, Washington, 1898.

Church Temperance Society: an American society organized in 1881 in the Protestant Episcopal Church, and having for its main purpose the promotion of temperance in the use of intoxicating drinks. Those who totally abstain from and those who temperately use liquors as beverages constitute its adult membership. Moral suasion is employed as an adjunct to legal restriction, and the objects of the society are stated to be the training of the young in habits of temperance; the rescue of drunkards; restriction of the saloon by legislation; and the employment of counteractive agencies, such as coffee-houses, workingmen's clubs, reading-rooms, and other resorts. The Church Temperance Legion, an auxiliary under the management of men and women, and comprising the Knights of Temperance, the Young Crusaders, and the Veteran Knights, is chiefly devoted to the welfare of boys, endeavoring to induce them to lead sober lives and to keep morally pure, and to strengthen and perpetuate such habits in men.

Cienfuegos, sē̆e-en-fwā'gōs: a city of Santa Clara province, Cuba; named in honor of a former Cuban governor; situated on Jagua Bay, south coast; 111 miles S. E. of Havana (see map of West Indies, ref. 4–C). The harbor has an area of 26 sq. miles, and is the best, though not the largest, in Cuba. Herrara spoke of it as "unrivaled in the world." The situation, however, was not utilized till Cienfuegos was founded, in 1819. The town became the center of trade for south central Cuba, and the fourth commercial port of the island, ranking after Havana, Matanzas, and Santiago de Cuba. It is connected by rail with Santa Clara, Matanzas, and Havana. Pop. including suburbs, 41,000. C. C. A.

Clark, Charles Edgar: naval officer; b. in Vermont, Aug. 10, 1843; entered the Naval Academy, Annapolis, in 1860 and remained until Oct. 1, 1863, when he was promoted ensign and assigned to duty on the steam-sloop Ossipee of the Western Gulf blockading squadron. Here he remained two years, being engaged in the battle of Mobile Bay, Aug. 5, 1864, and in the bombardment of Fort Morgan, Aug. 23 of the same year. He was commissioned master May 10, 1866, while serving on the Vanderbilt of the Pacific station; became lieutenant Feb. 21, 1867; lieutenant-commander Mar. 12, 1868, and was assigned to the Suwanee, which was wrecked July 7 of the same year. He was attached to the receiving-ship Vandalia at Portsmouth, N. H., 1868–69, and the next year was transferred to the steamer Seminole and later to the ironclad Dictator of the North Atlantic station. During the years 1870 to 1873 he was assigned to the Naval Academy, and then to the Mahopac of the North Atlantic station. He served on the steamers Hartford, Monocacy, and Kearsarge of the Asiatic station 1874–77, and then at the Boston navy-yard for three years. In 1881 he was transferred to the training-ship New Hampshire; was commissioned commander Nov. 15, 1881, and was assigned to the torpedo-station at Newport in 1883. For the next three years he served on the Ranger, engaged in the survey of the North Pacific, and then was lighthouse inspector for four years. In May, 1891, he was assigned to the Mare island navy-yard, San Francisco, where he remained until Sept., 1893, when he was put in command of the Mohican. In Jan., 1895, he was assigned to special duty, and in November was put in command of the receiving-ship Independence for a year. He was promoted captain June 21, 1896, and in the following September was assigned to the Monterey, holding command until Jan., 1898, when he was put in command of the battle-ship Oregon at Mare island navy-yard. On the outbreak of the war with Spain he was ordered to join the North Atlantic squadron, and made a notable voyage around Cape Horn, successfully evading the Spanish war-ships reported to be lying in wait for him off the coast of Brazil, reaching Key West May 27,

1898. He took part in the blockade of the Cuban ports and was engaged in the battle of July 3 off Santiago.

Clark, Edwin Charles, LL. D.: b. in Yorkshire, England, Nov. 5, 1835; was educated at Shrewsbury School and Trinity College, Cambridge University, taking high honors; was formerly scholar and fellow of Trinity College, now (1899) professorial fellow of St. John's College, and Regius Professor of Civil Law in Cambridge University; practiced as a conveyancer in London for a time. He has published *Early Roman Law: Regal Period* (1872); *Analysis of Criminal Liability* (1880); *Practical Jurisprudence* (1883); *Cambridge Legal Studies* (1888). He is a well-known student of archæology and architecture. F. Sturges Allen.

Clark, Rev. William, LL. D., D. C. L.: b. at Inverurie, Aberdeenshire, Scotland, Mar. 26, 1829; educated at the University of Aberdeen and at Oxford; ordained deacon in the Church of England 1857 and priest 1858. He went to Canada in 1882, and became Professor of Mental and Moral Philosophy in Trinity University, Toronto, in 1883. He has delivered public lectures on various literary and biographical subjects; was appointed in 1887 Baldwin lecturer at the University of Michigan, and in 1888 was chosen orator at Hobart College, Geneva, N. Y., and made a member of the college staff. He was a delegate to various synods of the Church of England, and to the Pan-American Congress of Religion and Education at Toronto in 1895. In 1896 he became a member of the Educational Council of Ontario. His writings include *The Redeemer*, sermons (1863); *The Comforter*, sermons (1864); *The Four Temperaments*, sermons (1874); *The Sin of Man and the Love of God*, sermons (1880); *Hefele's History of the Councils*, translated and edited (1886); *Witnesses to Christ* (1888); *Savonarola* (1892); Hagenbach's *History of Christian Doctrine*, translated and edited.

Clarke, Sir Edward George: b. in London, England, Feb. 15, 1841; educated at College House, Edmonton, City of London College, and King's College evening classes; was a writer in the India Office 1859–60; took up the study of law in 1861; became a barrister at Lincoln's Inn in 1864; practiced in the common-law courts with great success, and has been retained in a number of famous cases, including the Bartlett case in 1886, the Baccarat case in 1891, and the Jameson case in 1896; is a fellow of King's College in London, and has been a member of Parliament for Plymouth since 1880; has published a *Treatise on the Law of Extradition* (3d ed. 1888), and several series of public speeches. He was knighted in 1886, when he was made solicitor-general. F. Sturges Allen.

Clarke, Hyde: philologist; b. in London in 1815; became an engineer, and in 1836 was engaged in planning and surveying the Glasgow and Southwestern Railway; went to India in 1849 to aid in establishing a telegraph system, and was afterward active in establishing settlements and building railroads there. He was the founder of the London and County Bank and of the Council of Foreign Bondholders. He wrote a *Military Life of Wellington*, many pamphlets on philosophical subjects, political economy, banking, statistics, railways, international law, foreign loans, and public works, besides philological and ethnological books, among the last-named classes being *Pre-Hellenic Inhabitants of Asia Minor*; *The Connection of the Languages of India and Africa*; *Prehistoric Comparative Philology*; *The Khita and Khita-Peruvian Epoch*; *Serpent and Siva Worship and Mythology*; *The Earliest English*; and *Early History of the Mediterranean Populations*. D. in London, Mar. 1, 1895.

Clarke, William Horatio: organist; b. in Newton, Mass., 1840, and learned to play at a very early age; played the organ in church and the violin at local concerts while still a youth. He has been a church organist continuously since 1856. He settled in Boston as organist and teacher, where he has since remained with the exception of a short period about 1871, when he was superintendent of music in the public schools of Dayton, Ohio. His compositions are chiefly for the organ, and include several theoretical and practical instruction-books. D. E. Hervey.

END OF VOLUME TWO.