



THE IMPERIAL ENCYCLOPEDIA AND DICTIONARY

A LIBRARY OF UNIVERSAL
KNOWLEDGE AND AN UN-
ABRIDGED DICTIONARY OF
THE ENGLISH LANGUAGE
UNDER ONE ALPHABET

IN FORTY VOLUMES

VOLUME 16
GALVANIZED—GOLDHILL

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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS

Note.—(-) is the mark dividing words respelt phonetically into syllables; ('), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

Sound-symbols employed in Respelling.	Representing the Sounds as exemplified in the Words.	Words respelt with Sound-symbols and Marks for Pronunciation.
ā	...rate, fate, fail, aye	...māt, fāt, fāl, ā.
á	...mat, fat	...māt, fāt.
â	...far, calm, father	...fâr, kâm, fâ'thêr.
ä	...care, fair	...câr, fâr.
aw	...fall, laud, law	...fawl, lawd, law.
ē	...mete, meat, feet, free	...mêt, mêt, fêt, frê.
ě	...met, bed	...mêt, béd.
é	...her, stir, heard, cur	...hêr, stêr, hêrd, kêr.
î	...pine, ply, height	...pîn, plî, hît.
ï	...pin, nymph, ability	...pîn, nîmf, ä-bîl'î-tî.
ō	...note, toll, soul	...nôt, töl, söl.
ö	...not, plot	...nôt, plöt.
ó	...move, smooth	...môv, smôth.
ö	...Goethe (similar to <i>e</i> in her)	...gö'têh.
ow	...noun, bough, cow	...noun, bow, kow.
oy	...boy, boil	...boy, boyl.
û	...pure, dew, few	...pür, dü, fû.
ú	...bud, come, tough	...búd, kûm, túf.
ú	...full, push, good	...fúl, pûsh, gúd.
ü	...French plume, Scotch guid	...plüm, güd.
ch	...chair, match	...chär, mäch.
ch	...German buch, Heidelberg, Scotch loch (guttural)	...bôch, hî'del-bêrch, löch.
g	...game, go, gun	...gām, gō, gŭn.
j	...judge, gem, gin	...jŭj, jēm, jĭn.
k	...king, cat, cot, cut	...kĭng, kât, kôt, kŭt.
s	...sit, scene, cell, city, cypress	...sĭt, sĕn, sĕl, sĭt'ĭ, sĭ'prĕs
sh	...shun, ambition	...shŭn, äm-bĭsh'ŭn.
th	...thing, breath	...thĭng, brĕth.
th	...though, breathe	...thō, brĕth.
z	...zeal, maze, muse	...zĕl, māz, mŭz.
zh	...azure, vision	...äzh'ér, vĭzh'ŭn.

ABBREVIATIONS USED IN THIS WORK.

- a., or adj.**...adjective
A.B......Bachelor of Arts
abbr......abbreviation, abbreviated
abl. or abla.ablative
Abp......Archbishop
abt......about
Acad......Academy
acc. or ac.accusative
accom......accommodated, accommodation
act......active
A.D......in the year of our Lord [*Anno Domini*]
Adj......Adjutant
Adm......Admiral
adv. or ad.adverb
A. F......Anglo-French
Ag......Silver [*Argentum*]
agri......agriculture
A. L......Anglo-Latin
Al......Aluminium
Ala......Alabama
Alb......Albanian
alg......algebra
A.M......before noon [*ante meridiem*]
A.M......Master of Arts
Am......Amos
Amer......America, -n
anat......anatomy, anatomical
anc......ancient, anciently
AN. M......in the year of the world [*anno mundi*]
anon......anonymous
antiq......antiquity, antiquities
aor......aorist, -ic
app......appendix
appar......apparently
Apr......April
Ar......Arabic
arch......architecture
archæol......archæology
arith......arithmetic
Ariz......Arizona
Ark......Arkansas
art......article
artil......artillery
AS......Anglo-Saxon
As......Arsenic
Assoc......Association
asst......assistant
astrol......astrology
astron......astronomy
attrib......attributive
atty......attorney
at. wt......atomic weight
Au......Gold [*Aurum*]
- A.U.C.**.....in the year of the building of the city (Rome) [*Anno Urbis conditæ*]
Aug......August
aug......augmentative
Aust......Austrian
A. V......authorized version [of Bible, 1611]
avoir......avoirdupois
B......Boron
B......Britannic
b......born
Ba......Barium
Bart......Baronet
Bav......Bavarian
bl.; bbl......barrel; barrels
B.C......before Christ
B.C.L......Bachelor of Civil Law
B.D......Bachelor of Divinity
bef......before
Belg......Belgic
Beng......Bengali
Bi......Bismuth
biog......biography, biographical
biol......biology
B.L......Bachelor of Laws
Bohem......Bohemian
bot......botany, botanical
Bp......Bishop
Br......Bromine
Braz......Brazilian
Bret......Breton
Brig......Brigadier
Brit......British, Britanica
bro......brother
Bulg......Bulgarian
bush......bushel, bushels
C......Carbon
c......century
Ca......Calcium
Cal......California
Camb......Cambridge
Can......Canada
Cant......Canterbury
cap......capital
Capt......Captain
Card......Cardinal
carp......carpentry
Cath......Catholic
caus......causative
cav......cavalry
Cd......Cadmium
Ce......Cerium
Celt......Celtic
cent......central
cf......compare [*confer*]
ch or chh......church

ABBREVIATIO 3.

Chal.....	Chaldee	diff.....	different, difference
chap.....	chapter	dim.....	diminutive
chem.....	chemistry, chemical	dist....	district
Chin.....	Chinese	distrib..	distributive
Chron.....	Chronicles	div.....	division
chron.....	chronology	doz.....	dozen
Cl.....	Chlorine	Dr.....	Doctor
Class.....	Classical [= Greek and Latin]	dr.....	dram, drams
Co.....	Cobalt	dram.....	dramatic
Co... ..	Company	Dut. or D..	Dutch
co... ..	county	dwt.....	pennyweight
cog.....	cognate [with]	dynam or	
Col.....	Colonel	dyn.....	dynamics
Col.....	Colossians	E.....	Erbium
Coll.....	College	E. or e....	East, -ern, -ward
colloq.....	colloquial	E. or Eng..	English
Colo.....	Colorado	Eccl.....	Ecclesiastes
Com.....	Commodore	eccl. or	} ecclesiastical [af-
com.....	commerce, commercial	eccles....		} fairs]
com.....	common	ed.....	edited, edition, editor
comp.....	compare	e.g.....	for example [ex-
comp.....	composition, compound		gratia]
compar....	comparative	E. Ind. or	} East Indies, East
conch.....	conchology	E. I....		} Indian
cong.....	congress	elect.....	electricity
Congl.....	Congregational	Emp... ..	Emperor
conj.....	conjunction	Encyc.....	Encyclopedia
Conn or Ct.	Connecticut	Eng. or E..	English
contr.....	contraction, contracted	engin.....	engineering
Cop.....	Coptic	entom.....	entomology
Cor.....	Corinthians	env. ext....	envoy extraordinary
Corn.....	Cornish	ep.....	epistle
corr.....	corresponding	Eph.....	Ephesians
Cr.....	Chromium	Episc.....	Episcopal
crystal....	crystallography	eq. or =...	equal, equals
Cs.....	Cæsium	equiv... ..	equivalent
ct.....	cent	esp.....	especially
Ct. or Conn.	Connecticut	Est.....	Esther
Cu.....	Copper [Cuprum]	estab.....	established
cwt.....	a hundred weight	Esthon....	Esthonian
Cyc.....	Cyclopedia	etc.....	and others like [et
D.....	Didymium		cetera]
D. or Dut..	Dutch	Eth.....	Ethiopic
d.....	died	ethnog....	ethnography
d. [l. s. d.]	penny, pence	ethnol.....	ethnology
Dan.....	Daniel	et seq.....	and the following
Dan.....	Danish		[et sequentia]
dat.....	dative	etym.....	etymology
dau.....	daughter	Eur.....	European
D. C.....	District of Columbia	Ex.....	Exodus
D.C.L.....	Doctor of Civil [or Common] Law	exclam.....	exclamation
D.D.....	Doctor of Divinity	Ezek.....	Ezekiel
Dec.....	December	Ezr.....	Ezra
dec.....	declension	F.....	Fluorine
def.....	definite, definition	F. or Fahr.	Fahrenheit
deg.....	degree, degrees	f. or fem..	feminine
Del.....	Delaware	F. or Fr....	French
del.....	delegate, delegates	fa.....	father
dem.....	democratic	Fahr. or F.	Fahrenheit
dep.....	deputy	far.....	farriery
dep.....	deponent	Fe.....	Iron [Ferrum]
dept.....	department	Feb.....	February
deriv.....	derivation, derivative	fem or f. .	feminine
Deut.....	Deuteronomy	fig.....	figure, figuratively
dial.....	dialect, dialectal	Fin.....	Finnish
diam.....	diameter	F.—L.....	French from Latin
Die.....	Dictionary	Fla.....	Florida
		Flem... ..	Flemish
		for....	foreign
		fort.....	fortification
		Fr. or F..	French
		fr.....	from

ABBREVIATIONS.

freq.....	frequentative	ind.....	indicative
Fris	Frisian	indef	indefinite
ft.....	foot, feet	Indo-Eur...	Indo-European
fut.....	future	inf	infantry
G. or Ger...	German	inf or infin.	infinitive
G.....	Glucinium	instr.....	instrument, -al
Ga.....	Gallium	int.....	interest
Ga.....	Georgia	intens.....	intensive
Gael	Gaelic	interj. or	
Gal	Galatians	int	interjection
gal	gallon	interrog...	interrogative
galv.....	galvanism, galvanic		noun
gard.....	gardening	intr. or	
gen.....	gender	intrans...	intransitive
Gen.....	General	Io...	Iowa
Gen	Genesis	Ir.....	Iridium
gen.....	genitive	Ir.....	Irish
Geno.....	Genoese	Iran.....	Iranian
geog	geography	irr	irregular, -ly
geol.....	geology	Is.....	Isaiah
geom.....	geometry	It	Italian
Ger	German, Germany	Jan.....	January
Goth.....	Gothic	Jap.....	Japanese
Gov.....	Governor	Jas.....	James
govt.....	government	Jer...	Jeremiah
Gr.....	Grand, Great	Jn.....	John
Gr.....	Greek	Josh.....	Joshua
gr.....	grain, grains	Jr	Junior
gram	grammar	Judg	Judges
Gr. Brit....	Great Britain	K.....	Potassium [<i>Kalium</i>]
Gris.....	Grisons	K	Kings [in Bible]
gun	gunnery	K	king
H.....	Hegira	Kan.....	Kansas
H.....	Hydrogen	Kt.....	Knight
h.....	hour, hours	Ky.....	Kentucky
Hab.....	Habakkuk	L.....	Latin
Hag.....	Haggai	L.....	Lithium
H. B. M....	His [or Her] Britan- nic Majesty	l. [l. s. d.],	} pound, pounds or £..... } [sterling]
Heb.....	Hebrew, Hebrews	La.....		Lanthanum
her.....	heraldry	La.....	Louisiana
herpet.....	herpetology	Lam.....	Lamentations
Hg....	Mercury [<i>Hydrar- gyrum</i>]	Lang.....	Languedoc
hhd.....	hogshead, hogsheads	lang...	language
Hind.....	Hindustani, Hindu, or Hindi	Lap...	Lapland
hist	history, historical	lat	latitude
Hon	Honorable	lb.; lb. or	} pound; pounds lbs..... } [weight]
hort.....	horticulture	Let . . . . .		Lettish
Hos	Hosea	Lev	Leviticus
Hung.....	Hungarian	LG.....	Low German
Hydros.....	Hydrostatics	L.H.D.....	Doctor of Polite Lit- erature
I	Iodine	Lieut.....	Lieutenant
I.; Is.....	Island; Islands	Lim	Limousin
Icel.....	Icelandic	Lin	Linnæus, Linnæan
ichth.....	ichthyology	lit	literal-ly
Ida.....	Idaho	lit	literature
i.e.....	that is [<i>id est</i>]	Lith..	Lithuanian
Ill.....	Illinois	lithog.....	lithograph, -y
illus.....	illustration	LL.....	Late Latin, Low Latin
impera or		LL.D.....	Doctor of Laws
impr.....	imperative	long.....	longitude
impers.....	impersonal	Luth.....	Lutheran
impf or imp	imperfect	M.....	Middle
impf. p. or		M..	Monsieur
imp	imperfect participle	m..	mile, miles
improp....	improperly	m. or masc.	masculine
In.....	Indium	M.A.....	Master of Arts
in	inch, inches	Macc.	Maccabees
incept.....	inceptive	mach...	machinery
Ind	India, Indian	Mag.....	Magazine
Ind.....	Indiana		

ABBREVIATIONS.

Maj.....	Major	N. A., or	
Mal.....	Malachi	N. Amer.	North America, -n
Mal.....	Malay, Malayan	nat.....	natural
manuf.....	manufacturing, manufacturers	naut.....	nautical
Mar.....	March	nav.....	navigation, naval af- fairs
masc or m.	masculine	Nb.....	Niobium
Mass.....	Massachusetts	N. C. or	
math	mathematics, math- ematical	N. Car...	North Carolina
Matt.....	Matthew	N. D	North Dakota
m.d.....	Doctor of Medicine	Neb	Nebraska
MD.....	Middle Dutch	neg.....	negative
Md	Maryland	Neh	Nehemiah
ME.....	Middle English, or Old English	N. Eng.....	New England
Me.....	Maine	neut or n.....	neuter
mech.....	mechanics, mechani- cal	Nev.....	Nevada
med.....	medicine, medical	N.Gr.....	New Greek, Modern Greek
mem.....	member	N. H	New Hampshire
mensur....	mensuration	NHG	New High German [German]
Messrs. or		Ni	Nickel
MM	Gentlemen, Sirs	N. J.....	New Jersey
metal.....	metallurgy	NL	New Latin, Modern Latin
metaph....	metaphysics, meta- physical	N. Mex.....	New Mexico
meteor.....	meteorology	N. T., or	
Meth.....	Methodist	N. Test...	New Testament
Mex.....	Mexican	N. Y..	New York [State]
Mg	Magnesium	nom	nominative
M.Gr	Middle Greek	Norm. F...	Norman French
MHG....	Middle High Ger- man	North. E ..	Northern English
Mic.....	Micah	Norw... ..	Norwegian, Norse
Mich	Michigan	Nov.....	November
mid.....	middle [voice]	Num.....	Numbers
Milan.....	Milanese	numis.....	numismatics
mid. L. or }	Middle Latin, Me- ML. } diaeval Latin	O.....	Ohio
milit. or		O.....	Old
mil.....	military [affairs]	O.....	Oxygen
min	minute, minutes	Obad.....	Obadiah
mineral....	mineralogy	obj.....	objective
Minn	Minnesota	obs. or † ..	obsolete
Min. Plen..	Minister Plenipoten- tiary	obsoles	obsolescent
Miss	Mississippi	O.Bulg	Old Bulgarian or Old Slavic
ML. or	Middle Latin, Me- mid. L. } diaeval Latin	Oct.....	October
MLG.....	Middle Low German.	Odontog...	odontography
Mlle.....	Mademoiselle	OE.....	Old English
Mme	Madam	OF or	
Mn.....	Manganese	O. Fr....	Old French
Mo.....	Missouri	OHG.....	Old High German
Mo.....	Molybdenum	Ont.....	Ontario
mod.....	modern	opt	optics, optical
Mont	Montana	Or.....	Oregon
Mr.....	Master [Mister]	ord	order
Mrs.....	Mistress [Missis]	ord....	ordnance
MS.; MSS..	manuscript; manu- scripts	org....	organic
Mt.....	Mount, mountain	orig	original, -ly
mus	music	ornith.	ornithology
mus.doc...	Doctor of Music	Os	Osmium
myth	mythology, mytho- logical	OS.	Old Saxon
N.....	Nitrogen	O. T., or	
N. or n....	North, -ern, -ward	O. Test...	Old Testament
n	noun	Oxf.....	Oxford
n or neut..	neuter	oz.....	ounce, ounces
Na	Sodium [<i>Natrium</i>]	P.....	Phosphorus
Nah.....	Nahum	p.; pp.....	page; pages
		p. or part..	participle
		Pa. or Penn.	Pennsylvania
		paint	painting
		palæon.....	palæontology
		parl	parliament
		pass.....	passive

ABBREVIATIONS.

pathol or path.....pathology
 Pb.....Lead [*Plumbum*]
 Pd.....Palladium
 Penn or Pa. Pennsylvania
 perf.....perfect
 perh.....perhaps
 Pers.....Persian, Persic
 pers.....person
 persp... ..perspective
 pert.....pertaining [to]
 Pet.....Peter
 Pg. or Port. Portuguese
 phar.....pharmacy
 PH.D.....Doctor of Philoso-
 phy
 Phen.....Phenician
 Phil.....Philippians
 Philem.....Philemon
 philoi....philology, philologi-
 cal
 philos. { philosophy, philo-
 or phil... } sophical
 phonog....phonography
 photog....photography
 phren... ..phrenology
 phys... ..physics, physical
 physiol...physiology, physi-
 ological
 Pied.....Piedmontese
 Pl... ..Plate
 pl. or plu...plural
 Pl. D.....Platt Deutsch
 plupf.....pluperfect
 P.M.....[afternoon|*post meri-*
 diem]
 pneum... ..pneumatics
 P. O.....Post-office
 poet.....poetical
 Pol.....Polish
 pol econ...political economy
 polit.....politics, political
 pop... ..population
 Port. or Pg. Portuguese
 poss.....possessive
 pp.....pages
 pp.....past participle, per-
 fect participle
 p. pr.....present participle
 Pr. or Prov. Provençal
 pref.....prefix
 prep.....preposition
 Pres.....President
 pres.....present
 Presb.....Presbyterian
 pret.....preterit
 prim.....primitive
 priv.....privative
 prob.....probably, probable
 Prof.....Professor
 pron.....pronoun
 pron.....pronunciation, pro-
 nounced
 prop.....properly
 pros.....prosody
 Prot... ..Protestant
 Prov. or Pr. Provençal
 Prov.....Proverbs
 prov.....province, provincial
 Prov. Eng. Provincial English
 Prus.....Prussia, -n
 Ps.....Psalm, Psalms
 psychol...psychology

pt.....past tense
 pt.....pint
 Pt.....Platinum
 pub.....published, publisher,
 publication
 pwt.....pennyweight
 Q.....Quebec
 qt.....quart
 qtr.....quarter [weight]
 qu.....query
 q.v.....which see [*quod*
 vide]
 R.....Rhodium
 R.....River
 Rb.....Rubidium
 R. Cath....Roman Catholic
 rec. sec... ..recording secretary
 Ref.....Reformed
 refl.....reflex
 reg.....regular, -ly
 regt.....regiment
 rel. pro. or
 rel.....relative pronoun
 repr.....representing
 repub....republican
 Rev... ..Revelation
 Rev.....The Reverend
 Rev. V....Revised Version
 rhet.....rhetoric, -al
 R. I.....Rhode Island
 R. N.....Royal Navy
 Rom.....Roman, Romans
 Rom.....Romanic or Ro-
 manice
 Rom. Cath. { Roman Catholic
 Ch. or R. } Church
 C. Ch.... }
 r.r.....railroad
 Rt. Rev... ..Right Reverend
 Ru.....Ruthenium
 Russ.....Russian
 r.w.....railway
 S.....Saxon
 S.....Sulphur
 s.....second, seconds
 s. [l. s. d.]..shilling, shillings
 S. or s.....South, -ern, -ward
 S. A. or
 S. Amer..South America, -n
 Sam.....Samaritan
 Sam.....Samuel
 Sans, or
 Skr.....Sanskrit
 Sb.....Antimony [*Stibium*]
 s.c.....understand, supply,
 namely [*scilicet*]
 S. C. or
 S. Car....South Carolina
 Scand.....Scandinavian
 Scot.....Scotland, Scotch
 scr.....scruple, scruples
 Scrip.....Scripture [s], Scrip-
 tural
 sculp.....sculpture
 S. D.....South Dakota
 Se.....Selenium
 sec.....secretary
 sec.....section
 Sem.....Semitic
 Sep.....September
 Serv.....Servian
 Shaks.....Shakespeare
 Si.....Silicon

ABBREVIATIONS.

Sic.....	Sicilian	trigon.....	trigonometry
sing.....	singular	Turk.....	Turkish
sis.....	sister	typog.....	typography, typographical
Skr. or		U.....	Uranium
Sans.....	Sanskrit	ult.	ultimate, -ly
Slav.....	Slavonic, Slavic	Unit.....	Unitarian
Sn....	Tin [<i>Stannum</i>]	Univ.....	Universalist
Soc.....	Society	Univ... ..	University
Song Sol..	Song of Solomon	U. Presb...	United Presbyterian
Sp.....	Spanish	U. S... ..	United States
sp. gr.....	specific gravity	U. S. A....	United States Army
sq.....	square	U. S. N....	United States Navy
Sr.....	Senior	Ut.....	Utah
Sr	Strontium	V.....	Vanadium
St. Ste....	Saint	v.....	verb
St.	street	Va	Virginia
stat.....	statute	var.....	variant [word]
s.T.D.....	Doctor of Sacred Theology	var	variety of [species]
subj.....	subjunctive	Ven.....	Venerable
suf.....	suffix	Venet.....	Venetian
Su. Goth..	Suo-Gothic	vet....	veterinary
superl .. .	superlative	v. i. or	
Supp.....	Supplement	v. intr....	verb intransitive
Supt .. .	Superintendent	vil.....	village
surg.....	surgery, surgical	viz.....	namely, to-wit [<i>vide licet</i>]
Surv.....	surveying	v. n.....	verb neuter
Sw.....	Swedish	voc	vocative
Swab.....	Swabian	vol.....	volume
sym.....	symbol	vols.....	volunteers
syn.....	synonym, -y	Vt.....	Vermont
Syr.....	Syriac, Syrian	v. tr.....	verb transitive
t	town	W.....	Tungsten [<i>Wolfram</i>]
Ta... ..	Tantalum	W	Welsh
Tart.....	Tartar	W. or w....	West, -ern, -ward
Te.....	Tellurium	Wal	Walachian
technol ...	technology	Wall.....	Walloon
teleg.....	telegraphy	Wash. . . .	Washington
Tenn.....	Tennessee	Westph....	Westphalia, -n
term.....	termination	W. Ind. . .	West Indies, West or W. I... } Indian
terr.....	territory	Wis.....	Wisconsin
Teut.....	Teutonic	wt.....	weight
Tex.....	Texas	W. Va.....	West Virginia
Th	Thorium	Wyo.....	Wyoming
theat	theatrical	Y.....	Yttrium
theol.....	theology, theological	yd.....	yard
therap.....	therapeutics	yr.....	year
Thess	Thessalonians	Zech.....	Zechariah
Ti.....	Titanium	Zeph.	Zephaniah
Tim.....	Timothy	Zn	Zinc
Tit.....	Titus	zool.....	zoology, zoological
Tl	Thallium	Zr.....	Zirconium
toxicol ...	toxicology		
tp.....	township		
tr. or trans.	transitive		
transl.....	translation, translated		

See also ABBREVIATIONS: in Vol. I.

IMPERIAL ENCYCLOPEDIA AND DICTIONARY.

GALVANIZED IRON: term applied to iron coated with zinc, to prevent it from rusting. The iron is simply dipped in zinc, and is not coated by any galvanic process as its name would imply. Zinc, after a short exposure to air, becomes coated with a film of oxide, which does not increase, and this preserves both the zinc itself as well as the iron beneath it from further decay, provided there is no galvanic action going on between the two metals. Probably, however, this action does take place, and the iron is in that case protected by its acting as an electro-negative element to the zinc. But whatever the true explanation of the matter may be, practically it is found that iron so coated resists the oxidizing effects of air and water extremely well.

The process of coating iron with zinc is now practiced on a most extensive scale, and like some other inventions of modern times, has been claimed by patentees who were plainly not the original inventors. The French chemist, Dumas, states that so long ago as 1742, Malouin knew of a plan for coating iron with zinc. There is no doubt of the fact, at all events, for it is stated in Bp. Watson's *Chemical Essays*, 1786, that a method (essentially the same as that now in use for zincing iron) was then practiced at Rouen for coating hammered iron sauce pans with zinc, and some details of the operation are given. The first English patent for the process was granted to H. W. Craufurd 1837, and another for the zincing of iron previously tinned was taken out by E. Morewood 1841. Like most patents for processes or machines which are commercially successful, these were subjected to much dispute and litigation, and their validity deserved to be attacked. We prefer nowadays to coat our iron cooking-vessels with tin instead of zinc; but in a recently published volume of great interest on the *Industries of Birmingham*, it is stated that 'galvanized iron buckets, hardly known twenty-five years ago, are now sold by tens of thousands weekly.'

Craufurd's process, much the same as that now in use, was first to remove the rust and scale from the iron, by *pickling*—that is, immersing it in dilute sulphuric or hydrochloric acid, either hot or cold; but the hot was preferred; and for this purpose the acid was kept warm in a large

GALVANIZED IRON.

leaden bath, sunk in the ground for easier access. After the sheets or other articles of iron have been acted upon by the acid for a few minutes more or less, according to their requirements, they are plunged into cold water, to remove the acid, and afterward scoured with sand, and again washed clean with water. The iron being now ready to receive its coating of zinc, it is plunged into a bath of that metal, which, previous to its being melted, is coated with a thick layer of dry sal-ammoniac (chloride of ammonium); this melts also, and forms a viscid coating over the metal, which prevents that rapid oxidation to which otherwise the molten metal is liable.

For inferior material, the scouring with sand is usually dispensed with. The sheets of iron are then made to pass between two iron rollers in the zinc bath, and are thus more easily drawn through and kept perfectly smooth. Ships' bolts, nails, screws, chains, etc., are dipped in, in bundles, or in the case of nails, etc., in iron strainers; when removed the zinc makes them adhere together; and to effect their separation, they have to be placed in a crucible with powdered charcoal, in which they are heated to redness, and repeatedly shaken as they cool; by this means they are easily separated.

The important article of telegraph wire, of which some single firms annually turn out thousands of miles, is coated with zinc entirely by machinery. The iron wire from the drawing-mill, is passed through a pipe kept at white-heat by passing through a furnace; this furnace having a row of such pipes set like the tubes of a boiler, but all at the same level, and open at each end, so that the wire has a clear passage through. Next the wire passes at a dull red-heat through dilute hydrochloric acid, and immediately afterward through a bath of zinc, the process being performed by a self-acting apparatus having a series of drums.—The use of galvanized iron is daily increasing. It is largely employed in the form of sheets both plain and corrugated for roofs, sheds, cisterns, and arches of fire-proof floors; in the state of wire, besides that used in telegraphs, a large quantity is employed for wire-ropes, netting, and the like; and it has innumerable minor applications, such as for water-vessels, ship-fittings, and many other articles formerly made of wood, copper, brass, slate, etc. For most of these purposes the zinc coating is much more lasting and less troublesome than paint would be; but still in certain situations, as where it is exposed to the action of sulphurous compounds in smoke, and where its surface is brought directly into contact with other deleterious chemical substances, its use cannot be recommended.

The plan adopted by Morewood and Rogers for making the variety of galvanized iron called *galvanized tinned iron*, referred to above, is as follows: The sheets or other articles, after being pickled, and scoured, and washed, as in the usual process, are transferred to a large wooden bath. On the bottom of the bath is placed first a layer of finely granulated zinc, then a sheet of the iron, then another layer of granulated zinc, and so on as far as convenient; and the

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bath is filled up with a diluted solution of chloride of tin, so that by means of the galvanic action produced, the tin becomes deposited thinly over the sheets of iron. The plates are then taken to the zinc bath, prepared exactly as in the ordinary process, where they are dipped or passed through the rollers. By this process, a very even deposit of zinc is produced, and the material so made is preferred for some purposes to ordinary galvanized iron, though its properties are much the same.

GALVESTON, *găl'vès-ton*: city, port of entry, cap. of G. co., Tex.; on an island at mouth of G. Bay; s.e. terminus of the G. Houston and Henderson, and the Gulf Colorado and Santa Fé railroads; terminus of steamship lines to New York, New Orleans, Indianola, Morgan City, Havana, Vera Cruz, and Liverpool; lat. 29° 18' n., long. 94° 50' w. The island of G., which was the headquarters of Lafitte, the pirate, 1817-21, separates the Bay of G. from the Gulf of Mexico, is about 30 m. long and 3 m. wide, and is generally level with an elevation of 3 to 5 ft. above the water. The harbor is the best in the state, has from 12 to 15 ft. of water over the bar at high tide, and accommodates a large amount of shipping. With its steamship and railroad facilities G. occupies an exceptionally advantageous position, which her business men have fully utilized. The city is beautifully laid out with wide straight streets, which have a Spanish appearance with their bordering flower-gardens; is provided with substantial wharves and numerous large warehouses near them, is lighted with gas and electricity, has an efficient water, sewage, fire, and police service, and is one of the most healthful cities on the continent. It contains 33 churches divided denominationally as follows: Rom. Cath. 6; Prot. Episc. 4; Meth. Episc. 4; Bap. 2; Presb. 2; Christian 1; Evangelical 1; Jew 1; Lutheran 1; New Church 1; colored: Bapt. 5; Meth. 4; Prot. Episc. 1. There are a high and 5 dist. schools, 3 colored schools, and 21 select, private, and denominational schools. The Univ. of St. Mary (Rom. Cath.) was founded 1854; the Ursuline convent has a girls' acad. connected with it; there are 3 girls' seminaries, and the G. medical college founded 1864. There are 2 orphan asylums; 2 public libraries; a house of refuge; 3 hospitals, one of which is supported by the city; 2 national banks (cap. \$425,000), 2 state banks (cap. \$300,000), and 4 private banks. A capital of nearly \$3,000,000 is invested in manufactures; more than 1,500 hands are employed in these industries. The principal industry is the compressing and shipping of cotton, for which there are 5 large presses; one company owns 14 brick warehouses, each occupying 2½ acres, another 3 brick warehouses, covering 7½ acres. A cotton-seed oil mill covers 2½ acres and has been in operation several years. Beside cotton, the leading exports are wool, hides, cotton-seed oil and oil cake, bones, horns, and lumber, chiefly walnut. Other notable industries are a large artificial ice factory, 2 iron foundries, several planing mills, and door, sash, and blind factories. The city is governed by a mayor and board of 12 aldermen. There are 4

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daily and 2 (religious) weekly newspapers, and several hotels including one of the most commodious in the southern states, on the Gulf beach of the island. G. is the seat of a Rom. Cath. bp. Lafitte's piratical quarters were broken up 1831. G. took its commercial start 1837, and was incorporated 1838. In the civil war it was seized by the Union forces 1862, Oct. 8, but the Confederates regained it 1863, Jan. 1. It has been free from epidemic of every kind since 1857. On 1900, Sept. 8, a fearful storm and tidal wave visited G. causing a loss of life in the city of 6,000, and outside of city from 1,000 to 2,000. Property loss aggregated \$17,058,275. Pop. (1890) 29,084; (1900) 37,789.

. GALVEZ, *gál'veth*, BERNARDO, Count de: Spanish gov. of La. and viceroy of Mexico, 1755—1786, Nov. 30; b. Malaga, Spain; son of Matias G., viceroy of Mexico. He was educated for a military career in Spain and France, became brig.gen. for services against the Moors, was appointed second in command to Luis de Unuzaga, gov. of La., and succeeded him within a few months 1776, aided the Americans early in the revolution, fought the English when Spain joined the war and captured various places including Pensacola (1781, May 10), was created a count, appointed capt.-gen. of Cuba, La., and the two Floridas 1784, and succeeded his father as viceroy of Mexico. He built the famous palace of Chapultepec.

GALWAY, *gawol'wā*: maritime county of Ireland, province of Connaught, and, after Cork, largest of the Irish counties. It is bounded on the e. by two navigable rivers, the Shannon, and its affluent the Suck; and on the w. by the Atlantic Ocean. Area 1,566,354 acres, of which one half is arable, and most of the rest uncultivated. It is watered in the e. by the Shannon, the Suck, and their feeders; and in the w. by loughs Mask and Corrib. and by the streams which fall into these loughs and into G. Bay. In the s. are the Slieve-Baughta Mountains; and in the w. are the well-known Twelve Pins, a striking mountain group, with general elevation of about 2,000 ft.; and the Maam-Turk Mountains, of about equal height. This w. portion of the county is exceedingly wild and romantic; the hills are separated by picturesque glens, and by secluded and beautiful loughs. S.w. from the Lough Corrib to the sea is the district called Connemara, which contains vast bogs, moors, lakes, and morasses, and presents a peculiarly bleak and dreary aspect. N.e. of Connemara is Joyce's Country, and s.e. of it is Iar-Connaught, or Western Connaught. The coast-line is stated to be about 400 m. in length, and the shore is much broken and fringed with numerous islands. On the coast of Connemara (*Cun-na-mar*, 'bays of the sea') and Iar-Connaught, there are more harbors for large vessels than on any equal extent of coast perhaps in Europe. The climate is mild and humid, but in low-lying localities, sometimes unhealthful. The richest soil is in the district between the head of Galway Bay and the Shannon. Agriculture and fishing are the general pursuits; kelp is largely manufactured: also woolens, linens, friezes, felt hats, are

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manufactured. The lakes and loughs, as well as the coasts of G., are well stocked with fish. The county of G. abounds in ancient remains of the Celtic as well as of the English period. *Raths* and *cromlechs* are numerous; monastic ruins are found in all parts of the county; a very fine specimen of this class is that of Knockmoy, near Tuam; and there are no fewer than seven round towers in the county. Since 1885, G. county has returned four members to parliament.—Pop. (1851) 297,897; (1871) 248,458; (1881) 241,652. of whom 234,183 Rom. Cath., 6,545 Episc., 614 Presbyterian; (1891) 214,256; (1901) 192,549.

GALWAY: county town and parliamentary borough of Ireland, a seaport and county of itself, with an exclusive jurisdiction extending two m. on the n., e., and w.; at the mouth of the river Corrib, on the n. shore of G. Bay (q.v.), 50 m. n.n.w. from Limerick, 130 m. w.s.w. from Dublin. It is built on both sides of the river, and on two islands in its channel, its parts being united by two bridges. It is connected with Lough Corrib by a canal, and forms the terminus of the Midland Great Western railway. A line of steamers for a time plied between G. and N. America, seven days being the usual time for a fair passage. The old town of G. is poorly built and irregular, and some of its older houses have a somewhat Spanish appearance, which is accounted for by the commercial intercourse at one time between G. and Spain. To one of these houses, marked with a skull and crossbones, a remarkable story is attached, of a mayor of G., James Lynch Fitzstephen, who, 1493, like Brutus of old, condemned his own son to death for murder, and in order to prevent his being rescued, actually caused him to be hanged from his own window. The new town consists of well-planned and spacious streets, and is built on a rising-ground, which slopes gradually toward the sea and the river. The suburbs are mainly collections of wretched cabins, inhabited by miserably poor people. One of these suburbs, called Claddagh, is inhabited by fishermen, who exclude all strangers from their society, and marry within their own circle. These fishermen still speak the Irish language, and the Irish costume is still worn by the women. They annually elect a 'mayor,' whose function it is to administer the laws of their fishery, and to superintend all internal regulations. One of the principal buildings of G. is the parish church of St. Nicholas, founded 1320, in connection with which is an ecclesiastical body called the Royal College of G., consisting of a warden and eight vicars choral, elected by the Prot. members of the corporation. In the Rom. Cath. Church a similar ecclesiastical arrangement formerly existed. The see of Enachdune, of which G. formed a part, was united to Tuam 1324; but in 1484, G. was constituted a wardenship, with a distinct jurisdiction, similar to that of an episcopal see. The wardenship, in later times, was held by one of the bishops of the neighboring sees. The right of electing the warden, however, was vested in certain Rom. Cath. clans or families of the town—Blakes, Bodkins, Lynches, Frenches, etc.—who by a curious local custom, were distributed into 13

tribes. This singular system continued in use until about 1831, when the wardenship of G. was erected into an episcopal see, the bp. of which is appointed as other bishops in Ireland. There are three monasteries and five nunneries; the Queen's College, opened 1849; Erasmus Smith's College; the county court-house; barracks, etc. G. has numerous flour and other mills, also breweries, distilleries, foundries, etc., extensive salmon and sea fishing, a good harbor, with docks that admit vessels of 500 tons, and a light-house. The exports consist mainly of grain, flour, bacon, fish, kelp, and marble. In 1879, the total imports of G. were valued at £271,418. G. returns one member to parliament. Pop. (1851) town 23,787, parl. bor. 34,146; (1861) town 16,786, parl. bor. 24,990; (1871) town 15,597, of whom 14,424 Rom. Cath., 846 Episc., 171 Presb.; (1891) 13,746.

G. was taken by Richard de Burgo 1232, and the ancestor of many of the leading families now resident in this quarter settled here about that time. From the 13th till the middle of the 17th c., G. continued to rise in commercial importance. During the latter part of the 17th c., it suffered considerably for its adherence to the royalist cause. In 1652, it was taken by Sir Charles Coote after a blockade of several months; and 1691, July, it was compelled to surrender to General Ginkell.

GAL'WAY BAY: inlet of the Atlantic Ocean, on the w. coast of Ireland, between the counties of Galway and Clare. It is a noble sheet of water, and offers great facilities for an extended commerce. Great efforts were made to obtain a public grant for the construction of a harbor of refuge; and a company was formed, 1858, for the establishment of a transatlantic packet-service (see GALWAY—TOWN). A series of misadventures, however, attended its efforts; and though something was accomplished, the effect was transient, and G. B. relapsed into its former quiet. It is 30 m. in length from w. to e. and abt. 10 m. average breadth. At its entrance, and between the N. and S. Sounds, are the Islands of Arran.

GALYZIN, or GALIZIN, or GALITZIN, or GALLITZIN: see GOLITZIN.

GAMA, gá'má, Dom VASCO DA: abt. 1460–1524, Dec. 24; b. Sines, a small sea-port of Portugal: discoverer of the maritime route to India. He was of an ancient family, which was even supposed to have royal blood in its veins, though not legitimately. He early distinguished himself as an intrepid mariner; and after the return of Bartolommeo Diaz, 1487, from doubling the Cape of Good Hope, King João, seeking a proper man to undertake the discovery of a southern passage to India, fixed on G. The intentions of João were frustrated by death; but his successor, Manoel the Fortunate, fitted out four vessels, manned altogether with 160 men, and intrusted them to the command of G., presenting him at the same time with letters to all the potentates whom it was thought likely he might require to visit; among others, one to the mythical 'Prester John,' then supposed to be reigning in splendor somewhere in the

east of Africa. The little fleet left Lisbon 1497, July 8, but having been tormented by tempestuous winds almost the whole way, arrived at the haven now known as Table Bay so late as Nov. 16; here they cast anchor for a few days. On Nov. 19 G., after encountering a series of frightful storms, and being obliged to sternly suppress a mutiny among his terrified crew, who wanted him to return to Portugal, sailed round the s. extremity of Africa, and touched at various places on the hitherto unknown e. coast. At Melinda, where he found the people far more civilized than he expected, he obtained the services of a well-educated pilot, native of Guzerat, in India, who seemed familiar with the astrolabe, the compass, and quadrant. Under his guidance, G. struck out to sea, crossed the Indian Ocean, and arrived at Calicut, India, 1498, May 20. His reception by the ruler of Calicut (the 'Samudri-Rajah,' or Prince of the Coast, shortened into Zamorin) was not very favorable, nor did G.'s intercourse with him subsequently improve. The Arab merchants residing there were jealous of the newcomers, who might interfere with their monopoly of traffic, and incited the Hindus against them. Other complications arose, and the result was that, on his departure, G. had to fight his way out of the harbor. Satisfied with his discoveries, the Portuguese commander turned his course homeward, touched at several of the places that he had previously visited, and 1499, Sep., cast anchor at Lisbon, where he was received with great distinction. High-sounding titles were conferred on him. He was allowed the rare privilege of prefixing *Dom* to his name, and obtained a large indemnity for his trouble, besides certain monopolies in the commerce about to be opened with India. King Manoel immediately dispatched a squadron of 13 ships, under Pedro Alvarez Cabral, to India, for the purpose of establishing Portuguese settlements in that country. In this they were successful in only a few places. At Calicut 40 Portuguese, who had been left behind, were murdered by the natives. To avenge this injury, and particularly to secure the Indian Ocean commerce, the king fitted out a new squadron of 20 ships, which set sail under G.'s command 1502. This fleet reached in safety the e. coast of Africa, founded the Portuguese colonies of Mozambique and Sofala, which still exist, and sailed to Travancore. On his way, G. captured a richly laden vessel filled with Mussulmans from all parts of Asia, on their way to Mecca. He barbarously set it on fire; and all on board, amounting to about 300, were burned or slain, with the exception of some 20 women and children. What adds to the tragic character of this fearful incident is, that it occurred through a mistake. G. confounded these Asiatic followers of the Prophet with the Moors of Africa, the hereditary enemies of his nation and proceeded to extremities on that assumption. On reaching Calicut, G., after a delay of a few days, bombarded the place, destroyed a fleet of 29 ships, and compelled the rajah to conclude a peace with suitable indemnification. This act of vengeance or of punishment, executed with prudence and determination, inspired the natives with fear of the power of the Portu-

GAMA GRASS.

guese, and contributed to confirm the alliances made with several of the native princes. So rapid had been G.'s proceedings, that in 1503, before the close of Dec., he was back in Portugal with 13 richly laden vessels. He was not, however, again employed for a period of 20 years; and it appears that Manoel, for some reason, failed properly to appreciate his great services. Meanwhile, the Portuguese conquests in India increased, and were presided over by five successive viceroys, while G. was lying inactive at home. The fifth of these viceroys, however, was so unfortunate, that King João III., the successor of Manoel, was compelled to have recourse to the old hero; and 1524, bearing the title of viceroy, G. set sail once more for the scene of his former triumphs with a fleet of 13 or 14 vessels. As he approached the coast of India, an unaccountable agitation of the water was observed by all. There was no wind to cause it, and the superstitious sailors were greatly alarmed. 'Why fear?' said G.: 'the sea trembles before its conquerors.' His firmness and courage succeeded in making Portugal once more respected in India; but while engaged in his successful schemes, he was surprised by death at Cochin. His body was conveyed to Portugal, and buried with great pomp. In the character of G., resolution was found combined with prudence and great presence of mind. His justice, loyalty, honor, and religious fervor distinguished him above most of the great navigators and conquerors of his time. His discovery of a passage to India almost vies in importance with the discovery of America by Columbus only a few years before. Consult Barros, *Decades*; Castanheda and Lafitau, *Hist. Conqu. Portug.*; Cooley, *Hist. Mar. Discov.*; Major, *Discov. of Pr. Henry of Portugal*. His achievements have been celebrated by his countryman Luiz de Camoëns in the *Lusiad*, to whose glowing representations G.'s fame owes something of its splendor.

GAMA GRASS, *gā'ma* (*Tripsacum dactyloides*): a very large, vigorous and productive perennial grass with many long and broad leaves like those of Indian corn. It is known sometimes as Sesame Grass. The flower spikes are from four to eight inches long, the upper portion staminate, the lower pistillate. It is said to have been named from a Spaniard who first attempted its cultivation in Mexico. G. G. grows wild in a large part of the United States, and is found in many warm countries of the old and the new world, and is cultivated to some extent. It grows on both moist and dry land, roots deeply, has remarkable power of resisting drought, and frequently reaches a height of seven ft. Though coarse it is quite nutritious, and horses and cattle eat it readily either green or made into hay. If it is to be fed dry it should be cut before the seed stems are formed. Three or four cuttings can be made in a single season. The seed is deficient in vitality, and propagation is often effected by planting pieces of the roots, about two ft. apart in each direction, which soon take entire possession of the soil. G. G. is particularly useful at the South, where some of the finer grasses which flourish in cooler regions cannot be readily grown.

GAMALIEL.

GAMALIEL, *ga-mā'li-ël* [Greek form of Hebrew *Gam-li'el*, 'My Rewarder is God,' or 'Mine also is God'], known as G. the Elder, or G. I., and in the Talmud as Rabban G.: celebrated Hebrew Rabbi of the 1st c.: doubtless the one mentioned Acts, v. 34; xxii. 3. Both here and in the Talmudical writings, he appears only in his capacity of a teacher of the law, and a prominent Pharisaic member of the Sanhedrim (q.v.); but of the circumstances of his life, or the date of his birth and death we learn nothing from these, the only sources. He was the son of Simeon, the same, it may be assumed, who was first honored by the title of Rabban (our master)—a mark of distinction afterward bestowed on Gamaliel himself—and thus was the grandson of the celebrated Hillel. Whether (as would follow from Pesachim 88 b.) he actually presided over the Sanhedrim in the reigns of Tiberius, Caligula, and Claudius (of which there is no historical proof, and not even any probability), certain it is that the laws and ordinances issued by that body during his life bore the stamp of the all-embracing humanity and enlightened liberality which from the 'regal' House of Hillel were transferred to the School of Hillel—principally as opposed to the particularizing and austere school of Shamai. To the refinement and erudition hereditary in his family—to which, alone, on account of its exalted position, even the otherwise strictly forbidden study of Greek science and philosophy had been allowed (cf. Derech Eretz, iv.)—G. appears to have added a rare degree of discretion, and of that practical wisdom which betimes revokes or adapts social laws, according to the wants of the commonwealth. For the benefit of sufferers of all kinds, that most stringent law of the limited Sabbath-day's journey was relaxed; the license hitherto allowed to the absent husband, of annulling his letter of divorce (if he regretted his rashness), even after its delivery, before any court of two or of three men, was abolished (Gittin 32); while, on the other hand, to prevent confusion, prepense or involuntary, the strictest accuracy with respect to the names of the husband, wife, and witnesses contained in these documents was rigorously enforced. Again, the widow was to receive her marriage-portion (Kethuba) from the recalcitrant heirs, simply on her asseveration that she had not received it during her husband's lifetime: while formerly she had not been permitted even to make oath in the matter (Gittin, 34). But no less important, and testifying, at the same time, to a spirit free from prejudice, are the other laws respecting the treatment of the Gentiles, which may properly be ascribed to G.'s influence, and were perhaps inaugurated by him. Gentile and Jew, it was enacted, should henceforth, without distinction, be allowed the gleanings of the harvest-field; even on the day specially set aside to his idol-worship, the former should be greeted with the salutation of peace. Of his poor, the same care was to be taken; his sick were to be tended, his dead to be buried, his mourners to be comforted, exactly as if they belonged to the Jewish community (Gittin, 59 b., 61 ff.; Jer. Gitt. c. 5)—certainly

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no mean tribute to the principle of the equality of the human race, and a practical carrying out of Hillel's motto, the words of the Scripture (Lev. xix. 18), 'And thou shalt love thy neighbor as thyself' (cf. Sabbath, 30 b. ff.). The consideration of these and other legislative acts, all tending toward that social improvement and consolidation (*Tikkun Haolam*) which was G.'s avowed and acknowledged aim, seems also to set at rest that old and barren dispute, whether G., when he interposed on behalf of the apostles, and referred their matter to God himself, was secretly a Christian, or whether he was 'a cowardly tyrant, who even sought to withhold from them the privilege of martyrdom.' Tolerant, peaceful, as free from fanaticism on the one hand, as on the other from partiality for the new sect, which he seems to have placed simply on a par with the many other sects that sprang up and disappeared in those days: he exhorts to long suffering and good-will on all sides. For his relation to the apostle Paul, and for the 'Law' that he taught him (Acts, xxii. 3), as well as for the influence which his mind might have exercised over that of the 'apostle of the Gentiles,' see PAUL.

When G. died (about 17 years before the destruction of the Temple), 'the glory of the law' was said to have departed, and with him 'died the reverence before the law and the purity of *the abstinence*' (Pharisaism), (Sota, 49). His memory has always been held in highest honor. The story of his conversion to Christianity is devoid of any historical foundation, as is the legend also of the transmission of his bones to Pisa: nevertheless, G. has been placed on the list of Christian Saints, and his day is celebrated Aug. 3.

G.'s grandson, named G. of Jabneh (d. abt. 115), is ranked by the Talmudists with his grandfather as one of the seven great rabbans.

GAMASEA, n. *ga-mā'sē-a* [mod. L. *gamasus*]: the beetle-mites or spider mites, a tribe of arachnida (spiders), order *Acarina*. They are destitute of eyes, and their legs have two claws and a disk. They are parasitic on insects, birds, and other animals and on some plants. One species infests bird cages, often doing great injury to the bird. The species found on poultry will live for a time on the human skin and produces intense irritation and itching.

GAMASHES, n. plu. *gām āsh'iz* [F. *gamaches*, spatter-dashes], also GAMBA'DOES, n. plu. *-bā'dōz* [It. *gamba*, the leg, the shank]: a kind of leggings.

GAMB, *gāmb*: heraldic corruption of the French *jambe*, the leg: see JAMBE.

GAM'BA: see VIOL DI GAMBA.

GAMBADOES: see under GAMASHES.

GAMBETTA, *gām-bēt'á*, F. *gōng-bēh-tá'*, LEON: 1838, Oct. 30—1882, Dec 31; b. Cahors, France: lawyer and statesman. His family was of Genoese descent. He studied law; and 1859 joined the Paris bar. It was not till 1868 that his name came prominently before the public.

GAMBIA.

He then acquired fame as counsel for defendants in political prosecutions. He was an able and determined enemy of the second empire, and was in consequence returned to the chamber, both at Paris and Marseilles, at the elections of 1869. 1870, May 5, he delivered a speech containing a panegyric of the republican form of government, which attracted great attention. After Sedan, he became minister of the interior, and he remained for some time in Paris after it was invested by the Germans; but being anxious to stir up the provinces, he contrived to escape from the city by a balloon. He came down at Amiens, and went to Tours, where he was intrusted with the control of the war department. He assumed unlimited power, and made every effort to stir up the provinces in defense of Paris. He preached *guerre à outrance* against the Germans, and denounced the capitulation of Metz as an act of treason on the part of Marshal Bazaine. When a national assembly was resolved upon in 1871, G. sought by a decree to give it an exclusively republican character by directing that no official of the second empire should take part in the election. The decree was cancelled at the instigation of Prince Bismarck, and G. resigned office as minister. He subsequently entered the assembly as a member for Paris, became the leader of the extreme left, and to the violence of a speech which he delivered at Grenoble, was largely attributed the reaction which set in against the republican government, and the retirement of M. Thiers. After this his political action became more skilful and moderate, and to his leadership the republicans greatly owed their success in the elections of 1877, and their defeat of the attempts of the conservatives to deprive them of its results. Yet in the same year he was twice prosecuted for undue outspokenness, and once condemned to imprisonment. On the elevation of M. Grévy to the presidency of the republic 1879, G. became pres. of the chamber of deputies. He was more and more regarded as the most influential statesman in France; in 1880-1, enthusiastic public receptions and other circumstances testified to his being the most popular man in the republic, though he lost favor with some of the extreme left party; and in 1881, Nov., he formed a cabinet. In the following Jan., however, he was defeated in his attempt to carry the *Scrutin de liste*, according to which scheme the unit of area for electoral purposes would be the department, and not as of late, the arrondissement; and he resigned. Though not in responsible office, he was still the most powerful man in the state; and his sayings and doings were equally canvassed at home and abroad. His later views were less extreme, and by the irreconcilables he was bitterly accused of *opportunism*. His death was in consequence of a pistol wound in the hand aggravating a malady from which he had long suffered.

GAMBIA, *găm'bî-a*: river of w. Africa, whose basin, and that of the Senegal, constitute the region known as Senagambia. It enters the Atlantic, lat. 13° 30' n., and long 16° 34' w., after an estimated course of fully 1,000 miles. It is 4. m. broad at its mouth, having a reach of

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double the width immediately inside. It is navigable for vessels of 150 tons up to Barraconda, a town on its right bank, about 400 m. from the sea.

GAMBIA: a British colony since 1888, on the banks of the G. river, as far up as Barraconda, though not continuously. The principal station, Bathurst, is on the Island of St. Mary, at the mouth of the Gambia. Other posts are Fort James and Fort George, the former also on St. Mary's, and the latter on Macarthy's Island, 140 m. from the sea. The climate is comparatively healthful, indeed the most so of any European settlement in w. Africa. The export trade, already considerable, is steadily increasing, comprising chiefly wax, hides, ivory, gold-dust, rice, palm-oil, horns, timber, and ground-nuts. The exports ranged from £254,711 (1882) to £79,516 (1886); the imports £217,938 (1884) to £69,243 (1886); and the revenue from £28,952 (1882) to £13,453 (1886). Formerly a dependency of Sierra Leone, G. became an independent colony 1843, part of the W. African Settlements 1876, and a separate govt. 1888. Pop. (1901) 13,456, including 198 Europeans.

GAMBIER ISLANDS, *gām'bēr*: a Polynesian group, under a French protectorate, lat. 23° 8' s., and long. 134° 55' w.; comprising five larger and several smaller islands, all of coral formation. With the exception of Pitcairn's Island, they alone, on the route between Chili and Tahiti, yield good water sufficient for the supply of shipping.

GAMBIR, or GAMBIER, n. *gām'bēr* [Malay name]: astringent extract, one of the most powerful of pure astringents; resembling CATECHU (q.v.), and used for the same purposes; prepared from the leaves of the *Uncaria Gambir*, native of the E. Indies and Malay Archipelago. The genus *Uncaria* belongs to the nat. ord. *Cinchonaceæ*. The G. shrub is extensively cultivated in the Eastern Archipelago, great quantities of the light and brown yellow G. being used in preparing betel for chewing. G. is obtained by boiling the leaves for a long time in water, and evaporating either by the heat of a fire or of the sun. The finer sorts are used in Europe as medicine, and the black kind in tanning. It is often misnamed *Terra Japonica* in commerce. When examined by the microscope, G. is found to consist, in great part, of a multitude of small crystals of *catechine*.

GAMBISON, or GAMBESON, n. *gām'bi-sōn*, or WAMBEYS [OF. *gamboison*]: thickly quilted tunic stuffed with wool, and worn by knights under the hauberk, as a padding for the armor. As it was sufficiently strong to resist ordinary cuts, it was sometimes worn without other armor. The surcoat was also quilted or *gamboised* with cotton wool, as in that of the Black Prince, still hanging above his tomb in Canterbury Cathedral.

GAMBIT, n. *gām'bit* [F. *gambit*—from It. *gambetto*, to trip up by the heels]: at the game of chess, an opening made by sacrificing a pawn gratuitously at an early stage of the game in order to gain a particular advantage thereby.

GAMBLE.

GAMBLE, v. *găm'bl* [Bav. *gampen*, to jump, to sport: Swiss, *gammel*, merry-making (see GAME and GAMBOL)]: to play at a game extravagantly for money. GAM'BLING, imp.: N. the act or practice of one who gambles. GAMBLED, pp. *găm'blă*, lost by gambling. GAM'BLER, n. *-blër*, one who.—*Gambling* or *Gaming* is the act or practice of playing a game of hazard, or one depending partly on skill and partly on hazard or chance, with a view, more or less exclusive to a pecuniary gain. Games of this nature were forbidden by the Romans, both under the Republic and the Empire (Cic. *Philip.* ii. 23; *Dig.* ix. tit. 5; *Cod.* iii, tit. 43). The ground of prohibition was not the immoral tendency of such practices, but their effect in making the populace effeminate and unmanly. Horace (*Carm.* iii. 24) complains that youths of condition, instead of riding and hunting, had betaken themselves to illegal games of chance. It belonged to the *ædiles* to attend to the public interest by punishing violations of the gaming laws. During the *saturnalia*, a period of general license, these games were permitted (Martial iv. 14), and a like indulgence at other seasons was extended to old men among the Greeks and Romans (Eurip. *Med.* 67; Juv., xiv. 4). This vice has not been confined to civilized nations, either in the ancient or the modern world; Tacitus (*De Mor. Ger.* c. 2) mentions its existence among our own barbarian Teutonic forefathers, and it is known now to prevail among many half-civilized and even savage tribes. Often it is a refuge against the depressing sensations of languor and vacancy, which the want of active exertion causes in the minds of those who have no active inner life; and the classes most addicted to it in all countries are the idle, and men of mere business in their idle hours—men who have not cultivated an interest in anything but their business, and who, when that pressure is relaxed, find no other object for mental activity.

It is remarkable that in England as in Rome, the first ground on which gambling was prohibited was, not its demoralizing, but its effeminating influences on the community. The act 33 Henry VIII. c. 9 (1541) had in view the double object of 'maintaining artillery and debarring unlawful games.' By 'artillery' appears to be meant archery; and the act, reciting two others in the same reign, contained the preamble, that the skill of the people in this martial art 'is sore decayed, and daily is like to be more and more diminished.' The cause of this degeneracy was stated to have been the practice among the people of 'many and sundry new and crafty games,' which not only diverted popular attention from the more manly and patriotic art of shooting with the bow, but gave rise to murders, robberies, and other felonies. The act then contained anxious provisions now repealed for the revival of the art of shooting with yew bows, and other particulars. On that act followed 16 Charles II. c. 7, and 9 Anne, c. 14, the latter of which declared that all bonds, or other securities given for money won at play, or money lent at the time to play with, should be utterly void, and all mortgages or en-

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cumbrances of lands made on the same consideration, should be made over to the use of the mortgager. The act of 1845 repealed obsolete provisions, and re-enacted the prohibitions against card-playing and other games; and was followed by acts in 1853, 4, suppressing betting-houses, and gaming-houses. By 8 and Vict. c. 109, the common law of England was altered, and wagers which, with some exceptions, had hitherto been considered legal contracts, were declared no longer exigible in a court of law. This prohibition does not affect contributing to prizes for lawful games. The act also facilitates proceedings against common gaming-houses by enacting that where other evidence is lacking, it shall be sufficient to prove that the house or other place is kept or used for playing at any unlawful game, and that a bank is there kept by one or more of the players exclusively of the others: or that the chances of any game played therein are not alike favorable to all the players, including among the players the manager or managers of the bank. Later statutes put heavy penalties on those who obstructed the police by putting chains or bolts against the doors of gaming-houses, or by otherwise delaying the entry into such houses; and any apparatus or arrangement for giving alarm to the persons inside, was declared to be evidence that the house was a gaming-house. The persons found inside, and giving a false name or address, were made liable to a penalty of £50, and the owner or keeper of the house to a penalty of £500. The frequenters of the house are liable to be examined, and if making true and faithful discovery, are freed from all punishment. The Betting-houses' Act. 16 and 17 Vict. c. 119, was passed to put down all betting-houses where money is received as or for the consideration for any undertaking to pay money in the event of any horse-race or other race, fight, game, sport, or exercise, are declared gaming-houses within the statute. But nothing in the act extends to a person holding stakes to be paid to the winner of any race or lawful sport, game or exercise. In 1872 a penalty was put on the keeper of any house for the sale of liquors allowing any gaming for money or money's worth on the premises. These various enactments do not interfere with gaming in private houses.

In most of the states of Germany, gaming was allowed, and the extent to which it was practiced at the German watering-places was well known. The princes of the petty states often derived a large portion of their revenue from the tenants of their gaming establishments, whose exclusive privileges they guaranteed. Since 1873 the German gaming-tables all have been closed. Monaco has now the chief public gaming-tables of Europe. See vol. III. Political Dictionary of the *Standard Library Cyclopædia*.

Very strict laws have been enacted in the various states of the Union against all forms of gambling, particularly against book-making on horse-races, cock-fighting and betting thereon, and lotteries; yet the first and the last are openly carried on, and the second with more or less secrecy. Prize-fighting and betting on the results are prohibited in nearly every state, though means are frequently formed to

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evade the law or at least elude its officers: and except in isolated cases dog-fighting and rat-baiting, formerly the amusement and favorite method of gambling among the lowest classes, are matters of the past. All playing for money is generally prohibited, and no court will entertain a claim for money won by any species of gambling, though in some states money deposited with a stake-holder, pending a contest in some form of gambling, may be recovered by the loser prior to its being given the winner. In Ind. it is an indictable offense for persons to play at cards for money, even the smallest possible sum; but in N. Y. it is not deemed illegal to play to see which party shall pay for the use of property or implements in the game. Generally, too, it is illegal to resort to any kind of gambling to determine who shall pay for liquors, cigars, suppers, or other articles bought or to be bought. This sort of gambling, however, is widely carried on in the most public manner; and playing at poker, faro, keno, and other games of skill or chance where large sums of money and even valuable property like real-estate depend on the result, is of nightly occurrence in hundreds of private clubs and at the fashionable resorts, though in these cases the demoralizing business is conducted with more or less privacy.

GAMBOGE, n. *gǎm-bóǰ'* [from *Cambōdiǎ*, in Asia]: yellow gum-resin used as a pigment, and in medicine as a



Gamboge (*Hebradendron gambogioides*):

a, back view of a male flower; *b*, side view of male flower; *c*, an anther, with its umbilicate lid.

nauseating purge; brought from the E. Indies, and believed to be the product chiefly of *Cambogia gutta*, known also as *Hebradendron gambogioides*, tree of the nat. ord.

GAMBOL—GAMBROON.

Guttiferæ, native of Cambodia, Ceylon, Siam, etc. The G. tree attains a height of 40 ft., has smooth oval leaves, small polygamous flowers, and clustered succulent fruit. The fruit is about two inches in diameter, sweet and eatable, much used also as an ingredient in saucers. When the bark of the tree is wounded, G. exudes as a thick viscid yellow juice, which hardens by exposure to the air. Another species of the same genus (*C. pictoria*) occurs in the Mysore, and is believed to produce G. of similar quality. The finest G. comes from Siam.—*American G.*, very similar, and used for the same purposes, is obtained from *Vismia Guianensis*, tree of the nat. ord. *Hypericinæ*, native of Mexico and Surinam.—G. occurs in commerce in three forms: 1. in *rolls* or *solid cylinders*; 2. in *pipes* or *hollow cylinders*; and 3. in *cakes* or *amorphous masses*. The first two kinds are purest. Good G. contains about 70 per cent. of resin and 20 per cent. of gum, the remainder being woody fibre, fecula, and moisture. A deep orange or cherry-red substance obtained from the pure gum by evaporating to dryness, has received the names *gambogie* and *gambogic acid*.

In doses of a dram, or even considerably less, G. acts as an acrid poison, causing extreme vomiting and purging, followed by fainting and death. This result has been traced to its action as administered in certain quack pills. In small doses of one to three grains, combined with aloes and ginger or aromatic powder, it may be cautiously given in case of obstinate constipation, in cerebral affections (as apoplexy, or where there is an apoplectic tendency), in dropsy (especially connected with hepatic obstruction), and as a remedy for tape-worm. The use of G. is objectionable when there is an irritable or inflammatory condition of the stomach or intestines, or a tendency to abortion; and it is not often prescribed by regular practitioners.—G. is much used by painters to produce a beautiful yellow color. It is employed also for staining wood, and for making a gold-colored lacquer for brass. It has a shelly fracture, is destitute of smell, has an acrid taste, and burns with a dense smoke and many sparks.

GAMBOL, n. *găm'böl* [F. *gambiller*, to wag the leg, to dance: OF. *gambade*, a gambol—from *gambe*, the leg: It. *gambata*, a kick—from *gamba*, the leg: Lang. *jhimbela*, to tumble—from *ghimba*, to jump (see GAME)]: a dancing or skipping about for sport or joy; a sportive prank: V. to dance and skip about in sport or joy; to frisk. GAM'BOL-LING, or GAMBOLING, imp.: ADJ. sportive. GAM'BOLLED, or GAMBOLED, pp. *-böld*.—SYN. of 'gambol, v.': to dance; leap; tumble; frolic; skip; start;

GAMBREL, n. *găm'brël* [It. *gambarella*—from *gamba*, a leg]: the hind leg of a horse; a crooked stick used by butchers for suspending animals that have been slaughtered.

GAMBROON, n. *găm-brôn'*: a kind of twilled linen cloth for linings.

GAME.

GAME, n. *gam* [AS. and Icel. *gaman*, merry-making, sport: Sw. *gamman*, joy]: wild animals pursued and killed by hunting or shooting; the birds, etc., kept in preserves for the sport of those legally entitled to it; sport or diversion of any kind; contest for amusement; a single match at play; sportive insult or mockery; a scheme or measure planned or pursued: V. to play at any sport; to gambol: **ADJ.** in *familiar language*, crooked, as a 'game leg'; courageous; plucky. **GAMES**, n. plu. *gāms*, public athletic and other contests—especially those established in anc. times for the diversion of the people. **GA'MING**, imp.: N. practice or habit of gamblers (see **GAMBLE**. **GAMED**, pp. *gāmd*. **GAME'STER**, n. *-stēr*, one who is viciously addicted to play for money; a gambler. **GAME-KEEPER**, n. one who has the care of certain wild animals protected by law. **GAME'LY**, ad. *-lī*, in a plucky or courageous manner. **GAME'SOME**, a. *-sūm*, gay; sportive. **GAME'SOMELY**, ad. *-lī*. **GAME'SOMENESS**, n. **GAME-COCK**, a cock of a particular species bred for fighting. **GAME-LAWS**, laws by which persons are punished by fine or imprisonment if convicted of killing certain wild animals, as hares, pheasants, partridges, etc., of trespassing in the pursuit of them, or of having them in their possession without a certificate or license, or of killing or having them in possession at certain seasons contrary to law. **ANCIENT GAMES**: see **ISTHMUS**: **NEMEA**: **OLYMPIC GAMES**: **PYTHIAN GAMES**: **AMPHITHEATRE**: **CIRCUS**.

GAME: wild animals of kinds customarily pursued by hunters. In Britain certain wild animals are selected by what are called the game-laws from all other animals, and protected, for the exclusive benefit of those on whose lands they are found. In ancient times English kings distinguished themselves by the severity of the forest laws; but the crown has now little to do with game, except where certain ancient forests, parks, chases, and free warrens are to be found: these continue to this day privileged places in many respects. There are 69 forests in England alone. See **FOREST LAWS**.

For England, Blackstone laid down the doctrine, that at common law the sole right of hunting and killing game belongs to the crown, and that the subject can claim this right only by tracing title to the crown. This doctrine has been clearly shown erroneous. At common law the owner of the soil, or, if he has granted a lease without reserving the right, then the lessee or occupier, has the right to kill and catch every wild animal that comes on his land. But the game-laws have made it necessary that the owner, or other person having the legal right, shall take out a game-license; and there is a certain season, called the close season, during which it is unlawful for every person to catch or kill game. Game is defined to include the following animals only—viz., hares, pheasants, partridges, grouse, heath-game, moor-game, black-game, and bustards. The close season applies only to the winged game, so that hares can be lawfully killed all the year round. But no game may be killed on Sundays or Christmas-day. Though the above animals alone are game, the game acts

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protect from pursuit by illegal trespass certain other animals—viz., woodcocks, snipes, quails, landrails, and conies. Also the eggs of game are protected. Trespasses in the night-time, in pursuit of game, are punished more severely than those in the daytime; and when there are several persons acting together, exceeding five, the penalties are increased; still more when the poachers are armed with dangerous weapons, and use violence. As between landlord and tenant, the general rule in leases granted after 1831 (modified, as to hares only, by the Act of 1880) is that, if there is no provision to the contrary in the lease, the tenant has the exclusive right to kill the game; hence, the landlord, in order to preserve the right, must introduce an express clause for entry. When that is done, the tenant may be punished like other persons for poach g. Formerly, it was attempted to protect lands against poachers by setting spring-guns and man-traps, and the English courts were inclined to hold this to be legal. But in 1861 a statute was passed forbidding this. In order to discountenance poaching, game is declared to be not a legal article of sale except by licensed game-dealers. Licenses are required also to kill game; also to kill deer, woodcocks, snipes, quails, landrails, and rabbits. Exceptions, however, exist, as regards killing deer and rabbits, by the owner or occupier on his inclosed ground; also as to hunting deer with hounds, coursing hares, and taking woodcock with nets and springes; and as to attendants or friends going out with licensed sportsmen. There are a few other exceptions. For each dog or gun an excise license is required.

The policy of the game-laws has often been debated. They are represented, on one hand, as too stringent, badly administered by interested justices, and opposed to the moral sentiments of the less affluent classes, who persist in treating such offenses as venial, if not praiseworthy. On the other hand, owners of land say that they are entitled to protection against trespassers.

The former presumptions of law between landlord and tenant with reference to hares have been altered for the United Kingdom by the Ground Game Act 1880, 43 and 44 Vict. c 47. This act confers on every occupier of land the right at lawful times to kill and take ground game (i.e., hares and rabbits) on the land concurrently with any other person entitled to do so. The occupier may authorize in writing the members of his family, his servants on the farm, and one other person hired for the purpose, to kill the game. Only the occupier and one other person, however, may use firearms. In the case of moorlands and uninclosed lands, except where they lie in patches of less than 25 acres among arable land, the right is to be used only between the 11th of December and 31st of March. The right is inseparable from occupation, and remains with an occupier who, having full right to the game, lets it to another person. The occupier does not require a game-license, but if he use firearms, it must be between the end of the first hour after sunset and the beginning of the last hour before sunrise. Poison is prohibited, and also spring-traps, except in rabbit

GAMIN—GAMMADION.

holes. The act does not interfere with existing contracts of tenancy, but is being widely adopted by voluntary arrangement.

There are also the following acts: Sea-Birds Act; Wild-Birds Act; and Wild-Fowl Act. The close-time under the first of these acts (which does not apply to young birds not able to fly) is Apr. 1—Aug. 1, but this does not extend to the island of St. Kilda. For Sutherlandshire, the home office altered the period to Sep. 1—Dec. 31. The second act very inefficiently protects songsters and insect-killers, Mar. 15—Aug. 1. The third act protects wild-fowl marketable as food, Feb. 15—July 10. (See Oke's *Game-Laws*, by Bund, 3d ed. 1877.)

Unlike those in England and on the continent of Europe generally, where the chief consideration is the preservation of G. of all kinds for the personal pleasure or sport of the owner or lessee of hunting and fishing grounds, the G. laws of the United States are designed more particularly to prevent the extermination of popular species by protecting them during the propagating season. In nearly every state song and insectivorous birds are protected by law in all seasons of the year, and in all states wholesale slaughter is prohibited. In general, wild creatures, fish, flesh, and fowl are denominated G., and can be shot, trapped, hooked, speared, or otherwise killed by any one in seasons of the year specified in state and county laws, provided there is no trespass on private domains. In every state and territory where G. of any kind abounds in sufficient quantity to become an object of sport, the seasons in which each kind may be hunted are prescribed in state, county, and local laws. These seasons are in no wise uniform. In some states the hunting or fishing season for a given kind of G. differs in each county. The laws are very ample and strict, but they are ignored in sparsely settled sections and evaded where possible in others. This condition has prompted true sportsmen in various parts of the country to organize associations, which lease or buy tracts of land or water, stock them with G., and carefully protect them during the propagating season. In these cases hunting and fishing are practiced only in the 'open seasons,' and then to an extent that will not lead to extinction.

GAMIN, n. *gǎ-mǎng'* [F. *gamin*: comp. Gael. *gaman*, to run wildly about]: in *France*, a rude boy; an idle street boy; a blackguard.

GAMMA, *gǎm'ma*, or GAM'ME, or GAM'MUT: system of musical notation invented by Guido; named from the Greek letter *Gamma*, which he took as the name for his first note. This name, with Guido's solmization, fell into disuse. In modern music the term is applied to the scale or compass of wind-instruments. See GAMUT.

GAMMADION, n. *gǎm-mǎ'dĩ-on*: in *eccles.* and *chh. hist.*, cruciform ornament embroidered on or woven into ecclesiastical vestments; named from being composed of four gammas placed back to back, forming a voided Greek cross.

GAMMARUS—GAMUT.

GAMMARUS, *găm'ma-rūs*: genus of *Crustacea* of the section *Edriophthalma* (q.v.), and order *Amphipoda*, of which one species, *G. Pulex*, is extremely common in springs and rivulets in some countries, particularly where decaying vegetable matter has accumulated. It generally keeps near the bottom; swims on its side, with a kind of jerking motion, and feeds on dead fishes or any other animal matter. It is sometimes called the Fresh-water Shrimp.



Fresh-water Shrimp (*Gammarus pulex*), magnified.

GAMMA'TION: see **GAMMADION**.

GAMMER, n. *găm'mër* [AS. *gemedēr*: contr. of *god-mother* or *grandmother*: F. *grandmère*, grandmother]: a word formerly used in addressing old women.

GAMMON, n. *găm'mũn* [It. *gambone*, any great leg—from *gamba*, a leg: F. *jambon*, a ham—from *jambe*, a leg: OF. *gambon*—from *gambe*, a leg]: a smoked or cured ham; the hinder and thick portion of a fitch of bacon having part of the leg.

GAMMON, int. *găm'mũn* [Dan. *gammen*, sport: Fris. *gammen*, interjection of contempt]: a familiar exclamation, signifying 'nonsense, you are joking': N. an imposition or hoax: V. to impose on by hoaxing or humbugging; to defeat at the game backgammon. **GAM'MONING**, imp. **GAM'MONED**, pp. *-mũnd*. **BACKGAMMON**, n. a game played with men, and a box and dice.

GAMOPETALOUS, a. *găm'õ pět'ã-lũs* [Gr. *gamos*, marriage; *pětãlon*, a leaf]: in *bot.*, having a corolla formed by the union or grafting together of several petals so as to form a tube; monopetalous. **GAMOSEP'ALOUS**, a. *-sěp'ã-lũs* [*sepalon*, an adapted word from Gr. *petalon*, for a sepal]: having a calyx formed by the union of several sepals; monosepalous.

GAMOPHYLLOUS, a. *găm'õ-fĩ'l'ũs* [Gr. *gamos*, marriage; *phullon*, a leaf]: in *bot.*, having leaves united by their edges; applied to a single verticil of bracts with their edges, when they come into contact with each other, united so as to appear like a *gamosepalous* calyx, in contradistinction to *polyphyllous* bracts.

GAMRUN: see **GOMBROON**.

GAMUT, n. *găm'ũt* [F. *gamme*, the musical scale—from *game* or *gamme*, a chime of bells, and *ut*, used formerly to mark or designate the first note of the scale]: the lines and spaces on which musical notes are written; the musical scale: see **MUSIC: SCALE, MUSICAL**. Guido of Arezzo, in the 11th c., marked the last of the series of notes in his musical notation with a *g* or the Greek letter γ (*gamma*), which had a prominent place at front of the whole scale,

GAND—GANELON.

and whose name was thence used for the whole—often in a French form *gamme*. *Ganut* is compounded of this word and *ut*, the beginning of a Latin hymn used in singing the scale. See SOLFEGGIO.

GAND: see GHENT.

GANDER, n. *gǎn'dér* [AS. *gandra*]: the male of the goose.

GANDERSHEIM, *gán'ders-hīm*, ABBEY OF: one of the most famous structures in Germany, in the town of Gandersheim in the duchy of Brunswick on the Gander river; founded A.D. 856 by Duke Ludolf of Saxony and his wife Oda. On its completion they removed the nuns, whom they had established some time previously, to it, and appointed their daughter, Hathumeda, its first abbess. It afterward received a number of extraordinary privileges which soon made it well-known throughout Europe. King Louis III. decreed that the office of abbess should be filled from the ducal family as long as it had a competent member; Otto III. presented it a market, mint, and the right of collecting toll; Pope Innocent III. separated it from the jurisdiction of any bp. or abp., and secular laws made it subordinate only to the empire, and invested the abbess with the right of voting in the diet. The estate grew to a great extent and in time the abbess had a court so powerful that neither the elector of Hanover nor the king of Prussia dared disregard its summons. The last Rom. Cath. abbess, Magdalena, died 1589, 21 years after the introduction of Protestantism, and from that year till 1802, when G. became a part of Brunswick, Protestant abbesses were appointed and sustained in the exercise of all the early privileges.

GANDIA, *gán'di-á*: a well-built walled town of Spain, province of Valencia, 35 m. s.s.e. of Valencia; on the left bank of the Alcoy, abt. 2 m. from the sea. Besides churches, G. has a magnificent ducal palace. Its gardens are surpassingly luxuriant. It manufactures a little cloth, and has some trade. Pop. 7,000.

GANDO, *gǎn'dō*: a kingdom of Súdán, on both sides of the Niger; bounded n.w. by Songhay, e. by Sókoto. The Benue joins the Niger near its s. border. The country is fertile, and the vegetation in many places luxuriant. The principal productions are the yam, the date, and the banana. The inhabitants are of the Fulah race (see FULAHS), and mostly Mohammedans. Dr. Barth visited G. 1853.

GANDO, the cap. of the kingdom, lies in a narrow valley, surrounded and commanded by hilly chains. It is a pleasant and animated town, and the inhabitants are industrious, manufacturing much cotton cloth.—Rabba and Egga, on the Niger, are the chief commercial towns of the country.

GANDOL'FO: see CASTEL-GANDOLFO.

GANELON, *gǎn'é-lon*, Count of Mayence: a paladin of Charlemagne, of unusual strength and stature, with fiery hair and glaring eyes, who through jealousy of Roland turned traitor, and sought to destroy his rival by planning the attack of Roncesvalles, with the Moorish king Marsillus. He built a castle on Blocksberg, the highest

GANG—GANGA SAGOR.

peak of the Hartz Mountains, and spent his last days in solitude there, loathed by his former associates, friendless, and known through all those parts as the 'Judas' of chivalry. His name has long been used to signify the basest kind of traitor. See Sir Walter Scott's *The Abbot*, ch. xxiv., and *Croquemitaine*, iii.

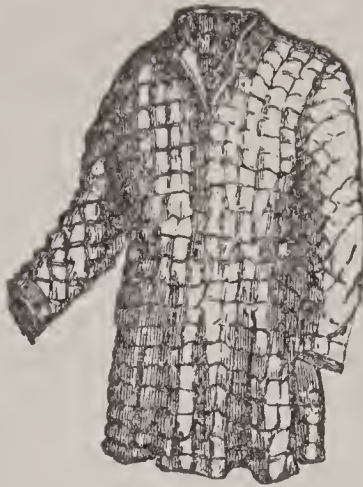
GANG, n. *gǎng* [AS. *gang*, a journey, a step: Icel. *gangr*, a going: Ger. *gang*, a walk, a gallery (see Go)]: a number going in company, generally of workmen, but frequently used in a bad sense; a crew; a band. **GANG'ABLE**, n. *-abl*, passable, as a road; tolerable; used in reference to money that has currency; current. **GANG'ER**, n. *-er*, the foreman of a gang of laborers on a railway. **GANG**, or **GANGUE**, n. *gǎng*, German term for a vein or lode; the matrix or portion of rock in which a metallic ore is embedded; quartz is the most common gang, but calc-spar also is very frequent, sulphate of barytes and fluor-spar are not rare. Much of a gang is usually submitted to metallurgic processes for the sake of its contents. **GANG'BOARD**, a board or plank with strips of wood nailed across it for the convenience of walking into a boat, etc., without slipping. **GANG-DAYS**, days of perambulation, or of walking through the bounds of a parish, in Rogation week: see **ROGATION**. **GANG'WAY**, entrance to a ship, consisting of cleats nailed on the ship's side-planking for steps, with a rope to aid in climbing; but usually, in harbor, a portable flight of steps called an accommodation-ladder is placed over the vessel's side: temporary road or passage into or out of a ship; the passage from one part of a ship to another; any temporary access formed of planks to a building: narrow passage of any kind. **GANG-WEEK**, the week in which the gang days occur. **AGRICULTURAL GANGS**: see **GANGS**, **AGRICULTURAL** (below).—**SYN.** of 'gang': company; society; association; combination.

GANGA, *gǎng'ga*, or **SAND-GROUSE** (*Pterocles*): genus of gallinaceous birds, of the family *Tetraonidæ*, closely allied to grouse and ptarmigan, but distinguished by a pointed tail. The toes are not feathered. The species are natives chiefly of the warm parts of Asia and Africa, and are most abundant in arid sandy plains. Two species, the Banded Sand-grouse (*P. arenarius*) and the Pin-tailed Sand-grouse (*P. setarius*), are found in s. Europe. The latter species is abundant on the arid plains of Persia. In Europe, it is found as far n. as the south of France, chiefly in the sterile *Landes*. It is always seen in the markets of Madrid. The Banded Sand-grouse is abundant in s. Russia. The African species are often seen in large flocks near their drinking-places.

GANGA SAGOR, *gǎn'ga sǎ'gūr*: low swampy island at the mouth of the great western or boliest branch of the Ganges; particularly sacred in the estimation of the Hindus. Multitudes of pilgrims annually resort to it, at the time of full moon, in Nov. and Jan. Infanticide formerly took place to a vast extent at these festivals, but is now prohibited by the British government,



Gamba.



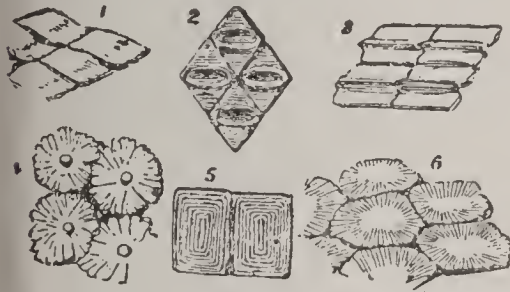
Gambison.



Quilted Gambison
of the Fifteenth Century.



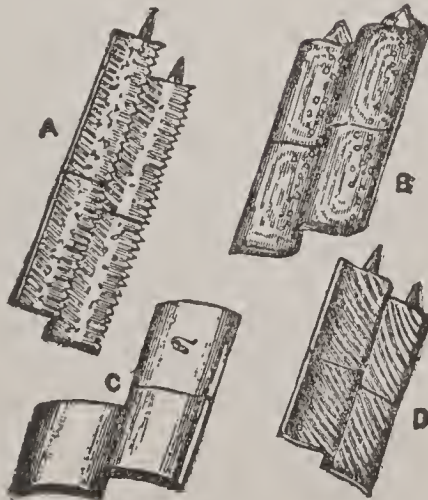
Ganglion. — Part of the nervous system of the larva of *Calosoma sycophanta*: a, a, a, Ganglia.



Ganoid. — Scales of different fossil genera of Ganoidians: 1, *Lepidosteus*; 2, *Cheiracanthus*; 3, *P. læoniscus*; 4, *Cephalaspis*; 5, *Dipterus*; 6, *Acipenser*.



Gambir Plant (*Uncaria Gambir*).



Ganoid Scales of: A, *Eurynotus crenatus*; B, *Dapedius granulatus*; C, *Palæoniscus Voltzii*; D, *Amblypterus striatus*.

GANGES.

GANGES, *gǎn'jēz* or *gán'jēz*: river prominent alike in the religion and in the geography of the East, divides, at least toward the sea, India in its largest sense into the two grand divisions of *Hither* and *Farther*. Its entire length is more than 1,500 m. Its general direction during the first half of its course is s.e.; it then flows e. through the plain of Bengal, as far as Rajmuhā, about 400 m., after which it again proceeds s.e. and enters the sea through a multitudinous delta. For detailed description, the stream, which shows great variety of phases in its different parts, may be considered in five sections: (1) from its springs to Gangotri; (2) Gangotri to Hurdwar; (3) Hurdwar to Allahabad; (4, Allahabād to Seebgunge, or the head of the Delta; (5) Seebgunge, or the head of the Delta, to the Bay of Bengal.

From its Springs to Gangotri.—The Bhageerettee, Bhagirathi, or Bhaghireti, generally regarded as the true G. rises in Gurhwal, near lat. $30^{\circ} 54'$ n., and long. $79^{\circ} 7'$ e., from a snow-field imbedded between three mountains about 22,000 ft. in height. The actual spot from which it is seen to issue is 13,800 ft. above the sea. After a course of 10 m. throughout which the torrent is almost inaccessible, it reaches the temple of Gangotri, the first work of man on its banks, at an elevation of 10,300 ft. having descended about 350 ft. in a mile.—*From Gangotri to Hurdwar.*—After seven m. the stream is joined on the right by the Jahnvi, considerably larger than itself. lat. $31^{\circ} 2'$ n. and long. $78^{\circ} 54'$ e.; and the united waters, 13 m. further down, burst through the Himalaya proper, lat. $30^{\circ} 59'$ n. and long. $78^{\circ} 45'$ e. Still 90 m. lower, it receives the Aluknanda with a volume one half greater than its own, and here first it receives the name Ganges. A distance of 47 m. more carries the still rapid current down to Hurdwar, on the verge of the great plain of Hindustan, at an elevation of 1,024 ft. showing a descent of 9,276 ft. in 157 m. or of nearly 60 ft. in a mile.—*From Hurdwar to Allahabad.*—This portion of the river, 488 m. averaging a fall of 22 inches in a mile, is beset almost throughout by shoals and rapids. It is navigable, however, for river-craft the whole way to Hurdwar, for passenger-steamers to within 100 m. of the mountains, and for loaded barges up to Cawnpore, 140 m. above Allahabad, which city stands at the confluence of the G. and the Jumna.—*From Allahabad to Seebgunge, or the head of the Delta.*—This, the longest of the five divisions of the stream, is 563 m. in length, and has a fall of about five inches in a mile. Notwithstanding many shoals, it is navigable throughout, even in the driest season of the year, for vessels drawing 18 inches. About 270 m. below Allahabad, the G. is joined on the left by the Ghogra, having previously received the Gumti on the same side, and the Tons and the Kurumnassa on the right. About half-way between Allahabad and the Ghogra is the city of Benares. Between the Ghogra and Seebgunge, the principal affluents are the Sone on the right, and the Gunduk and the Coosy or Sun Kosi, on the left. Along this entire section, the G. varies largely both in breadth and in depth, according to the season of the year.—*From Seeb:*

gunge, or the head of the Delta, to the Bay of Bengal.—Here the descent, along a line of 283 m. averages about three inches in a mile. Hitherto swollen by its feeders, the G. here begins to send off branches, parting at Scebgunge with the Bhagrutti, and next, 70 m. further down, with the Jellinghi, at the town of the same name, which two, after separate courses of about 120 m. each, unite to form the Hoogly of Calcutta. Below the point of departure of the Jellinghi, the G. throws out similar offsets, the Marabhanga, the Gorae, the Chundni, and the Kirtynassa. Meanwhile, this waste toward the right is in a great measure compensated by affluents on the left, especially by various channels of the Brahmaputra—the two great net-works of waters intertwining themselves together in a manner too complex for delineation, and at last indenting a long line of coast with at least 20 estuaries. The mouth of the Hoogly, the most available of all the branches of the G. as the means of communicating with the outside world, is in lat. $21^{\circ} 40'$ n., and long. 88° e. By it the largest ships reach Diamond Harbor, while vessels of considerable burden ascend to Chandernagore. Between the Hoogly and the G., above the Delta, there are two routes. When the water is high, the Bhagrutti and the Jellinghi afford the requisite facilities; but in the dry season, the intercourse is maintained by the Sunderbund or Sunderbans Passage, a circuitous course to the n. e. which opens into the Chundni.

As a whole, however, the G. is incapable of being definitely described. It varies not merely from season to season, but also from year to year. From year to year it exchanges old passages for new ones, particularly in the alluvial basin of its lower sections. Even as far up as Futtehpore, immediately above Allahabad, 846 m. from the sea, this characteristic is remarkably exemplified. The river has in this part a bed of the average width of four m. within the limits of which it changes its course annually, in the lapse of four or five years shifting from one limit to the other. Between season and season, again, the fluctuations are still more conspicuous: for instance, at Benares, 710 m. from the sea, the stream ranges, according to the time of year, from 1,400 ft. to 3,000 ft. in breadth, and from 35 ft. to 78 ft. in depth. Lower down, the vicissitudes, without being more striking in themselves, produce more striking results. About the close of July, a considerable proportion of the Delta presents an inundation more than 100 m. in diameter, with nothing visible but villages and trees, and craft of every sort. To prevent or mitigate this evil, expensive dams have been constructed, having collectively a length of above 1,000 m. The influence of the tides extends, at the dry season, 240. m. from the sea. The minimum quantity of water delivered per second has been estimated at 36,330 cubic ft. and the maximum at 494,208 cubic feet. Like all rivers that overflow their banks, the G. holds in suspension a large admixture of mud and sand—intrusive elements eminently unfavorable to steam-navigation, as causing quick wear and decay of the cocks and valves of the engines. It has been com-

puted that the G. delivers, on an average, annually into the sea 534,600,000 tons of solid matter.

Among the rivers which at the *classical* and the *Purânic* period of India were held in peculiar sanctity by the nation, the G.—or, as it is called, the *Gangâ* (feminine)—undoubtedly occupied the foremost rank. In the vedic poetry, it is seldom mentioned; and whenever its name occurs, whether in the hymns of the *Rig-Veda* or the ritual text of the *Yajur-Veda*, no legendary fact or mythical narrative is connected with it. Nor does the law-book of Manu justify the conclusion that its author was acquainted with any of the myths which connect this river in the epic poems and in the Purânas with the Pantheon of India. See INDIA, and various titles there referred to. The earliest, and by far the most poetical legend of the G., occurs in that master-piece of Sanskrit poetry, the *Râmâyana*. We give its substance, because it explains the principal epithets by which this river is spoken of, or invoked, in ancient and modern Hindu poetry, and because it may be regarded as the type of the many fables which refer to the purifying and supernatural properties of its waters. There lived says the *Râmâyana*, in Ayodhyâ (the modern Oude), a king, Sagara, who had two wives, Kesinî and Sumati; but they bore him no issue. He therefore repaired to the Himalaya; and after a hundred years' severe austerities, Bhṛigu, the saint, became favorable to his wishes, and granted him posterity. Kesinî bore him a son named Asamanjas, and Sumati brought forth a gourd, whence sprang 60,000 sons, who in time became as many heroes. Asamanjas, however, in growing up, was addicted to cruel practices, and was therefore banished by his father from the kingdom, and his son Ansumat thus became heir to the throne of Ayodhyâ. Now, it happened that King Sagara resolved to perform a great horse-sacrifice; and in accordance with the sacred law, chose for this purpose a beautiful horse, which he confided to the care of Ansumat. But while the latter was engaged in the initiatory rites of the sacrifice, a huge serpent emerged from the soil, and carried off the horse to the infernal regions. Thereupon, Sagara, being informed of the obstruction of his pious undertaking, ordered his 60,000 sons to recover the horse from the subterranean robber. These then set to work, digging the earth, and striking terror into all creation. Having explored, for many years, the infernal regions, they at last found the sacred horse grazing, and watched by a fiery saint, in whom they recognized the serpent, the cause of their troubles. Enraged, they attacked him; but the saint, who was no other being than the god Vishnu, at once reduced them to ashes. Waiting in vain for the return of his sons, Sagara sent his grandson, Ansumat, in search of them and the sacred horse. Ansumat went, and soon ascertained the fate of his relatives; but when—mindful of his duties—he wished to sprinkle consecrated water on their ashes, so as to enable their souls to rise to heaven, Garuda, the bird of Vishnu, and brother of Sumati, came in sight, and told Ansumat that it was improper for him to

use terrestrial water for such a libation, and that he ought to provide the water of the Gangâ, the heavenly daughter of Himavat (the Himalaya). Anumat, bowing to the behest of the king of birds, went home with the horse to Sagara; and the sacrifice being achieved, Sagara strove to cause the descent of the Gangâ, but all his devices remained fruitless; and after 30,000 years, he went to heaven. Nor was Anumat more successful in his attempt with the austerities that he performed for the same purpose, nor his son Dwilipa, who, obeying the law of time, after 30,000 years, went to the heaven of Indra. Dwilipa had obtained a son named Bhagîratha. He, too, was eager to obtain the descent of the Gangâ; and having completed a course of severe austerities, he obtained the favor of Brahman, who told him he would yield to his prayers, provided that the god Siva consented to receive the sacred river on his head, as the earth would be too feeble to bear its fall when coming from heaven. And now Bhagîratha recommenced his penance, until Siva consented, and told the Gangâ to descend from heaven. The river obeyed; but, enraged at his command, she assumed a form of immense size, and increased her celerity, thinking thus to carry him off to the infernal regions. Yet the god becoming aware of her intentions, caught and entangled her in his matted hair, out of which she could find no means of extricating herself though erring there for many years. Nor would she have been released, had not Bhagîratha, by his renewed penance, appeased the god, who then allowed her to descend from his head in seven streams—Hlâdinî, Pâvinî, and Nalinî, which went eastward; and Sîtâ, Suchakshus, and Sindhu, which went westward while the seventh stream followed Bhagîratha wherever he proceeded. But it so happened that the king on his journey passed by the hermitage of an irascible saint whose name was Jahnu. The latter seeing the Gangâ overflowing in her arrogance the precincts of his sacrificial spot, and destroying his sacred vessels, became impatient, and drank up all her waters; thereupon all the gods became terrified, and promised him that, in future, the Gangâ would pay him filial respect, and become his daughter, if he would restore her again to existence. Quieted by this promise, Jahnu then allowed her to flow out from his ear, and therefore she is still called Jâhnavî, or the daughter of Jahnu. But, because Bhagîratha, by dint of his exertions, enabled his ancestors, now sprinkled with the waters of the Gangâ, to ascend to heaven, Brahman allowed him to consider her as his daughter, whence she is called Bhâgirathî. And she is called also the river of 'the three paths,' because her waters flow in heaven, on earth, and pervaded the subterranean regions.—Such is the account of the *Râmâyana*, and its substance is repeated by the *Mahâbhârata* and several of the Purânas, though they differ in the names of the streams formed by the Gangâ in her descent, some (for instance, the *Vishu-* and *Vâyu-Purâna*) restricting their number from seven to four, called by the *Vishnu-Purâna* Sîtâ, Alakanandâ, Chakshu, and Bhadrâ. A

further deviation from the original myth was caused by sectarian influence; for, whereas in the *Râmâyana*, the Gangâ springs from the Himavat (Himalaya), whose daughter, therefore, she is, and whereas Siva plays the most prominent part in her descent to earth, the *Vishnu-Purâna* assigns her source to the nail of the great toe of Vishnu's left foot, and allows Siva merely to receive one of her branches on his head. The following passage from this Purâna will show the ideas of the Vishnuite sect on the history and the properties of this river: 'From that third region of the atmosphere, or seat of Vishnu, proceeds the stream that washes away all sin, the river Gangâ, embrowned with the unguents of the nymphs of heaven, who have sported in her waters. Having her source in the nail of the great toe of Vishnu's left foot, Dhruva (Siva) reverses her, and sustains her day and night devoutly on his head, and thence the seven Rishis practice the exercises of austerity in her waters, wreathing their braided locks with her waves. The orb of the moon, encompassed by her accumulated current, derives augmented lustre from her contact. Falling from on high, as she issues from the moon, she alights on the summit of Meru, and thence flows to the four quarters of the earth, for its purification. The Sitâ, Alakanandâ, Chakshu, and Bhadrâ, are four branches of but one river, divided according to the regions toward which it proceeds. The branch known as Alakanandâ was borne affectionately by Siva, upon his head, for more than a hundred years, and was the river which raised to heaven the sinful sons of Sagara by washing their ashes. The offenses of any man who bathes in this river are immediately expiated, and unprecedented virtue is engendered. Its waters, offered by sons to their ancestors in faith for three years, yield to the latter rarely attainable gratification. Men of the twice-born orders, who offer sacrifice in this river to the lord of sacrifice, Purnashottama, obtain whatever they desire, either here or in heaven. Saints who are purified from all evil by bathing in its waters, and whose minds are intent on Kesava (Vishnu), acquire thereby final liberation. This sacred stream, heard of, desired, seen, touched, bathed in, or hymned day by day, sanctifies all beings; and those who even at a distance of a hundred leagues, exclaim "Gangâ, Gangâ," atone for the sins committed during three previous lives.' How far the belief expressed in the latter passage was carried at a period probably succeeding that of the composition of the *Vishnu-Purâna* may be seen from a legend in the *Kriyâyogasâra*, the sixth division of the *Padma-Purâna*. This Purâna relates that a king, Manobhadra, having grown old and weak, resolved upon dividing his kingdom between his two sons. He therefore convoked a council of his ministers, when, of a sudden, a vulture and his mate flew into the hall, to the surprise of the whole assembly. Questioned about the purpose of their visit, they replied that, having witnessed the evil luck of the two princes in a former birth, they now came to rejoice in their happiness. The king's curiosity having been roused, the male

GANGES CANAL.

vulture then said, that in the age called Dwâpara, the two princes had been two men of low caste, called Gara and Sangara, and when dead, were brought before Yama, the judge of the dead, who sentenced them to be thrown into a fearful hell. Their lives had indeed been faultless; no sin had been committed by them, but whenever they gave alms, they did not offer them to a Brâhmana, and thus robbing the latter of the property which otherwise would have come to him, they became candidates for hell. He, the vulture, had come to the same place, because, when being a noble Brâhmana, Sarvaša, he slighted his parents. Now the period of their sentence having expired, he was reborn as a member of the vulture tribe, which is living on the flesh of the dead, whereas the king's two sons became two locusts. Once, however, a hurricane arose, and threw the locusts into the Ganges; there they died; but having found their death in the water of the river which destroys all guilt, the servants of Vishnu came with heavenly chariots to conduct them to his town. Having stayed there till to the end of the third Kalpa, they were bidden by Brahman to enjoy themselves in the paradise of Indra; and after a certain time they were reborn in the family of Manobhadra, ultimately to rule his country.—All the hymns addressed to the Ganges—and a remarkable one occurs in the same division of the *Padmâ-Purâna*—partly allude to the legends mentioned before, or to other feats of purification worked by the sacred water of this river. Its efficacy is deemed greatest at the spot where the Ganges joins the Yamunâ, or Jumna, at Allahabad, and—the latter river having previously received the Saraswati below Delhi—where in reality the waters of the three sacred rivers meet. In some representations of Siva, the Gangâ is seen in his hair, and the river issuing from her mouth; she is also pictured, as Moor tells in the *Hindû Pantheon*, as part of the *Trivenî* or sacred triad of the rivers just named, when she is white, and bears the forehead mark of Siva; on her right is Saraswatî, red, and with a roll of paper in her hand; on her left, Yamunâ, as Lakshmî, the deity of this river, blue, and holding a golden jar. The whole group is riding on a fish; the fish, the clothing of the goddesses, and the glory encircling their heads, being of gold.—Gangâ is considered also as the mother of the god of war: see KÂRTTIKEYA.

GAN'GES CANAL: modern imitation, in some measure of the more ancient works of the kind on the Jumna (q. v.), has two main objects—the irrigating of the Doab, and the avoiding of the difficulties in the navigation of the river above Cawnpore. Extending, on the right of the Ganges, from Hurdwar to Cawnpore, it measures, including its branches, 810 m.—350 for the trunk, and 460 for the offsets. In its course, it crosses the Solani on perhaps the most magnificent aqueduct in the world. This noble work, erected at a cost of \$1,500,000, consists of 15 arches, each having a span of 50 ft.; while the piers, sunk 20 ft. below the bed of the stream, are protected on every side against

GANGETIC—GANGRA.

the force of the current by ingeniously compacted masses of piles and stones.

GANGETIC, a. *gǎn-jět'ík*: pertaining to the great river *Ganges*, or connected with it; designating a family of languages.

GANGI, *gán'jè*: town of Sicily, province of Palermo, 53 m. s.e. of Palermo. It occupies the summit and slopes of a steep and lofty hill. The old town was destroyed 1299 by Frederick II. The painter Giuseppe Salerno was born here, and in one of the churches is a much admired painting, the *Last Judgment*, from his hand. Pop. 12,000.

GANGLION, n. *gǎng'glì-òn*, **GAN'GLIONS**, or **GAN'GLIA**, n. plu. *-glì-à* [Gr. *gangliôn*, a little tumor under the skin near the sinews]: in *anat.*; an enlargement in the course of a nerve; a tumor in the sheath of a tendon: see **BRAIN: NERVOUS SYSTEM**. **GAN'GLIATED**, a. *-à-téd*, having ganglions; intertwined. **GAN'GLION'IC**, a. *-òn'ík*, relating to ganglia; applied to collections of nucleated nerve-cells which are centres of nervous power to the fibres connected with them. **GAN'GLIONEU'RA**, n. *-ò-nū'rà* [Gr. *neuron*, a nerve]: a name applied to the molluscous and articulate divisions of the animal kingdom, which are characterized by a ganglionic nervous system.

GANGOTRI, *gán-gó'trè*: temple erected on the highest accessible spot on the Ganges (q.v.), about 10,000 ft. above the sea; on the right bank of the river, here called the Bhagirathi, about ten m. from its source. Immediately in front, the stream expends into a small lake, which is subdivided into pools, taking their names respectively from Brahma, Vishnu, and other gods of the native mythology. Though the water is specially sacred, and ablution peculiarly efficacious, yet, from various causes, the pilgrims are not numerous. Beside the length and ruggedness of the journey, and the difficulty of procuring subsistence by the way, there is no accommodation for visitors, the only dwelling-house in the locality being occupied by the officiating Brahmans. Superstition, however, has found a remedy in the exportation of flasks of the holy element, sealed by the attendant priests.

GANGRA, *gǎn'gra*, **COUNCIL OF**: at Gangra, cap. of Paphlagonia, ab. A.D. 379, to condemn the asceticism of Eustathius, Bp. of Sebaste, who had been teaching the unlawfulness of eating certain meats, separating married couples, and directing those to communicate at home who were dissatisfied with the public offices of the church. It is believed that Eustathius was deposed by the council, for St. Basil (died 379) made no mention of the council, and Eustathius no longer held the see of Sebaste in 380. The council published 21 canons, which anathematized those who out of spiritual pride and a false conception of purity condemned marriage and despised those who were married, and at the same time guarded the council from being supposed not to honor and admire virginity when adopted with humility and charity.

GANGRENE—GAN-HWUY.

GANGRENE, n. *gǎng'grēn* [F. *gangrène*—from L. *gangræna*—from Gr. *ganggraina*, a gangrene—*grainō*, I eat or gnaw]: loss of vitality in a part of the living body, whether external or internal, the part becoming often, in the first instance, more or less red, hot, and painful, then livid, and finally dark and discolored, black or olive-green, according to circumstances, and putrescent; after which a separation takes place gradually between the living and dead parts, and if the patient survive, the disorganized and lifeless texture is thrown off, and the part heals by the formation of a cicatrix (q.v.) or scar, indicating the loss of substance. Gangrene is an occasional consequence of inflammation (q.v.), but is often also determined by more specific causes, such as typhus fever or erysipelas (q.v.); sometimes, also, by the action of poisons on the system, and frequently by disease or obstruction of the arteries of a part. This last is especially the case in the form called senile gangrene. Gangrene is often dangerous, and admits only to a slight extent of medical treatment; but there is sometimes a necessity for surgical interference, to preserve a useful stump, or to arrest bleeding. Generally speaking, the strength must be maintained by a nourishing but not too stimulating diet, and the part carefully preserved from external injury, and from changes of temperature. **GANGRENE**, v. to mortify or become mortified. **GANGRENING**, imp. **GANGRENED**, pp. *-grēnd*: **ADJ.** affected with gangrene. **GANGRENOUS**, a. *gǎng'grē-nūs*, showing a tendency to gangrene; having the character of gangrene.

GANGS, **AGRICULTURAL**: in England, companies of women and boys and girls, brought together for labor in the fen-districts or the low and level tracts s. of the Wash, once a marsh, now one of the most fertile agricultural districts of England. The reclaimed land was cultivated by laborers mainly from the villages which are numerous on the high ground that borders it. To save expense, they consisted, as much as possible, of women, girls, and boys. They worked in gangs, and as many as 27,000 persons were so employed. An act of 1867 provided that no woman or child was to be employed in the same gang with men or boys, and that no woman or girl was to be employed in any gang under a male gangmaster, unless a woman licensed to act as superintendent was also present with the gang. The act was received with hearty approval in the districts chiefly concerned, and its effect has been salutary. The Agricultural Children Bill, 1873, Aug. 5, throws important safeguards around the employment of children in agriculture.

GANGUE: see **GANG**.

GAN-HWUY, *gǎn-hwǎ'*, or **NGAN-HWEL**, *n'gǎn-ho-ā'*: one of the five eastern provinces of China Proper; 50,000 sq. m. It is intersected by the Yang-tze-kiang, on the left bank of which river its cap. Ngan-king-foo, is situated. In the s.e. parts of the province are extensive tea-plantations, and it produces rice, grain, and some silk. Pop. according to recent estimate 23,670,314.

GANJAH, n. *gǎn'jah* [Mahratta and Hínd.]: term used in India for the leaves or young leaf buds of the hemp plant which are frequently rubbed between the hands, added to tobacco, and smoked to increase the power of that narcotic: see HEMP.

GANJAM, *gán-jám'*: district in the presidency of Madras, on the n.w. coast of the Bay of Bengal, immediately s. of Cuttack; n. lat. $18^{\circ} 13'$ — $19^{\circ} 52'$, and e. long. $83^{\circ} 50'$ — $85^{\circ} 15'$; 8,315 sq. m. The chief products are rice, maize, sugar-canes, millet, pulse, oil-seeds, wax, gums, dye-stuffs, and arrowroot. On the n. boundary is the salt-lake Chilka, 42 m. long, 15 broad, and only 6 ft. deep. The coast does not offer a single haven to ships of any burden. Small vessels, however, may enter the Rosikoila. From its chief town G. is often called *Chicacole*. Pop. of dist. (1891) 1,893,813.

GANJAM: town in the presidency of Madras, on the left bank of the Rosikoila, immediately above its entrance into the Bay of Bengal; lat. $19^{\circ} 23'$ n., and long. $85^{\circ} 7'$ e. It was formerly cap. of the district of G., and was remarkable for its fine buildings. But in 1815, when the town was visited by deadly fevers and agues, all the public establishments were removed to Chicacole (q.v.); the fort and cantonments gradually fell into ruin, and the place sank into decay.

GANJEH: see ELIZABETOPOL.

GANNAT, *gán-ná'*: town of France, dept. of Allier, pleasantly situated on the Andelot, a tributary of the Allier, amid hills covered with vines and timber trees, 34 m. s.s.w. of Moulins. In former times, it was fortified by walls and ditches, the latter supplied with water by the stream on which the town stands. G. has tanneries and breweries, and a trade in corn, wine, and cattle. Pop. (1891) 5,764.

GANNET, n. *gǎn'nět* [AS. *ganota*, the wild goose], (*Sula*): genus of web-footed birds, of the family *Pelecanidae*, having a long, strong, conical bill, the face and throat naked, the feet with four toes, three before and one behind, all united by the web. To this genus the Booby (q.v.) belongs. Another species is the COMMON G., or SOLAN GOOSE (*S. Bassana*), a bird which breeds on insular rocks in northern seas, and migrates in winter to warmer and even tropical regions. The name *Solan* or *Soland* Goose is from *Solent*, an old name of the English Channel. The entire length of the G. is about three ft.; its general color milk-white, the crown and back of the head pale yellow, the quill feathers of the wings black. The G. lays usually a single egg, of chalky white color; the young bird, when newly hatched, has a naked blueish-black skin, but soon becomes covered with a thick white down, so that it resembles a powder-puff, or a mass of cotton; and when the true feathers appear, they are black, with lines and spots of dull white, so that the plumage of the young is very unlike that of the mature bird. The G. is long-lived, and takes about four years to come to maturity. Its motions on land are very awkward; but it is a bird of very powerful wing and graceful flight.

GANNET.

It extends its flight to great distances from the rocks which it inhabits, pursuing shoals of such fish chiefly as swim near the surface, particularly herring, pilchards, and others



Adult Gannet, or Solan Goose (*Sula Bassana*).

of the same family. The presence of a shoal of pilchards often becomes known to fishermen from the attendant gannets. When feeding, the G. always flies against the wind at an altitude of not more than about 100 ft. above the sea. When it espies a fish it instantaneously stops, and with wings *half* distended, stoops and swiftly cleaves the air. When within a yard or two of the surface, and just as it makes the plunge, the wings are clapped close to its sides: thus the bird enters the water like a bolt. The G. is found in every continent. The number of gannets that annually visits the Bass Rock in the Firth of Forth is estimated at 16,—20,000. The young are killed by cliffmen who are lowered down the rock by a rope; they are valued for their down, flesh, and oil, which bring a profit to the person who rents the rock. On and around the Bass, gannets are seen in prodigious numbers, the air around the rock being filled with them like bees around a hive, and the rock itself whitened by them and their accumulated excrements. Their nests are formed of seaweeds and marine grasses. The G., during incubation, will often allow itself to be touched with a stick without rising from the nest. Its flesh is rank and oily; but that of the young, baked, is eaten in many places, and by some is even reckoned a delicacy. The eggs are considered a decided delicacy. They are boiled 20 minutes, and eaten cold, with vinegar, salt, and pepper. The voice of the G. is harsh, and the cries of the multitudinous birds, when disturbed at their breeding-places, are deafening. The G. comes to its breeding-places in the beginning of April, and leaves in autumn.—A species of G. (*S. variegata*), extremely abund-

GANNETT—GANOID.

ant in some parts of the southern hemisphere, is said to be the chief producer of guano.

GANNETT, *găn'nět*, EZRA STILES, D.D.: 1801, May 4—1871, Aug. 28; b. Cambridge, Mass.: Unitarian minister. He graduated at Harvard College 1820, and the Cambridge Divinity School 1823, became colleague of William E. Channing, D.D., in Federal Street Church, Boston 1824, June 20; succeeded him as pastor and held the office till death. He was active in the two great controversies over Unitarianism, became one of the editors of the *Christian Examiner*, was pres. of the American Unit. Assoc. 1847—51, pres. of the Benevolent Fraternity of Churches 1857—62, and an overseer of Harvard College 1835—58. During the civil war he was active in the work of the U. S. Sanitary Commission, and subsequently labored in the interest of the Freedmen's Aid Soc. He received the degree D.D. from Harvard College 1843. He was a gifted preacher, and though a firm Unitarian, was in what has been called the evangelical wing of that denomination.

GANNISTER, or GANNISTER-BEDS, n. *găn'nīs-tēr*: a miner's term for certain hard silicious beds at the base of the true coal-measures; a term denoting a fine hard-grained grit.

GANO, STEPHEN, M.D.: 1762, Dec. 25—1828, Aug. 18; b. New York: physician and Bapt. minister. He studied medicine, was appointed surgeon in the revolutionary army when 19 years old, and served till the close of the war, and while practicing as a physician in Tappan, N. Y., began a Christian life, studied theology, and was ordained a Bapt. minister 1786, Aug. 2. In 1792 he accepted a call from the First Bapt. Church, Providence, and preached there till his death. He was one of the overseers of Harvard College 34 years.

GANOCEPHALA, n. *găn'ō-sěf'ă-lă* [Gr. *ganos*, lustre; *kephālē*, the head]: a name applied to one of the orders of Reptilia, living and extinct, having reference to the sculptured and externally polished or ganoid bony plates with which the head is defended. GAN'OCeph'ALOUS, a. *-lūs*, pertaining to.

GANOID, a. *găn'oyd*, also GANOI'DIAN, a. *-oy'dē-ăn* [Gr. *ganos*, splendor; *eidōs*, appearance]: applied to an order of



Various forms of Ganoid Scales.

fishes, living and extinct, having angular scales, composed of horny or bony plates covered with a strong shining en-

GANS—GANTLET.

amel. GANOIDEI, n. plu. *găn-oy'dē-ī*, the order of ganoid fishes; one of the four orders of fishes in the classification of Agassiz, characterized by shining scales, covered with enamel, angular, either rhomboidal or polygonal. Ganoid scales are often large, thick, and bony; they are usually in oblique rows, and united to each other by a kind of hook at the anterior angle. Recent ganoid fishes do not form a natural group, but differ in very important parts of their organization. Some of them have an osseous, some a cartilaginous skeleton. Recent ganoid fishes are, however, comparatively few; whereas, among fossil fishes, the ganoid type is extremely prevalent. The sturgeon is an example of a ganoid fish.

GANS, *gâns*, EDUARD, LL.D.: jurist: 1798, Mar. 22—1839, May 5; b. Berlin; of Jewess parentage. He studied at the Universities of Berlin, Göttingen, and Heidelberg, became a doctor of law and published *Scholien zum Gajus* 1820, visited France and England 1825, and was appointed prof. extraordinary in the Univ. of Berlin 1826. His vivacious style made him exceedingly popular as a lecturer, but his liberal political views were an annoyance to the govt. He published *Das Erbrecht in Weltgeschichtlicher Entwicklung*, 4 vols. (Stuttgart, 1824–35), in which he opposed the scientific features of the historical school of jurisprudence, and treated the science of law on the basis of Hegel's philosophy and edited the *Philosophie der Geschichte* in the posthumous edition of Hegel's works.

GANSEVOORT, *găn'sē-vōrt*, PETER, JR.: 1749, July 17—1812, July 2; b. Albany: soldier. He was appointed maj. in the 2d N. Y. regt. 1775, July 19, and in Aug. accompanied the army that invaded Canada under Gen. Montgomery. In 1776 he was promoted lieut. col. and col., and appointed commander of Fort George; and in 1777, as commander of Fort Stanwix, he defended the post against a combined British and Indian siege of 20 days, and so prevented St. Leger's co-operation with Burgoyne. For this feat he received the thanks of congress. After the war he became brig.gen. of N. Y. militia, U. S. commissioner of Indian affairs, commissioner for fortifying the frontier, military agent, and brig.gen. U. S. army.

GANTELOPE: see GANTLET.

GANTLET, n. *gânt'lêt*, or GAUNTLET, n. *gânt'lêt* [OF. *gantlet*, an iron glove—from OF. *gant*, a glove: It. *quanto*, a glove—from mid. L. *wantus*, a gantlet, a glove]: anciently an iron glove, part of the armor of knights and men at-arms, introduced abt. the 13th c. The back of the hand was covered with plates jointed together to permit the hand to close. Gantlets were frequently thrown down by way of challenge, like gloves. They are frequent in heraldry, the fact of their being for the right or left hand being expressed by the words 'dexter' or 'sinister.' Gantlet is, in recent years, applied to a somewhat large thick glove with a (usually) stiff prolongation over the wrist. GAUNTLETED, a. *-lêt-éd*, wearing a gantlet. TO THROW THE GANTLET, to challenge. TO TAKE UP THE GANTLET, to accept a

GANTLET—GAOL.

challenge. *Note.*—GAUNTLET is a common spelling, though GANTLET is the better and original form.

GANTLET (in TO RUN THE GANTLET), or GANTELOPE, *gǎn'tél-ôp* [Sw. *gatlopp*—from *gata*, a street, a line of soldiers; *lopp*, a course; or from *gang*, passage, and Dutch *loopen*, to run—comp. *elope*]: to run through a company of soldiers or sailors standing in two rows, making a lane, each having a switch or knotted cord in his hand to scourge the criminal, who is naked to the waist. *Note.*—It will be seen that GANTLET, in the expression *to run the gantlet*, has really no connection with GANTLET or GAUNTLET, but is a mere corruption of *gantelope*, or *gangloop*.

GANTUNG PASS: mountain road leading e. from Kuna-war, a district of Bussahir in Hindustan, into Eastern Tartary; lat. 31° 38' n., and long. 78° 47' e. It is 18,295 ft. above the sea, and is overhung by Gantung peak, about 3,000 ft. loftier. The place is unspeakably desolate and rugged. It is beset with perpetual snow, and being devoid of fuel, is little traversed. Gerard, one of the few travellers that have visited it, crossed it—and that in July—amid snow and sleet; he reports the whitened surface as presenting here and there dangerous pools of still water.

GANYMEDE: see PLANETOIDS.

GANYMEDES, *gǎn-î-mê'dêz*: in classic mythology, cup-bearer of Zeus. According to Homer, he was son of Tros; according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he attracted the notice of the king of the gods, who despatched his eagle to carry him off to heaven, where he succeeded Hebe as cup-bearer. The Greeks believed that Zeus gave Tros a pair of divine horses as a compensation for kidnapping his boy, and comforted him at the same time by informing him that G. had become immortal and free from all earthly ills. At a later period G. was identified with the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius (the water-bearer), in allusion to his celestial function. G. was a favorite subject of ancient art.

GAOL, n. *jāl*, in the *United States*, usually written JAIL [F. *geôle*, a gaol—from OF. *gaiole*—from It. *gaiola* for *gabbiola*, a cage—from mid. L. *gabiōlā*, a cage—from L. *cavēā*, a cage, a coop; *cavus*, hollow: comp. Sp. *gayola*, a cell for mad persons: Gael. *gabhar*, a gaol—from *gabh*, to take. to seize]: a place of confinement for debtors and criminals; a prison: see PRISON: V. to confine in a prison. GAOL'ING, imp. GAOLED, pp. *jāld*. GAOL'ER, n. the keeper of a gaol or prisoner. GAOL-BIRD, a criminal in gaol. GAOL-DELIVERY, the clearing of a prison of accused persons by bring them to trial. COMMISSION OF GAOL-DELIVERY, in *England*, is one of the four commissions issued to judges of assize, under which they discharge their duties on circuit: see ASSIZE. Commission of gaol-delivery empowers the judges to try and to deliver every prisoner who shall be in the gaol when they arrive at the circuit town. It is not incumbent on the commissioners to deliver all the prisoners

in the gaol, but they cannot try any one who was not in custody or on bail at the opening of the commission. A commission of gaol-delivery has power to order that the proceedings at any trial shall not be published till all the trials are finished.

GAP, n. *gǎp* [AS. *geap*, wide; *geapan*, to gape, to open: Icel. *glapa*, to stare; *gapa*, to gape: Norw. *gap*, a passage: Gael. *gab*, a mouth]: any opening; a hiatus; a breach; a hole. **TO STOP A GAP**, to patch up or make a shift for a time. **TO STAND IN THE GAP**, to stand forward in the post of danger, as a defender. **GAPE**, v. *gǎp* or *gāp*, to open the mouth wide, as from drowsiness or dullness; to yawn; to open, as a crevice: N. a gaping; a yawn; the opening between the mandibles of birds. **GA'PING**, imp.: **ADJ.** opening like a crevice or large crack; opening wide the mouth. **GAPED**, pp. *gāpt* or *gǎpt*. **GA'PER**, n. one who stares foolishly. **GAPES**, n. plu. *gāps* or *gāps*, a fatal disease among poultry and birds, in which they open their mouths wide and gasp for breath, caused by the presence of the parasite *scleros'toma syn'gamus* in large numbers in the trachea, or in the lungs. **TO GAPE FOR OR AFTER**, to desire earnestly; to long for; to stare or gaze. **TO GAPE AT**, to stare in a wondering manner.—**SYN.** of 'gap': defect; flaw; break; chasm;—of 'gape, v.': to gaze; stare.

GAP, *gǎp*: small town of France, cap. of the dept. of Hautes Alpes, pleasantly situated on the right bank of the Luie, about 50 m. s.e. of Grenoble. It is approached through walnut avenues, and surrounded by slopes on which the vine flourishes 2,558 ft. above sea level. Seen from a certain distance the town is picturesque; but on closer inspection, it is found a labyrinth of dirty, narrow and ill-paved streets. The chief public building is the cathedral, with a mausoleum in marble of the Constable de Lesdiguières. The town has manufactures of coarse woollens, linens, agricultural implements, and leather. Pop. (1896) 11,376. G., the anc. *Vapincum*, was formerly cap. of the district of Dauphiné to which it gave the name of Gapencois. At the commencement of the 17th c., it is said to have had about 16,000 inhabitants. Since that period, however, it has steadily declined in size and importance. It was sacked, and almost wholly reduced to ashes, by Victor Amadeus of Savoy 1692.

GAPES, *gāps* or *gāps*: disease affecting domestic fowls and some other gallinaceous birds; due to a trematode worm (*Fasciola trachealis*) in the throat. Though differing in appearance this worm is allied to the fluke worm (see **FLUKE**), which attacks and often proves destructive to sheep. Its presence produces inflammation, causes difficulty in breathing, and if neglected may prove fatal. The causes are impurities in drinking water and damp and unclean quarters. The indications are frequent gaping, stretching the neck, lassitude, and general debility. Remedies: Thorough cleansing and disinfection of the yards and pens is imperative. The affected birds are to be separated from the remainder of the flock and put into barrels into which some dry air-

GAR—GARANCINE.

slaked lime should then be thrown. The dust will cause violent coughing which will probably dislodge the worms. If not successful, or if lime is not at hand, the tip of a feather may be moistened with spirits of turpentine, or with carbolic acid and glycerine, in the proportion of 20 drops of the former to an ounce of the latter, and passed down the wind-pipe: turn it around several times and withdraw quickly: repeat with another feather until no more worms are removed. Light food should be given for a few days and a little camphor in the drinking water will be beneficial.

GAR, v. *gâr* [Icel. *gera*, or *göra*, to make, to do: Bret. *gra*, affair, business]: in *Scot.* and *prov. Eng.*, to cause; to make one do a thing; to compel; to force. **GAR'RING**, imp. **GARRED**, pp. *gârd*.

GARANCEUX, *gâr-ang-sêh*: the rough preparation formerly called garancine—namely, the spent madder acted on by sulphuric acid, as mentioned under **GARANCINE**.

GARANCINE, *gûr'an-sîn*: manufactured product of madder; hence its name, from Fr. *garance*. The discovery of the process for making this material is due to the French; and it has proved one of the most valuable additions of the present c. to our dyeing materials. It was practically used first in the dyeing establishment of Messrs. Lagier and Thomas at Avignon, where it was introduced with the hope of turning the spent madder to account; but the rude manner in which it was prepared long prevented its general use and ignorance of the organic chemistry of madder at first hindered its improvement. It was first prepared by drying and pulverizing or grinding the spent madder which had been used in the ordinary process of dyeing madder styles; this was then saturated with sulphuric acid, which was supposed to char the woody tissue and destroy the *alizurine* and some other organic products of the madder, but to have no effect upon the purpurine, which was constantly available for fresh dyeing processes. Subsequent experience showed these views to be wrong, and G. is now prepared from pure ground madder-root which has not previously been used. For this purpose, the ground madder is mixed with water, and left for a day; then fresh water is added, and the whole drawn off. By this means, the sugar, and probably the whole of the rubian, another principle of the madder, are dissolved and removed. Sulphuric acid is then added, and the temperature raised to about 90° F. for some hours, after which it is well washed with cold water, strained, pressed, and dried, and afterward ground. In this state, it has a fine chocolate-brown color, and somewhat resembles ground coffee. The advantages of G. over madder are, that it is more easily used, and the colors which it gives are brighter and more intense, though not so permanent.

GARAY—GARBLÉ.

GARAY, *gör'oy*, JÁNOS: 1812–1853, Nov. 5; b. Szegszárd: Hungarian poet. G.'s poetical genius manifested itself from early boyhood; for it was noticed by his teachers, that whenever he had to make a school *pensum* of Latin verses, he would usually bring at the same time an elaborate Magyar version. His *Csatár* (the Warrior) was published 1834, and from that time till his death, G. was one of the most assiduous workmen in the field of Hungarian literature, being attached in succession to the editorial staffs of the *Regélői*, *Rajzolatok*, *Hírnök*, and *Jelenkor*. His dramatic works are—*Csáb*, tragedy in five acts (1835); *Arboez*, tragedy in five acts (1837); *Ország Ilona*, historical drama in three acts (1837); *Utolsó Magyar Khan*, tragedy in five acts; *Báthory Erzsébet*, historical drama in five acts. The first complete edition of his poetical works was published at Pesth 1843. A collection of tales appeared under the title *Tollrajzok*, 1845; and the historical legends of Hungary, under the title *Arpádok*, 1847. A new series of poetry, *Balatoni Kagylók*, was published 1848. He died at Pesth. His last work was *Szent László*, a long historical poem in 12 cantos (2 vols., Erlau 1850). A complete edition of his poems was published after his death by Franz Ney (Pesth 1853); and a select number have been translated into German by Kertbeny (Pesth 1854; 2d ed. Vienna 1857).

GARB, n. *gárb* [OF. *garbe*, gracefulness: Sp. *garbo*, grace: It. *garbo*, comeliness, behavior]: dress; clothes; mode or fashion of dress.—SYN.: guise; habit; clothing; fashion; mode.

GARB, or GARBE, n. *gárb* [F. *garbe*; O.H.G. *garba*, a sheaf]: in *OE.*, sheaf of any kind of grain. It is frequent in heraldry. If blazoned a garb simply, wheat is understood; if any other grain is intended, it must be mentioned—e.g., 'a garb of oats.'

GARBAGE n. *gár'bāj* [Gael. *garrbhuaichd*, the filth about sheep or cattle inclosed—from *garr*, filth: Sp. *garbillare*, to separate the bad from the good: comp. F. *grabeau*, refuse of drugs]: the refuse of flesh or vegetables; the bowels of an animal; offal.

GARBLE, v. *gár'bl* [Sp. *garbillo*, a coarse sieve; *garbillar*, to garble, to sift: OF. *garbeller*, to examine precisely, to sift nearly: Ar. *ghirbal*, a large sieve: comp. Gael *garbh*, thick, rough; *buaille*, to strike out—*lit.*, to sift out the refuse]: to strike out the thick or prominent parts; to pick out and choose such parts from a statement, a writing, or an author, as may serve a purpose—generally in a bad sense; to mutilate. GAR'BLEABLE, capable of being garbled; liable to be garbled. GAR'BLING, imp.: N. a picking or sorting. GAR'BLINGS, n. plu. the worst kind, or the refuse, of any commodity. GAR'BLÉD, pp. *-blé*: ADJ. separated or picked out to serve a purpose. GAR'BLER, n. *-blér*, one who; a sorter and cleanser, as of spices. GAR-BLES, n. plu. *gár'blz*, the dust, soil, or dross separated from good spices or drugs, etc. GAR'BELLÉD, a. *-béld*, in *com.*, sorted or picked. GAR'BELLER, n. a sorter of spices or any other commodity. *Note.*—Perhaps GARBAGE is derived

from the same sources as GARBLE, or there may have been a confusion of GARBLE with OF. *garber*, to collect—see Skeat.

GARBOIL, n. *gâr'boyl* [OF. *garbouil*; It. *garbuglio*, confusion: Sp. *garbullo*, a crowd, a multitude]: in *OE.*, great confusion; disorder; hurly-burly.

GARCIA, CALIXTO: a Cuban patriot; 1836, Oct. 14—1898, Dec. 11; entered the law profession. In 1868 he aided in organizing the revolution against Spain, which is known as the Ten Years' War. He was made brigadier under Gomez and afterward succeeded the latter as commander-in-chief of the Cuban army. In 1873 he was captured by the Spaniards and sent to Spain. On being pardoned, 1878, he returned to Cuba, where he again fought against Spain in what was called the Little War. He was a second time captured and detained in Spain for 17 years under surveillance of the police. In 1895, he escaped to Cuba via the U. S. In 1898, when the Americans took Santiago, he withdrew from the Cuban army because he was not given command of the city. He soon accepted the new conditions, and in Nov. of the same year became chairman of a commission to lay before President McKinley the wishes of the Cuban leaders.

GARCIA, *gâr'sē-a*, Sp. *gâr-thē'á*, MANUEL: 1775–1832, June; b. Seville, Spain: musician. After acquiring reputation as a singer in Cadiz and Madrid, he went to Paris 1808, where he obtained great success at the Italian opera; and 1811 went to Italy, where he found equal favor in Turin, Rome, and Naples. He was constantly engaged as a singer, either in Paris or London, 1816–24. Subsequently he visited New York and Mexico. Many of G.'s pupils reached great excellence, but none equalled his eldest daughter Maria, afterward Madame Malibran (q.v.)

GARCILASO, *gâr-thē-lá'sō*, surnamed (by himself) the *Inca*: 1540–1616; b. Cuzco, Peru; son of G. de la Vega, who belonged to the same family as the poet of that name, and was one of the conquerors of Peru. G.'s father married Elizabeth Palla, Peruvian princess of the race of the Incas, niece of the famous Huayna Capac, the last emperor of Peru; and G., though a Spaniard and a Christian, was exceedingly proud of the royal blood which flowed in his mother's veins. During the greater portion of his life he lived at Cordova, where he died. His first work was *History of Florida* (*La Florida del Ynca*. Lisbon 1605). In 1609 appeared the first, and 1616, shortly before his death, the second part of his work, on the *History of Peru*, entitled *Commentarios Reales que tratan del Origen de los Incas de sus Leyes y Gobierno*, valuable as being almost the only source of information which we possess concerning the ancient Peruvians.

GARCILASO DE LA VEGA, *gâr-thē-lá'sō dā lâ vā'ga*: 1500 (or 1503)—1536, Nov.; b. Toledo: Spanish soldier and poet. He early adopted the profession of arms, and gained distinguished reputation for bravery in the wars by Emperor Charles V. against the French and Turks, but was mortally wounded while storming a castle near Fréjus, in

GARCINIA—GARDA.

the s. of France, and died at Nice, in the thirty-third year of his age. G., though prematurely cut off, lived long enough to win immortality as a poet, and though he wrote little, he revolutionized the national poetic taste of his countrymen. For the short metre of the older romances and redondillas, he substituted the hendecasyllable verse of the Italians. His pieces consist of only 37 sonnets, 5 *canzones*, 2 elegies, 1 epistle, and 3 pastorals. Strangely, they show no trace of military ardor, but are inspired by a tender sweetness and melancholy which appeared to have deeply affected his countrymen. 'His sonnets,' says Ticknor, in his *History of Spanish Literature*, 'were heard everywhere; his eclogues were acted like popular dramas. The greatest geniuses of his nation express for him a reverence they show to none of his predecessors. Lope de Vega imitates him in every possible way; Cervantes praises him more than he does any other poet, and cites him oftener. And thus G. has come down to us enjoying a general admiration, such as is hardly given to any other Spanish poet, and to none that lived before his time.' The best of the numerous editions of G.'s poems is that by Azara (Madrid 1765). They have been translated into English by Wiffen (Lond. 1823).

GARCIN'IA: see MANGOSTEEN.

GARÇON, n. *gâr'sông* [F. *garçon*, a little boy—from *gars*, a boy: comp. Gael. *gasar*, a little fellow]: in *France*, a boy, a lad; a young man; a waiter; a messenger.

GARD, *gâr*: department in s. France, bounded e. by the river Rhone. It is triangular in shape, its s. extremity reaching into the Mediterranean in a headland which has a coast-line of about ten miles. Its total area is 2,250 sq. miles; one-third arable, one-third waste land, the remainder occupied by forests, plantations, vineyards, and, on the coast, by extensive and unhealthful marshes. It is watered mainly by the Rhone, and by its tributaries, the Gard—from which the dept. has its name—and the Ceze. Of its surface, the n.w. is occupied by a branch of the Cevennes; the remainder slopes toward the Rhone and the Mediterranean. The soil is in general dry, the best land occurring in the river-valleys. Coal is found in several places and salt-works are extensively carried on in the south. The vine (which yields about 26,400,000 gallons of wine annually), the olive, and the mulberry are principal products. The chief manufactures are silk, woolen, and cotton goods; hats, ribbons, gloves, etc. Wine is largely exported. The dept. is divided into the four arrondissements of Nîmes, Alais, Uzès, and Le Vigan: the chief town is Nîmes.—Pop. (1881) 415,629; (1891) 419,388; (1901) 420,836.

GARDA, *gâr'dâ*, LAGO DI: one of the most remarkable of the Alpine lakes, and the largest in Italy; the Lacus Benacus of the Romans. Its modern name is from the small village of Garda, on its e. shore, containing 3,000 inhabitants. G.'s chief tributary is the river Sarca, which rises from the glacier of Monte Adamo, but it receives several smaller streams descending from the valleys of

GARDAIA—GARDELEGEN.

Ledro, Tavallo, and Vesta. The n. extremity of the lake enters the territory of Trent in the Italian Tyrol. On the e. it has the province of Verona; on the w., that of Brescia; on the s., that of Mantua. Its greatest length, from Riva to Peschiera, is 32 m.; its breadth, from Desenzano to Garda, 10 miles. Its depth is very variable; the average generally exceeds 120 ft.; in the direction of Mallesine, it reaches 700 and 800 ft.; and its maximum as yet ascertained is 950 English ft. The principal islands are Trimelone, Olivé, and St. Pietro. The scenery is grand. Alpine spurs border the lake on both sides, and descend steeply to its shores, but enfold also many beautiful and fertile valleys. The waters of this lake are remarkably clear, and abound in fish of various kinds. Owing to the extent of its surface, and the violent winds to which it is exposed, waves often rise on it to a considerable height, giving it the appearance of a rough sea. The only outlet is the river Mincio at Peschiera, which descends to Mantua, and discharges itself into the Po. The mild climate in the district of the lake, and the beauty of its vicinity, have caused its shores to be lined with beautiful villas. Especially attractive to the scholar is the neck of land called *Sermione* (the *Sirmia* of Catullus), where the remains of that poet's country-house are still traceable. After the peace of Villa-franca, Lake G. formed the barrier which separated Venetia from the kingdom of Italy.

GARDAIA, *gâr-dî'â*, or **G HARDEIA**, *gâr-dâ'yâ*: important trading town of Algeria, in the Sahara; chief town, and seat of the Djemmâa or elective council of the Republic of the Seven Cities of the Mزاب district; situated amid savagely naked and rocky mountains, lat. 32° 28' n. and long. 4° 38' e.; 312 m. s. s. e. of Algiers. It is fortified by an enclosing wall which is surmounted by nine towers and pierced by ten gates; contains six mosques, one remarkable for great size; and has a flourishing trade by caravans with Tunis, Algiers, Fez, Morocco, Sudan, and Timbuctu, in slaves, dates, barley, pottery, provisions, oil, wool, cotton, indigo, leather, gold-dust, ivory, and all the varied raw produce of central and n. Africa. G. is surrounded by extensive orchards, irrigated from wells, some of which are 900 ft. deep. In the vicinity are the ruins of a tower, supposed to have belonged to the Romans. The Mزاب republic or confederacy pays to the French an annual tribute of 30,000 francs, 14,000 francs of which are contributed by G. alone. In return for this, the French secure them from all wars and marauders, and open to them freely the markets of the coast regions of Algeria. Pop. (1891) 26,452.—See the *Great Sahara, Wanderings South of the Atlas Mountains*, by H. B. Tristram (London 1860).

GARDANT, *gâr'd'ant*, in Heraldry. applied to an animal as represented full-faced, and looking forward: see **PAS-SANT-GARDANT**.

GARDELEGEN, *gâr'dè-lâ-chen*: small town of Prussian Saxony, about 30 m. n.n.w. of Magdeburg, on the Milde. It has manufactures of leather, several mills and distilleries.

GARDEN—GARDE NATIONALE.

and five annual fairs. G. is very old. Tradition says that in ancient times it was called Isenburg (*Castrum Isis*), from being a sanctuary of the goddess Isis, and that it was destroyed by the Franks. Be this as it may, it was certainly destroyed by a Duke Dervan A.D. 633, and rebuilt about 924. Subsequently, for a long period, it was the seat of princely markgrafs, called Counts of Gardelegen. Until 1478, it remained a free town. Pop. (1890) 7,263.

GARDEN, n. *gâr'dn* [OF. *gârdin*; F. *jardin*—from Goth. *gards*; Ger. *garten*, a garden: It. *giardino*]: an inclosed cultivated space in which flowers, fruits, vegetables, etc., are reared; a large, well-cultivated, and fruitful territory: V. to cultivate a garden. GAR'DENING, imp. *-dn'ing*: N. the act or art of laying out and cultivating ground as gardens. GARDENED, pp. *gâr'dnd*. GARDENER, n. *-dn'ér*, one who has charge of a garden, or who cultivates one. KITCHEN-GARDEN, an inclosed space where culinary herbs and vegetables are reared.

GARDEN, *gâr'dén*, ALEXANDER: soldier: 1757, Dec. 4—1829, Feb. 29; b. Charleston; son of Alexander G., M.D., F.R.S., distinguished naturalist. He received a univ. education in London and Glasgow, returned to S. C., and entered the revolutionary army 1780, July, served under John Laurens and Henry Lee, was aide on Gen. Greene's staff, and attained the rank of major. After the war his father's estate, which had been confiscated because of his extreme royalism, was returned to him. He published *Anecdotes of the Revolutionary War* (Charleston, 1822).

GARDE NATIONALE, *gârd nâ-sî-ô-nâl'*: celebrated burgher defenders of order in Paris and certain other French towns; introduced into Paris first during the Revolution of 1789. It had existed for a long time in some of the French towns, at first for defense of the rights and privileges of the city, subsequently for guarding the persons and property of the citizens. When, 1789, July, all of the lower orders of the capital rose and demanded arms, the leaders of the Revolution, sitting at the Hôtel de Ville, seized the opportunity to decree, without consulting the government, the formation of a national guard for Paris of 48,000 citizens, which in the first instance, they named the Parisian Militia. Each electoral district was to enroll a battalion of 800 men, divided into four companies of 200 men each, 15 of these companies forming a legion. The officers of the battalions were to be elected by the privates; but the higher officers were named by the Committee. The device chosen as the badge of the service was of blue and red, the colors of the city, to which white, the color of the army, was added. Thus arose the celebrated tricolor, afterward adopted as the national badge, and now borne in honor wherever the French name extends. On the king consenting to the removal of the regular troops from Paris, Lafayette (q.v.) was named commandant of the national guard of the city. Ere many more days had elapsed, the friends of municipal freedom had organized themselves into burgher troops in every important town, and the

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National Guard had become a recognized institution of the whole kingdom, the entire number raised being not less than 300,000. The force soon acquired an extraordinary degree of discipline and efficiency—in a great degree from the number of old soldiers who, having deserted the crown, were elected to commissions by the municipal troops.

Throughout 1789, the National Guard looked on supinely at the excesses of the democratic party in the provinces, and joined the mob in Paris during the atrocities of Oct. 5; but, under Lafayette, better counsels prevailed, and the national army restored order, rescuing the royal family Oct. 11. For some months after this time, the National Guard firmly withstood the more violent insurrectionists, who would have deluged the capital with blood; but irresolution and indecision marked their action, 1792, Aug., and they stood tamely by during the appalling massacres in the prisons. As the Revolution held its sanguinary course, the National Guard receded more and more from the moderate views which it had at first supported, until, in 1794, it was among the most devoted adherents of Robespierre and his bloody triumvirate, ever ready to give its aid in the execution of their merciless decrees. Later in the year, however, when the Reign of Terror stood balanced between power and death, the National Guard proved, under the command of Barras, faithful to the Convention, which had deposed Robespierre and his terrible colleagues. In 1795, the National Guard aided in the disarmament of the populace; the reign of the multitude ceased, and the force itself was thoroughly re-organized, all elements of internal turbulence being carefully excluded from its ranks. Under this constitution, none were eligible to serve as National Guards but citizens of substance, laborers and the lowest classes being deemed dangerous. Not many months later, so great was the reaction, that the corps had become quite royalist in its feelings, carrying their sympathies at length to open rebellion against the Convention; but they sustained an utter defeat from a small body of troops of the regular army, who, under Barras and Napoleon Bonaparte, defended the Convention. After this reverse, the National Guard ceased practically to exist. It is worthy of remark that in 1794 Napoleon had been offered the command of the National Guard by Robespierre, and had declined it; had he accepted it how different might have been the fate of Europe.

In 1805, on the eve of the great continental campaign, which he expected would denude France of its regular troops, Napoleon re-instituted the G. N., taking care, however, that no elective or democratic principles should pervade the body. By a decree of Sep. 23, in which the whole empire was included, every man in good health was required to serve, between the ages of 21 and 60; the officers were to be named by the emperor. The companies were localized among the villages and townships; ten companies formed a cohort, and several cohorts, according to the district, formed a legion. This force was maintained in succeeding years in discipline and efficiency; and 1812, before the great Russian campaign, the emperor placed a large portion of the

National Guard on permanent duty. He reaped the advantages of this step when, 1813, after the disastrous issue of that year's warfare, he found 100,000 well-drilled steady troops ready to replace his lost veterans, and fill some of the vacancies in the ranks. In 1814—when advancing to meet the allies, he parted from his empress and his son, the little king of Rome, for the last time—Napoleon solemnly committed them to the protection of the National Guard of Paris. After the Bourbon restoration, the National Guard continued an important body in the state until 1827, when, its attitude becoming insubordinate, Charles X. dissolved it, but neglected to *disarm* the members. Enraged at this slight, these men were among his most formidable opponents at the revolution of 1830. Under Louis Phillippe, in that year, the G. N. was re established throughout France, Lafayette being appointed to the command-in-chief, a post, however, from which he was removed shortly afterward, as his power became dangerously great. In 1831 the National Guard of Lyon was implicated in the insurrection there; and in the following year, a considerable portion of the urban legions of Paris took part in the sanguinary disturbances of the Quartier St. Meri, in which, however, they were overcome by the firmness and fidelity of the suburban legions of the *banlieu*. Feeling its power over the Citizen King of its own creation, the National Guard verged more and more toward Republican principles, until, in the critical moments of the reform insurrection of 1848, the guard of the capital deserted from Louis Phillippe to the revolutionists, and so put an end to the Orleans dynasty. In the troubles of the spring and summer of 1848, the G. N.—excepting a few legions, subsequently dissolved—steadfastly supported order, and opposed the Socialists. On the election of Louis Napoleon to the presidency, he found it necessary to dissolve the Guards in 153 communes; and he re-organized the remainder on a footing to insure the absence of Socialistic views.

By an ordinance of 1851, June, the G. N. was placed nearly on the footing of Louis Phillippe's reign; but by a decree of 1852, which held till 1870, Sep. 4, the entire force was dissolved, and reformed on a more military basis, in certain departments only. During the Franco-German war, the G. N. was divided into sedentary and active battalions. After the defeat of the Commune, 1871, the French National Assembly decreed to dissolve the G. N., leaving the prefects of departments to choose the time of executing the decree. At present this body may be considered abolished, as its existence is incompatible with a new law of recruiting.

GARDEN CITY: city projected by the late Alexander T. Stewart in Queens co., Long Island, N. Y.; adjoining the town of Hempstead, 18 m. from New York. Mr. Stewart bought Hempstead Plains, a tract of 10,000 acres of level meadow land, for \$450,000, and designed erecting from 10,000 to 30,000 dwellings with modern improvements, to be rented to people of moderate means. He constructed 27 m. of handsome boulevards, 80 ft. wide and crossing each other at right angles, planted 50,000 shade trees, and

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began putting up neat houses 75 ft. back from the street. Before his building operations had advanced far he died, and his widow took up another part of his project and carried it forward till her death. This was the erection and endowment of all buildings necessary for the seat of the Prot. Episc. bp. of Long Island, and included the Cathedral of the Incarnation, a grand Gothic structure with a stone spire more than 200 ft. high (dedicated 1885, Apr. 9) in which a \$100,000 tomb for the bodies of Mr. and Mrs. Stewart was built, St. Paul's Memorial School for boys, St. Mary's Memorial School for girls, and the see-house of the bishop. All these buildings were completely furnished and provided with steam heat and gas. Beside these buildings the grounds contain a large hotel and 100 houses of various styles, and a park of 30 acres tastefully laid out and provided with a number of ornate fountains. The cathedral property has been deeded to the diocese of Long Island, the remainder is held in fee by the Stewart estate.

GARDENIA, *gâr-dē'nĭ-a*: genus of trees and shrubs, of nat. ord. *Cinchonaceæ*, natives of tropical and sub-tropical countries, many of which are now favorites in European and American green-houses and hot-houses for their beautiful and fragrant flowers. Some are hardy enough to endure the open air in summer. The corolla is funnel-shaped, or approaching to salver-shaped, the tube much longer than the calyx; the fruit is a berry crowned with the calyx. *G. florida* and *G. radicans* are among the species best known in Britain, and bear the name of Cape Jasmine, but are natives of Japan. The fruit of the former, about the size of a pigeon's egg and orange-colored, is sold in the shops of China and Japan for dyeing silks yellow. A beautiful yellow resin exudes from wounds in the bark of *G. arborea* and *G. gummiferi*, Indian species. The wood of *G. Thunbergii* and *G. Rothmannia* is very hard, and is used for agricultural implements, wheel axles, etc., at the Cape of Good Hope.

GARDENING.

GARDENING, or **HORTICULTURE**: arrangement, cultivation, and general management of a garden. The art of G. undoubtedly preceded that of agriculture, to which it is closely allied. The first cultivation of the ground of which we have either record or tradition was in the form of G. Several of the nations of antiquity carried this art to a high degree of perfection. The Assyrians, Chaldeans, and Egyptians were remarkably successful in their G., and the hanging gardens of the Babylonians were classed among the wonders of the ancient world. The floating gardens of Cashmere and Mexico attracted wide attention at a later period. The Greeks and Romans were skilful gardeners, and the latter greatly improved the methods which had prevailed in provinces which came under their dominion. During the middle ages G. was carried on to a considerable extent at the monasteries, some of the gardens connected with these establishments being laid out with great skill and carefully tended. At the close of this dark period the interest in G. was greatly extended. In Italy and the Netherlands it became a favorite occupation and was skilfully conducted, while in France and Spain it reached considerable development. During the past two centuries it has been much improved, and is now regarded in all civilized countries as an extremely important industrial pursuit.

G. is practically a branch of agriculture. Both are subject to the same principles, and many of the required operations are conducted in the same manner. But in general agriculture, what may be styled an extensive system is usually pursued, while in G. the intensive method prevails. The one deals with spacious grounds and seeks more land: the other cultivates small fields, and by heavy manuring and thoroughly and frequently stirring the soil, looks for large crops from limited areas. In agriculture the labor and fertilizers are given to the farm at large; in G. they are concentrated on a very few acres.

The ordinary crops produced in a garden are the various culinary vegetables, fruits, and flowers. By some writers the term G. is made to include the care and planting of shrubs and ornamental trees, but this work seems more properly to belong to another field (see **LANDSCAPE GARDENING**). The cultivation of flowers should, to some extent, receive attention in every garden not devoted wholly to the sale of vegetables, but it must be one of the minor features of ordinary G. (see **FLORICULTURE**). The larger fruits, too, such as the apple and pear, if grown on standard trees are out of place in small gardens. They require more room than can well be spared for their production. In large gardens they can be grown, to some extent, at the sides of the inclosure, but the natural place for this class of fruits is the orchard (see **ORCHARD**). In the market-garden those vegetables and small fruits which find ready sale are produced. In the kitchen-garden an abundance of culinary vegetables should be grown and strawberries and other small fruits ought always to be found. On too many farms the garden is a sadly neglected spot, though no part of the

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cultivated fields pays as well or yields such an abundance of palatable and healthful food. Land being abundant, the various details of planting and cultivation can be carried out with less labor and expense than is involved where space is limited and every foot of ground must be utilized, as is the case with market-gardens and with kitchen-gardens in the vicinity of villages and large towns.

The location of the garden will be determined largely by circumstances which cannot be controlled; but where selection is possible, a situation protected from cold winds should be chosen. A sunny exposure also is desirable and, in case of the farm garden, it is important that it be near the house. If conveniently located it will often receive needed attention which would not be given if it were necessary to go to a distant field. A rich, mellow soil, free from stones, is to be preferred, but to a great extent natural deficiencies in this direction can be supplied. If the land is wet and heavy, thorough underdraining will be required. Light soils need liberal quantities of manure and careful cultivation, but can be made productive. When possible the garden should be much longer than it is broad: this in order that the crops which admit of horse cultivation may be planted in long rows, thus saving much time and a great amount of hand work. In gardens in which the useful and ornamental are combined broad and permanent walks are laid, and edgings of very low evergreens or of flowers are set along the sides, but these are not common and may more properly be considered under another head (see **LANDSCAPE GARDENING**).

In order to fit grass land for G., it should for two or three years be applied to some hoed crop, which must be kept scrupulously free from weeds. Fertilizers should be liberally used. Land in other crops than grass, and which is desired for a garden, should be heavily manured, but if weedy should not be used for G. until the foul plants have been thoroughly eradicated. Weeds in a garden are a source of endless trouble, involve a heavy loss of time and labor, and seriously injure the crops. It is, therefore, very important that as far as possible their introduction be prevented. Plowing may be done either in the fall or spring; but if the land is inclined to be heavy the fall is best, as the action of storms and frost will do much toward pulverizing the surface. The work should be well done, but the plow should not be run so deep as to turn up the subsoil. A liberal quantity of barnyard manure should be spread upon the surface before the land is plowed and a dressing of some commercial fertilizer (see **FERTILIZERS**) adapted to the crops which are to be produced may be profitably applied after the plowing has been done. Land plowed in the fall sometimes requires re-plowing in the spring, but this is determined entirely by the character and condition of the soil. In any case the surface must be made very fine and mellow, and in the portion devoted to crops which root deeply, as carrots and parsnips, the ground should be loosened to the depth of at least eight inches. The preparation of the land should be attended to as early in the spring as it is in condi-

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tion to work, in order that the seed of the early vegetables may be planted without unnecessary delay. Where operations are conducted on a large scale it is best to place the early crops by themselves and prepare the land for later products when the season is farther advanced, as it is highly beneficial to stir the surface soil just before the seed is sown.

The selection of the seed is a matter of very great importance, as upon the skill and success with which this is done the yield and quality of the crop will largely depend. The most liberal manuring, perfect preparation of the soil, and thorough cultivation cannot insure satisfactory returns if the seed is of a low quality. A great deal of seed which will germinate readily is either impure, untrue to name, or was produced by inferior plants, and is consequently wholly unfit to use. Sometimes seed is deficient in vitality and gives only weak and unprofitable plants, while in many cases it will utterly fail to grow. This may be due to weakness of the plants from which it was grown, to careless storage, or to deterioration by age. To prevent vexatious delays and losses, seed should be purchased only of well-known and trustworthy growers. The seed of plants desired for early use, as lettuce, or for transplanting as soon as the ground is warm, as cabbage, may be started in a cold frame or hot-bed (see FORCING, in gardening; also HOT-BED). Where but few early plants are wanted it is sometimes cheaper to purchase than it is to attempt to grow them, but a cold frame will be convenient and useful and should be found in every garden. Transplanting should be carefully done (see TRANSPLANTING). If the plants are in good condition and the weather is not extremely unfavorable, it will be almost uniformly successful. In sowing and planting care should be taken to make straight rows as this will save much labor in hoeing and weeding. Prompt attention to all the details of the work is indispensable. Early sowing is essential to early maturity, which, in market G., is an important point, as the price often falls one-half in a few days after the first early vegetables are offered for sale. It is also necessary where two crops are to be grown on the same ground in a single season, and is desirable where vegetables are grown only for home use. Early cultivation saves a vast amount of labor. Weeds when small are easily destroyed, but it is difficult to eradicate them when once established (see WEEDS). Their presence also proves a great injury to growing crops. The method of cultivation to be pursued will vary somewhat with the kind of crops produced and should be adapted to their specific requirements. But to all plants grown in G. frequent stirring of the soil is beneficial and clean cultivation a necessity. Many plants require careful guarding against the attacks of insect pests. The various small fruits which naturally find a place in the farm garden also need careful attention (see SMALL FRUITS). As different crop stake the elements of fertility from the soil in varying proportions, it is not well to grow a crop on the same land for more than two years in succession (see ROTATION OF CROPS). To this rule there are a very few exceptions,

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as onions, which do well for many consecutive years, while a few others, as cabbage, should have a new location each year. Wherever circumstances prevent the observance of this rule, care must be taken to supply fertilizers which are rich in the elements which the crop requires for its full development (see FERTILIZERS).

The special implements required in ordinary G. are few in number, but they should be the best and most efficient of their kinds. In addition to the plows, harrows or pulverizers, cultivators, and hand implements in common use on the farm, a seed-drill and wheel-hoe (the combined form answers well for a small garden), a scuffle-hoe, a steel rake, and some weeding-knives, should always be at hand, and a light roller will be convenient and useful. For market G. several other tools are needed (see MARKET GARDEN). As far as possible the use of implements should take the place of hand work.

While the ordinary operations of G. are somewhat lighter than those of agriculture, the work demands the closest attention and a high degree of skill in order to make it successful. Even when conducted merely to supply the family with fresh vegetables and small fruits, constant care will be required to keep down weeds, and skill will be needed to bring the land to the highest possible state of productivity. In market G. there is, in addition to these points, need of great skill in meeting the strong competition which everywhere exists. In all G., as far as possible, the ground must be made to produce two crops in a single season. Work must be planned so that the greatest degree of efficiency may be secured. Its rewards will then be reasonably sure and very liberal. To small landholders, especially in the vicinity of towns and cities, it offers an inviting field of industry. In suitable locations it can, on a small scale, often be made profitable in connection with agriculture, but on the great majority of farms G. operations must be confined to the production of crops for home consumption.

GARDES SUISSES—GARDINER.

GARDES SUISSES, *gârd swîs*: celebrated corps in the French army, constituted 'Gardes' by royal decree 1616. They comprised more than 2,000 men, were always unswerving in their fidelity to the Bourbon kings, and are remarkable chiefly for their heroic end. 1792, Aug. 10, they withstood the Parisian revolutionary mob, and defended the palace of the Louvre till almost every man was cut down. During the resistance that they offered, the royal family was enabled to escape to such shelter as the National Assembly afforded.

GARDE-VISURE, *gârd-vê-zôr*: heraldic term used for what is commonly called the visor, or front part of the helmet, for the defense of the face and eyes.

GARDINER, *gârd'nêr*: city of Kennebec co., Me.; on the Kennebec river, and on the Maine Central railroad: 7 m. s. of Augusta, 56 m. n.e. of Portland. G. has admirable water-power derived from the Cobbossee river, which flows through it and has 8 dams within a m. of its mouth on the Kennebec river, giving a total fall of 135 ft. above low tide. Accordingly it has valuable manufacturing interests, including 12 saw-mills, 4 paper-mills, 2 potteries, and furniture, carriage, woolens, boot and shoe, and sash, blind, and door factories. It is lighted by electricity, has 10 churches, 3 banks, city hall, high school, public library and costly water-works, and does a large business in lumber and ice. Pop. (1880) 4,439; (1890) 5,491; (1900) 5,501. (See GARDINER, SYLVESTER.)

GARDINER, *gârd'nêr*, JAMES: colonel in the British army: 1688, Jan. 11–1745, Sep. 21; b. Carriden, in Linlithgowshire; son of Capt. Patrick G. At the age of 14 he obtained a commission in a Scots regiment in the Dutch service. He afterward entered the English army, and was severely wounded at the battle of Ramilies 1706. G. fought with great distinction in all the other battles of Marlborough. 1714–5, he was made capt.lieut. in a regt. of dragoons. Some time afterward he gave conspicuous proof of courage, when, with 11 other daring fellows (eight of whom were killed), he fired the barricades of the Highlanders at Preston. From an early period, G. was noted for his licentiousness, which was so marked, that ordinary officers, making no pretensions to religion, rather shunned his society, for fear of being corrupted; yet his strong constitution contributing to his continual gayety and good health, he was known as 'the happy rake.' But in 1719, he suddenly became the subject of profound religious impressions. The circumstances, as narrated by Dr. Doddridge (who had them from G. himself), contain much that is marvellous. Doddridge himself is hardly satisfied with G.'s account, and hints at the possibility of the whole being a dream, instead of a 'visible representation of the Lord Jesus Christ upon the Cross, surrounded on all sides with a glory,' etc. He also mentions that G. 'did not seem very confident' whether the voice which came to him was really 'an audible voice, or only a strong impression on his mind equally striking.' Considerable doubt

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has recently been cast on the whole story by the publication of the *Autobiography of Dr. Alexander Carlyle*, edited by John Hill Burton (Edin. Blackwood and Sons, 1860), in which Carlyle denies altogether the truth of Doddridge's version of the story, at least of the supernatural portion of it. The circumstances, however, are of little moment one way or another; the great fact is the conversion of the brave but wicked soldier into a most devout, exemplary, and faithful Christian, and regarding this there has never been any doubt. In 1724, G. was raised to the rank of major, and 1726 he married Lady Frances Erskine, daughter of the fourth Earl of Buchan, by whom he had 13 children, only five of whom survived him. In 1730 he became lieut.col. of dragoons, and in 1743 col. of a new regt. of dragoons. He was killed at the battle of Prestonpans. The *Life of Colonel G.* was written by Dr. Doddridge.

GARD'INER, JOHN: lawyer, 1731-1793, Oct. 15: b. Boston; son of Sylvester G., M.D. He studied law and was admitted to practice in London, pursued his profession in England and Wales, was junior council for John Wilkes 1764, was appointed attorney-gen. of St. Christopher, W. I. 1766, returned to Boston 1783, served in the Mass. legislature 1789-93, and secured the abolition of the law of primogeniture in Mass.; the prohibition of special pleading, and, after protracted labor, the repeal of the anti-theatrical laws. He was an active promoter of the movement which resulted in changing King's Chapel from an Episc. to a Unit. church, was an ardent republican and a man of great learning and eloquence.

GARDINER, STEPHEN: English prelate and statesman: 1483-1555, Nov. 12; b. Bury St. Edmunds, Suffolk; illegitimate son of Dr. Lionel Woodville, Bp. of Salisbury, and brother of Elizabeth Grey, queen of Edward IV. He studied at Trinity Hall, Cambridge, and 1520 became master of his Hall. Soon, through the patronage of the Duke of Norfolk, he was introduced to Cardinal Wolsey, who made him his secretary. In this capacity he acquired the favor of Henry VIII., and from his knowledge of the civil and canon law, was sent to Rome 1527, to conduct the negotiation with the pope for the king's divorce from Catharine of Aragon. He was then usually called Dr. Stephens. His exertions were unsuccessful; but having rendered services at the papal court to the Bp. of Norwich, he was by him afterward appointed Archdeacon of Norfolk, while he promoted Wolsey's interests as a candidate for the pontificate. On his return, he was made sec. of state, and in the spring of 1531 was advanced to the archdeaconry of Leicester. In Nov. of the same year, he was installed Bp. of Winchester. Notwithstanding his allegiance to the pope, he warmly supported the king's supremacy, and wrote a treatise in defense of it, entitled *De Vera Obedientia*. He was sent on embassies to France and Germany, and invariably opposed all measures tending to a religious reformation in England. He had a principal

GARDINER—GARDINER'S ISLAND.

hand in the downfall and death by execution of Thomas Cromwell, 1540, and he drew up an impeachment of heresy against Henry's last queen, Catharine Parr; but in a personal interview with Henry she re-established herself in the king's favor, and G. fell into disgrace. At the accession of Edward VI., 1547, Jan. 28, for refusing to comply with the Reformed doctrines, he was committed to the Fleet prison, but released in the following December. In 1548, he was again seized, and committed to the Tower, and on his refusal to sign certain articles submitted to him, was deprived of his bishopric. When Mary ascended the throne 1553, he was set at liberty, restored to his see, and appointed lord chancellor and first minister of state. He took the lead in all the bitter persecutions of the Protestants during Mary's reign, and is charged with great caprice and extreme cruelty; but Dr. Maitland shows that many of the statements regarding G. are gross misrepresentations; and Roger Aseham freely confesses that G. interposed to protect him when summoned by the council on a charge of heterodoxy. The management of the queen's marriage with Philip of Spain was intrusted to him, and he officiated at their nuptials. A treatise, *Necessary Doctrine of a Christian Man*, 1543, is said to have been the joint production of G. and Cranmer. G.'s character has been the subject of much criticism. Doubtless he was a zealous, though not a spiritually-minded, ecclesiastic. His devotion was that of an out-and-out *partisan*; but it was nevertheless real after its fashion, for G. would have given his life to advance the cause which had commanded his sympathies and his support.

GARDINER, SYLVESTER, M.D.: 1707-1786, Aug. 8: b. Kingston, R. I.: philanthropist. He received his medical education in London and Paris, and settling in Boston, practiced, taught materia medica and anatomy, and became wealthy as a drug merchant. He was one of the owners of the Plymouth Purchase on the Kennebec river, founded the city of Gardiner, Me., 1760, colonized it with Germans, built and endowed an Episc. church and a valuable library for it, compiled and published a prayer-book, and was a founder of King's Chapel in Boston. In 1775 he became a royalist, left Boston after the British evacuation 1776, lived in England during the war, and had some 100,000 acres of his property confiscated under the colonial prescription and banishment act. He returned to America 1785, and passed the remainder of his life in Newport, Rhode Island.

GARDINER'S ISLAND: island belonging to Easthampton, Suffolk co. N. Y., off the e. end of Long Island, separated from the mainland by G. bay; area 3,300 acres. It has a light-house at the n. end, containing a fixed light 29 ft. above high water. It was bought from the Indians by Lion Gardiner, English military engineer, 1639, was the first English settlement within the present limits of N. Y., was erected into a lordship and manor for Gardiner by Gov. Dougan, and constituted an independent 'plantation,

GARDNER—GARESSIO.

and has remained in the possession of the same family, was the scene of the burial of some of Capt. Kidd's treasure 1699, which was subsequently recovered. The British used the island as a supply station during the wars of the revolution, and 1812-15, and a Cuban filibustering expedition was broken up there by the U. S. authorities 1869.

GARD'NER: thriving town of Worcester co., Mass.: at crossing of the Boston Barre and G., and the Vt. and Mass. railroads: 15 m. w. of Fitchburg, 26 m. n.n.w. of Worcester, 70 m. w.n.w. of Boston. It contains 2 national banks, high school, weekly newspaper, and cane and willow seat chair factories, which employ 2,000 hands, make over 200 varieties of chairs and yield an annual product of over \$2,000,000. Pop. (1870) 3,730; (1900) 10,813.

GARD'NER, JOHN LANE: 1793, Aug. 1—1869, Feb. 19; b. Boston: soldier. He was appointed 3d lieut. of U. S. inf. 1812, served in Canada during the war with England, was wounded, and after the war transferred to the artillery. He was brevetted maj. 1833, served with the 4th U. S. artill. in the Fla. war, was promoted maj. 1845, Oct., served through the Mexican war and was brevetted lieut. col. for gallantry at Cerro Gordo, and col. for his part in the attack on Contreras. He commanded the Fla. dist. 1849-50, was promoted lieut.col. 1852, and was in command of Charleston harbor 1860. He secretly prepared to hold Fort Moultrie against any secession movement, but was removed by Sec. Floyd, and ordered to Tex. He was promoted col. 1861, July 23, retired 1862, employed on recruiting service, reappointed to command Charleston harbor after the war, and brevetted brig.gen. for long and faithful service 1865.

GAREE, GARI, or GHARRY, n. *gār'ē*: often pronounced *gār'rī* [Skr.]: in *India*, any wheeled conveyance, such as a barouche, phaeton, or a railway carriage.

GARE-FOWL: see **AUK**.

GARESSIO, *gā-rēs'sē-ō*: town of Piedmont, n. Italy, province of Coni, 17 m. s.e. of Mondovi; 30 m. s.e. of the town of Coni, on the left bank of the river Tanaro. Many varieties of marble are quarried here, especially that known as Persigliano. Pop. 6,500.

GARFIELD.

GARFIELD, *gâr'fêld*, JAMES ABRAM: 20th pres. of the United States 1831, Nov. 19—1881, Sep. 19; b. Orange, Cuyahoga co., O. He attended the district school, worked on the frontier farm, drove a boat-horse on the O. canal, attended the Geauga Seminary at Chester, O., 1849-50, entered the present Hiram College in Portage co., O., a 'Campbellite' (properly, Disciples) institution 1851, taught there while studying, entered Williams College, Mass., 1854, and graduated with the brightest honors of his class 1856. Returning to O. he resumed teaching in Hiram College, became its pres. 1857, began studying law while teaching and preaching 1858, was admitted to the bar and elected state senator 1859. In 1861, Aug. he was appointed by Gov. Dennison lieut.col of the 42d O. vols., composed largely of his former pupils. Soon afterward he was elected col., and in Dec. he reported to Gen. Buell, at Louisville, Ky., for duty. He was given command of a brigade and charged with the expulsion of the Confederates under Gen. Marshall from e. Ky. In 1862, Jan., he accomplished the task, for which he was promoted brig.gen. of vols., and assigned to command the 20th brigade of Buell's army. He took part in the second day's fight at Shiloh, in the operations before Corinth, and rebuilt the bridges of the Memphis and Charleston railroads and repaired the fortifications at Huntsville. In 1862, Nov., he was appointed a member of the court that tried Gen. Fitz John Porter; 1863, Feb., was made chief of staff to Gen. Rosecrans, commander of the army of the Cumberland, Sep. 19 was promoted maj.gen. of vols. for gallantry on the unfortunate field of Chickamauga, and Dec. 5, resigned his commission at Pres. Lincoln's request to take the seat in congress to which he had been elected more than a year previously. His high military record led to his appointment as member of the committee on military affairs, and in his second congressional term he became its chairman. While special importance was attached to his military opinions and judgment, the house and the country soon came to recognize in him a man of more than ordinary information, a scholar, a linguist, a hard student, and an effective debater. In 1865 he was placed on the committee of ways and means, disliking service on the military committee after the war was over, but was restored to the chairmanship of the military committee 1867. He vigorously opposed Pres. Johnson's reconstruction policy, made his first speech on general finances and the national debt 1866, Mar., foreshadowing the specie resumption of later years, became chairman of the new committee on banking and currency on its creation, and served on the committees on the census rules, appropriations (chairman), and, under the democratic organization of the house, the ways and means again. After the pres. canvas 1872 he, with the vice-pres., the vice-pres. elect, the sec. of the treasury, speaker of the house, and several senators and representatives, was charged with having accepted Credit Mobilier (q.v.) stock at a low rate for improper purposes. Committees of investigation were appointed in both houses of

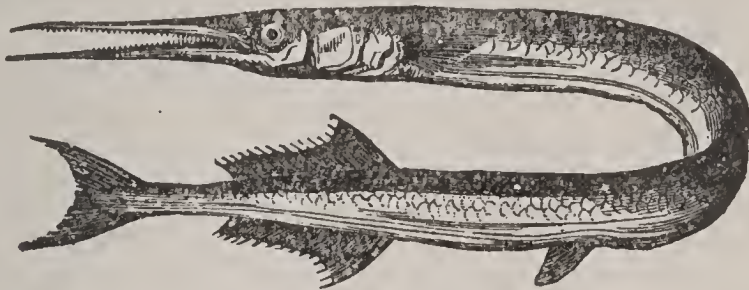
GARFIELD.

congress 1872, Dec., and reported 1873, Feb., in favor of expelling certain members and censuring others. G. was charged with having bought \$1,000 worth of the stock and with receiving a dividend on it of \$329, but he denied having ever owned such stock and declared the money received from Oakes Ames was a loan of \$300, which he had repaid. The same congress, investigating the affairs of the govt. of the D. C., connected his name with the notorious De Golyer paving contract. He was charged with having accepted a bribe of \$5,000 to influence his vote in favor of a bill of the board of public works to pave Washington with the De Golyer wood pavement. His defense and the finding of the investigating committee were that he had been paid that amount as a legal fee for preparing a brief showing the superiority of the pavement over 40 other kinds, and that whatever there was of fraud in the paving business was due to the terms of the contract, not to the patent. In 1876, at the request of Pres. Grant, he was one of a delegation of republicans who went to New Orleans to oversee the counting of the La. presidential vote, and reported on the West Feliciana parish case. He opposed the appointment of the electoral commission and delivered a strong speech on the duty of congress in a presidential election, holding that the vice-pres. had a constitutional right to count the electoral vote. On the passage of the bill authorizing the commission he and George F. Hoar, of Mass. were chosen the two republican members, and 1877, Feb. 9, 16, he discussed the Fla. and La. returns before it. During that year he became the republican candidate for speaker of the house, and on the advancement of James G. Blaine to the senate, was regarded as the leader of his party in the lower house. After a continuous service in the house of representatives of 17 years, he was elected U. S. senator 1880, Jan. 13. In June the memorable 'third term' contest occurred in the national republican convention, when the admirers of Gen. Grant determined to give him the presidential nomination for a third term. In that body G. headed the O. delegation, and not only was an open champion of John Sherman, but put him in nomination. For 33 ballots Gen. Grant received a vote that only varied between 303 and 313, a result due almost exclusively to the friendship and great tact of Roscoe Conkling. On the 34th ballot Wis. cast 36 votes for G. to the surprise of the whole convention: on the 35th he gained largely; and on the 36th there was a general break, and he received 399 votes, a majority. He was unanimously nominated June 8 with Chester A. Arthur, of N. Y., for vice-pres. In the election Nov. 2, the republican candidates received 4,449,053 popular and 214 electoral votes, and the democratic candidates, Gen. Winfield S. Hancock and William H. English, 4,442,035 popular and 155 electoral votes. Shortly after his inauguration he gave offense to Senators Conkling (q.v.) and Platt, of N. Y., by his nominations of U. S. officials in N. Y., and May 16 both senators resigned. July 2, in the waiting-room of the Baltimore and Potomac railroad in Washington as he was about joining

GARFISH—GARGANEY.

his wife on a New England pleasure trip, he was twice shot by Charles J. Guiteau, a disappointed and mentally unbalanced office-seeker. He was at once conveyed to the White House and there attended by the highest medical skill till Sep. 6, when he was removed to the seashore at Elberon, N. J. Blood-poisoning appeared on the 15th, and four days later he died. Funeral services were held in Washington Sep 23, and Cleveland 26th, and on 1882, Feb. 27, his friend and sec. of state, James G. Blaine, delivered a memorial oration at the request of both houses of congress in the hall of the house of representatives. The remains were guarded by a military force in a temporary vault in Lake View cemetery, Cleveland, pending the erection of an imposing monument. A bronze statue of him was unveiled in Washington, 1887, May 12, and over \$360,000 was raised by popular subscription for his widow and children. His assassin was promptly arrested, indicted, and after one of the most sensational trials on record, convicted, and executed 1882, June 30. G. had brilliant intellect, fine scholarship, and a warm and genial nature which made him a popular favorite. He was a member of the 'Disciples' Church, and sometimes preached in its pulpits.

GARFISH, n. *gâr'fish* [AS. *gar*, a spear], (*Belone*): genus of the family *Scomberesocidæ*, having very long bodies with minute scales and green bones. The flesh is wholesome. The COMMON G. (*B. vulgaris*) is sometimes called Greenbone,



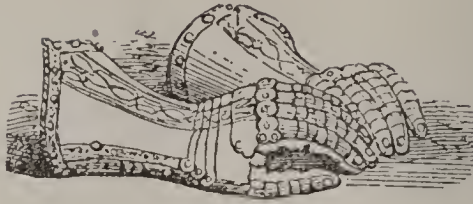
Garfish (*Belone vulgaris*).

Gorebill, and Mackerel-guide, receiving the last name because it visits the coasts just before the mackerel. It is usually about two ft. in length; the tail is forked; the pectoral and ventral fins are small; the upper part of the head and back is of a dark greenish blue; the cheeks and gill-covers, the sides and the belly, are silvery white. The G. is a very lively fish; it swims near the surface of the water, and frequently springs out of it. The flesh has a flavor somewhat like that of mackerel. Some species of G. attain large size. Other species are fresh-water fishes of warm climates, as India and Guiana.

GARGANEY, *gâr'ga-nĭ* (*Anas querquedula*, or *Querquedula circia*): species of duck or teal, considerably larger than the common teal, though not so large as the wild duck, nor even as the widgeon; a rare British bird, more common in s. Europe, found also in n. Africa, and in Asia, at least as far e. as Calcutta. The male G. is a beautiful bird; the prevailing color dark brown, finely varied on the cheeks and neck, with short hair-like lines of white; the speculum



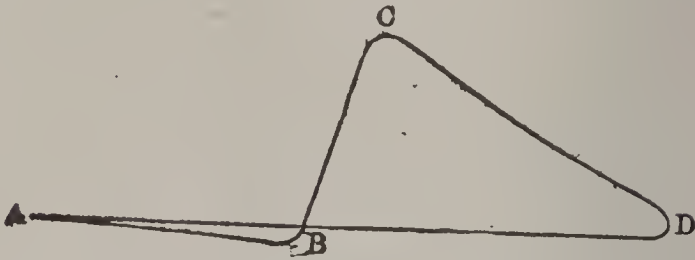
Gardant.



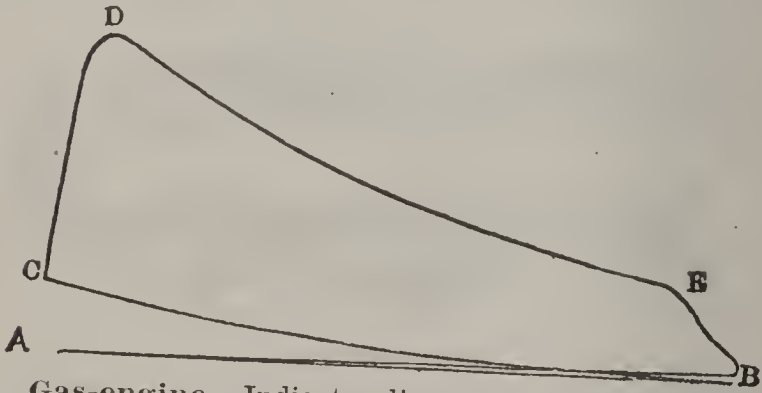
Gantlets.



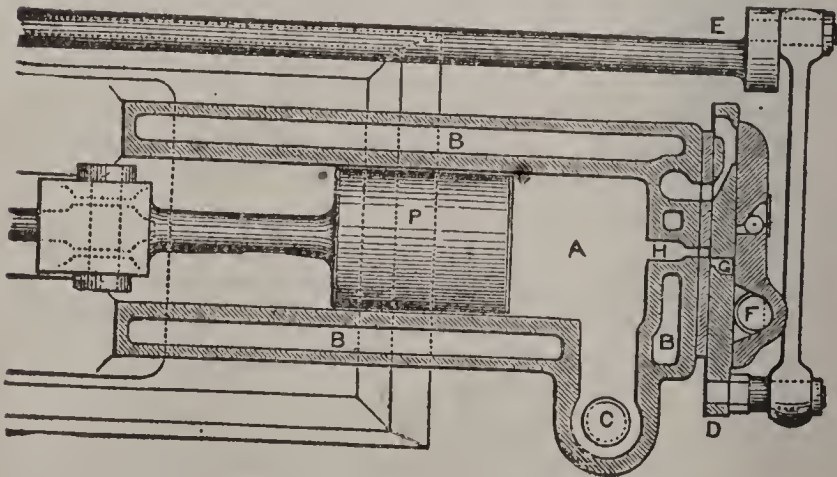
Lion gardant.



Gas-engine.—Indicator-diagram of Lenoir's Engine.



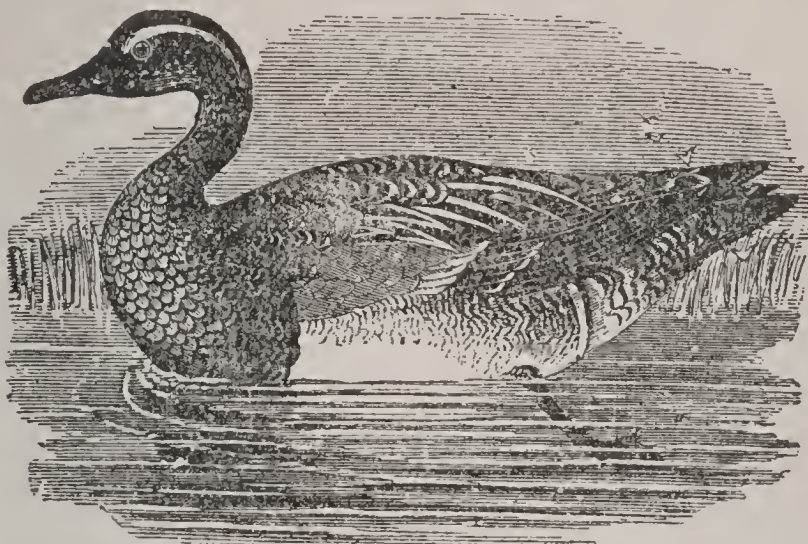
Gas-engine.—Indicator-diagram of Otto's Engine.



Gas-engine.—Section through Cylinder of Otto's Engine.

GARGANO—GARGLE.

grayish-green, margined with white; a conspicuous white streak over each eye extending to the neck. The female



Garganey, or Summer Teal (*Anas querquedula*).

is smaller than the male, the colors more dull, and the white streak obscure. The G. is much esteemed for the table.

GARGANO, *gâr-gâ'nô* (anc. *Garganus*): group of mountains in the province of Foggia, s. Italy, forming a peninsula which stretches e. about 20 m. into the Adriatic Sea. The group is composed of three chains of mountains, and is 48 m. long by 24 in breadth. The s. chain is bleak, sterile, and rocky, broken up into deep gorges and ravines. The n. side has fertile valleys, and is covered with woods. Owing to the great abundance of aromatic plants, G. is still as famous for its honey as in the time of Horace. Monte St. Angelo, one of the chain, is famous for the sanctuary dedicated to St. Michael 492. G. possesses extensive alabaster quarries.

GARGANTUAN, a. *gâr-gân'tû-an* [from *Gargantua*, the giant in Rabelais]: immense; enormous; prodigious.

GAR'GARA, or GAR'GARUS: see *IDA*.

GARGET, n. *gâr'gêt* [unascertained]: inflammation or distemper in cattle. GARGOL, n. *gâr'göl*, a distemper in hogs.

GAR'GET-ROOT: see *POKE*: *PHYTOLACCA*.

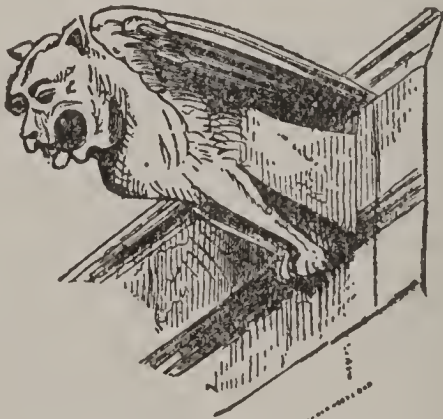
GARGLE, n. *gâr'gl*, or GARGARISM, *gâr'gâr-izm* [imitative of the sound produced: F. *gargouiller*, to gargle: comp. Gael. *garg*, rough; Gr. *gargarëôn*, the throat]: various liquid medicinal preparations intended to be churned about in the mouth and throat, with a view of cleansing the parts when affected with discharges from ulcers; or of acting as astringents (q.v.), or stimulants (q.v.), in relaxed sore throat. The best gargles are composed of vinegar or hydrochloric acid largely diluted; of chlorine water or Condy's disinfecting liquor, in putrescent cases; of port-wine, alum, and capsicum (cayenne pepper), when a stimulating effect is required; of tannin or oak-bark decoction with alum or borax in case a pure astringent is needed. Gargles are very useful in the later stages of almost all varieties of sore throat.

GARGOYLE—GARHWAL.

GARGLE, v. to wash the mouth and throat by keeping the liquid in play in the back part of the throat by expirations of air from the lungs. **GAR'GLING**, imp. *-gling*. **GARGLED**, pp. *-gâr'gld*.

GARGOYLE, n. *gâr'goyl*, or **GURGOYLE**, n. *gér'goyl* [F. *gargouille*, the throat, a spout to void the rain-water of a house: comp. Gael. *gearr*, to cut; *goill*, a face distorted]: projecting spout, leading the rain-water from the roof-gutters of buildings. Gargoyles of various forms have been used in almost all styles of architecture, but were peculiarly developed in Gothic architecture. In some of the larger mediæval buildings, where the height of the walls is considerable, the gargoyles have to project very far, in order to serve their purpose, and are in such cases of large size. The gargoyles of French buildings have usually great prominence, much more than in England. Some gargoyles are small and plain, others large and ornamental, according to their various positions. They are carved into all conceivable forms—angelic, human, and of the lower orders; are often of antic or impish suggestion; and as in fountains,

GARGOYLES.



St Stephen's, Vienna.



St. Alkmunds Church, Derby;
circa 1450.



Horsley Church, Derbyshire;
circa 1450.

the water is generally spouted through the mouth. In late castellated buildings, they frequently assume the form of small cannons projecting from the parapet. In modern times they have been almost entirely superseded by leaden pipes

GARHWAL: see **GURHWAL**.

GARIBALDI.

GARIBALDI, n. *gǎr-ĭ-băl'dĭ*: a kind of waist worn by ladies, and so called from its resemblance to the red shirt worn by Garibaldi and his men; also a hat so named for its similarity to their hats.

GARIBALDI, *gǎr-ĭ-băl'dĭ*, It. *gá-rĕ-bál'dĕ*, GIUSEPPE: 1807, July 22—1882, June 2; b. Nice, Italy; of respectable parents. His father, the owner of a trading-vessel, having been engaged all his life in maritime pursuits, young G. soon acquired a predilection for the hazards of a seafaring life. With the permission of his father, he adopted the profession of a sailor, and made his first voyage to Odessa under the command of an able and experienced seaman, Captain Pesante. He subsequently visited Rome, Cagliari, Vado, Genoa, etc., with various commanders, and soon became a skilful and fearless mariner, distinguished by his prompt decision in action and imperturbable presence of mind. In 1830, he was himself in command of the brig *Notre Dame de Grâce*; and about this time his sentiments of patriotism seem to have gained intensity by his intercourse with a fervid Italian patriot, a casual passenger on his vessel. From 1833, his acquaintance with Mazzini and the leaders of the Italian liberal movement dates, and from that period his unquenchable hatred of despotism, and devotion to the service of universal freedom, exercised a predominant influence on all his actions, and ultimately became the *single* motive of his career. In 1834, having compromised himself by participating in a futile revolutionary outbreak at Genoa, he was compelled to save his life by flight; and after extreme hardship, succeeding in gaining French territory simultaneously with the publication in Italy of the sentence of his condemnation to death. G. now resumed his seafaring life, but was soon in S. America fighting for Rio Grande, then in rebellion against Brazil. He was a cattle-dealer at Monte Video when he volunteered to serve Uruguay in its war with Buenos Ayres, but soon showed so remarkable a talent for military leadership, that he was raised to the supreme command both naval and military. In 1848, war having broken out between Austria and the liberals of Italy, G. hastened to Europe. He bore an effective part in the whole Italian campaign, but distinguished himself especially at Rome by his resistance to the French forces, who during four weeks were successfully kept at bay, and repeatedly repulsed by the republican forces of Rome, under his direction. Rome having at length succumbed to the immensely superior forces at the disposal of Gen. Oudinot, G. marched forth from the city as the French poured in. After a retreat of unparalleled difficulty through districts densely occupied by Austrian forces, G., accompanied by his devoted and heroic Brazilian wife, set sail in a small fishing-craft toward Venice; but being pursued by Austrian vessels, they were compelled to land at random, and not far from the shore his wife, exhausted by the dangers and terrible exertions of their flight, expired in the arms of her husband. G. at length reached Genoa in safety, and was next heard of as a candlemaker at New York. Subse-

GARIBALDI.

quently as commander of an American trading vessel, he was welcomed at several English ports. In 1854, he bought half of the rocky island of Caprera, off the Sardinian coast, the rest being afterwards presented to him by friends. Between the war of 1848 and that of 1859, G. publicly accepted the substitution of monarchy such as existed in Piedmont, for the republican form of government, for which he had originally combated, and was therefore free to serve as an irregular auxiliary of the Piedmontese forces on the commencement of hostilities. His services in that capacity were both brilliant and effective, notwithstanding the limited scope assigned for his operations. In the course of the following year (1860), the most triumphant and momentous enterprise of his marvellous career was accomplished. The chief result of the peace of Villafranca, by which the Italian war of 1859 was brought to an abrupt and unsatisfactory termination, was the immediate resumption by the Italian people of the revolutionary and progressive responsibilities, which during the campaign had been vested by the nation in the govt. of Sardinia. Thus, early in 1860, insurrectionary disturbances broke out in Palermo, and though speedily quelled in the city by the great numerical strength of the Neapolitan garrison, they were constantly repeated throughout the interior of the island, where the insurgents were full of elation and daring, in consequence of G. having transmitted to them the assurance that he would speedily appear himself to head their struggle. In fulfilment of this promise, G. assembled at Genoa a volunteer force of 1,070 patriots, and set sail May 5 for the island of Sicily. On the 11th, his two small transport steamers having reached Marsala in safety, the landing of his followers was successfully effected in sight, and partially under fire, of the Neapolitan fleet. On the 15th, in the battle of Calatafimi, 3,600 Neapolitan troops were routed by G.'s small force, and to this opening victory may be largely attributed the subsequent success of the entire expedition. It at once cleared the way to Palermo, and inspired G.'s soldiers with irresistible confidence. On the 18th of the same month, G. and his little army of heroes occupied the heights which command Palermo, and after a desperate conflict with the royalist troops, fought his way into that unhappy city, which for several subsequent days had to sustain a ruthless bombardment from the united fire of the Neapolitan garrison and fleet.

The intervention of the British fleet, seconded by the isolated and destitute condition of the garrison shut up in the forts, induced the Neapolitan general to capitulate: and on his departure with his troops, G. remained in undisputed possession of the city and strongholds of Palermo. His first public enactment was the universal armament of the citizens. July 20, at the head of 2,500 men, he gave battle at Melazzo to 7,000 Neapolitans, who were completely defeated, and compelled to evacuate the fortress. On the 25th, the Neapolitans were driven back into Messina, where G. made his triumphal entry on the 27th, the mutinous garrison, terrified at his approach, having compelled

GARIBALDI.

their general to submit. Toward the middle of August, G. made a descent in Calabria, and was immediately joined by large bodies of volunteers from all directions, by whom he was accompanied on his memorable and eventful march to Naples. Sep. 5, G.'s army, which then amounted to 25,000 or 30,000 men, occupied Salerno on the withdrawal of the royalists, and on the 7th, amid the frenzied enthusiasm of the inhabitants, G. entered Naples, with only one or two friends, to prove to Europe that his advent was that of a welcome liberator, and not of a terror-inspiring conqueror. On the previous day, the capital had sullenly witnessed the withdrawal of King Francis II. to the fortress of Gaeta. Before the close of the month, G. had enacted several judicious public reforms, calculated to increase the popularity of the Sardinian govt. of which he was the declared representative, though for a brief space he accepted the title and powers of Dictator. Oct. 1, his military duties became again paramount, as the royalist troops, numbering, 15,000 men, came forth from Capua, and attacked fiercely the whole line of the Garibaldians, spread along the Volturno. For some hours a terrible suspense reigned, and more than once it seemed as if success were about to desert the patriots at the last moment; but finally the royalists were driven back to Capua in disorder, and G. announced the result in his famous telegram—'Complete victory along the entire line.' This was G.'s last triumph in that struggle; Victor Emmanuel, having re-assumed the command of his army, crossed the papal frontier, routed the troops under Lamoricière, and passed on into the kingdom of Naples, where he was met by G., who immediately relinquished into his sovereign's hands the unconditional disposal of the southern volunteer army, and the absolute sway over the Neapolitan provinces.

In the spring of 1864, G. visited England, and was honored with a banquet by the Lord Mayor and the city of London. His sudden departure led to a good deal of public discussion, and the British govt. was compelled by public opinion to explain why it advised this course. During the campaign of 1866, G. took the field, and was engaged in operations against the Austrians in the Tyrol, where he sustained a severe repulse, which he retrieved next day, and was preparing to advance against the enemy when the war was brought to a close, and he returned to Caprera. 1867 was a disastrous year for G. He then openly organized an invasion of the States of the Church, to complete the unification of Italy, but was made prisoner, and afterward allowed to return to Caprera, in the neighborhood of which a man-of-war was stationed to prevent his escape. He did escape, however, only to be speedily defeated by the pontifical, reinforced by French troops. Again G. retired to his island home, which he left to fight for the French republic 1870. He was nominated to the command of the irregular forces in the Vosges, and performed the best services in the field during the memorable Franco-German war. In 1871 G. was returned a deputy to the French National Assembly for Paris, but declined to sit, and returned to Caprera. He

GARIEP—GARLAND.

entered the Italian parliament 1875. After much hesitation, he accepted from the parliament an annual pension of 50,000 lire. He devoted all his energy to the promotion of plans for the regulation of the course of the Tiber and the reclamation of the waste land near Rome. These schemes being pronounced impracticable, G. withdrew again from public life and settled at home. He had returned to his former Mazzinian republicanism, and sympathized with the *Italia Irredenta* movement. In 1880, the liberator went to Milan to unveil a monument to those who fell at Mentana 1867, in the unsuccessful attempt on Rome; and 1882, March, he went to Palermo to the celebration of the sixth centenary of the Sicilian Vespers. Less than three months afterward he died. His wish that his body should be cremated was not given effect to. By his first wife G. left two sons (of whom the elder, MENOTTI G., fought with credit by his father's side) and a daughter; and he had two other children by a peasant woman whom he married late in life. G.'s novels (*Olelia*, 1870; *Cantonio*, 1870; *I. Mille*, 1874) show fervid anti clericalism, but have no literary value.

GARIEP, *gár-ēp'*, or **ORANGE**: river of s. Africa, which, after a westward course of 1,000 m., enters the Atlantic, lat. 23° 30' s. Its source is about 10,000 ft. above the sea. Through nearly its whole length it forms the n. boundary of the Cape Colony. For navigation, this river is almost useless.

GARIGLIANO, *gá-rēl-yá'nō* (*Liris* of the ancients): largest and most important river of s. Italy. It rises in the Abruzzi, and empties into the Mediterranean, in the Gulf of Gaeta. Its sluggish course was noted by the ancient poets. On the banks of the G. was fought a famous battle, 1503, between the French and the Spaniards commanded by Gonsalvo de Cordova, surnamed the Great Captain, in which the French were totally routed.

GARISH, **GARISHLY**, **GARISHNESS**: see under **GAIRISH**.

GARLAND, n *gár'lánd* [OF. *garlande*, a garland—from mid. L. *garlanda*: Sp. *guirnalda*; F. *guirlande*, a garland—from It. *ghirlanda*, a garland: comp. Gael. *gair*, joy; *lan*, full]: a wreath or chaplet made of branches, flowers, etc (see **CROWN**): a collection of poetical extracts: V. to deck with flowers. **GARLANDING**, imp. **GAR'LANDED**, pp.

GARLAND, *gár'land*, **AUGUSTUS HILL**: lawyer: b. Tipton co., Tenn., 1832, June 11. He received a collegiate education in Lebanon and Bardstown, Ky., was admitted to the bar in Washington, Ark., 1853, and after practicing there three years settled in Little Rock. He was a Bell and Everett presidential elector in 1860, opposed secession in the Ark. state convention, served in the provisional and both branches of the Confederate congresses, was denied a seat as U. S. senator elect 1867, and the same year received a favorable decision from the U. S. supreme court on his application for the right to practice before it without taking the 'iron clad' oath. In 1874 he was elected gov. of Ark., 1876 and 83 U. S. senator as a democrat, and 1886, Mar. 5, be-

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came atty.-gen. of the United States in Pres. Cleveland's cabinet, and served till 1889. He died 1899, Jan. 26.

GARLAND, HAMLIN: an American author; b. 1860, Sept. 16; was educated in the common schools of Mitchell co., Ia., and afterward took a course in literary studies; taught school in 1882-83, and a little later settled in Boston where he began his career as a story writer. He wrote *Prairie Songs*; *Wayside Courtships*; *Her Mountain Lover*; etc.

GARLIC, n. *gár'lik* [AS. *garleac*: Icel. *geirlaukr*, garlic—*gar*, Icel. *geirr*, a spear, and Icel. *laukr*, a leek], (*Allium sativum*, see **ALLIUM**): a bulbous-rooted plant, a native of the East, cultivated from the earliest ages. The name is given also to the bulb. The stem rises to the height of about two ft., unbranched, and bearing at top an umbel of a few whitish flowers, mixed with many small bulbs. The upper part of the stem before flowering is rolled together into a ring. The leaves are grass-like, obscurely keeled, and not fistulous like those of the onion. Three alternate stamens are 3-pointed, the middle point bearing the anther. The bulb consists of 12—15 ovate-oblong *cloves* or subordinate bulbs, axillary buds of its scales thus developed; it contains a viscid juice sometimes used as a cement for porcelain, and has a penetrating and powerful *alliaceous* odor, which indeed pervades the whole plant, with a pungent aromatic taste. It is in general use in some countries as a condiment with other articles of food, and to many it is in this way very agreeable; to others, it is disgusting. It is much more largely used in other countries than in the United States and Britain; in Spain, it enters into the composition of almost every dish. G., or its fresh juice, is used also in medicine: it is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific properties, and is a good expectorant, promoting all the excretions. Applied externally, it is a rubefacient, and is used to stimulate indolent tumors. A liniment of oil and G. juice is sometimes applied to the chest in infantile convulsions. In some cases of deafness, much benefit is obtained from a clove of G. or a few drops of the juice put into the ear. G. is used also as an anthelmintic. It owes its properties chiefly to *oil of garlic* (see below). G. abounds also in mucilage.



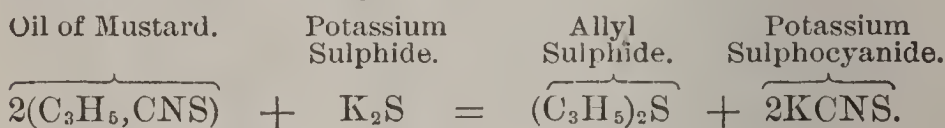
Common Garlic (*Allium sativum*).

GARLIC, OIL OF: substance giving to garlic its distinctive properties. When cloves of garlic are distilled

GARLIC.

with water, about 0·2 per cent. of a brown heavy oil, with an acrid taste, and a strong disagreeable smell, passes over. By careful rectification from a salt-water bath, about two-thirds of the oil may be obtained in the form of a yellow liquid lighter than water, and which, when treated with chloride of calcium (in order to dry it), and subsequently distilled from fragments of potassium, comes over pure and colorless as sulphide of allyl, an organic compound of considerable interest, formula $(C_3H_5)_2S$. The crude oil contains also oxide of allyl $(C_3H_5)_2O$, and a compound of allyl still richer in sulphur than the sulphide.

Sulphide of allyl exists not only in oil of garlic, but also in the oils of onions, leeks, cress, alliaria, radishes, asafetida, etc. It is a light, clear, pale-yellow oil, with a penetrating odor of garlic; it boils at 284° , and dissolves readily in alcohol and ether. Sulphide of allyl may be obtained from essential oil of black mustard (which in its purified form is represented by (C_3H_5, CNS) and may consequently be regarded as sulphocyanide of allyl) by distillation with sulphide of potassium. The reaction is exhibited in the following equation:



We may perform the converse experiment, and obtain oil of mustard from oil of garlic by mixing alcoholic solutions of sulphide of allyl and corrosive sublimate, when a white precipitate is formed represented by $(C_3H_5)_2S, 2HgS + C_3H_5Cl, HgCl_2$ and distilling this compound with sulphocyanide of potassium; in which case oil of mustard will be found among the products.—The pungency of horse-radish, scurvy-grass, and allied plants, is due to the presence of this essential oil of mustard or sulphocyanide of allyl. For further consideration of sulphocyanide of allyl see **MUSTARD, OIL OF**. Following is a brief notice of the chief members of the allyl series, which has recently been studied with very fruitful results by several most eminent chemists.

Free allyl (C_3H_5 , or, more probably, C_3H_5, C_3H_5) is a very volatile combustible fluid, with a combined odor of ether and radishes: is obtained by the action of sodium on iodide of allyl.—Allylic alcohol ($C_3H_5.OH$) is metameric with acetone and propylic aldehyde, but differs from them in properties: it is obtained by the action of ammonia on oxalate of allyl.—Allylic ether or oxide of allyl $(C_3H_5)_2O$ has been formed in at least two different ways, but the reactions accompanying its formation are complicated. It exists ready formed in small quantity in oil of garlic, and in some other oils that resemble it, and may be obtained by the decomposition of oil of black mustard. The chloride, bromide, and iodide of allyl all have been obtained. The iodide is a colorless liquid, specific gravity 1·789, with an ethereal, and somewhat alliaceous odor. It is decomposed by digestion with a watery solution of ammonia, and on distillation with potash, a volatile base with a fishy am-

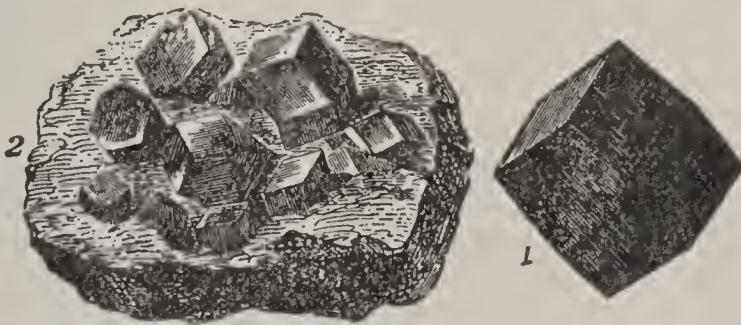
GARMENT—GARNET.

moniacal odor is formed. It is probably allyl-amine (C_3H_7N or C_3H_5, H_2N), the basic volatile alkali of the allylic series, which has been obtained also by a different process, and corresponds to ethyl-amine in the ethylic series.—Miller's *Elements of Chemistry*, 2d ed., 1862, III. 574–584; Gorup-Besanez, *Lehrbuch d. Chemie*, II. 266–272; and the recent memoirs of Berthelot and Luca, Hofmann and Cahours, etc.

GARMENT, n. *gár'měnt* [It. *guarnimento*; F. *garniment*, decking or trimming; F. *garnir*, to deck, to adorn]. any article of clothing. **GAR'MENTS**, n. plu. dress in general.—**SYN.** of 'garment': dress; attire; apparel; habit; costume; clothes; clothing; vesture; vestment; raiment; coat; gown.

GARNER, n. *gár'něr* [OF. *gernier*; F. *grenier*, a corn-loft—from *grene*, grain—from L. *granāriūm*, a granary]: a place where grain is stored; a granary: V. to store in a granary. **GAR'NERING**, imp. **GAR'NERED**, pp. *-nėrd*.

GARNET, n. *gár'nět* [It. *granato*, the pomegranate, fine scarlet; *granata*, a garnet or precious stone—from mid. L. *grānātūs*, having many grains or seeds, in mid. L. a garnet: OF. *grenat* or *granat*]: a precious stone, some of the varieties of which are of great beauty; while some are less highly prized than other not more beautiful minerals, because much more common. Garnets are found most frequently in mica-slate, hornblende slate, and gneiss; less frequently in granite and granular limestone; sometimes in serpentine and lava. There are numerous varieties, differing considerably in chemical composition; anhydrous silicates of alumina and lime or magnesia, colored with oxide of iron, of manganese, or of chrome. The color is various, generally some shade of red, brown, black, green, or yellow.



Garnet:

1, a detached crystal; 2, portion of rock with imbedded crystals.

low. Colorless and white specimens also occur. Red garnets sometimes contain so much iron as to be attracted by the magnet. The coarser variety of G., known as **COMMON G.**, is generally found massive, often forming a considerable part of the rock in which it occurs, so as even to be used as a flux in the smelting of iron. Crystallized garnets also are often very numerous in the rock which contains them; the crystals sometimes very small, almost imperceptible grains; sometimes as large as a man's fist. The primary form of the crystal is a cube, but the common

GARNET—GARNIER.

secondary forms are a rhombic dodecahedron, and an acute double eight-sided pyramid, the summits of which are abruptly acuminate by four planes.—NOBLE G., or PRECIOUS G., also called *Almandine*, is generally of crimson-red color, sometimes of so deep a tint, that jewellers hollow it out beneath, or place at the back of it a plate of silver. It is sometimes transparent, sometimes only translucent. It is found in some mountainous parts of England and Scotland, of the United States, and other countries, but the finest garnets are imported from Syriam, in Pegu. A Syriam G., of a velvety black color, without defect, is valued at about half the price of a blue sapphire of the same weight. The large specimens of the precious G. are generally engraved with figures, and thus acquire very high value.—A variety of G., known as *Grossularia*, from its resemblance in form, size, and color, to a green gooseberry, is brought from Siberia.—Cinnamon Stone (q. v.) is a variety of garnet.—Pyrope, Vesuvian, and Epidote are nearly allied to it.—Powdered garnets are often used for polishing and cutting other stones; this powder is known to lapidaries as *Red Emery*.

GARNET, *gâr'nět*, HENRY HIGHLAND, D.D.: 1815, Dec. 23—1882, Feb. 13; b. in slavery, Chestertown, Md.: Presb. clergyman. He escaped from slavery with his parents when 8 years old, settled in New York city 1826, entered Canaan Acad., N. H., 1835, graduated at Oneida Institute, N. Y., 1839, was licensed to preach 1842, and was pastor of a colored Presb. congregation in Troy, N. Y. nearly 10 years. In 1850, he went to Europe as delegate to the world's peace congress, spent three years lecturing on slavery in England and Ireland, was a missionary of the Scotch Presb. Church in Jamaica 1853-55, became pastor of the Shiloh Presb. Church, New York, 1855, and, excepting a four year's charge in Washington, remained there till 1881, when Pres. Garfield appointed him U. S. minister and consul-gen. to Liberia. He died at Monrovia soon after his arrival.

GARNIER, *gâr-ne-ä'*, JEAN LOUIS CHARLES: French architect: b. Paris, 1825, Nov. 6. He studied sculpture and alto-relievo at the special school of design where he took several prizes, attended the school of fine arts 1842-48, and took the great prize with his design for a *Conservatoire pour les arts et métiers* 1848, continued his studies in Italy and Greece, and returned to France 1854. He exhibited a polychromatic design for the restoration of the temple of Jupiter at Ægina at the exposition 1855, and works in water-color at the Salons 1857, 59, 63, obtained a 3d class medal 1857, a 1st. class 1863, and was decorated with the cross of the Legion of Honor 1864 and as an officer 1875. His plans for the new grand opera-house in Paris were unanimously adopted 1861, and he was given the supervision of construction and decoration which cost \$9,900,000. Owing to the Franco-German war the building was not completed till 1875. In 1877 he was appointed inspector-gen. of civil

GARNIER—GARNISH.

constructions, 1876, Jan., San Carlos Theatre, Monaco, designed by him, was opened, and 1886 he was voted the gold medal of the Institute of British Architects.

GARNIER, MARIE JOSEPH FRANÇOIS, usually called FRANCIS G.: 1839, July 25—1873, Dec. 7; b. St. Etienne, France: explorer. He served several years in the French navy, became an officer on the staff of Admiral Charner, was on duty in Cochin-China 1860-62, and in the latter year was appointed inspector of the natives in that province, and administrator of the town of Cho-len. He suggested the advantage of sending a French mission through Laos to Tibet, and being considered too young to command such a party the chief authority was given to Capt. Dou-dart de Lagrée, while G. was intrusted with important though subordinate duties. The expedition traversed 5,392 m. between Cratieh in Cambodia and Shanghai, of which 3,625 m., chiefly of country unknown to European geography, were surveyed by G., who also fixed important positions by astronomical observations. He successfully conducted a detachment to Talifu, cap. of Suleiman, sultan of the Mahometan rebels in Yunnan, assumed command of the mission on the death of Lagrée, and conducted it safely to the Chinese coast. In 1870 he was presented with the Victoria medal of the Royal Geographical Soc. of London, during the Franco-German war held a naval staff office, 1872 returned to Cochin-China, 1873 was commissioned to form a French colony in Tonquin, Nov. 20 took Hanoi, the cap. of Tonquin, and Dec. 7 was killed by the natives.

GARNIER-PAGES, *gâr-ne-â' pâ-zhâs'*, LOUIS ANTOINE: 1803, July 18—1878, Nov. 1; b. Marseilles: author. He was engaged in mercantile business till the death of his step-brother, Étienne Joseph Louis, leader of the French republican party, though he was a close attendant at the secret meetings which aided in precipitating the revolution of 1830. In 1842 he was elected to the chamber of deputies and joined the party of the extreme left, was active in all matters pertaining to industry and finance, became a notable promoter of the reform agitation 1847, and on the overthrow of the govt. of Louis Philippe, 1848, was elected a member of the provisional govt., and mayor of Paris, and Mar. 5 was appointed minister of finance. His decree of an additional tax of 45 centimes rendered him and his friends very unpopular, and, though he sat in the executive committee and the constituent assembly, caused his defeat for the legislative assembly. He was elected to the corps legislatif 1864 and the provisional govt. 1870, but defeated for the national assembly 1871, and then resumed his historical writings. He published *An Episode of the Revolution of 1848* (1850); *The 45 Centimes Tax* (1859); *History of the Revolution of 1848*, 8 vols. (1860-62); *History of the Executive Committee* (1869); and *The June Days* (1873).

GARNISH, v. *gâr'nîsh* [It. *guarnire*; F. *garnir*, to deck, to adorn; F. *garnissant*, embellishing]: to adorn; to

GARNISH—GARONNE.

decorate; to ornament; to furnish; to supply: N. a name formerly given to an unauthorized prison-fee in England, demanded by prisoners from new-comers. GAR'NISHING, imp.: N. something added for embellishment, as round a dish at table; that which ornaments. GAR'NISHED, pp. *nīsh't*, in *her.*, applied to a charge with the ornament set on it. GAR'NISHMENT, n. ornament; embellishment. GAR'NITURE, n. *-nī-tūr* [F. *garniture*, garnishing]: ornament; furniture; dress.

GAR'NISH — GAR'NISHMENT — GARNISHEE, n. *gār'nīsh-ē'* [F. *garer*, beware, look out]: legal terms relating to the notice or warning given to a person in whose hands is money or other property of another party—which property has been attached by a creditor of that party—not to deliver it to the defendant.—See also FOREIGN ATTACHMENT.

In law in the United States, *garnish* is to warn; *garnishment* is the warning by process of attachment; *garnishee* is the person holding property belonging to a defendant which has been attached. In general practice garnishment denotes the process of attachment of money or goods due a defendant and at the time in the hands of a third party. The effect of the process is to warn the holder not to deliver to the defendant the articles held, but to answer the plaintiff's suit. In the United States when an attachment has been issued against a debtor after judgment in order to secure to the plaintiff a claim due by a third person to such debtor the course is to give notice to (garnish) such third person, which notice given is garnishment, and he is called the garnishee. Any person privately, corporations, and individuals acting as executors and administrators, are capable of being made garnishees, but no officer of the law or assignee in bankruptcy: see ATTACHMENT.

GARONNE (anc. *Garumna*): principal river in the s.w. of France, rises within the Spanish frontier in the Val d'Aran, at the base of Mount Maladetta, in the Pyrenees. About 26 m. from its source, it enters French Territory in the dept. of the Haute Garonne, flows n.e. to Toulouse, then bends n.w. until, joined by the Dordogne about 20 m. below Bordeaux, and widening afterward into the estuary which bears the name of the Gironde, it enters the Atlantic at the Pointe de Grave. The basin of the G. is more than 200 m. in length, and about an equal extent in width at its broadest part; though narrowing in the n.w. to 25 m. The total length of the river is about 350 m.; and its natural navigation, though much impeded above Toulouse, commences at Cazères, 262 m. from its embouchure. At Bordeaux, the river attains a breadth of 1,603 ft. Its principal affluents are the Tarn, Aveyron, Lot, and Dordogne, on the right; and on the left, the Save, Gers, and Baise. At Toulouse it is joined by the Canal du Midi, which, running e. to the Mediterranean, forms with the G. communication between the Mediterranean and the Atlantic. The valley of the G. is noted for beauty of scenery, and abundant produce of corn and wine.—The estuary of

GARONNE—GARRET.

the Gironde is 40 m. in length, and about 4 m. in average breadth. Below Blaye, its shores consist of bare rocks and bleak and dreary heath.

GARONNE, *gâr-rôn'*, HAUTE: dept. in s. of France, bounded s. by the Pyrenees, w. by the departments of Hautes Pyrénées and Gers; 2,420 sq. m. It is watered throughout by the Garonne, from which it derives its name, and within the basin of which it wholly lies. Occupied in the s. by a branch of the Pyrenean range, the slope of the dept. and the course of its streams, are toward the n. and n.e., where the land is generally level. The soil is on the whole good; that in the valleys is remarkably productive, and brings forth heavy crops of grain, maize, flax, and potatoes. Orchard-fruits, with melons and tobacco, are produced in abundance, and the annual yield of wine is about 14,300,000 gallons, two-thirds of which is exported. Minerals also abound, but, with the exception of iron, have not yet been obtained in any great quantity. The chief manufactures are woolen and cotton fabrics and hardware; and these, with timber, cattle, wine, and preserved meats, are principal exports. The dept. was formerly divided between the provinces of Languedoc and Gascony. It is divided into the four arrondissements, Toulouse Muret, St. Gaudens, and Villefranche, with Toulouse as capital. Pop. of dept. (1891) 472,383; (1901) 448,481.

GAROOKUH, n. *gâr-ôk-ûh* [Pers. or Arab]: a vessel of the Persian Gulf, from 50 to 100 ft. long, having a short keel and a long overhanging prow and stern; used principally for fishing purposes.

GARPIKE, n. *gâr'pîk* [see GARFISH]: the garfish or sea-needle; an Amer. fresh-water fish covered with bony plates.

GARRARD, *gâr-rârd'*, JAMES: 1749, Jan. 14—1822, Jan. 19; b. Stafford co., Va.: soldier and governor. He became a col. in the revolutionary army, member of the Va. legislature, pioneer of Bourbon co., Ky., 1782, Bapt. minister, and gov. of Ky. 1796—1804. He was a strong advocate for religious liberty in Va., and for the exclusion of slavery from Ky. by constitutional enactment.

GARRARD, KENNER: 1828—1879, May 15; b. Ky.: soldier. He graduated at the U. S. Milit. Acad. 1851; entered the army as brev. 2d lieut. artill.; was transferred to 1st U. S. dragoons 1852, promoted 2d lieut. 1853, 1st lieut. of cav. 1855, capt. 1861, maj. 1863; was appointed col. 146th U. S. vols. 1862, Sep.; promoted brig.gen. of vols. 1863, July; mustered out of vol. service 1865, Aug.; brevetted col., brig.gen., and maj.gen. U.S.A. for gallant services through the war; and resigned from the regular army 1866, Nov. 9.

GARRET, n. *gâr'rêt* [OF. *garite*, a place of refuge, the tower of a castle—from *garir*, to take refuge: comp. Gael. *garait*, a hiding-place]: the apartments of a house immediately under the roof. **GAR'LETED**, a. *-rêt-éd*, located in a garret; turreted. **GARRETEER'**, n. *-ër'*, one who lives in a garret: applied to poor authors.

GARRETT.

GARRETT, *gär'rèt*, ALEXANDER CHARLES, D.D., LL.D.: Prot. Episc. bp.: b. Ballymot, Ireland, 1832, Nov. 4. He graduated at Trinity College, Dublin, 1855, was ordained deacon 1856, July 6, and priest 1857, July 7, was curate of East Worldham, Eng. 1857-59, missionary in British Columbia 1859-69, rector of St. James's (Prot. Episc.) Church, San Francisco, 1869-72; rector of Trinity Cathedral and dean of the chapter, Omaha, 1872-74; was consecrated missionary bp. of n. Texas, 1874, Dec. 20. He received the degree D.D. from Nebraska College 1872 and Trinity College, Dublin. 1882. and LL.D. from the Univ. of Miss. 1876.

GARRETT, ELIZABETH, M.D.: see ANDERSON, ELIZABETH (GARRETT), M.D.

GARRETT, JOHN WORK: 1820, July 31—1884, Sep. 26; b; Baltimore: capitalist. He spent one year in Lafayette College (1834-5), then entered his father's mercantile office, and was admitted to partnership in the firm of Robert G. & Sons 1879. In 1857 he became a director of the Baltimore and Ohio railroad, in 1858 was elected pres. and so served till his death. Under his management the road paid its first dividend on one year's operations, and was relieved of its floating debt at the end of his second year. He promoted the establishment of steamship lines between Baltimore and Bremen, and Baltimore and Liverpool; organized the Baltimore and Ohio Express Company and the Baltimore and Ohio Dist. Tel. Company, and became an active trustee of Johns Hopkins University.

GARRETT, ROBERT: railroad pres.: 1847, Apr. 9—1896, July 29; b. Baltimore. He was educated at Princeton Coll., graduating 1867, and entered the banking house of Robert Garrett & Sons. In 1875 he became interested in the Baltimore and Ohio r. r., of which he was made pres. 1884. He established the B. & O. telegraph and express systems. Suffering from a mental affliction he resigned the presidency and went abroad 1887, but returned 1888. He d. at Deer Park, Md —GARRETT, MARY ELIZABETH: sister of the preceding: a philanthropist and promoter of higher education for women, who, in 1892. founded a medical college for women and men, donating more than \$300,000 for the purpose.

GARRETT, THOMAS: abolitionist: 1783, Aug. 21—1871, Jan. 23; b. Upper Darby, Penn.; of Quaker parentage. He learned the edge-tool making trade with his father, settled in Wilmington, Del. 1820, and carried on the iron and hardware business, becoming very wealthy. His anti-slavery feelings had been aroused 1807 by the kidnapping from his father's house of a colored woman servant, and after settling in Wilmington he began studying the condition of the slaves. His anti-slavery opinions were widely spread, his name was passed from slave to slave till thousands came to recognize him as their friend and to seek his aid in gaining freedom, and though he aided the escape of more than 3,000 he shrewdly avoided a breach of the law. After the passage of the fugitive-slave law he was twice convicted of violating its provisions and fined so heavily that he lost his entire fortune. He was warned by the U. S.

GARRICK.

dist. court judge to desist from his practice, but he openly declared that his door should never be closed against a fugitive slave. He had established so high a reputation for integrity and business ability that the citizens of Wilmington gave him capital to resume business, and the banks lent him money without security. The day of his funeral was one of general mourning, and in accordance with his instructions his body was carried to the grave by colored people.

GARRICK, *găr'ik*, DAVID: 17161-779, Jan. 20; b. Hereford: English actor and author. He was educated at the grammar school of Lichfield. After a short residence at Lisbon with an uncle, a wine-merchant, he returned to England, and 1735 became a pupil of the famous Dr. Johnson; but after six months, master and pupil both proceeded to London, with the view of improving their fortunes. G. attempted the study of law, but an irresistible instinct soon urged him to the stage. He made his *début* at Ipswich 1741, as Aboan, in *Oroonoka*, with great success; and ventured to appear before a London audience in the autumn, and in the character of Richard III. was received with prodigious applause. The fashionable theatres were emptied to gaze upon the new star that was shedding an unwonted lustre on the obscurity of the Goodman's Fields' stage, and the other theatrical celebrities, such as Quin and Cibber, could not conceal their chagrin and disgust. In the following year, G. accepted an engagement at Dublin, where he excited the Hibernian enthusiasm to a miraculous degree. The playhouse, we are told, was so crowded, 'that a very mortal fever was produced, which was called Garrick's fever.' In 1747, he became joint-patentee of Drury Lane, and two years later married Mademoiselle Violette, a foreign *danseuse*, and to prevent the ridicule which he feared he got his friend Edward Moore 'to write a diverting poem upon his marriage.' This was not the only occasion when his sensitiveness to malicious banter induced him to forestall the wits and critics, and so blunt the edge of their jests and criticisms. Before acting *Macbeth* for the first time, he wrote a humorous pamphlet, reflecting on the 'mimical behavior of a certain fashionable faulty actor,' to wit, G. himself. In 1763 he visited Italy, and 1769 projected and conducted the memorable jubilee at Stratford-upon-Avon in honor of Shakespeare. He died in London, having accumulated a fortune of £140,000. G. ranks as one of the greatest—perhaps the very greatest—of English actors. He exhibited a Shakespearean universality in the representation of character, and was equally at home in the highest flights of tragedy and the lowest depths of farce. But the *naturalness* which so wonderfully marked him on the stage, often forsook him in real life. He was jealous to an extreme, and had an unbounded stomach for flattery. His friend Goldsmith hits off his character happily in the poem, entitled *Retaliation*. As a dramatic author, G. does not hold a high place. He wrote about 40 pieces, some original, but mostly adaptations of old plays. His prologues and epilogues, however, deserve

GARRISON.

considerable praise. See his *Life* by Percy Fitzgerald (2 vols. 1868).

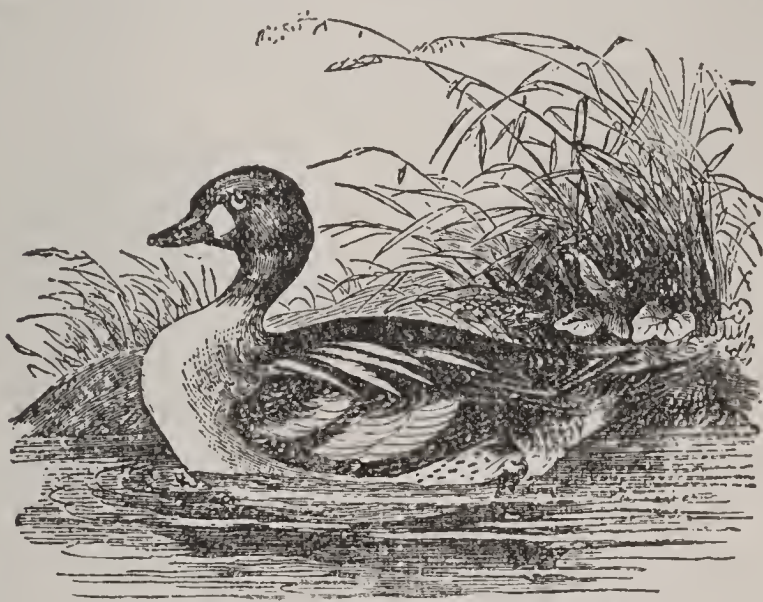
GARRISON, n. *gǎr'ri-sŭn* [Norm. F. *garnison*, any garnishing, munition, or provision of war—from *garnisant*, supplying; *garnir*, to supply (see GARNISH)]: a fortified place; the body of troops stationed in a fort or town, either for defensive purposes or as ordinary quarters: V. to place troops in a fort or town for its defense; to secure by fortresses. GAR'RISONING, imp. GAR'RISONED, pp. -*sŭnd*.

GARRISON, *gǎr'ŭ-son*, WILLIAM LLOYD: 1805, Dec. 10—1879, May 24; b. Newburyport, Mass.: American abolitionist. His father was a man of literary taste and ability, but falling into dissolute habits, deserted his wife, who, for the support of her family, had to act as professional nurse. As early as 1814, William was apprenticed to a shoemaker at Lynn, but his mother, finding that the business did not suit him, sent him back to Newburyport, where he went to school for some time, working out of school hours to pay his board. In 1818, he began to learn cabinet-making, but this proving also distasteful to him, he was, in Oct. of the same year, apprenticed to the printer of the *Newburyport Herald*. This occupation suited his taste; he soon made himself master of the mechanical part of the business, and when only 16 or 17 years of age began to write for the *Herald*. His contributions, which were anonymous, were favorably received, and he soon began to send articles to the *Salem Gazette* and other papers, drawing the attention of political circles by a series of articles under the signature Aristides, with the view of removing the almost universal apathy on the subject of slavery. In 1824, he became editor of the *Herald*; and in 1826, proprietor and editor of the *Free Press*, in which he was accustomed to set up his own editorial articles in type, without writing them out. This enterprise was financially unsuccessful, and he went to Boston, where he worked for a time as a journeyman-printer. In 1827, he became the editor of the *National Philanthropist* in that city; 1828 he joined a friend in the publication of the *Journal of the Times* at Bennington, Vt., and 1829 he joined Benjamin Lundy at Baltimore, in editing the *Genius of Universal Emancipation*. The vigorous expression of his anti-slavery views in this last paper led to his imprisonment for libel, from which he was released by Mr. Tappan, a New York merchant, who paid his fine. He now prepared a series of emancipation lectures, subsequently delivered in New York and other places. He returned to Boston, and 1831 started the *Liberator*, a paper with which his name is inseparably associated, and which he carried on for 35 years, until slavery was abolished in the United States. For the first few years almost every mail brought letters to G., threatening his assassination if he did not discontinue this journal; the legislature of Georgia offered a reward of \$5,000 to any one who should prosecute and bring him to conviction in accordance with the laws of that state; in 1835 he was severely handled by

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a Boston mob, and the mayor of that city was constantly appealed to from the South to suppress his paper. In spite of all, he successfully persevered. In 1833, he visited Great Britain, and on his return organized the American Anti-slavery Soc., of which he was afterward president. He visited England again, in the furtherance of his anti-slavery opinions, 1846 and 48. In 1865, after the total abolition of slavery in the United States, his friends presented him with \$30,000 as a memorial of his services. In 1867 he was once more in England, and entertained at a public breakfast in St. James's Hall, where he was the recipient of compliments from the Duke of Argyll and John Bright. He died at New York. Some *Sonnets and other Poems* by him were published 1847; *Selections from his Writings and Speeches*, 1852; *Life*, by his children, 1885.

GARROT, *gär'ot* (*Clangula*): genus of the oceanic section of Ducks (q. v.), having the bill shorter than the head. One species, the GOLDEN-EYE (*C. vulgaris* or *C. chrysophthalmus*),



Golden-eye (*Clangula vulgaris*).—Male.

A bird not quite so large as a widgeon, is a common winter visitant of the central and southern parts of Europe, and of the temperate parts of Asia and N. America, appearing in small flocks, most frequently in severe weather, not only in estuaries, but on the lakes and rivers of inland parts of the country. It breeds in arctic and subarctic regions, preferring wooded districts, and forms its nest either on the ground, in the crevice of a rock, or the hole of a tree. The parent birds are said to transport their young from the nest to the water, holding them under the bill, and supported by the neck. The Lapps take advantage of the predilection of the golden-eyes for making their nests in holes, by setting up boxes for them, and then robbing them of their eggs.—Another species is the HARLEQUIN G., or HARLEQUIN DUCK (*C. histrionica*), a rare winter visitant: it is a native of the n. parts of the world generally. The male is curiously streaked and marked with white.—The BUFFEL-HEADED G., or BUFFEL-HEADED DUCK (*C. albeola*),

GARROTTE—GARRULAX.

is very common in N. America, where it is often called the Spirit Duck, a name which is said to have been bestowed in allusion to its power of eluding observation by diving. It is rather smaller than the golden-eye and harlequin garrot. The flesh of the garrots is eaten, but not very highly esteemed.

GARROTTE, or **GARROTE**, or **GAROTE**, n. *gǎ-rôt'* [Sp. *garrote*, strangling a criminal with an iron collar: F. *garrotter*, to tie fast or bind with cords]: capital punishment in Spain and the Spanish colonies. The term signifies also strangulation, and a bow-string as the instrument of strangulation. The punishment originally consisted in simply placing a cord round the neck of a criminal seated on a chair fixed to a post, and then twisting the cord by means of a *stick* (whence the name) inserted between it and the back of the neck, till strangulation was produced. Afterward a brass collar was used, containing a screw, which the executioner turned till its point entered the spinal marrow where it unites with the brain, causing instantaneous death. The inquisitors were wont to grant as a favor this mode of strangulation, before being burned, to such condemned persons as recanted. If the executioner was unskilful, however, the pain was sometimes very great. Llorente (*Hist. de l' Inq.*, III. 472) mentions that at an *Auto da Fé* (q. v.) at Cuença, a poor Jew who had obtained this dismal privilege of preliminary strangulation, noticing the bungling manner in which the executioner had performed the operation on the two who preceded him, said to the official: 'Peter, if you are likely to strangle me so clumsily, I would much rather be burned alive.' The same process was applied as a species of torture to the limbs, also, or to such portions of the body as might be injured with comparative impunity. It is probable that the Spaniards adopted the G. from the Moors; at all events, in its primitive form, it exactly resembles the punishment of the bowstring in use among Mohammedan nations.—Garrotting is also an English and American name for a species of robbery, in which the robbers suddenly come behind their victim, and throwing a cord, or handkerchief, or something of the sort, round his neck, produce temporary strangulation till their purpose is effected. **GARROTTE**, v. to render suddenly insensible by compressing the throat, etc., and then to rob. **GARROT'TING**, imp.: N. the practice or method of garrotters. **GARROT'TED**, pp. **GARROT'TER**, n. *-tér*, one who attacks by garrotting; a machine for hooping casks by squeezing their staves together.

GARROVILLAS-DE-ALCONETAR, *gár-rō-vēl' yás-dū-ál-kō-nā-tár'*: small town of Spain, province of Cáceres, 20 m. n.w. of the town of Cáceres; on the left bank of the Tagus. It has manufactures of linen and woolen fabrics, and some trade in grain, cattle, and fruit. Pop. 5,000.

GARRULAX, n. *gǎr'rū-lǎks* [L. *garrulus*, prattling]: genus of *Corvidæ* (crows), sub-family *Timalinæ*. *G. leucolophus* is the laughing crow of India, and *G. chinensis*, the Indian black-faced thrush.

GARRULOUS—GARTER.

GARRULOUS, a. *gǎr'rû-lûs* [L. *garrulus*, chattering, prating—from *garrîo*, I chatter, I prate: It. *garrulo*]: talkative; chattering; loquacious. **GARRULOUSLY**, ad. *-lî*. **GARRULITY**, n. *-rû'î-tî*, and **GARRULOUSNESS**, n. *-nês*, the practice or habit of talking much.

GARRULUS, n. *gǎr'rû-lûs*: type of the sub-family *Garrulinae*, a sub-family of *Corvidæ*, containing the jays; found in both e. and w. hemispheres.

GARTER, n. *gâr'tër* [F. *jarretière*; prov. F. *gartier*, a garter—from *jarret*, or *garet*, the ham or back of the leg: W. and Bret. *gar*, ham]: a string or band used to hold up the stocking on the leg; the badge of the highest order of knighthood in Great Britain; the order itself (see **BEND**, in *Heraldry*): V. to bind or invest with the garter. **GARTERING**, imp. **GARTERED**, pp. *-têrd*: **ADJ.** wearing a garter. **GARTER KING-AT-ARMS**, see below.

GARTER, ORDER OF THE: highest and most ancient orders of knighthood in Britain; and one of the most famous, though not the most ancient, of the military orders of Europe; instituted 1344 (or 1350) by king Edward III. Selden says that it 'exceeds in majesty, honor, and fame all chivalrous orders in the world.' It is said to have been devised for the purpose of attracting to the king's party such soldiers of fortune as might be likely to aid in asserting the claim which he was then making to the crown of France, and intended as an imitation of king Arthur's round table. The round table was erected at Windsor, and the



Star of the Order of the Garter.

knights and nobles who were invited from all parts of the world were exercised at tilts and tournaments as a preparation for the magnificent feasts that were spread before them. That general 'jousts and tournaments' of this description were held at Windsor, is known from the letters summoning them bearing date 1344, Jan. 1, quoted by Sir Harris Nicolas in his *Orders of Knighthood*, i. p. 6; and from the narrative of Froissart, who connects them with the institution of the order. The original number of the knights of the garter was 25, his majesty himself being the 26th. The story that the Countess of Salisbury let fall her garter at a court ball when dancing with the king, and that the king picked it up and tied it round his own leg; but that, observing the jealous glances of the queen, he restored it to its fair owner with the exclamation, *Honi soit qui mal y pense*, is about as well authenticated as most tales of the kind; and has in its favor moreover, that it accounts for the otherwise unaccountable emblem and motto of the order. Sir Harris Nicolas, whose error does not usually lie in the direction of credulity, says, that though the writers on the order have treated this story with con-

GARTER KING-AT-ARMS.

tempt, they have neither succeeded in showing its absurdity, nor suggested a more probable theory. Various dates are assigned to the order.



Collar, Badge, and Garter.

Froissart, as above mentioned, gives 1344, and fixes on St. George's day (Apr. 23), but Stow, and, it is said, the statutes of the order, fix it six years later. The original statutes have long since perished, and little reliance can be placed on the modern copies of them, and nothing is known on the subject with precision till the compilation of the *Black Book* in the latter part of the reign of Henry VIII. In these circumstances, Sir Harris Nico-

las is of opinion, that, though founded at the former period, it was not till the latter that the order was finally organized and the companions chosen. Another story attributes the institution to Richard I., who at the reign of Acre tied thongs of leather around the legs of some officers as badges of distinction: see Brande and Cox.) The order was founded in honor of the Holy Trinity, the Virgin Mary, St. Edward the Confessor, and St. George; but the last, who had become the tutelary saint of England, was considered its special patron; and for this reason it has always borne the title of 'The Order of St. George,' as well as of 'The Garter.' A list of the original knights, or knights-founders, is given by Sir Harris Nicolas.

The well-known emblem of the order is a dark-blue ribbon edged with gold, bearing the motto *Honi soit qui mal y pense*, in golden letters, with a buckle and pendant of gold richly chased: it is worn on the left leg below the knee. The mantle is of blue velvet, lined with white taffeta, and on the left breast a star is embroidered. The hood and surcoat are of crimson velvet, lined with white taffeta. The hat is of black velvet, with a plume of white ostrich feathers, in the centre of which is a tuft of black herons' feathers, all fastened to the hat by a band of diamonds. The collar is of gold, of 26 pieces, each in the form of a garter. The 'George' is the figure of St. George on horseback encountering the Dragon, and is worn hanging from the collar; there is a 'lesser George' pendent to a broad dark-blue ribbon over the left shoulder. The Star, of eight points, is silver, and has on the centre the Cross of St. George, gules, encircled with the garter. The officers are—the Prelate (Bp. of Winchester), the Chancellor (Bp. of Oxford), the Registrar (Dean of Windsor), the Garter King of Arms (q.v.), and the Usher of the Black Rod.

GAR'TER KING-AT-ARMS: herald to the order of the Garter, and highest officer of the *Heralds' College* next to

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the Earl Marshal. He is also the Principal King-at-Arms in England, though these two offices are distinct. The first was instituted for the service of the order of the Garter (see GARTER, ORDER OF THE), not on its first foundation, but afterward by Henry V. as sovereign, with the advice and consent of the knights-companions. The peculiar duty of Garter King-at-Arms is to attend upon the knights at their solemnities, to intimate their election to those chosen by the order, to call them to be installed at Windsor, to cause their arms to be hung up over their stalls, and to marshal their funeral processions, and those of royal personages, and of members of the higher nobility. In the capacity of Principal King-at-Arms, he grants and confirms arms, under the authority of the Earl Marshal, to whom he is not subject as Garter King-at-Arms. All new grants or patents of arms in England are first signed and sealed by Garter King-at-Arms, and then by the king of the province to which the applicant belongs. See HERALDS' COLLEGE.

GARTH, n. *gáarth* [Scot. *garth*; W. *gardd*, an inclosure]: an inclosure; a yard; an inclosed garden; in *Orkney*, a house and the land attached; a dam or inclosure for catching fish.

GARTH, *gáarth*, SAMUEL M.D.: 1660–1718, Jan. 18; b. Bolam, county of Durham, England: physician and poet. He was a member of Peterhouse, Cambridge, and graduated M.D. 1691. In the following year, he settled in London, and was admitted into the College of Physicians, in which he subsequently held important offices. His professional skill was associated with great conversational powers, and he soon acquired extensive practice. The year 1700 presents an honorable incident in G.'s life: he provided a suitable interment in Westminster Abby for the neglected corpse of Dryden, which he caused to be brought to the College in Warwick Lane; and he pronounced a eulogium over the great poet's remains. On the accession of George I., he received knighthood, was appointed physician in ordinary to the king, and physician-gen. to the army. He died in London.—G. is known in literary history as the author of *The Dispensary*, a poetical satire on the apothecaries and those physicians who sided with them in opposing the project of giving medicine gratuitously to the sick poor. The sketches of some of his contemporaries—e.g., Drs. Gould, Tyson, and How, who are introduced into the poem as 'obsequious Umbra,' 'slow Carus,' and 'shrill Querpo'—are severe; and though, doubtless, exaggerated by poetic license, must have been true to nature, or the work could not have obtained such immediate and extensive circulation. The first edition came out 1669; the second and third followed in a few months. In 1706, he brought out the sixth edition with considerable additions. In 1715, he published a poem *Claremont*, and in 1717 he superintended and contributed to a translation of Ovid's *Metamorphoses* by some of the most eminent writers of that age—Addison, Pope, Gay, Congreve, and Rowe being among

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the contributors. Pope frequently refers to him, both in his letters and in his poems, with great respect—

And we, too, boast our Garth and Addison.

Pope's second *Pastoral* was dedicated to G.

GARTNER, *gěrt'něr*, FRIEDRICH VON: 1792–1847, Apr. 21; b. Coblenz: German architect. His father, also an architect, removed 1804 to Munich, where young G. received his first education in architecture. To complete that education, he travelled 1812 to Paris; and 1814 to Italy, where he spent four years in earnest study of antiquities. The fruits of this labor appeared 1819 in some views, accompanied by descriptions, of the principal monuments preserved in Sicily (*Ansichten der am Meisten erhaltenen Monuments Siciliens, Lithographien mit erläuterndem Text*). After a visit to England, he was called, 1820, to the chair of Architecture in the Acad. of Munich. With this appointment began his work as a practical architect. Many of the architectural ornaments of Munich, and various other buildings throughout Germany, as well as the new royal palace at Athens, are built from his plans. In the style of his works, which all have a common impress, G. represents the renaissance of the mediæval architecture in its Romanesque forms. The round arch with its accompaniments prevails in them all. G. was rewarded with the fellowship of several academies, with orders of his own and foreign countries, with a degree from Erlangen, with the office of head govt.-surveyor of buildings, and with the directorship of the Acad. of Arts in Munich.

GARTSHERRIE, *gárt-shěr'ri*: village, in the parish of Old Monkland, Lanarkshire; noted for extensive ironworks and coal-mines. G. is included in the census limits of Coatbridge. In the immediate neighborhood are other extensive ironworks, all of which, with Coatbridge, contribute to the iron-trade of Glasgow. See LANARKSHIRE.

GARUA, n. *gǎ-ró'ǎ*: a local term for the dense sea-fogs that occur periodically along certain parts of the Pacific coast of S. America.

GARUM, n. *gǎr-ŭm* [L.]: kind of fish-sauce, prepared from several kinds of fish, particularly the scomber, but formerly from the garus; a pickle made of the gills and blood of the tunny.

GARY, JAMES ALBERT: an American statesman; 1833, Oct. 22, b. in Conn.; was educated at Allegheny College, Pa., and settled in Maryland 1840. In 1861 he became a partner in the cotton-duck manufacturing firm of his father, whom he succeeded as head of the establishment in 1870. He was defeated as Republican candidate for governor of Maryland in 1879, and was postmaster-general in 1897-98.

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GAS, n. *gās* [a word coined by Van Helmont to signify the most subtle and volatile part of anything: comp. Ger. *geist*, ghost, spirit]: an aeriform fluid; any air; the carburetted hydrogen used for illumination. **GASALIER**, n. *gās'ā-lēr*, a branching apparatus for giving light by gas in rooms. **GASEITY**, n. *gās-ē'ī-tī*, the state of being in the form or condition of a gas. **GASEOUS**, a. *gāz'ē-ūs*, in the form of gas. **GASOMETER**, n. *gās'ōm'ē-tēr* [Gr. *metron*, a measure]: the large gas-holder of a gas-work (see **GAS**, **LIGHTING BY**). **GASOM'ETRY**, n. *-trī*, the art or act of measuring gas; spelled also **GAZOMETRY**. **GAS-ENGINE** (see below). **GAS-FITTINGS**, the different contrivances for the application of gas-lighting. **GAS-FITTER**, n. one who fits up the pipes, etc., for giving light by gas. **GAS FURNACE** (see **IRON**). **GAS-HOLDER**, a vessel for containing and distributing gas (see **GAS**, **LIGHTING BY**). **GAS-METER**, any apparatus used for measuring the volume or quantity of gas consumed. **GAS-WORK**, the place where gas is manufactured. **GASIFY**, v. *gās'ī-fī*, to turn or change into gas. **GASIFYING**, imp. **GAS'IFIED**, pp. *-fīd*. **GAS'IFICA'TION**, n. *-fī-kā'shūn* [L. *faciō*, I make]: the process of converting into gas. *Note.*—The word **GAS** was evidently formed from the notion of such words as *ghost*, *gust*, etc.

GAS, LIGHTING BY: most common mode of obtaining artificial light in recent years, though hardly known at the beginning of the present century. It is now extending even in the larger cities of Asia. From 1658 to 1739, the attention of men of science in England had been repeatedly turned to the streams of inflammable air issuing from wells and mines in the coal districts, various communications on the subject having been read before the Royal Soc. of London. In 1739, the Rev. Dr. John Clayton, Dean of Kildare, gave an account of experiments in which he had distilled gas from coal. It was not, however, till 1792 that the possibility of applying gas, distilled from coal, to the production of artificial light was demonstrated. In that year, William Murdoch constructed apparatus by which he lighted his house and offices at Redruth, in Cornwall. In 1798, he lighted part of the manufactory of Bolton and Watt at Soho; and in 1805 he lighted the cotton-mills of Phillips and Lee at Salford. A proposal was made by M. Le Bon to light a portion of Paris with gas 1802. In the succeeding year, Winsor commenced lecturing on the subject in London. He was of a sanguine and enthusiastic temper, and his strong statements probably tended to retard rather than advance the new art. He promised to every depositor of £5 an income exceeding £500 per annum, and he urged the government to take the matter into their own hands, as a certain means not only of clearing off the national debt, but of securing a permanent and large revenue to the country. The chartered Gas Company of London, the first company incorporated, obtained their act of parliament 1810. At that time, Winsor, who had been instrumental in establishing the company, was employed by them; but in 1813 they found it necessary to engage Samuel Clegg, who, from 1805, had been engaged

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in promoting the use of gas, and who was the inventor of the hydraulic main, of the wet-lime purifier, and of the wet gas-meter, all which contributed to the success of gas-lighting.

The first gas applied to artificial lighting was obtained from coal; and owing to the abundance of bituminous coal the same method has been followed to the present day in England and on the Continent of Europe. In America immense quantities of water-gas are made, from coal, water, and naphtha. Resin and oils have been used as substitutes for coal. Many schemes have been proposed for supplanting coal-gas by air charged with vapor of volatile hydrocarbon fluids, such as petroleum naphtha; also for improving coal-gas, and rendering hydrogen gas, derived from water, suitable for illuminating purposes. Many have been exploited to a considerable extent, and others may hereafter have profitable development. The modifications known as *water-gas* and *producer-gas* are spoken of below. Destructive distillation by the action of heat is the means employed to disengage the gas from coal. The modes of storing, distributing, and using the various substitutes which have been proposed, are similar to those applied to coal-gas.

As a branch of manufacturing industry, gas works occupy an important position, not only from the immense capital permanently embarked, and the great number of hands employed in them, but also from the demand created by them for coal, lime, iron ore, etc., and for iron-work, brass-work, and gas-meters. In London alone, the aggregate share and borrowed capital of the nine companies supplying the metropolitan district amounts to a nearly nine and a half millions sterling. The coals best adapted for the manufacture of gas are those called in England cannel coals, and in Scotland parrot coals. The bituminous or caking coals, mostly got near Newcastle-on-Tyne, are from their cheapness and the superior quality of the coke which remains after distillation, more extensively used in England than any other. In Scotland, parrot coals were used exclusively till a recent period. America and the Canadian Provinces have immense deposits of this type of bituminous coal, some excelling the best English. Cannel is used extensively in Liverpool, Manchester, and some other towns; a proportion of cannel is used in all countries where obtainable to mix with caking coal to improve the quality of the gas, the greater volume being derived from caking coal. The coke of cannel coal is of very variable quality, in nearly all cases inferior to that of the caking coals.

In comparing the illuminating power of one gas with another, the standard of comparison is the light from a sperm candle burning 120 grains of sperm per hour, the gas-burner consuming at the rate of 5 cubic ft. per hour. When the quantities consumed are different from these, the results are rectified by calculation. Bituminous coal yields from 8,000 to 12,000 cubic ft. of gas per ton, of

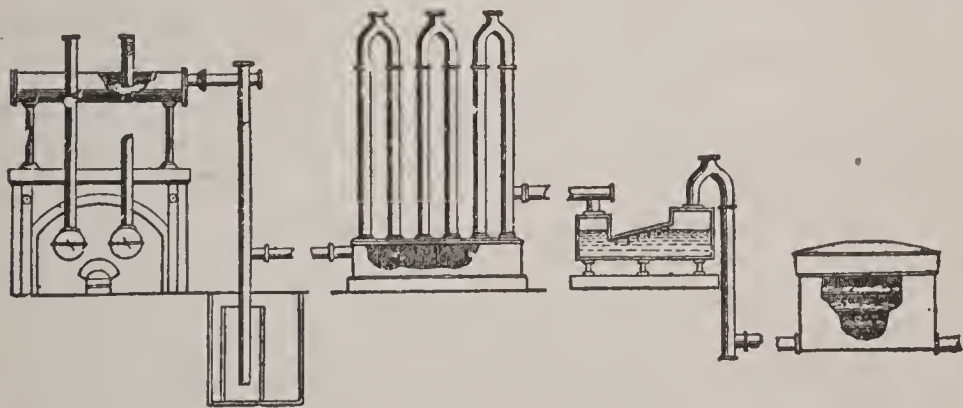
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illuminating power varying from 12 to 16 sperm candles to a burner consuming five ft. per hour; cannel coals yield 8,000 to 13,000 cubic ft. per ton, of illuminating power varying from 20 to 50 sperm candles. As a general rule, the coal which yields the greatest quantity of gas, yields gas also of the highest illuminating power. Bituminous shales may be used in part to supply the place of cannel coals. They yield 6,000 to 8,000 ft. of gas, varying from 34 to 40 candles illuminating power.

In the process of distillation, gas, tar, and ammoniacal liquor come off together, and are separated by the action of the apparatus employed: a large residuum of coke remains in the retort. The gas consists of a mixture of heavy carburetted hydrogen (olefiant gas), specific gravity, 985; heavy hydrocarbon vapors of various kinds; light carburetted hydrogen, specific gravity, 555; sulphuretted hydrogen, specific gravity, 1,191; sulphide or sulphuret of carbon in minute quantity; carbonic oxide, specific gravity, 972; carbonic acid gas specific gravity, 1,524. Recent investigations have shown that gas contains large quantities of benzole 2.702, which has hitherto been treated as olefiant gas in analyses.

The value of coal-gas depends on the proportion of olefiant gas and heavy hydro-carbons which it contains. Great attention is required in heating the retorts; if their temperature be too low, the tar and liquor are increased in quantity, and the gas diminished in quantity and deteriorated in quality. It was formerly held that if the temperature be too high, the olefiant gas is decomposed, and light carburetted hydrogen formed. At present this theory has fallen into disrepute and the general effort is to keep the retorts as hot as possible consistent with durability. While different parts of the apparatus necessary for producing, purifying, storing, and sending out the gas are capable of many variations in size, form, and construction, the order in which they come into use is almost invariable. First there are the *retorts, ascension* and

ELEVATION OF GAS-WORKS.



Retorts, etc. Tar Well. Condenser. Washer. Dry-Lime Purifier.

dip pipes, hydraulic main; then the tar-well, and condenser, the exhauster, the washer or scrubber, the purifier, the station-meter, the gas-holder, and the governor—the parts

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printed in italics being indispensable. Besides the above. valves of various forms, simple and complicated, are employed, These, in some of their arrangements, are very ingenious. Water-traps or siphons also have to be applied for collecting and removing the water and tar which condense in the pipes. The accompanying wood-cut shows an arrangement common in small gas-works.

The retorts are now generally made of fire-clay, though some cast-iron retorts are still used. They are made D-shaped, cylindrical, kidney-shaped, and elliptical. The sizes most frequent are 6 to 9 ft. in length, and 12 to 20 inches in diameter. In large works, two 9-ft. lengths are joined together, forming one retort 18 ft. long, with a mouth at each end—a mode of construction found to possess considerable advantages. The retort is built horizontally into an arched oven, in such a manner as to be equally heated throughout from a furnace beneath. From one to seven retorts, sometimes more, are set in the same oven. The open mouth-piece of the retort is of cast-iron, and projects outward from the front wall of the oven sufficiently far to admit, between the mouth and the front of the oven, an opening, to which the ascension-pipe, or stand-pipe as it is generally termed in the United States, is connected for conveying the gas to the hydraulic main. When the coal to be distilled is introduced into the retort, the mouth is closed with a lid, which is kept tight by a luting of clay, a packing of lead, by a surfaced joint round the edge, or by some similar method, and made fast with a screw, passing through a transverse 'cotter-bar' attached on each side of the lid to the mouthpiece.

The hydraulic main is a large pipe made of thick plate or cast-iron. It is first about half-filled with water, which in the course of a short time is entirely displaced by the liquid product of distillation. The dip-pipes, which are the continuation of the ascension-pipes, and are connected to them by 'bridge-pipes,' dip to a depth of $\frac{1}{4}$ to 1 in. into the liquid through which the gas bubbles up into the upper portion of the hydraulic main. The gas and liquid come off at the end of the hydraulic main, and flow together till they reach the tar-well, into which the liquid, by its greater gravity, falls. The liquid consists of tar and ammoniacal water. These are separated by standing and settling and are withdrawn from the tar-well, and become the raw material from which other products are manufactured. From the tar, naphtha, pitch-oil, pitch, many chemical products such as the aniline colors, carbolic acid or phenol, alizarine, etc. (q. v.), and coke are obtained; and from the water, salts of ammonia are prepared. The tar and ammoniacal water being of different densities, are easily separated, by being allowed to settle in a vessel. See GAS-TAR: NAPHTHA: SULPHATE OF AMMONIA: SAL-AMMONIAC: ETC. When a retort is opened for withdrawing the exhausted charge of coal and renewing it, the pressure of the gas on the hydraulic main forces the liquid to ascend the dip-pipe, and thus seals it against the gas in the hydraulic, which, but for

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this, would rush up the dip-pipe, descend the ascension-pipe, escape, and ignite at the open mouth of the retort. In the tar-well there is also a dip-pipe, inserted into a deep vessel, to prevent the gas from entering the well. A similar contrivance is resorted to wherever it is necessary to introduce or draw off liquids at any part of the apparatus. The tar-well must be placed so low, that all the liquid in the pipes leading to it from the hydraulic main, and from it to the condenser, will incline toward it.

The simplest form of condenser consists of a series of upright pipes, each pair connected at the top by an arch pipe. These are erected upon a horizontal chest, the top of which has an opening into the bottom of each upright pipe. Immediately under the centre of each arch pipe, a plate descends from the top of the chest, and reaches to within a few inches of the bottom. When in operation, the chest is always filled with liquid to such a height, that these plates dip into it, and prevent the gas from passing through the chest horizontally. When admitted into the chest, the gas finds no exit but by ascending the first upright pipe; and, passing over the arch, it descends to the chest again through the second upright pipe. There being no dip-plate between the second and third upright pipes, the gas ascends the third pipe and descends the fourth, and so on through the condenser. The upright pipes are kept cool by exposure to the atmosphere, and sometimes a thin stream of water is caused to flow over them. As the gas ascends and descends, cooling rapidly in its passage, the liquid which has been carried along in a state of vapor, condenses, and falls into the chest, from which it is conveyed back by an overflow-pipe to the tar-well.

The exhauster, when used, may be the next part of the apparatus but its position varies in different works. It is a species of pump, driven by steam-power, and is made in various forms, both direct-acting and rotary. It serves the purpose of relieving the retorts of the resistance or pressure, created in the passing of the gas through the apparatus, and in raising the gas-holders. The use of the exhauster greatly lessens the deposit of carbon in the retorts in the form of graphite, secures a much greater yield of gas, and is attended with other important advantages.

At this stage of the process, the liquid products have been separated from the gaseous. A portion of the ammonia and the sulphuretted hydrogen and carbonic acid have still to be removed. To remove ammonia from the gas, the washer or scrubber is used. In the washer, the gas is forced to pass through water to a depth of several inches, or through a solution containing an ingredient with which the ammonia will combine. The scrubber, which may be used instead of the washer, is an upright vessel, in which the gas is made to pass through brushwood, layers of small stones, coke, or suitable shelving of wood or iron, through or over which water may be made to percolate.

There are two kinds of purifiers—the wet and the dry. Either may be used separately, or they may be used in

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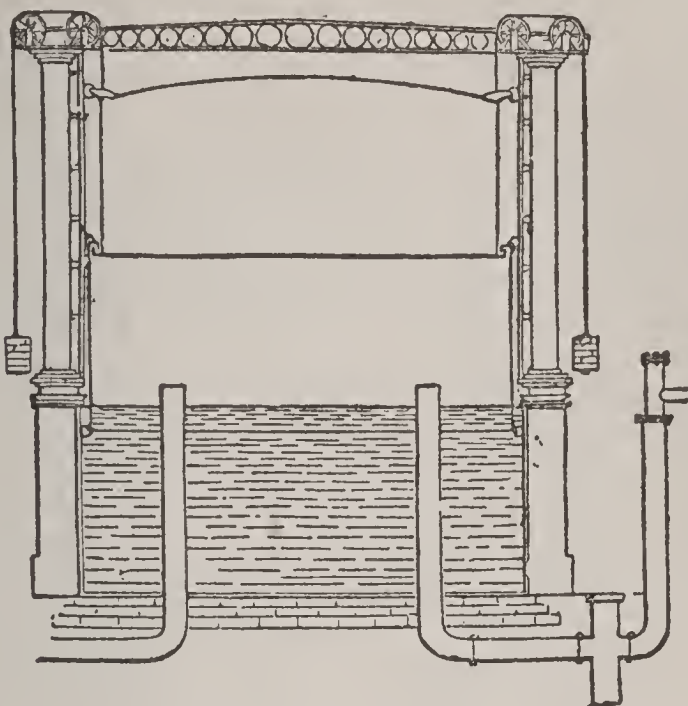
succession. The wet variety is now rare. The dry purifier is a vessel containing a series of perforated trays, on each of which the purifying material is spread. Slaked lime (in the form of dry hydrate) is used in this purifier in layers of $2\frac{1}{2}$ to $3\frac{1}{8}$ inches on each tray. The lime absorbs the sulphuretted hydrogen, a portion of the ammonia, and the carbonic acid. When saturated, it is removed, and the vessel is refilled with fresh material. The test for its exhaustion is the action of gas drawn from its top upon paper impregnated with acetate of lead. When this turns brown or black, owing to the formation of lead sulphide, the purifier is considered exhausted as far as absorption of sulphuretted hydrogen is concerned, although then in the best condition for removing bisulphide of carbon. Hence many engineers keep some purifiers at work long after the gas from them blackens lead-paper. The refuse lime is used as a manure, though in most soils of little or no value. When the oxide of iron is employed as the purifying material, the preparation is spread in the same manner as the lime, but to much greater thickness. When, by the absorption of sulphuretted hydrogen, the oxide of iron has become sulphide of iron, it is taken out and by exposure to the atmosphere, it is reconverted into oxide, and can be used again and again. When oxide of iron is used, a separate lime-purifier is necessary for removing the carbonic acid. A narrow chamber, about 2 ft. deep and 4 in. wide, nearly full of water, surrounds the upper edge of the dry purifier; into this chamber the sides of the cover, which is of sheet-iron, descend, and the gas is thus prevented from escaping.

After passing the purifier, the gas, now fit for use, is measured by the station-meter, an instrument similar in principle to the consumers' meter, described below. It is then conveyed to the gas-holder, to be stored and issued as required.

The gas-holder or gasometer is an inverted cylindrical vessel of sheet-iron, placed in a tank of cast-iron, stone, or brick containing water. A pipe ascends from the bottom of the tank through the water, to admit the gas to the space between the surface of the water and the crown of the gas-holder. Sometimes a second pipe descends through the water and the bottom of the tank, for the issue of the gas to the main-pipe. Frequently only one pipe is used for inlet and outlet alternately. The water is for the purpose of retaining the gas within the vessel. The pressure of the gas raises the gas-holder; and the weight of the gas-holder, or such part of it as is not taken off by balance-weights, impels the gas through the pipes. When balance-weights are necessary, they are attached to the edge of the crown of the gas-holder by long chains, which pass over pulleys on the top of columns which serve also to guide the motion of the vessel in rising and falling. Gas-holders are constructed of various sizes, some exceeding 200 ft. in diameter and having nearly 6,000,000, cubic ft. capacity. In large establishments, telescopic gas-holders are used, and economy of

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space and cost are thereby effected—two concentric gas-holders being contained in one tank. The outer vessel of a telescopic gas-holder has no crown. The upper edge is turned first inward and then downward, forming an invert-



Telescopic Gas-holder.

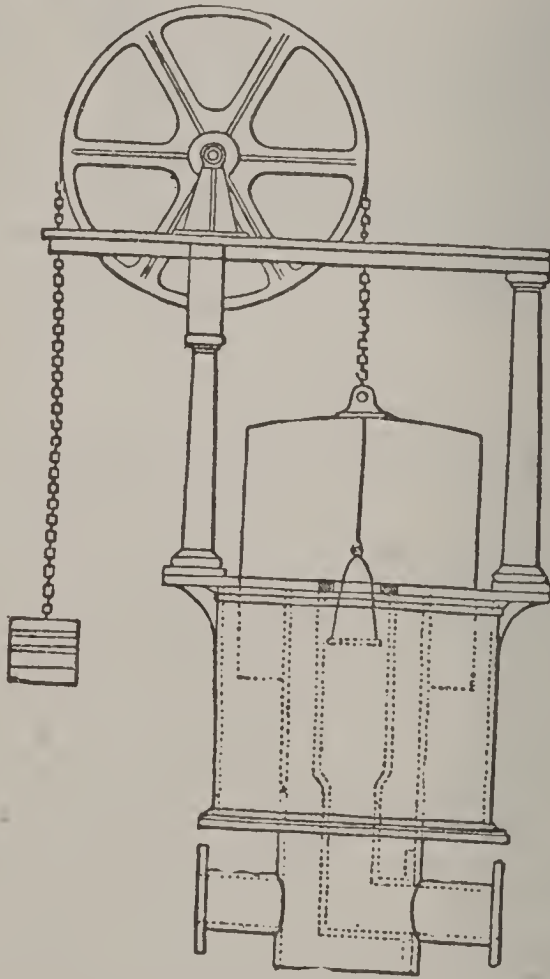
ed hollow annular chamber. The under edge of the inner vessel is turned outward and upward forming also an annular hollow chamber, which, when the vessel rises out of the tank, will be full of water. The inner side of the inverted chamber, round the top of the outer vessel, fits into the inside of the chamber round the bottom of the inner vessel, and enters it when that vessel has nearly ascended to the top of the tank. The water in the chamber retains the gas, and the two vessels then rise together. The inner vessel, it will be observed, ascends first; both then ascend and descend together, till the outer vessel has reached the bottom of the tank, on which it rests, and the inner vessel then also descends into the tank. Three or four sections or lifts, as they are termed, are occasionally placed in the same tank.

Before reaching the main-pipes, the pressure of the gas is regulated by the governor. In small establishments, the governor is very frequently dispensed with, and the pressure adjusted with sufficient nicety by the regulation of the outlet valve. The typical governor consists of a small gas-holder, the inlet-pipe to which is placed in the centre of the tank, and terminates with a plate having a circular orifice in its centre. In this orifice hangs a cone, which is attached to the crown of the small holder. When the gas is issuing slowly, the holder rises, taking with it the cone, and so restricting the orifice by which the gas enters. When the gas issues rapidly, the holder falls, and with it the cone, thereby enlarging the inlet. Many and varied,

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applications of machinery are used in the larger gas-works, showing much mechanical skill, and continuous progress in the adoption of means to economize labor, and to facilitate and improve the manufacture and distribution of gas.

The gas is conveyed from the works by main-pipes or mains of cast-iron, to which branch or service pipes are connected wherever a supply is wanted. The main-pipes require to be skilfully arranged with respect to size, carefully jointed, and laid with as few changes in their inclination as possible; but as such changes are unavoidable, it is necessary to provide for the removal of water, which, flowing along with the gas in the form of vapor, condenses in the pipes, and lodges at low points. For this purpose,



Gas Governor.

a vessel, similar in construction to the tar-well, is connected to the main-pipe, and the water is removed by a pump. When little condensation is anticipated, and when there is no risk of the water affecting the flow of the gas, a small pipe may be attached to the main if the latter is accessible with a stop-cock to run off the water. The service-pipes should incline toward the main; and where this cannot be attained, provision should be made for drawing off water.

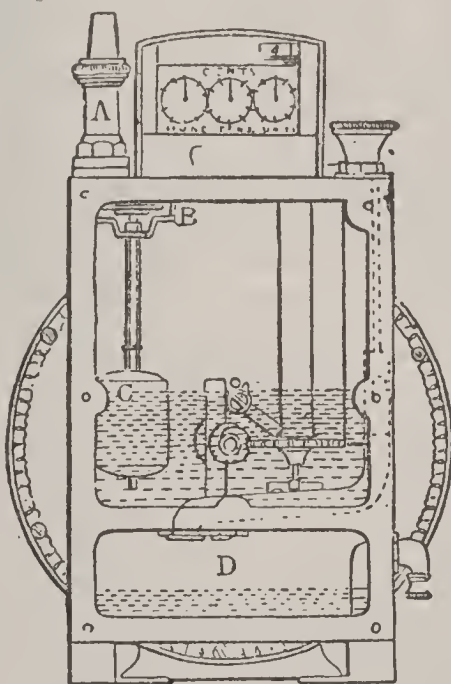
Gas-fittings.—The small pipes for fitting up the interiors

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of houses are either of wrought-iron or of soft metal. To insure permanent efficiency, it is of utmost importance that these pipes should be *capacious*; they should be laid *evenly*, with an inclination toward the meter; and where the inclination is materially disturbed, a siphon or tray should be provided for the collection and removal of water.

Gas for street-lighting is usually supplied by contract, a specified burner being used, and the lights being lighted and extinguished at stipulated hours. Lights in private establishments were originally charged for on the same system. The uncertainty of such a mode of charge directed the attention of gas-engineers to the construction of meters at a very early period. Accordingly, in 1816, Mr. Clegg took out his first patent for the wet gas-meter, which, subsequently improved by Malam, Crosley, and others, came into general use about 1822. Dry gas-meters are now extensively manufactured on a principle first patented by A. A. Croll, who has patented also various modifications of the apparatus and processes used in the manufacture and purification of gas, and the utilization of the liquid products.

The wet gas-meter consists of a hollow circular case, somewhat more than half filled with water. The measurement is made by the cylinder, a hollow drum or wheel,



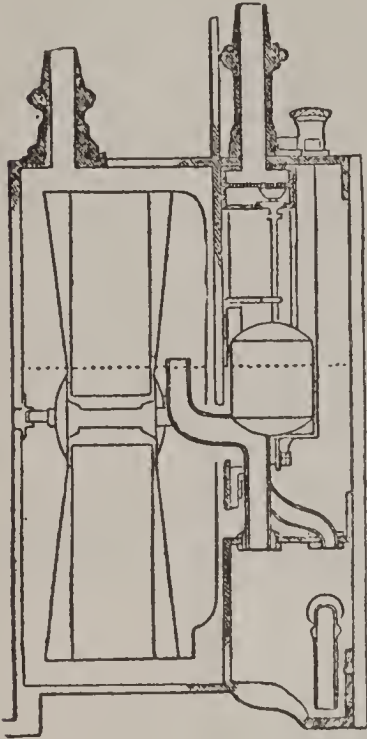
Wet Meter—front box open:

A, entrance pipe; B, valve chamber; C, float, with valve on the upper end; D, surplus or waste-water box.

which revolves on a horizontal axis inside the case, the pressure of the gas supplying the motive-power. The cylinder is divided into four chambers by partitions running in a slanting direction from back to front, and presenting a section of a four-threaded Archimedean screw. A convex cover is fixed on one end of the cylinder. This

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cover has an opening in the centre, which admits the pipe by which the gas enters the cylinder; the opening being below the surface of the water, so as to be sealed by it. The pipe, after entering the opening, is turned up, so that its mouth is above the water. The gas thus admitted within the cover, finds its way through a slit into one of the four chambers into which the cylinder is divided. The



Wet Meter--side section.

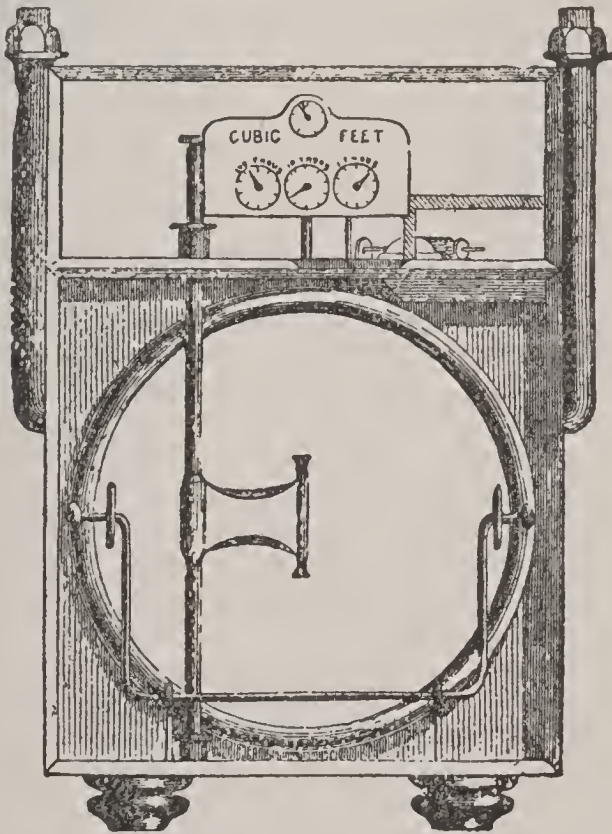
chamber which first comes into action is at the moment almost entirely under the water. The gas presses between the water and the partition of the chamber, and, in raising the partition, turns the cylinder on its axis, and brings the chamber above the water, filling it at the same time. The outlet slit of the chamber is on the side of the cylinder opposite to the inlet slit, and is open to the case of the meter. It is not, however, directly opposite to the inlet slit, but is so arranged that it remains sealed under water till the chamber is completely filled with gas, by which time the revolution of the cylinder has brought the inlet slit of the next chamber above the water, and it is ready to receive the gas. The filling of the next chamber carries round the one already filled, causes its descent into the water as it revolves, and completely expels the gas by the outlet slit. Two chambers only can be in action at one time. These chambers are made with great accuracy, and are liable to no variation but the enlargement caused by the evaporation of the water, and the consequent depression of the water-line. On the front of the case of the meter is placed a box, into which the axis of the cylinder extends, having a spiral worm-wheel on its end. The worm-wheel communicates motion to an upright spindle, which again moves the train of wheels by which the handles of the index are worked. The front box contains also the filling and overflow pipes for the supply and adjustment of the water, the entrance-chamber by which the gas is admitted, and in which the float-valve is placed. This valve is supported and kept open by a float which descends, closes the valve, and shuts off the gas when the water is depressed too much.

An act of the British legislature has been passed, according to which all gas-meters must be so constructed as not to register more than two per cent. in favor of the seller, and three per cent. in favor of the purchaser of gas; thus allowing 5 per cent. for variation caused by the depression of the water-line on wet gas-meters. All meters fixed since the act came into operation must bear the seal of an inspec-

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tor appointed under the act. Similar acts are in force in the United States.

The dry gas-meter possesses advantages, which, were it in other respects equally reliable with the wet meter, would give it universal preference. Once adjusted, it gives no further trouble; it is not liable to derangement in frosty weather; and, in passing through it, the gas takes up no additional moisture to increase the risk of annoyance from deposit of water in the pipes. But doubts are still entertained by many of the machine as an efficient and correct measurer. The meter consists of chambers separated from each other by partitions; generally there are two, but some makers use three chambers. Each chamber is divided into two parts by a flexible partition which moves backward and forward, its motion being regulated by valves beautifully contrived for the purpose. The meter bears some resemblance to a double or triple steam-engine. Following out this resemblance, Mr. Croll thus describes his meter: 'It consists of a cylinder, divided, by a plate in the centre, into two separate cylindrical compartments, which are closed at the opposite ends by metal disks; these metal

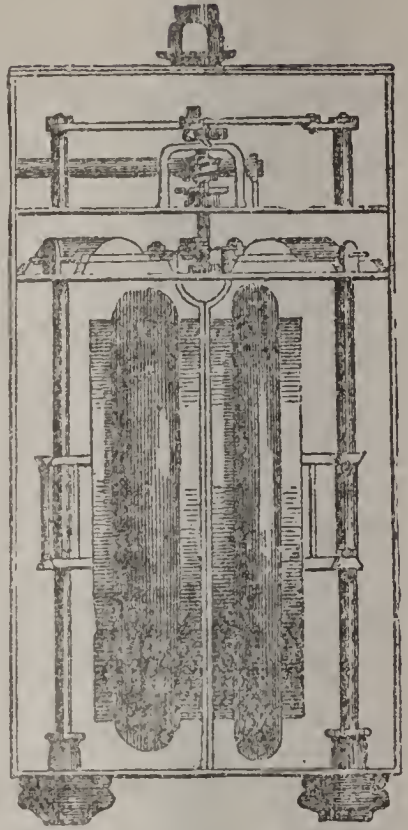


Dry Meter—front view open.

disks serve the purpose of pistons, and they are kept in their places by a kind of universal-joint adapted to each; the space through which the disks move, and, consequently, the means of measurement is governed, by metal arms and rods, which space, when once adjusted, cannot vary. To avoid the friction attending a piston working in a cylinder, a band of leather is attached, which acts as a hinge, and folds with the motion of the disk; this band is not

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instrumental in the measuring, so that if it were to contract or expand, the registering of the meter would not be affected; inasmuch as it would only decrease or increase the capacity of the hinge, the disk still being at liberty to move through the required space; the leather is also distributed in such a manner, being curved, and bending only in one direction, that it prevents any wrinkles or creases forming, and renders it therefore much more durable. The arrangement of the valves and arms differs somewhat from that of a steam-engine, though similar in principle. Recent modifications of the meter provide indexes registering directly the value of gas burned. Others only pass gas when a coin has been dropped into a slit, and when the value of this coin in gas has been consumed the gas is automatically shut off.



Dry meter—side view open.

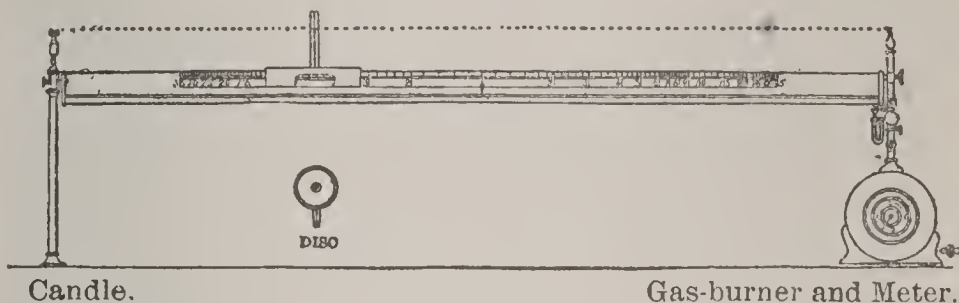
Gas-burners. — The burner made on the argand principle is the best of ordinary burners for gas of low illuminating power, and gives the steadiest flame. It is somewhat troublesome to keep clean, and involves outlay for glasses from time to time. Fish-tails, or union-jets, and batwings are therefore in more frequent use. These burners are now made by machinery at very low prices, so that to change them when out of order costs little, and is easily done. They are also easily cleaned. Jets are of two kinds—cockspurs and union-jets or fish-tails. The cockspurs are pierced with one or more straight holes; the union-jets are pierced with two holes diverging inward from the point of issue, so that two small streams of gas impinge on each other and produce a flat flame. Batwings are made with a clean slit across the head of the burner. Metal burners are very liable to rust and become useless. This difficulty is obviated in the so-called steatite burner, made of a silicious composition, which lasts for years without deterioration.

There is one important fact in the burning of gas, and of animal and vegetable oils: When a given quantity is burnt in a large flame, a greater amount of light is obtained than when the same quantity is burnt in a smaller flame. Hence one large lamp or gas-jet is better than three or four burning the same quantity in the same time. The cause of this becomes apparent by considering what takes place when a jet of gas is turned down to the lowest point. Here the white light altogether disappears, and only a blue flame remains; the small body of gas as it issues becomes mixed

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and diluted with air, and the whole is perfectly consumed, as in the Bunsen burner, without any of the carbon becoming solid and incandescent. On gradually admitting more gas, a white speck first appears in the middle of the blue, and this speck—the area of imperfect combustion—goes on increasing not only in absolute size, but its proportion to the area of perfect combustion becomes greater as the whole flame is enlarged. The limit to this economy is the quantity that can be burnt without smoke. This difference between large and small flames does not hold in burning paraffin oil. There are many contrivances for improved burners and improved modes of using gas. Among them

Gas photometer.



Candle.

Gas-burner and Meter.

are the sunlights, consisting of a ring of union-jets, placed horizontally and set round the interior of the base of a cone which is passed through the ceiling, and conveys away the products of combustion through a flue, thus serving both for lighting and ventilation. Double, triple and quadruple argand burners also were in the direction of advance. These produced concentric rings of flame between which air entered. By far the most important improvement in this line is the regenerative burner. In this type the gas burns in a closed compartment partly made of glass so that light can be emitted. The products of combustion as they escape are caused to heat the incoming gas and air so that the illuminating power is greatly increased, sometimes being doubled for the same consumption of gas. These burners are generally of the inverted type, the flame spreading radially from the centre annulus of a saucer-shaped deflector, and being inclosed from below by a hemispherical glass shade. Other forms also are in use. Second only in interest to these are the incandescence burners, in which a non-luminous flame is produced and is made to heat a solid non-combustible substance to incandescence. Very beautiful effects are thus produced, but the burner is sensitive to jarring or draughts, so that the light is liable to vary. In one form, the Welsbach burner, the incandescing body takes the form of a wick of zirconia or similar substance, suspended over and heated by a Bunsen burner. The latter is a burner that produces a non-luminous flame by drawing in air to mix with the gas. Other burners are designed for use with gas of the hydrogen type that naturally gives no light in its combustion.

Regulators.—The object of these instruments is to restrict the supply of gas when superabundant, and it should be

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noticed that the supply requires to be so before any advantage can result from the use of them. A conical valve, operating by the pressure of the gas in a manner similar to the governor at the gas-works, is in general the acting part of the apparatus.

The impurities which should be removed in the manufacture of coal-gas are sulphuretted hydrogen, ammonia, and carbonic acid. The presence of sulphuretted hydrogen is detected by allowing a stream of the gas to play on a paper wetted with a solution of acetate of lead as already described; the test-paper is blackened if the deleterious gas be present. Ammonia is detected by allowing the gas to play on paper stained yellow with turmeric: ammonia changes the yellow to brown. The presence of carbonic acid gas can be ascertained by causing the gas to bubble through lime-water. If carbonic acid gas be present, it combines with the lime, and the water becomes milky.

The value of gas for lighting depends on its illuminating power, which, again, depends mainly on the proportion of olefiant gas and heavy hydrocarbons contained in the mixture. The specific gravity of the gas would be a complete test of the illuminating power, were it first ascertained that no deleterious gases were contained in the mixture. The chlorine and bromine tests, applied by bringing the gas into contact with either of these substances in a graduated tube, also require that the absence of deleterious gases be ascertained. Chlorine and bromine condense the olefiant gas and heavy hydrocarbons, and the proportion of them present is ascertained by the proportion of the gas which is condensed.

The most practical mode of determining the illuminating power is by the use of the Bunsen photometer. At one end of a straight bar of wood, a gas-burner is mounted; on the other end, a candlestick. These are so placed, that when lighted, there are exactly 100 inches or other determined space between the centres of the lights. The bar is correctly graduated on the principle of the intensity of light varying with the square of its distance to show how many times the one light exceeds the other. A circular disk of paper made semi-transparent, excepting a spot in the centre, which is left opaque, is placed at right angles across the graduated bar on a stand which slides along the bar. When the disk is moved into a position where the opaque spot is invisible, the lights are equal—the disappearance of the spot being caused by the light transmitted by the semi-transparent part of the disk being equal to that reflected by the opaque part. The figures immediately below the disk indicate the power of the light. As has been stated, the illuminating power of coal-gas may vary from 12 sperm candles to nearly 50, though neither extreme is supplied to consumers. In England, quality varies from 14 to 22 candles; in the United States, 14 to 32 candles. Cost of production is affected by causes independent of the illuminating power, and these are so various, that the cost can hardly be the same in any two places. In contrasting the price of gas in different places, another difficulty arises

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from the unavoidable variation in the quantity accounted for: the loss sustained under the head of condensation, leakage, bad debts, and waste, varies from 5 to 30 per cent. on the whole quantity made; and though, when this loss is excessive, the remedy should, to a certain extent, be in the power of the manufacturer, yet there is a considerable range within which the loss may vary, owing to local and peculiar circumstances which the manufacturer cannot control.

The economy of gas compared with sperm candles for lighting purposes will be apparent when it is considered that 50 ft. of gas, consumed in a burner at 5 ft. per hour, will last 10 hours; while a sperm candle of six to the pound, and burning 120 grains per hour, will last only 9.722 hours. Assuming, however, that both will last 10 hours—a view which is in favor of the candle—1,000 cubic ft. will last as long as 20 candles; therefore, with an illuminating power of 15 candles, it will give an amount of light equal to 300 candles, or 50 lbs., which at 50 cts. per pound would cost \$25; at 30 candles, it would equal 600, or 100 lbs., costing \$50.

The relative illuminating value of different oils and of coal-gas formed the object of a series of careful experiments by Dr. Stevenson Macadam, lecturer on chemistry in Edinburgh; and the following are some of the results, bearing especially on the relative cost of the various sources of artificial light. The standard of comparison is the sperm candle above described; an hour of such a candle is assumed as the unit of light supply, and is called *a candle-hour*.

Candles.—Taking the price of tallow, composite, and paraffin, at 6d., 8d., and 1s., respectively (in U. S. money abt. 12 cts., 16 cts., and 24 cts., respectively)—

Tallow will give	7.29	candle-hours for 1d.=2 cts.
Composite	6.19	“ “
Paraffine “	6.36	“ “

Animal and Vegetable Oils.—Burnt in a flat-wick lamp—

Sperm-oil gives	4.69	candle-hours for 1d.=2 cts.
Rape-oil “	7.18	“ “
Whale-oil “	8.56	“ “

Burnt in an Argand lamp—

Sperm-oil gives	8.99	candle-hours for 1d.=2 cts.
Rape-oil “	14.17	“ “
Whale-oil “	15.42	“ “

Paraffine Oil.—At 2s. (abt. 48 cts.) per gallon, paraffin oil gives 53.33 candle-hours for 1d.=2 cts.; at 1s. 6d. (abt. 36 cts.) per gallon it gives 71.11 candle-hours for 1d.=2 cts.

Coal-gas.—In experimenting with coal-gas, the standard assumed was a gas which, with a burner consuming 5 cubic ft. an hour, gave the light of 28 sperm candles. This burner is called No. 5, and the others, Nos. 4, 3, 2, 1, 0.5, are such as under a regulated pressure pass 4, 3, etc. cubic ft. an hour respectively.

Tabular Result.—With standard gas at 5s. (abt. \$1.20) per 1,000 ft:

No. 5 jet gives	93.33	candle-hours for 1d.=2 cts.
“ 4 “	86.66	“ “
“ 3 “	76.66	“ “
“ 2 “	65	“ “
“ 1 “	50	“ “
“ ½ “	33.33	“ “

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In Britain, coal-gas is thus cheaper than paraffin, when the gas is burnt in large jets; but dearer in small jets. In the United States this comparison would not generally apply, as in few places is gas supplied to consumers at so low a rate, and in many places the rates are much higher. The rate given for paraffine oil, represented here by kerosene oil, is also excessive, so that the comparison shows kerosene to be much cheaper than the cheapest gas.

The increasing production of petroleum giving large quantities of naphtha has of late stimulated the invention and improvement of various new methods of making illuminating gas. One method uses petroleum, water, and air, and is said to produce a 21 candle-gas at abt. 36 cts. per thousand cubic ft. A very white and pure gas is obtained from shale oil, injected in small quantities by a steam jet into a special form of retort. Yet another improved gas is manufactured from kerosene or other hydrocarbon oil, with certain other ingredients. The mixtures are put into a tank, and intermittently injected into heated retorts; then purified and stored in a gasometer like coal-gas. The power of the product is said to be from 25 to 78 standard candles, according to pressure and kind of burner used; and the price is less than that of coal-gas.

The use of gas for heating and cooking is becoming extensive. Its great recommendations are facility of regulation, readiness of application, perfect cleanliness, and avoidance of a strong heat in warm weather. In roasting by gas, the juices are retained in the meat to a greater extent than in the process by coal; while in all the operations, the heat can be regulated with so much nicety, as greatly to aid the cook in presenting the food in the most wholesome and agreeable condition. As the fire is burned only when required, and can be at once extinguished, it is not an expensive method of cooking.

Besides brilliancy of light, safety and cleanliness attend the use of gas. Explosions under ordinary circumstances are hardly possible—the escape of gas is quite disagreeably perceptible by the smell when there is one three-thousandth part present in the atmosphere; and there can be no explosion unless with, at the least, 200 times that proportion, or 1 part in 15. Such accumulations will, and do undoubtedly, take place in confined situations, but ordinary precaution in avoiding the use of a light in such places where there is odor of escaping gas will avert the risk of accident. Gas, having a tendency to ascend, escapes near the ceiling of an apartment are more likely to form an explosive mixture than escapes occurring low down: the situation becomes a confined one when the gas is prevented from ascending freely. See the works on gas-lighting by Clegg, Hughes, and Richards.

GAS-LIGHTING IN RAIL CARS.—Many methods have been tried for lighting railway carriages with ordinary coal-gas and with oil-gas of high illuminating power. One method employs an india-rubber bag or box, protected by iron rods or bands, and weighted to press out the contents as the exhaustion goes on. The bag is filled with gas at the sta

tion whence the train starts. A tube from the bag passes out by an opening from the car, and leads up to metal pipes that lie along the roofs of the carriages: an india-rubber tube forms an elastic link from carriage to carriage; and small pipes bend down through the roof to supply burners in the interior of each carriage. The chief disadvantage of such plans is, that no carriages can be added to or removed from the train without disturbing the arrangements, as the tubing forms a connected system from end to end.—Another plan enables each carriage to maintain its light irrespective of the others in the train. There is a reservoir underneath the floor of the carriage; consisting of a boiler-like wrought iron vessel, nine or ten ft. long by 18 inches in diameter; it is not prominent to view, and in no way incommodes the passengers. It is filled at the station before the train starts, with gas enough to last all the burners in the carriage during a double through-trip to some distant station and back again. Pipes lead up the ends of the carriage, and along the top to the spots where they bend down to supply the burners. The gradual exhaustion of the reservoir would produce a constantly decreasing pressure on the gas, and a consequent dimness of the light; but this is prevented by an automatic compensating valve, which maintains the pressure equably. The gas, in the first instance, is forced into the reservoir at a pressure of 120 lbs. to 600 lbs. to the sq. inch.—Another plan supplies an oblong box on the top of each car, with gas enough to last for two trips. Of late, methods for condensing and storing gas on cars, boats, and floating buoys, have been greatly improved.

GAS, NATURAL: natural gas, whose extensive exploitation in the United States since 1884 reads like a fairy tale has been known for centuries. The Chinese brine-wells deliver a certain quantity of gas, which has for a long period been used to assist in evaporating the liquid in the manufacture of salt. More or less has been known also in this country for many years. In 1884 the gas found by explorers for oil in western Penn. and in Ohio began to attract attention, and in 1885 when gas was found in still greater quantities the excitement grew intense. Its economic possibilities were at last realized, and now wells have been drilled in nearly every state and territory of the United States, for the purpose of finding natural gas. As a result of this prospecting it has been found that gas exists in greater or less quantity over most of this country. Along the coast e. of the Appalachian chain no gas, or very little, is found. The greatest quantities are in the Mississippi valley e. of the river. N. Y., Penn., Ohio, and Ind. are the principal producing states. It has been found generally in the Trenton limestones of Ohio, and in the upper coal measures of Penn., also in all formations from the Potsdam to the Drift. The origin is unknown; geologists have not even determined whether it has been long generated, or whether it is still in course of formation.

To exploit a gas-field, wells are drilled exactly as if for oil or water. When the gas is struck the tremendous pressure frequently blows out everything from the bore of

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the well, and the gas rushes out often at a pressure of 500 lbs. or more to the sq. inch. The well is connected to a gas main and part or all of the supply is carried off to the point of consumption. Up to 16 inches in diameter, wrought-iron pipes are the rule; for larger sizes cast-iron is usually employed. The immense pressure available has made it possible to carry the gas long distances, 50 or 100 m. is easily compassed. The pressure also causes leakage, which is coped with in different ways. In the Westinghouse system a conical pile of loose stone is used to cover each joint, which pile is enveloped in thick-tarred paper. A trumpet-mouthed pipe is connected to the apex of this cone, which carries away any gas which escapes and which is burned at intervals of about one hundred yards at lamp-posts. This somewhat crude system is used on the smaller mains: for the large cast-iron pipes a metallic casing for each joint is provided. Into this casing a small pipe is tapped which delivers the leakage to a two-inch subsidiary main. The leakage-gas is carried to lamp-post burners at about the same interval as mentioned above. A vertical pipe with a cap screwed on rises from each casing near the surface. By unscrewing the cap it can be ascertained whether the joint leaks badly. If it does it can generally be made tight by pumping a fluid asphaltum compound into it, replacing the cap, and allowing it to stand a few days. The fluid penetrates the cracks and after the casing is pumped out the joint is practically tight. A heap of stones with tarred paper wrapping and escape-pipe covers the casings also, to provide for low-pressure leakages from them. Governors of proper construction are used to reduce the pressure to a manageable point.

Natural gas varies widely in composition and properties. Its illuminating power is generally low, and its calorific value is inferior to that of coal gas. Its industrial applications are very numerous and great. In regions where it can be had it displaces coal for steam-boilers, iron and glass works, and other factories, as well as for domestic uses. A peculiar system of charging has been adopted. As the gas costs nothing, no attempt is made to measure it, but the consumer is charged for the uses that he makes of it. Thus the following are among the rates which were charged at Pittsburgh: Puddling iron per ton of product, \$1.00; steam boilers, per month, \$50—\$100; flint glass, for each 10-pot furnace, per month, \$160; domestic use, open grate, \$2 per month. This system of charging has brought about an enormous waste, and it has been a matter of serious consideration whether it should not be sold by the 1,000 cubic ft. The economy in some of its industrial uses is estimated as not far from 50 per cent. It is computed that over \$3 can be saved in producing one ton of bar iron. Glass made in gas-heated furnaces is superior in quality also. For domestic purposes little if any direct economy is effected, but the absence of ashes and smoke makes it the ideal fuel. Both in the factory and in the house labor is saved by it. The smoky atmosphere of metallurgical centres is abolished, in itself a great amelioration.

In 1890 the value of natural gas displacing coal was as

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follows Penn., \$11,785,996; Ind., \$6,276,119; O., \$4,119,059; W. Va., \$2,694,925; N. Y., \$1,694,925; Kan., \$659,173; Ky., \$187,660; Cal., \$67,602; Tex., \$20,000; and S. D., Ill., Col., and Mo., \$12,208; total, \$27,067,500. The estimated value of coal, wood and other fuel displaced by this gas was \$32,245,156. On 1902, Jan. 1, there were 1,545 natural gas companies, operating 11,297 wells, and owning 21,848.16 miles of pipe. These supplied fuel for 709,921 domestic fires, 100 iron mills, 2 steel works, 219 glass works, and 5,421 other establishments. The consumption of natural gas has continued to increase, although its pressure, except in the new fields of West Va., has continued to decline. Large quantities of gas have been allowed to escape and burn at the mouths of stand pipes; and the stopping of this waste tends largely to overcome the decrease in pressure.

GAS, WATER: illuminating gas made from various materials with water. The cheapness of anthracite coal and of naphtha have given an immense impulse to the production of water-gas in the United States. The processes of purification, condensation, and storage are identical with those of coal gas. Non-luminous gas is produced by passing steam over incandescent coal. The coal is usually contained in a cupola or gasogene. Air is blown through the ignited mass until it is white hot, the products of combustion being allowed to escape. Then the air is shut off, steam is turned on, and the valves are shifted. The steam is decomposed, producing hydrogen and carbonic oxide gas, which are collected. After the heat runs down, the steam is turned off, and air again admitted. Thus the two alternate in action for periods varying from 10 minutes to half an hour. The gas produced is non-luminous. Oil or naphtha is added to it, and the mixture is exposed to a red heat to 'fix' the gas. This heating may be done in retorts or in a second cupola filled with hot fire-brick. In the latter case the heating of the fire-brick is sometimes effected by the waste gases of combustion from the gasogene. The characteristic features of the process are the alternate admissions of air and steam; and the two phases, one of production of hydrogen and carbonic oxide, and the second of carburetting and fixing. A ton of anthracite gives 35,000 to 40,000 cubic ft. and 4 to 6 gall. of naphtha, are used in carburetting it. Other modifications are used, based on the same general principles. Anthracite and naphtha are generally the materials, but others are employed.

PRODUCER-GAS: this corresponds to a combination of the air and steam blowing of the cupola in the water-gas process. If steam and air in proper proportions are blown into a mass of incandescent coal the heat remains constant, and a gas is produced consisting of hydrogen, carbonic oxide, carbonic acid, and nitrogen, which can be used in metallurgical operations. It is in calorific power above Siemen's producer-gas and below non-luminous water-gas. It has an extensive use in this country and abroad.

GASALIER: see GAS.

GASCOIGNE, *gàs-koy'n'* GEORGE: 1535-77; b. West-

GASCOIGNE—GASCON.

moreland, England: poet. He was educated at Cambridge, admitted to Gray's Inn 1555, disinherited by his father for unsteady habits, and served as a soldier under the Prince of Orange in Holland with some distinction, till captured by the Spaniards at Leyden and sent back to England. He then resumed the dramatic writings that he had begun before his disinheritance. In 1575 he joined the court of Queen Elizabeth, devised a political entertainment for her during her visit to Kenilworth, and greeted her with his *Tale of Hemetes* at Woodstock. The ms. of this, presented to the queen on the following New Year's day, is preserved in the British Museum. In 1576 he published the tragedy, *The Glass of Government*, written 1565, and completed his two most important works, *The Complaint of Philomene* and *The Steel Glass*, on which he had been engaged since 1562, beside publishing *A Delicate Diet for Dainty-Mouthed Drunkards*. His chief dramatic works were a translation of Ariosto's *I Suppositi*—the earliest extant prose play in the English language, utilized by Shakespeare in his *Taming of the Shrew*—and *Jocasta*, the first attempt to naturalize Greek tragedy. Both plays were produced on Gray's Inn stage 1566. G. is considered one of the great pioneers of Elizabethan poetry, the earliest English satirist, and the earliest English critic in poesy.

GASCOIGNE, *gäs-koy'n'*, Sir WILLIAM: English judge: 1350–1413, Dec. 17; b. Gaythorpe, Yorkshire; of a noble Yorkshire family. After studying for the bar, he acquired reputation as a pleader, and 1398 was made serjeant-at-law. On the accession of Henry IV., 1399, he was appointed one of the justices of the court of common pleas; and 1401, was promoted chief-justice of the king's bench. In the older English law reports are many abstracts of his opinions, arguments, and decisions. In 1403, July, he was joined with the Earl of Westmoreland in a commission for levying forces against the insurrection of Henry Percy, the celebrated Hotspur; he was also one of the commissioners to treat with the rebels. On the apprehension of Scroop, Abp. of York, he refused, at the command of the king, to sentence that prelate to death as a traitor, because the law gave him no jurisdiction over the life of an ecclesiastic: Henry respected his uprightness, and knighted him the same year. When one of the dissolute associates of the Prince of Wales was arraigned before him for felony, the prince imperiously demanded his release, and on being ordered to leave the court, he rushed furiously up to the bench, and, it is recorded, struck the chief-justice on the judgment-seat. G. immediately committed him to prison, when the prince, sensible of his misconduct, at once submitted. The king, when informed of the facts approved the judge's act. G. was married twice, and left numerous descendants.

GASCON, n. *gäs'kõn* [from *Gascony*, formerly a dist. in France, the natives of which were great boasters: comp. Gael. *gas ganach*, conceited]: boaster; braggart. GASCONADE, *gäs'kõn-äd'*, boast; bluster; bravado: V. to bluster; to brag ostentatiously. GAS'CONA'DING, imp. GAS'CONA'DED, pp. —The following example of this trait attributed to

GASCONADE—GAS-ENGINE.

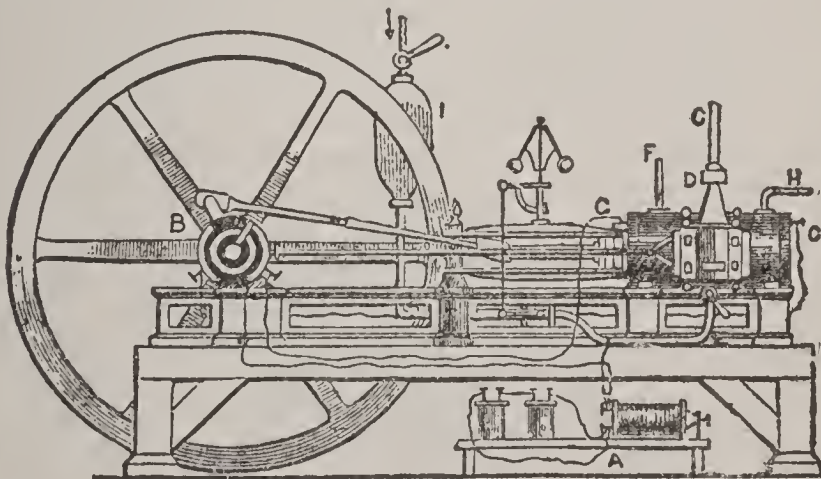
the people of Gascony, is cited: A Gascon visiting Paris, was asked by a city-friend his opinion of the grand colonnade of the Louvre. His reply was: 'Ah, it's not bad; it resembles quite closely the back part of the stables at my father's castle.'

GASCONADE, *gās-ko-nād'*: river, rising in the s. of Missouri, flowing n.e. 250 m., and joining the river Missouri about 40 m. below Jefferson City. It flows through a hilly country, covered with forests of pine and other timber, and rich in picturesque scenery. Great rafts of yellow pine lumber are floated down the river annually.

GASCONY, *gās'ko-nŷ* (Lat. *Vasconia*): formerly a dist. in s.w. France, between the Bay of Biscay, the River Garonne, and the Western Pyrenees; now included in the depts. of Landes, Gers, Hautes Pyrénées, and the s. portions of Haute Garonne, Tarn-et-Garonne, and Lot-et-Garonne. It derived its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the s. slope of the Western Pyrénées, crossed to the n. side of that mountain-range in the middle of the 6th c., and settled in the former Roman dist. of Novempopulana. In 602, after obstinate resistance, the Vasques were forced to submit to the Franks. They passed under the sovereignty of the Dukes of Aquitania, who for a time were independent of the crown; but were afterward conquered by King Pepin, and later by Charlemagne. Later G. became incorporated with Aquitania (q.v.).

GASEITY, GASIFY, GAS-HOLDER, etc.: see **GAS**.

GAS'-ENGINE: machine furnishing power by small successive explosions of gas. Many attempts have been made to utilize, as a motive-power, the expansive force arising from the explosion of a mixture of common coal-gas in general use for illuminating purposes, and common air. The first attempt which had commercial success was that of Lenoir, French inventor. The cut represents his engine. It resembles in its general features an ordinary horizontal steam engine. It has two slides, one on each side of the

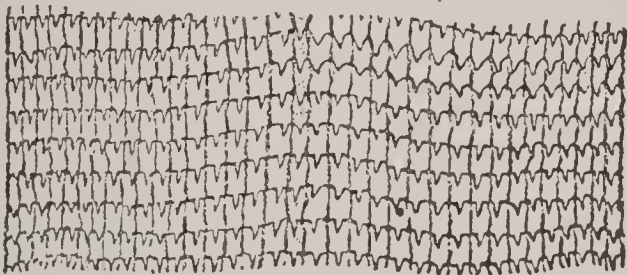
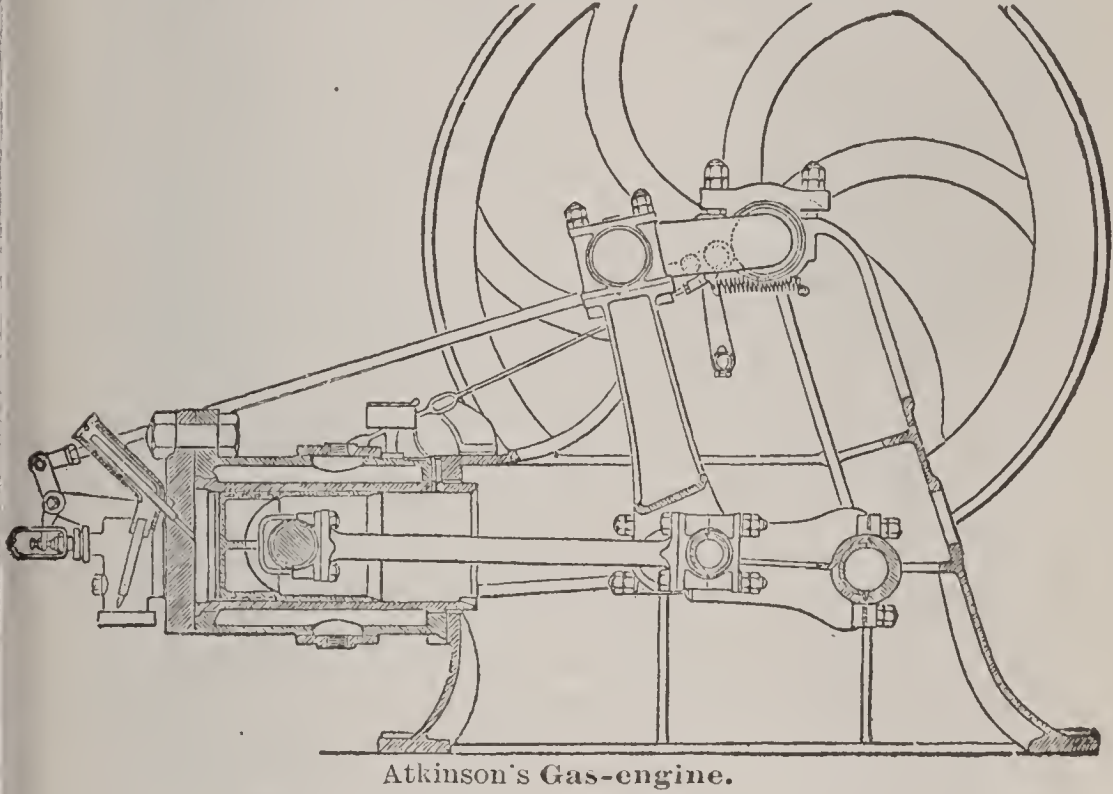
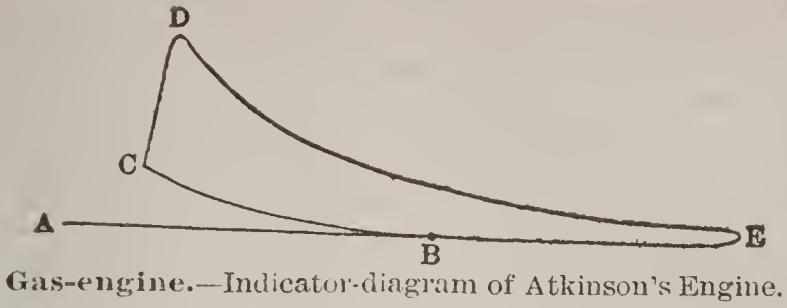


Gas-engine:

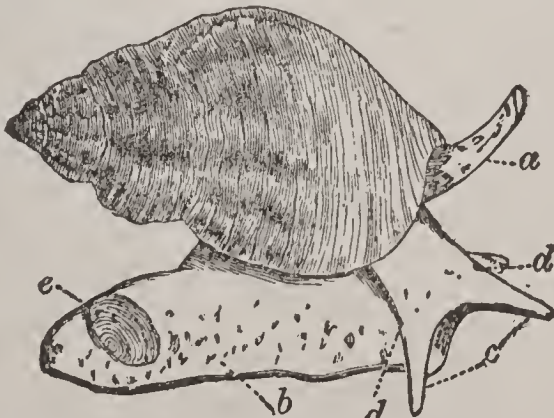
A, electric battery; B, distributor of electricity; C, electric igniters, D, admission of air (atmospheric); E, admission of gas (common coal-gas); F, exhaust pipe; G, water-pipe (inlet); H, water-pipe (outlet); I, India-rubber pouch.

GAS-ENGINE.

cylinder, which are opened and closed by eccentrics in the usual way. Through one of the slides, air and gas flow into the cylinder, in the proportions of about 11 of air to 1 of gas, until the cylinder is nearly half full, when the connection with a galvanic battery is made by the revolution of the shaft at B, causing a spark inside the cylinder, and consequent explosion of the mixture of air and gas. This explosion forces the piston from the middle of the cylinder to the further end. The products of the explosion then escape from the cylinder by the other side-valve, which opens at the proper instant. The momentum which the fly-wheel has now acquired will carry the piston back to the middle of the cylinder, sucking in behind it, through openings, which are made by the action of the eccentric on the slide, a fresh supply of air and gas; and when the piston has reached to the middle of the cylinder, the further inflow of air and gas is stopped by the slide closing, and at the same instant a spark of electricity is sent into the air and gas, exploding it as before. The first half of the stroke of the piston is thus employed in sucking in the requisite quantities of air and gas, and the last half of the stroke in giving off the power arising from the explosion of the mixture of air and gas. Improved gas-engines are now in use; one of the best is the 'Otto' silent gas-engine, differing in some respects from Lenoir's. Instead of an electric spark, a small constantly burning gas flame is used to fire the charge. But the main difference is in the use of a more dilute mixture of gas and air, placed under a pressure of about 30 lbs. above the atmosphere, by which only a portion of the charge becomes combustible; the remainder is simply expanded, and so not only is the shock of a full explosion avoided, but there is a more sustained pressure on the piston throughout the stroke. The interior of the cylinder may be compared to that of a soda-water bottle with straight sides lengthwise, only it has no constricted portion or neck. One-third of its length at the bottom end is taken up by the combustion chamber; about another third by the piston; and the remaining third or a little more by the space over which the piston travels. A jacket of cold water surrounds the cylinder to keep it cool. There are two openings in the combustion chamber—one for the admission of the charge, and the other for the escape of the products of combustion. Attached to the combustion chamber is a slide-valve whose movements are so arranged that it first admits the air and gas in due proportions, which the return of the piston compresses, and then another movement of the valve fires the mixture by exposing it to the gas-flame. The explosion, so to call it, occurs once in two revolutions when the engine is fully loaded, but less often when it is not. In the Otto it acts on the piston at the beginning, not as in the Lenoir at the middle of the stroke; but the piston is connected in a similar way with the fly-wheel, in both engines. The cost for gas is about 2 cts. per hour per horse-power, at the rate for gas of \$1.20 per 1,000 ft.



Gasteropoda.—Part of the Rasper of the Snail.



Gasteropoda.—A Whelk, showing respiratory siphon, *a*; head with tentacles, *c*, and eyes, *d*, *d*; foot, *b*, with shell-lid or operculum, *e*.

GASES.

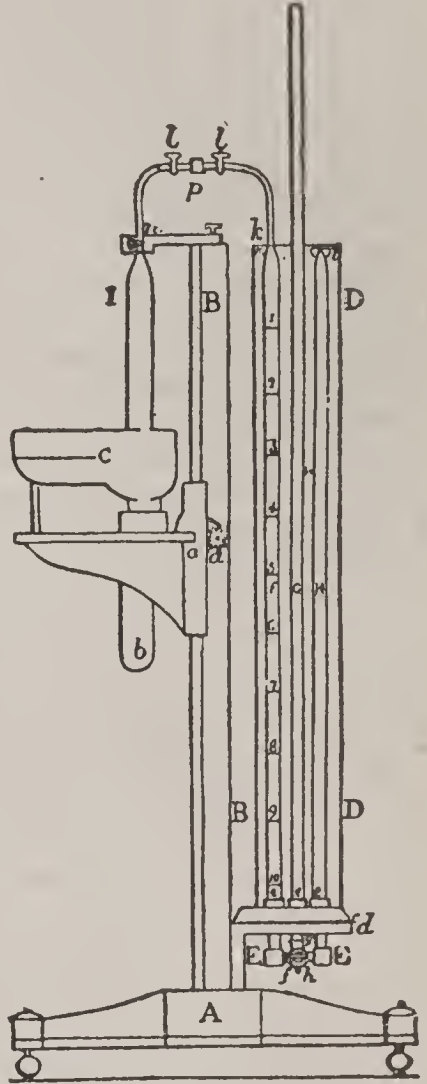
GASES, ANALYSIS OF: department of analysis originating in the attempts of various chemists, during the last quarter of the 18th, and the first quarter of the 19th c., to determine the volume of oxygen in specimens of atmospheric air taken from different localities. The general principle on which the early eudiometers (q.v.) were constructed, was that of exposing atmospheric air to the action of some substance which combined with its oxygen. Various eudiometers and eudiometrical processes were devised by Priestley, De Marté, Guyton, Seguin, Volta, Berthollet, Hope, Henry, Pcpys, Ure, etc., which are now of interest in only a historical view. They were not only almost exclusively limited to the determination of the quantity of oxygen, but they were more or less imperfect in their action; and the analysis of the gases generally did not become developed into a system until Prof. Bunsen of Heidelberg, abt. 30 years ago, began to investigate the subject. Ingenious instruments for analysis of gaseous mixtures have since been devised, not only by Bunsen, but by Regnault and Reiset, Williamson and Russell, and Frankland and Ward: the instrument devised by Ward is described below. In collecting gases, we usually employ small glass vessels, the contents of which, consisting of water, mercury, or air, are displaced by the gas to be analyzed. Of these three fluids, water is the least capable of general application, inasmuch as it gives rise to phenomena of absorption and diffusion, which modify the composition of the gas to be collected, and gases are more or less soluble in it. For the best methods of collecting gases from mineral springs and waters, from volcanic lakes, geysers or boiling springs, from openings in rocks, clefts of glaciers, furnaces, fissures in volcanic craters, etc., reference is made to Bunsen's *Gasometry*, translated by Rosco 1857. Also it must be recollected that the nature of the gas evolved often varies with the progressive phases of a decomposition; e.g., in the process of coking, or in the phenomena of combustion and decomposition occurring in the strata of a furnace. In these cases, it is necessary to collect a series of specimens during the progress of the decomposition.

The apparatus of Frankland and Ward, which in its day was regarded as the best that had yet been invented, is quite complicated: a full account of it is in their Memoir in the *Quarterly Journal of the Chemical Society*, and in Williams' *Hand-book of Chemical Manipulation*. The following remarks, which are, with slight modifications, from their Memoir, will explain the manner of its use.—We take as an example an analysis of atmospheric air. A few (three or four) cubic inches of air, freed from carbonic acid, having been introduced into the tube I, it is transferred into F for measurement by opening the cocks *l, l*, and placing the tube F in connection with the exit-pipe *h*; the transference can be assisted, if necessary, by elevating the mercurial trough C. (The part marked *b* in the figure is merely the tubular well of the mercurial trough C). When the air, followed by a few drops of mercury, has passed completely into F, the cock *l* is shut, and *f* turned, to connect

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F and H with *h*. Mercury is allowed to flow out until a vacuum of two or three inches in length is formed in H, and the metal in F is just below one of the graduated divisions; the cock *f* is then reversed, and mercury very gradually admitted from G, until the highest point in F exactly

A, a tripod, with levelling screws; **BB**, a vertical pillar, to which is attached **C**, a mercurial trough, movable by a rack and pinion, *aa*; **DD**, a glass cylinder, 36 inches long, with an internal diameter of 4 inches, containing three tubes, **F**, **G**, **H**, which communicate with one another and with the exit-pipe, *h*, by the apparatus **E f E**. The rest of the figure will be sufficiently intelligible from the description given in the text.



corresponds with one of the divisions upon that tube: we will assume it to be the sixth division, there being ten divisions in all. This adjustment of mercury, and the subsequent readings, can be very accurately made by means of a small horizontal telescope, placed at a distance of about six ft., and sliding on a vertical rod. The height of the mercury in H must now be accurately determined; and if from the number thus read off, the height of the sixth division above the zero of the scale in H is deducted (the scale on H is not marked in the figure), the remainder will express the true volume of the gas, no corrections being required for variations of temperature, atmospheric pressure, tension of aqueous vapor, etc.

Hydrogen, in the proportion of half the volume of the air used, must be passed into I, and thence into F, when the volume of the mixed gases must again be determined, as before. An electric spark must now be passed through the mixed gases in F by means of the platinum wires at *m*. A slight explosion occurs, after which we observe a con-

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siderable contraction in the volume of the mixed gases. The determination of this contraction terminates the analysis. One-third of the contraction thus determined represents the volume of oxygen contained in the air submitted to analysis, and in this case, as oxygen and nitrogen were the only gases present, the estimation of the former also determines the latter. Such an analysis as that which we have described is termed a direct determination; in other cases, we employ an indirect method.

1. The method of direct determination is applicable to mixtures of the following gases: carbonic acid, oxygen, olefiant gas, and carbonic oxide. If all these gases are present in the specimen to be analyzed, a few drops of a concentrated solution of potash is introduced into the apparatus, after a measured quantity of the gas has been transferred to it as before; the carbonic acid is speedily absorbed by the potash, and converted into carbonate of potash. The remaining gas is remeasured at the same pressure as before, and the difference of the two measurements represents the volume of the carbonic acid that was present. The remaining gas is next brought into contact with a few drops of a strong solution of pyrogallic acid, which is introduced into the apparatus so as to form potassium pyrogallate, combining with the potassium hydrate. In a few minutes, the whole of the oxygen is absorbed by the pyrogallate solution, which assumes a deep blood-red color. The remeasurement of the gas at the original pressure gives the volume of oxygen in the mixture.

The absorption of the olefiant gas is effected by the introduction into the tube I of a coke-bullet saturated with a solution of anhydrous sulphuric acid in oil of vitriol. This absorption occupies far more time than that of the preceding gas, an hour or more being required; and the residual gas contains sulphurous acid and the vapor of anhydrous sulphuric acid, which must be removed by a few drops of a strong solution of potash. The residual gas being again measured in F, the diminished pressure represents the volume of olefiant gas. The carbonic oxide is then determined by a solution of dichloride of copper, prepared best by allowing a concentrated solution of the protochloride to be in contact with copper turnings in a stoppered bottle for some days. The gas must be brought in contact for ten minutes with a little of this solution, introduced into the apparatus. The pressure of the gas is again measured, and determines the volume of carbonic oxide that has been absorbed. This gas is, however, usually determined by the indirect method.

2. The method of indirect determination is especially applicable to mixtures of the following gases: hydrogen, light carburetted hydrogen, carbonic oxide, and nitrogen. We explode a known volume of the mixture of these gases in the tube F, with an excess of oxygen, and determine (1) the diminution of volume after the explosion, and (2) the volume of carbonic acid produced by the combustion. The gas that remains after the absorption of the carbonic acid (by a solution of potash), consists merely of

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nitrogen, with any excess of oxygen beyond what was necessary. The volume of oxygen determined by explosion with hydrogen, subtracted from the residual gas, gives the amount of nitrogen contained in the mixture. For the determination of the respective volumes of nitrogen, hydrogen, carbonic oxide, and light carburetted hydrogen, we have the following data—viz. (1) the volume of the gas taken for analysis, which we will call A; (2), the volume of the combustible gases contained in it, which we will call A', and which is ascertained by deducting from A the amount of nitrogen determined as above; (3), the contraction of volume on explosion, which we will call C; and (4) the volume of carbonic acid generated on explosion, which we will call D; and we know likewise that on exploding one volume of hydrogen with an excess of oxygen, the contraction of volume is expressed by 1·5; that on similarly exploding one volume of carbonic oxide, the contraction is expressed by 0·5, while one volume of carbonic acid is produced; and that with light carburetted hydrogen the contraction is represented by 2·0, while one volume of carbonic acid is produced. Hence, if we call w, x, y, z , the unknown volumes of nitrogen, hydrogen, carbonic oxide, and light carburetted hydrogen, we see at once that $w = A - A'$, and $x = A' - D$; and the above numerical data give us the equations

$$C = \frac{3x}{2} + \frac{y}{2} + 2z, \quad \text{and } D = y + z; \quad \text{whence}$$

$$y = \frac{3A' - 2C + D}{3}, \quad \text{and } z = \frac{2D - 3A' + 2C}{3},$$

which affords the complete solution of the analytical problem.

If, on the application of these formulæ to the results of an analysis, one of the quantities w, x, y, z , is found = 0, or a small negative result, it obviously follows, that the gas whose volume is represented by the letter in question, is not present in the mixture.

Although as already stated, water is not well adapted for collecting, etc., gases in analysis, yet for rapid work several apparatus have been devised in which all the work is done with water as a substitute for mercury and excellent results are attained by them. Elliott's apparatus is the leading American one; and Hempfel's is the most efficient of the German apparatus.

For further details regarding this somewhat difficult branch of chemical analysis, see Bunsen's treatise, and the articles 'Analyse für Gase,' in 2d ed. of Liebig, Pogendorff, and Wöhler's *Handwörterbuch der Chemie*; and 'Gasometric Analysis,' in the *English Cyclopædia—Arts and Sciences*, IV.

GASES.

GASES, GENERAL PROPERTIES OF: physical characteristics of aëriiform fluids. The term gas from the same root as ghost, Ger. *geist*, breath, spirit—was used by the older chemists to designate any kind of air or vapor. Van Helmont was the first chemist who limited the term gas to such elastic fluids as had not been rendered liquid or solid by a reduction of temperature. In common language a distinction is made between gases and vapors. Gases are understood to be invariably aëriiform at ordinary temperatures and atmospheric pressures, while vapors under these conditions are solid or liquid, and assume a vaporous or apparently gaseous form only at relatively high temperatures. Thus oxygen, hydrogen, nitrogen, chlorine, etc., are considered true gases; while water, sulphur, iodine, etc., when heated to certain definite points, become transformed into vapors. The above is a general statement, as variations in the application of the term 'vapor' will be found in different books,

The *kinetic theory of gases*, put forth first by Daniel Bernoulli, is to the effect that they are formed of material particles, free in space, and actuated by very rapid rectilinear movements; and that the tension of elastic fluids results from the shock of their particles against the sides of the containing vessels. This theory has been recently revived and developed chiefly by Glausius and Clerk Maxwell. The perfect elasticity of gases is one of their most important physical peculiarities. Within the limits of all ordinary experiments it is generally true that 'the volume of a gaseous body is inversely as the compressing force:' see MARIOTTE'S LAW. In consequence of their extreme elasticity, gases exhibit entire absence of cohesion among their particles, and in this respect they differ essentially from liquids. A vessel may be filled either partially or completely with a liquid, and this liquid will have a definite level surface or limit. With gases, it is otherwise; they always perfectly fill the vessel, that contains them, however irregular its form. Instead of cohesion, there is a mutual repulsion among their particles, which have a continual tendency to recede further from each other, and thus exert a pressure in an outward direction upon the sides of the vessel in which the gas is inclosed. This outward pressure is greater or less according as the elasticity of the gas is increased or diminished.

Dalton long ago remarked that 'there can scarcely be a doubt entertained respecting the reducibility of all elastic fluids, of whatever kind, into liquids; and we ought not to despair of effecting it at low temperatures and by strong pressure exerted upon the unmixed gases.' This prediction has been fulfilled. It occurred to Faraday, who led in these investigations, that the most probable mode of obtaining gases (or rather what, under ordinary circumstances, would be gases) in the liquid state, would be to generate them under strong pressure. When thus produced in strong bent glass tubes, they continued liquid at low temperatures while the pressure was maintained; but on removing the pressure (breaking the tube), they instantly

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ly passed into the gaseous state. In his memoir (*Philosophical Transactions*, 1823), he announced that he had succeeded in liquefying chlorine, euchlorine, sulphuretted hydrogen, nitrous oxide, cyanogen, ammonia, and hydrochloric, sulphurous, and carbonic acids. Since his time by the joint action of powerful mechanical pressure and extreme cold, the number of liquefiable gases has been so far extended as to include all, oxygen, hydrogen, and nitrogen, being the last of the elemental gases to succumb.

The researches of Andrews established the fact that for every gas there is a certain minimum temperature at which the energy of the molecular movement is exactly balanced by the force of cohesion, *whatever be the pressure to which the vapor is subjected*; this temperature is the 'critical point' of the gas. It was because the critical points of certain gases are very low that they so long resisted all efforts to condense them. No amount of pressure without the necessary cold could be effectual. At last, in the end of 1877, by the use of powerful apparatus and ingenious contrivances for producing cold, the difficulties have been overcome by MM. Cailletet and Raoul Pictet of Geneva. By combining a cold of 120° to 140° below zero, with enormous pressures of 550 and even 650 atmospheres, M. Pictet was able to liquefy oxygen. 'He has also liquefied and even solidified hydrogen, which he has seen to issue from the tube in the form of a steel-blue liquid jet, which partly solidified. The solid hydrogen, in falling on the floor, produced the shrill noise of a metallic hail, thus confirming the bold and ingenious idea of Faraday, who first suggested that hydrogen is a metal.' The distinction between permanent and condensable gases is thus abolished. It is of historical interest to note that many years before the publication of Faraday's earliest researches on this subject, sulphurous acid gas had been liquefied by Monge and Clouet, ammonia by Guyton Morveau, and arseniuretted hydrogen by Stromeyer, by the simple application of cold, without increased pressure.

For the expansion and contraction of gases by changes of temperature, see HEAT.

The process of intermixture in gases, and the movements of these substances generally have been very carefully studied by Faraday, Döbereiner, Mitchell, Bunsen, and especially Graham. These movements are considered usually under four heads, viz.: 1. *Diffusion*, or the intermixture of one gas with another; 2. *Effusion*, or the escape of a gas through a minute aperture in a thin plate into a vacuum; 3. *Transpiration*, or the passage of different gases through long capillary tubes into a rarefied atmosphere; 4. *Osmosis*, or the passage of gases through diaphragms.

For the general principles of diffusion in gases, see DIFFUSION: some supplementary remarks follow, chiefly with the view of rendering the following table more intelligible. Graham's experiments with the simple diffusion-tube show (see Graham's Memoirs. *Transactions of the Royal Societies of London and Edinburgh*; or Miller's *Chemical Physics*) that the diffusiveness or *diffusion volume* of a

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gas is in the inverse ratio of the sq. root of its density; consequently, the squares of the times of equal diffusion of the different gases are in the ratio of their specific gravities. Thus, the density of air being taken as the standard of comparison at 1, the sq. root of that density is 1, and its diffusion volume is also 1; the density of hydrogen is 0.0692, the sq. root of that density is 0.2632, and its diffusion volume is $\frac{1}{0.2632}$, or 3.7994; or, as actual experiment shows, 3.83—that is to say, if hydrogen and common air be placed under circumstances favoring their mutual diffusion, 3.83 volumes of hydrogen will change place with 1.00 of air. The following table gives; 1. The density; 2. The sq. root of the density; 3. The calculated, and 4. The observed velocity of diffusion or diffusiveness of several important gases; the numbers in the last column, headed 'Rate of Effusion,' being the results obtained by experiment upon the rapidity with which the different gases escape into a vacuum through a minute aperture in a thin plate which aperture was about $\frac{1}{30}$ of an inch in

GAS.	Density.	Square Root of Density.	Calculated Velocity of Diffusion.	Observed Velocity of Diffusion. Air = 1.	Rate of Effusion.
Hydrogen.....	0.06926	0.2632	3.7994	3.83	3.613
Light Carburet'd Hydro'n.	0.559	0.7476	1.3375	1.344	1.322
Carbonic Oxide	0.9678	0.9837	1.0165	1.0149	1.0123
Nitrogen....	0.9713	0.9859	1.0147	1.0143	1.0164
Olefiant Gas	0.978	0.9889	1.0112	1.0191	1.0128
Binoxide of Nitrogen.....	1.039	1.0196	0.9808		
Oxygen	1.1056	1.0515	0.9510	0.9487	0.950
Sulphuretted Hydrogen...	1.1912	1.0914	0.9162	0.95	
Protoxide of Nitrogen....	1.527	1.2357	0.8092	0.82	0.834
Carbonic Acid.....	1.52901	1.2365	0.8087	0.812	0.821
Sulphurous Acid.....	2.247	1.4991	0.6671	0.68	

diameter. 'The process of diffusion,' says Prof. Miller, 'is one which is continually performing an important part in the atmosphere around us. Accumulations of gases which are unfit for the support of animal and vegetable life are by its means silently and speedily dispersed, and this process thereby contributes largely to maintain that uniformity in the composition of the aerial ocean which is so essential to the comfort and health of the animal creation. Respiration itself, but for the process of diffusion, would fail of its appointed end in rapidly renewing to the lungs a fresh supply of air in place of that which has been rendered unfit for the support of life by the chemical changes which it has undergone.' A reference to the last two columns of the above table shows that, within the limits of experimental errors, the rate of effusion of each gas coincides with its rate of diffusion.

Graham's experiments show that the velocity of *transpiration* (the term which that chemist applied to the passage of gas through long capillary tubes) is entirely independent of the rate of diffusion, or of any other known

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property. It varies with the chemical nature of the gas, and is probably 'the resultant of a kind of elasticity depending upon the absolute quantity of heat, latent as well as sensible, which different gases contain under the same volume; and therefore will be found to be connected more immediately with the specific heat than with any other property of gases.' Oxygen is found to have the lowest rate of transpiration. Taking its transpiration velocity at 1, that of air is 1.1074; of nitrogen, 1.141; of carbonic acid, 1.369; of sulphuretted hydrogen, 1.614; of ammonia, 1.935; of olefiant gas, 1.980; and of hydrogen, 2.288.

In Osmosis, or the passage of gases through diaphragms, the law of the diffusion of gases is more or less disturbed or modified according to the force of adhesion in the material of which the diaphragm is composed; the disturbance being greatest in the case of soluble gases and a moist thin diaphragm such as a bladder or a rabbit's stomach: for details, see OSMOSE.

All gases are more or less soluble in water and other liquids. Some gases, e.g. hydrochloric acid and ammonia, are absorbed by water very rapidly, and to a great extent, the liquid taking up 400 or 600 times its bulk of the gas; in other cases, as carbonic acid, water takes up its own volume of the gas; while in the case of nitrogen, oxygen, and hydrogen, it takes up not more than from $\frac{1}{25}$ to $\frac{1}{50}$ of its bulk. 'As the elasticity of the gas,' says Prof. Miller, 'is the power which is here opposed to adhesion, and which at length limits the quantity dissolved, it is found that the solubility of each gas is greater, the lower the temperature, and the greater the pressure exerted upon the surface of the liquid. Dr. Henry found that at any given temperature the *volume* of any gas which was absorbed was uniform, whatever might be the pressure; consequently, that the *weight* of any given gas absorbed by a given volume of any liquid at a fixed temperature, increased directly with the pressure. If the pressure be uniform, the quantity of any given gas absorbed by a given liquid is also uniform for each temperature; and the numerical expression of the solubility of each gas in such liquids, is termed its *coefficient of absorption* or *of solubility*, at the particular temperature and pressure, the volume of the gas absorbed being in all cases calculated for 32° F., under a pressure of 29.92 inches of mercury. Thus, 1 volume of water at 32°, under a pressure of 29.92 inches of the barometer, dissolves 0.04114 of its volume of oxygen; and this fraction represents the coefficient of absorption of oxygen at that temperature and pressure. Similarly, the coefficient of absorption of common air is 0.02471. In consequence of this solubility of the air, all water contains a certain small proportion of it in solution; and if placed in a vessel under the air-pump, so as to remove the atmospheric pressure from its surface, the dissolved gases rise in minute bubbles. Small as is the quantity of oxygen thus taken up by water from the atmosphere, it is the means of maintaining the life of all aquatic animals. If the air is expelled from water by boiling and it be covered with a

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layer of oil, to prevent it from again absorbing air, fish or any aquatic animals placed in such water quickly perish. Even the life of the superior animals is dependent on the solubility of oxygen in the fluid which moistens the air-tubes of the lungs, in consequence of which this gas is absorbed into the mass of the blood, and circulates through the pulmonary vessels.'

The following table, drawn from the researches of Bunsen and Carius, shows the solubility of some of the most important gases, both in water and in alcohol:

Gas.	Volume of each Gas dissolved in 1 Volume of Water.		Volume of each Gas dissolved in 1 Volume of Alcohol.	
	At 32 Degrees F.	At 59 Degrees F.	At 32 Degrees F.	At 59 Degrees F.
Ammonia	1049·60	727·2		
Hydrochloric Acid..	505·9	458·0		
Sulphurous Acid ...	68·861	43·564	328·62	144·55
Sulphuret'd Hydro'n	4·3706	3·2326	17·181	9·539
Chlorine... ..	Solid	2·368		
Carbonic Acid.....	1·7967	1·002	4·3295	3·1993
Protoxide of Nitro'n.	1·3052	0·0778	4·1780	3·2678
Olefiant Gas	0·2563	0·1615	3·5950	2·8825
Binoxide of Nitrogen			0·31606	0·27478
Marsh Gas.	0·05449	0·03909	0·52259	0·48280
Carbonic Oxide.....	0·03287	0·02432	0·20443	0·20443
Oxygen.....	0·04114	0·02989	0·28397	0·28397
Nitrogen	0·02035	0·01478	0·12634	0·12142
Air	0·02471	0·01795		
Hydrogen.....	0·01930	0·01930	0·06925	0·06725

All these gases, with the exception of hydrochloric acid, may be expelled from the water by long-continued boiling. Gases are not absorbed by all liquids in the same order; e.g., naphtha absorbs most olefiant gas, oil of lavender most protoxide of nitrogen, olive oil most carbonic acid, and solution of chloride of potassium most carbonic oxide. If a mixture of two or more gases be agitated with water, or probably any other liquid, a portion of each gas will be absorbed, and the amount of each so absorbed or dissolved will be proportional to the relative volume of each gas multiplied with its coefficient of solubility at the observed temperature and pressure. As all ordinary liquids exert a greater or less solvent action on gases, a gas that we wish to examine quantitatively should be collected over mercury.

The adhesion of gases to solids next requires notice. Illustrations of this phenomenon perpetually occur. Thus, wood and other solid substances immersed in water or other liquids appear covered with air-bubbles. It is this adhesion of air to the surface of glass tubes which causes the difficulty of obtaining barometers and thermometers completely free from air. It is in consequence of the adhesion of air to their surfaces that many small insects are enabled to skim lightly over the surface of water which does not wet them. A simple method of illustrating this phenomenon is by gently dusting iron filings over the surface of a vessel of water; if we proceed carefully, a considerable

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mass of the iron may accumulate upon the surface; till, at last, it falls in large flakes, carrying down with it numerous bubbles of air. As the particles of iron are nearly eight times as heavy as water, it was only the adherent air that enabled them to float upon the surface by permitting surface tension to act. Closely allied to this adhesion is the remarkable property of condensation which porous bodies, especially charcoal, exert on gases. Owing to this property of charcoal—especially freshly burned vegetable charcoal—various gases may be separated from their watery solution by filtration of the latter through it; e.g., sulphuretted hydrogen may be removed from water so completely that it cannot be detected either by its well-known odor or by the ordinary tests. Saussure found that 1 volume of freshly burned box-wood charcoal absorbed 90 volumes of ammonia, 85 of hydrochloric acid, 65 of sulphurous acid, 55 of sulphuretted hydrogen, 40 of protoxide of nitrogen, 35 of carbonic acid, 35 of bi-carburetted hydrogen, 9·4 of carbonic oxide, 9·2 of oxygen, 7·5 of nitrogen, 5·0 of carburetted hydrogen, and 1·7 of hydrogen. These results follow an order very nearly the same as that of the solubility of the gases in water. Stenhouse has investigated the differences in the absorbent power of different kinds of charcoal; the following are his most important results: 0·5 of a gramme of each kind of charcoal being employed, and the numbers in the table indicating in cubic centimetres the quantity of absorbed gas.

GAS USED.	Kind of Charcoal employed.		
	Wood.	Peat.	Animal.
Ammonia	98·5	96·0	43 5
Hydrochloric Acid	45·0	60·0	
Sulphurous Acid	32·5	27·5	17·5
Sulphuretted Hydrogen.....	30·0	28·5	9·0
Carbonic Acid.....	14·0	10·0	5·0
Oxygen.....	0·8	0·6	0·5

So rapid is this action of charcoal, that Stenhouse has proposed to use a respirator filled with it to protect the mouth and nostrils in an affected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to act very beneficially in purifying the air by absorbing the offensive gases. Its use in the filtration of water has been already alluded to.

The determination of the exact specific gravity of the different gases is of great importance in calculating the proportions of the different ingredients of compounds into which they enter; and the whole series of numbers expressing the chemical equivalents or atomic weights of bodies depend upon the accuracy of the determination of the specific gravity of hydrogen and oxygen.

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The following table gives the specific gravity and the weight of 100 cubic inches of some of the most important gases at a barometric pressure of 30 inches, and at a temperature of 60°, together with the name of the observer:

GAS.	Specific Gravity. Air = 1.	Weight of 100 Cubic Inches in Grains.	Observer.
Air	1·0000	30·935	Regnault.
Oxygen	1·1056	34·203	“
Nitrogen	0·9713	30·119	“
Hydrogen	0·0692	2·143	“
Carbonic Acid	1·5290	47·303	“
Chlorine	2·5000	76·250	Thomson.
Ammonia	0·5902	18·003	“
Caburetted Hydrogen	0·5555	16·944	“
Olefiant Gas	0·9722	29·652	“
Arseniuretted Hydrogen	0·5290	16·130	Tromsdorff.
Sulphuretted Hydrogen	1·1805	36·007	Thomson.
Cyanogen	1·8055	55·069	Gay Lussac.
Hydrochloric Acid	1·2847	39·183	Thomson.
Sulphurous Acid	2·2222	67·777	“

For the methods of determining the specific gravity of a gas, both by direct observation and by calculation, see SPECIFIC GRAVITY.

As to the chemical properties of gases, most of the different gases, when pure, can be readily distinguished by some well-marked physical or chemical property. Some are distinguished by their color, others by the peculiar odor; but several of the most important—viz., oxygen, nitrogen, hydrogen, carbonic acid, carbonic oxide, light carburetted hydrogen, olefiant gas, and protoxide of nitrogen—require other means for their discrimination. For the distinctive characters of the most important gases, see OXYGEN: HYDROGEN: CHLORINE: etc.: for the outlines of the general method of analyzing a gaseous mixture, see GASES, ANALYSIS OF. For further details on the physical and chemical characters of the gases, see Miller's *Elements of Chemistry*, especially the vol. on *Chemical Physics* (freely used in this article); to Kekule's *Lehrbuch der Organischen Chemie*, 1859; and to Roscoe's translation of Bunsen's *Gasometry*.

GASH, n. *gāsh* [OF. *garser*, to scarify with a lancet—from mid. L. *garsa*, scarification of the flesh: Gael. *gaise*, an injury with a sharp weapon: Low Ger. *gatsken*, to cut a large hole]: a deep long cut; a deep irregular wound from a slash: V. to cut deeply. GASH'ING, imp. GASHED, pp. *gāsh't*.

GASH, v. *gāsh* [F. *gausser*, to mock, to banter: Gael. *gaish*, a torrent]: in *Scot.*, to talk freely and fluently; to talk pertly or insolently: ADJ. lively and fluent in discourse; sagacious. GASH'ING, imp. GASHED, pp. *gāsh't*.

GASIFY, etc.: see GAS.

GASKELL, *gās'kel*, ELIZABETH C.: English authoress: abt. 1820–1865, Nov. (maiden name, Stevenson); wife of a Unitarian clergyman in Manchester. Her novels, of which

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Mary Barton (1848) and *Ruth* (1853) are perhaps the best examples, are chiefly descriptive of the habits, thoughts, privations, and struggles of the industrial poor, in such a social bee-hive as the city of her residence. Some of her characters are drawn with remarkable dramatic power, and many of her descriptive passages are very graphic. Among her works are *The Moorland Cottage* (1850), a Christmas Story; *North and South* (1855); *Cranford*; and *Lizzie Leigh*—the last three of which originally appeared in *Household Words*. Mrs. G. also edited a very interesting life of Charlotte Brontë (q.v.), 1857. Among her later works were *Sylvia's Lovers* and *Cousin Phyllis*.

GASKET, n. *gās'kēt* [F. *garcette*, a gasket—from Sp. *garceta*]: plaited hemp used for packing pistons, etc.; plaited cords or small ropes by which the sails when furled are kept bound up close to the yards or gaffs.

GASKINS: contracted form of **GALLIGASKINS** (q.v.).

GASOLENE, *gās'ō-lēn*, or **GASOLINE**: liquid obtained from the distillation of crude naphtha—a product of the distillation of petroleum; used for illuminating purposes. It is the most volatile product of petroleum, highly inflammable and explosive; hence it is said to be impossible to make it safe to burn in the form of oil. It is used largely for making air-gas. See **PETROLEUM**.

GASOMETER, etc.: see **GAS**: **GAS**, **LIGHTING BY**.

GASP, n. *gāsp* [Icel. *geispa*, to yawn: Dan. *gispe*; Sw. *gaspa*, to gasp]: the short convulsive opening of the mouth for breath when not able to breathe freely; the short sharp catching of the breath in agony or in dying: V. to breathe with difficulty by short inspirations. **GASP'ING**, imp.: **ADJ.** opening the mouth to catch breath: **N.** act of opening the mouth to catch breath; the short catch of breath in agony or in dying. **GASPED**, pp. *gāsp*. *Note.*—**GASP** may be considered a frequentative of *gape*.

GASPÉ, *gās-pā'*: most easterly district of Lower Canada, consisting of the counties of Gaspé and Bonaventure; chiefly a peninsula projecting into the Gulf of St. Lawrence, between the estuary of the same name on the north and the Bay of Chaleur on the south. It is n. lat. 48°—49° 20', and in w. long. 64° 15'—67° 56'; 7,500 sq. m. Cod and whale fishing are the staple business of the country. The pop., mostly of French descent, (1891) 26,875.

GASPÉ BASIN, is a prosperous and rising village on the bay of G., with a safe and splendid harbor. It was constituted a free port 1860, and gives promise of becoming an important trading centre. Pop. about 700.

GASSENDI, *gās-sēn'dē*, F. *gâ-sōng-dē'* (or **GASSEND**), **PIERRE**: 1592, Jan. 22—1655, Oct. 14; b. Champtercier, Provence, dept. of the Lower Alps: French philosopher and mathematician. His unusual powers of mind showed themselves at an early age, and 1616 he became prof. of theology at Aix. After six years' study, he became disgusted with the scholastic philosophy, and undertook to maintain certain theses against the Aristotelians. His polemic appeared at Grenoble 1634, and was entitled

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Exercitationes paradoxicae adversus Aristototeleos. It was accompanied by an expression of his belief in the church, for whose honor and glory he declared himself 'ready to shed the last drop of his blood.' He drew a distinction for the first time between the church and the scholastic philosophy, denying that the former must stand or fall by the latter. G. now visited Paris, where he made several influential friends. In the same year in which he published his *Exercitationes*, he was appointed *prevôt* of the cathedral at Digne, an office which enabled him to pursue without distraction his astronomical and philosophical studies. In 1628 he travelled in Holland, and in a controversy with Robert Fludd, an English mystic, relative to the Mosaic cosmogony, gained the advantage of his incoherent opponent. At the recommendation of the Abp. of Lyon, brother of Cardinal Richelieu, G. was appointed prof. of mathematics in the College Royal de France, at Paris, where he died. As a philosopher, G. maintained, with great learning and ingenuity most, though not all, of the doctrines of Epicurus. His philosophy was in such repute, that the savans of that time were divided into Cartesians and Gassendists. The two chiefs themselves always entertained the highest respect for each other, and were at one time on the friendliest terms. The agreeableness of their intercourse, however, was for a while interrupted by the publication of a work of G.'s entitled *Dubitaciones ad Meditationes Cartesii*, in which he expressed himself dissatisfied with the tendencies of the new system of philosophy introduced by Descartes; for G. was averse to novelty in the sphere of mental speculation, though he warmly espoused the side of progress in physical science, by which he made many enemies among his bigoted ecclesiastical brethren. He ranked Kepler and Galileo among his friends, and was himself the instructor of Molière. His principal work is *De Vita, Moribus, et Placitis Epicuri* (Lyon 1649) to which the *Syntagma Philosophiæ Epicuræ* (1649) belongs. It contains a complete view of the system of Epicurus. His *Institutio Astronomica* (1645) is a clear and connected representation of the state of the science in his own day; in his *Tycho-nis Braheii, Nicolai Copernici, Georgii Puerbachii, et Joannis Regiomontani Astronomorum Celebrium Vitæ* (Par. 1654), he not only gives a masterly account of the lives of these men, but likewise a complete history of astronomy down to his own time. G. was pronounced by Bayle the greatest philosopher among scholars, and the greatest scholar among philosophers. His works were collected and published by Montmor and Sorbière (Lyon 6 vols. 1658).

GASSNER, *gás'nér*, JOHANN JOSEPH: 1727, Aug. 28—1779, Mar.; b. Bratz, near Pludenz, in the Tyrol: notorious exorcist. While he was a Rom. Cath. priest at Klösterle, in the diocese of Coire, the accounts of demoniacs in the New Testament, combined with the writings of celebrated magicians, brought him to the conviction that most diseases are attributable to evil spirits, whose power can be destroyed only by conjuration and prayer. He began to carry out his conviction by practicing on some of his parishion-

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ers, and succeeded so far as to attract notice. The Bp. of Constance called him to his residence, but having come very soon to the conviction that he was a charlatan, advised him to return to his parsonage. G. betook himself, however, to other prelates of the empire, some of whom believed that his cures were miraculous. In 1774, he even received a call from the bishop at Ratisbon, to Ellwangen, where, by the mere word of command, *Cesset* (Give over), he cured persons who pretended to be lame or blind, but especially those afflicted with convulsions and epilepsy, who were all supposed to be possessed by the devil. Although an official person kept a continued record of his cures, in which the most extraordinary things were testified, yet it was soon found that G. often made persons in health play the part of those in sickness, and that his cures of real sufferers were successful only so long as their imagination remained heated by the persuasions of the conjuror. He died in possession of the wealthy deanery of Benndorf, but had previously lost all repute.

GAST, *v.* *gäst* [AS. *gást*, the breath, a spirit (see GHOST)]: in *OE.*, to frighten; to terrify: N. spirit; breath; a ghost. GAST'ING, *imp.* GAST'ED, *pp.* frightened. GAST'NESS, *n.* -*nës*, terror.

GAS'-TAR, or COAL'-TAR: thick, black, opaque liquid, which comes over and condenses in the pipes when gas is distilled from coal. It is slightly heavier than water, and has a strong, disagreeable odor. Coal tar is a mixture of many distinct liquid and solid substances, and the separation of the more useful of these constitutes an important branch of manufacturing chemistry. The tar is first distilled in large malleable iron stills, when *water* and *crude naphtha* first come over; and afterward, when the temperature rises, a heavy, fetid smelling oil, called *dead oil*, which sinks in water. There remains in the still a large residue of *pitch*, which is again distilled in brick ovens, giving off an oil called *coke-oil*, and leaving a large quantity of *pitch-coke*. The crude naphtha is purified by sulphuric acid and quicklime, and re-distilled, when it is nearly as colorless as water. This, then, forms the refined coal-tar naphtha of commerce. It is largely used for burning in lamps; as a solvent for india-rubber and gutta-percha; to preserve animal substances from moth; and it is also burned to produce a fine carbon for the manufacture of printing ink. It is from the lighter portion of naphtha, called *benzole*, that the beautiful mauve and magenta colors are manufactured: see BENZOLE: DYE-STUFFS. Benzole is used for removing stains of fat or oil from cloth. The dead-oil or pitch-oil is sometimes used, in its crude state, as a cheap material for affording light in lamps burned in the open air. It contains considerable creasote, and forms the best preservative for wood in damp situations. The coke-oil is not of much commercial importance, but it can be burned in lamps, and this oil with the dead-oil, when consumed in a confined atmosphere, gives a smoky flame, the soot from which constitutes lamp-black. The pitch-coke is valuable as a fuel

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for melting iron, being free from impurities. Pitch itself is used for making asphalt pavement, also for roofing-felt.

From the last portion of the distillation of the crude naphtha, and the first of the dead-oil, a beautiful white crystalline solid, called naphthaline, is obtained. It has been long known without being applied to any useful purpose, but is now beginning to be employed for the manufacture of colors, in a similar way to benzole. The dead-oil contains also considerable quantities of a yellow solid termed paranaphthaline, a mere chemical curiosity.—The creasote is extracted from the dead-oil by stirring it with soda, in which the creasote dissolves. When this soda solution is boiled for some hours, and then has an acid added to it, the creasote separates as an oil on the surface of the fluid, and, when distilled, is nearly pure. This treatment requires to be repeated several times to get it quite pure, and to keep its color. Most of the creasote used by druggists is made from coal-tar. The creasote from wood is a similar though quite distinct body.—Sulphuric acid extracts both from the dead-oil and from the crude naphtha several volatile basic oils besides benzole—namely, toluole, xylole, cumole, and cymole. Aniline is found, but not in sufficient quantity to pay for its extraction; also pyrrol.

GASTEIN, *gäs'tin*: valley in the s. of the Austrian duchy of Salzburg; branch of the upper Salzach valley; abt. 25 m. long, $1\frac{1}{4}$ m. wide. It is 3,000—3,500 ft. above the sea. Lofty mountains form its s. boundary, and lower ranges border its e. and w. sides. It is traversed by the river Ache, which, near Wildbad-Gastein, falls over rocks 200 ft. and again 280 ft. high; while another stream near has a fall of 250 ft. The valley contains, with two other villages, one of the most famous watering-places in Europe, *Wildbad-Gastein*. Here, 1865, was concluded the convention between Austria and Prussia respecting the duchies of Schleswig-Holstein and Lauenburg, which they jointly had taken from Denmark.—More than 3,000 guests, mostly of the higher classes, visit the place in summer to bathe in the waters or drink them. The thermal springs, known since the 7th c., have a temperature of 117° F. and are beneficial in nervous affections, debility, and skin diseases. Pop. of entire valley, abt. 3,800.

GASTEROMYCETES, n. *gäs'tér-ō-mī-sē'tēz* [Gr. *gastēr*, the belly; *mukēs*, a mushroom]: in *bot.*, a class of the fungi in which the fructification is always inclosed at first, and only exposed in decay, as in the puff-balls.

GASTEROPODS.

GASTEROPODS, n. plu. *gās-tēr'ō-pōdz*, or GASTROPODS, *gās'trō-pōdz*, or GAS'TEROP'ODA, n. plu. *-ōp'ō-dā* [Gr. *gaster*, the belly; *podēs*, feet]: class of mollusks, inferior in organization to cephalopods, but far superior to almost all other mollusks, and containing a multitude of species, the greater number marine, but some inhabitants of fresh water, and some terrestrial. Snails, whelks, periwinkles, limpets, cowries, and the greater number of mollusks with univalve shells belong to this class, and univalve mollusks constitute the greater part of it; but it contains also some mollusks with multivalve shells, as chitons, and some, as slugs, which have either only a rudimental internal shell, or no shell at all. Some aquatic kinds are destitute of shell in the adult state, but they are protected by a rudimentary shell on first issuing from the egg. No known gastropod has a bivalve shell, unless the *operculum*, which closed the mouth of the shell in many species, be regarded as a second valve. GAS'TEROP'ODOUS, a. *-ōp'ō-dūs*, pertaining to the gasteropods.

Gastropods have a head, more or less fully developed, in which is situated the mouth, and which generally carries two to six fleshy, retractile tentacula. The tentacula do not encircle the mouth; they seem to be special and exquisitely

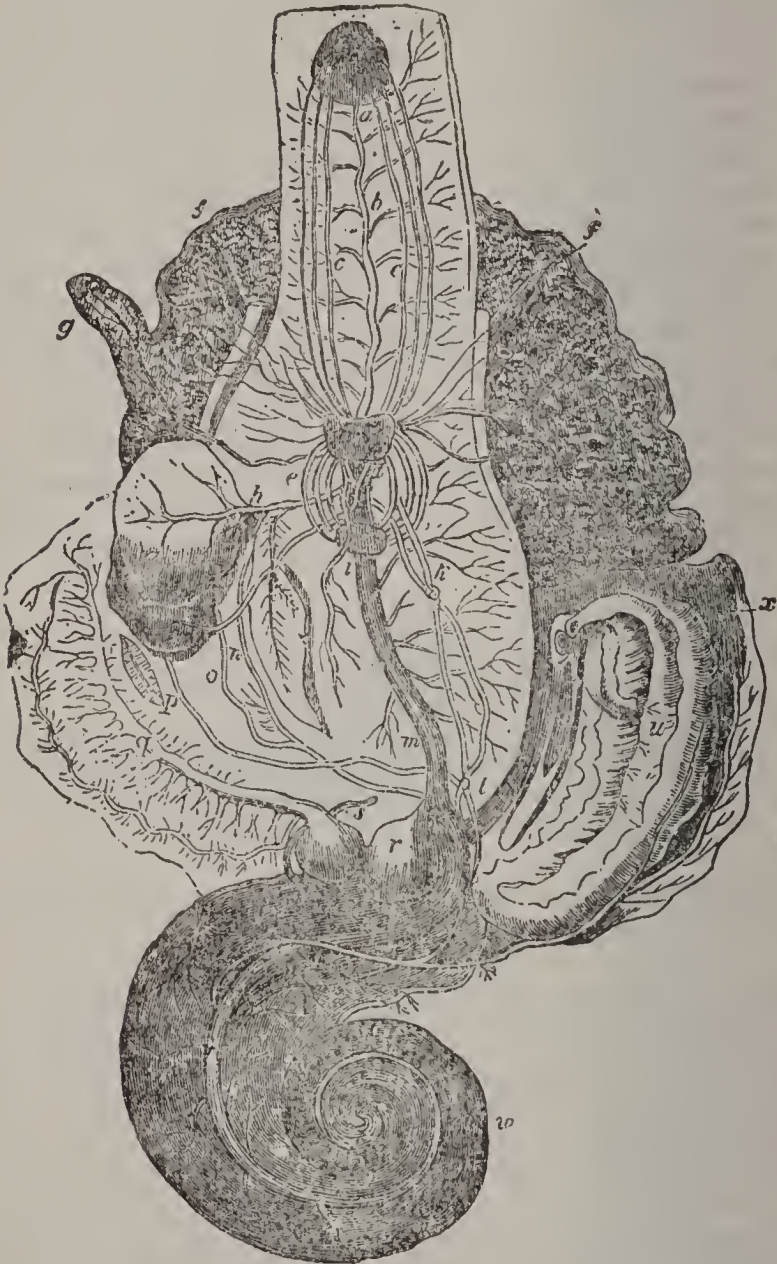


Fig. showing the soft parts of a Gasteropod (*Dolium Galea*):
a, head; d, d, foot.

sensitive organs of touch, a sense which the general surface of the body does not seem to possess in a high degree; and in some G., e.g. snails, they carry the eyes at their tips, but in others the eyes—always small—are situated elsewhere on the head, and a few are destitute of eyes. They are believed to possess the senses of taste and smell, and at least some of them that also of hearing, as they not only have a nervous centre analogous to the acoustic division of the brain in vertebrate animals, but also a little sac on each side, apparently an organ of this sense. Their nervous system is more complex and concentrated than that of the headless (*acephalous*) mollusks; the principal nervous masses surround the gullet. In the highest G., such as snails, there are only two principal nervous masses, one of which, supplying the nerves connected with sensation, is called the brain.—The blood of G. is often opalescent, with a few colorless corpuscles. The heart is always *systemic* only, and in almost all consists of one auricle and one ventricle, although a few G. have two auricles, one for each set of gills. Near the commencement of the aorta, there is often a contractile muscular swelling (*bulbus arteriosus*), as in

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fishes. Respiration takes place generally by gills, which are very variously situated, sometimes externally, sometimes in a special cavity, and exhibit an equally great variety of form and structure; but some G., as snails and slugs, have instead of gills, a pulmonary sac or cavity, lined with a vascular net-work, these being either inhabi-



Anatomy of the Whelk (copied from Jones's *Gen. Struc. of Animal Kingdom*):

ab, vein of proboscis and its branches; *c, c*, nervous branches proceeding from the brain to the extremity of the proboscis; *d*, brain, situated above the oesophagus or gullet; *e*, nervous branches connecting the brain with the great ganglion or nervous mass beneath the oesophagus; *f*, tentacula; *g*, penis; *h*, liver; *i*, a large nervous mass beneath the oesophagus; *k, l*, ganglia; *m*, one of the two principal trunks of the aorta, supplying the foot and anterior part of the body; *n, o*, nervous branches connecting ganglia; *p*, orifice of respiratory cavity; *q*, branchial vein; *rs*, heart (*r*, ventricle; *s*, auricle); *t*, one of the two principal trunks of the aorta, winding among the mass of viscera contained in the shell, and distributing ramifications to them; *u*, branchial fringes, or gills; *w*, posterior part of the body, or mass of viscera contained in the shell; *x*, roof of respiratory cavity thrown back.

GASTEROPODS.

tants of the land, or, if of the water, obliged to come occasionally to the surface for breathing. A few of the lowest G., doubtfully placed in this class, are destitute of distinct respiratory organs. The digestive apparatus also exhibits much diversity. Some of the G. feed on vegetable, some on animal substances, and some of them on animals which they themselves kill. Thus, while snails eat leaves and other soft parts of vegetables, whelks (*Buccinum*) prey on other molluscs, and are provided with a remarkable apparatus at the end of a proboscis into which the mouth is elongated, for filing a hole—as nice as could be made by the drill of a mechanic—through the hardest shell. The mouth of the snail is, in like manner admirably adapted to the cutting of leaves or similar substances by the action of the lips against a sharp horny plate. Other G. have the mouth furnished with two cutting blades, wrought by powerful muscles. The tongue of some is covered with minute recurved hooks, to prevent the possibility of anything escaping from the mouth; and the stomach of some is a muscular gizzard, provided with cartilaginous or sometimes calcareous projections, or stomachic teeth, to aid in the comminution of the food. The intestine is generally bent back, so that the anus is not far from the head. The liver is large, as are also the salivary glands of many gastropods. Very great diversities are found in the reproductive system. In some G., the sexes are distinct (G. DIÆCIA); others are hermaphrodite (G. MONÆCIA); and while self-impregnation takes place in some of these, others—as snails—mutually impregnate each other by copulation. In general, the reproductive organs are very largely developed, and are of complex and remarkable structure. The G. are in general oviparous; a few are ovoviviparous. The young of aquatic G. at first swim about actively by means of ciliated fins attached to the head. G. are generally unsymmetrical, one side of the body being developed without the other, some of the principal organs of which—the gills and nerves—are atrophied; and thus the shell with which most of them are covered becomes, in the greater number, spiral, the spire turning toward the unatrophied side, generally the right side, though in some (*reversed* or *sinistrorsal* shells) it is the left. The head and the organ of locomotion are capable of being withdrawn into the last whorl of the shell, and in aquatic species generally, the mouth of the shell can be closed by an *operculum* (q. v.), exactly fitting it, and attached to the foot, but in which many varieties of beautiful structure are exhibited, and which is generally horny, sometimes calcareous. Some shells are simply conical, and there are numerous diversities of form. The shell is secreted by the mantle. See MOLLUSKS: SHELLS: UNIVALVES. The viscera are contained in a thin sac—part of the mantle—which fills the upper part of the shell. The organ of locomotion, called the *foot*, is in general a muscular disc, developed from the ventral surface of the body; sometimes, as in limpets, capable of acting as a sucker, and exhibiting other even more remarkable modifications, so that in some it

GASTON—GASTRIC.

becomes an organ for swimming. G. generally creep by means of this disc adhering to surfaces, and contracting in transverse wrinkles or undulations, which begin from behind. The G. generally secrete a peculiar kind of slime. Some of them produce other peculiar secretions, of which the Tyrian purple is an example. G. have a great power of renewing lost parts; tentacles are thus restored, and even the eyes which they bear at their tips, the mouth with all its apparatus, or the head itself.

GASTON, *găs'ton*, WILLIAM, LL.D.: lawyer: b. s. Killingly, Conn., 1820, Oct. 3. He graduated at Brown Univ. 1840, studied law, was admitted to the bar 1846, and practiced in Roxbury, Mass. till 1866, when he removed to Boston. He was a member of the Mass. assembly 1853-4 and 56, mayor of Roxbury 1861-2, state senator 1868, mayor of Boston 1871-3, several times unsuccessful candidate for member of congress and gov.; and elected gov. 1874-76. He afterward applied himself to his law practice. He was a democrat in politics. He d. 1894, Jan. 19.

GASTON DE FOIX: see FOIX.

GASTORNIS, n. *găs-tawr'nĭs* [named after *Gaston M. Plante*, its discoverer; Gr *ornĭs*, a bird]: a huge fossil bird from the Eocene; one either of the *Natatores* or of the *Cursosores*. The only known species is the *Gastornis parisiensis* of the Paris basin.

GASTRÆA, n. *găs-trĕ'ă* [Gr. *gastĕr*, the stomach]: a minute animal of the simplest description supposed to have once existed, being a form of the *Gastrula*. GASTRÆA THEORY, the theory which endeavors to establish that all animals above the *Protozoa*, with the exception of the sponges, take their origin from a form of *Gastrula*, which proceed upward to the more perfect forms by the mere enlargement and differentiation of the primitive layers of cells representing the persistent *ectoderm* and *endoderm*.

GASTRÆUM, n. *găs-trĕ'ŭm* [Gr. *gastĕr*, the belly]: the whole of the under surface of an animal's body.

GASTRALGIA, n. *găs-trĕl'jĭ-ă* [Gr. *gastĕr*, the belly; *algos*, pain]: pain in the region of the stomach, a symptom of indigestion: also called GASTRODYNIA: see GASTRIC: also CARDIALGIA.

GASTRIC, a. *găs'trĭk* [L. *gastrĭcus*, gastric—from Gr. *gastĕr*, the belly or stomach: F. *gastrique*]: relating to the belly or stomach in man; applied to certain forms of fever. GASTRIC JUICE, the fluid in the stomach which acts as the principal agent in digestion (see DIGESTION, ORGANS AND PROCESS OF). GASTRI'TIS, n. *-trĭ'tĭs* [*ĭtis*, denoting inflammation]: inflammation of the stomach (see STOMACH, DISEASES OF). GASTRO, *găs'trō*, in *anat.* and *med.*, a prefix in compound words signifying related to, or connected with, the stomach. GAS'TRODYN'IA, n. *-dĭn'ĭ-ă* [Gr. *ōdŭnĕ*, pain]: a painful affection of the stomach (see CARDIALGIA). GASTRO-ENTERITIS (see STOMACH, DISEASES OF: also ENTERITIS). GASTRONOMY, n. *găs-trōn'ō-mĭ* [Gr. *nōmōs*, a law]: the art or science of good eating; epicurism. GAS'

GASTRITIS—GASTROCNEMIUS.

TRONOM'IC, a. *-trō-nōm'ik*, or **GAS'TRONOM'ICAL**, a. *-ī-kāl*, pertaining to the stomach or good living. **GASTRON'OMIST**, n. *-ō-mīst*, one who likes good living; also **GASTRON'OMER**. **GASTRONOME**, n. *gās'trō-nōm* [F.]: an adept in gastronomy. **GASTROS'TOMY**, surgical operation which has been two or three times performed for relief of stricture of the gullet, to relieve the patient from the imminent risk of starvation, by introducing food directly into the stomach through an external opening. The well-known case of Alexis St. Martin, and numerous experiments on the lower animals, have led to this attempt, not unreasonably, to save life; it has not yet, however, been successful. **GASTROT'OMY**, n. *-trōt'ō-mī* [Gr. *tomē*, a cutting]: the operation of making an incision into the stomach or into the cavity of the abdomen (q.v.); for removing some diseased texture or foreign body. For a cognate operation, sometimes loosely called by this name, see **CESARIAN OPERATION**.

GASTRITIS—GASTRODYNIA—GASTRO-ENTERITIS: see **GASTRIC**.

GASTROCHÆNA, *gās-trō-kē'nā*: genus of lamellibranchiate mollusks, having a delicate shell of two equal valves, gaping very much in front; the animal sometimes taking possession of an already existing cavity, which it often lines with a calcareous lining, so as to form a tube, to which the valves of its shell are cemented; sometimes burrowing for itself in sand, madrepores, or calcareous rocks, and lining its hole with a shelly layer. *G. modiolina*, common



Gastrochæna Modiolina:

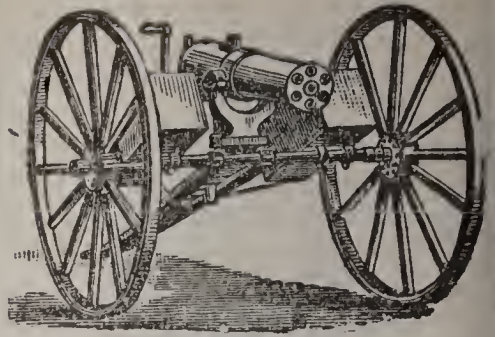
α, one of the tubes broken open, showing the valves.

in the Mediterranean, perforates shells and limestone, making holes about two inches deep and half an inch in diameter. It sometimes bores right through an oyster into the ground below, and makes for itself a flask-shaped case, with its neck fixed in the oyster-shell. The tubes of some of the tropical species which live in sand are very curious.—To the family *Gastrochænidæ* are referred *Aspergillum* and *Clavagella*.

GASTROCNEMIUS, n. *gās'trōk-nē'mī-ūs* [Gr. *gastēr*, the belly; *knēmē*, the leg]: applied to the muscle which principally forms the calf of the leg, and whose office it is to extend the foot. It arises by two heads from the two condyles of the thigh-bone, and is inserted by the **TENDO**



Gasteropoda.—Young Pond Snail (*Lymnaeus*).



Gatling Gun.



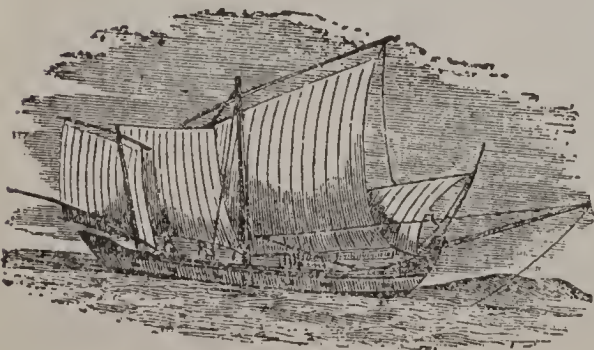
Gate-house at Sens, Villeneuve-sur-Yonne.



Gasteropoda.—Section of Triton-shell: *ac*, Notch for siphon; *c*, Axis or columella.



Gaultheria shallon.



Gayyou of Anam.



Stag at Gaze.

GASTRODIA—GATE.

ACHILLIS (see **FOOT**) at the posterior part of the heel-bone. In man, these muscles possess great power, and are constantly called in use in standing, walking, leaping, etc. In walking, they raise the heel, and, with it, the entire body from the ground; and the body being thus supported on the raised foot, the other leg is carried forward. From their close association with the erect position, they are much less developed in other mammals than in the human subject.

GASTRODIA, *gās-trō'dī-ā*: genus of orchids. *G. sesamoides* is a native of Van Diemen's Land, and its roots form large coral-like masses, sometimes called *native potatoes*, being edible; but they are watery and insipid.

GASTROMALACIA, n. *gās'trō-māl ā'sī-ā* [Gr. *gastēr*, the stomach; L. *malācus*, Gr. *malākos*, soft to the touch, tender]: a softening of the stomach, held to be due to the action of the gastric juice on the coats of the stomach after death.

GASTROPODS, n. plu.: see **GASTEROPODS**.

GASTRORRHŒA, n. *gās'trōr-rē-ā* [Gr. *gastēr*, the belly; *rhēō*, I flow]: the catarrh of the stomach in dogs, attended with the discharge of abundant and dense mucus.

GASTRULA, n. *gās trō'lā* [a dim. formed from Gr. *gastēr*, the stomach]: a name applied to the developmental stage in various animals, in which the embryo consists of two fundamental membranes, an outer and an inner, inclosing a central cavity which communicates with the outer water by a single primitive opening: see **GASTRÆA**.

GATCHINA: see **GATSCHINA**.

GATE, n. *gāt* [Goth. *gatvo*; Dan. *gade*, a street: Icel. *gota*, a street, a path—from *gat*, a hole—*lit.*, a way to get at a thing]: an entrance-door to a city, castle, etc.; a large frame of wood moving on hinges which opens or closes any passage; a door. **GATE'LESS**, a. without a gate. **GA'TED**, a. having gates. **GATE'WAY**, n. a way through a gate; the gate itself. The gateway, as a passage or opening in which a gate or large door is hung, may be either an open way with side pillars or a covered way vaulted or roofed. The gateway being a most important point in all fortified places, is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description were poured upon the besiegers. City gates, and gates of large castles, have in all ages been the subjects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view, they have maintained their position as important architectural works. In very ancient times, we read of the 'gate' as the most prominent part of a city, where proclamations were made, and where the kings administered justice. The Greek and Roman gates were frequently of great magnificence. The propylæa at Athens

GATE OF ITALY—GATES.

is a beautiful example, and the triumphal arches of the Romans are the ornamental offspring of their city gates. Most of the towns in Britain have lost their walls and city gates; but a few remaining, such as York and Chester, give some idea of the ancient construction. The castles retain more of their ancient gateways, from which may be imagined the frowning aspect of every town during the middle ages. Abbeys, colleges, and every class of buildings were shut in and defended by similar barriers; many of these still exist in Oxford and Cambridge, and the abbey gates of Canterbury and Bury St. Edmund's are well-known specimens of monastic gateways. On the continent of Europe the remaining constructions of this kind are more numerous.

GATE OF ITALY: narrow mountain gorge, part of the valley of the Adige, near Trent and Rovedero.

GATE OF TEARS: portion of the strait of Bab el-Mandeb, the entrance from the Indian ocean into the Red Sea. It was so named by the Arabs from the number of wrecks due to the dangerous navigation.

GATES, gāts, HORATIO: 1728–1806, Apr. 10; b. Maldon, Essex, England: general in the American army of the Revolution. He early entered on a military career, and first bore arms under Prince Ferdinand of Brunswick. Sent to America 1755, as capt. of infantry, he served under Gen. Braddock, and with difficulty escaped in the defeat in which that officer was slain. On the peace of 1763, he purchased an estate in Virginia, where he resided until the war of independence. In this struggle, he sided with his adoptive, against his native, country, and 1775 was made ad.gen. with the rank of brig. in the colonial army. He accompanied Washington to Mass. 1775, July; and 1776, June, received the chief command of the army which had just retreated from Canada. In 1777, Mar., he superseded Schuyler in command of the army of the North, but being considered too prudent, was himself superseded by Schuyler in May following. In Aug., however, he once more undertook the command, and soon compelled the entire British army under Burgoyne (consisting, as some say, of 5,700 men, or as others, of 3,500) to surrender at Saratoga. This brilliant success gained for him a great military reputation, and his considerate conduct toward his compatriots won him the esteem of even his enemies. In 1780, G. was called by Congress to the command of the army of the South, and in his unfortunate defeat by Cornwallis at Camden lost his laurels. He was superseded by Gen. Green, and was not acquitted of blame by court-martial till 1782, after a protracted trial. He then retired to Va. till 1790, when he emancipated all his slaves, and settled in N. Y. 1800, receiving the honor of the 'freedom of the city,' and was soon elected to the state legislature.

GATES, MERRILL EDWARDS, PH.D., L.L.D.: educator: b. Warsaw, N. Y., 1848, Apr. 6. He graduated at Rochester Univ. 1870, was chosen principal of Albany Acad. the same year, and pres. of Rutgers's College, New Bruns-

GATESHEAD—GATH.

wick, N. J., 1882, and was appointed a member of the U. S. board of Indian-commissioners 1884. He received the degree PH.D. from the Univ. of N. Y. 1880, and LL.D. from Princeton College 1882. 1890, Aug., he was elected pres. of Amherst College; resigned, 1899.

GATESHEAD, *gāts'hēd*: town of England, county of Durham; an ancient borough under the Episcopal palatines of that county; formerly governed by a bailiff and burgesses; since 1835 a parliamentary and municipal borough. It is on the south bank of the Tyne, directly opposite Newcastle, to which it is joined by two bridges, and with which it is otherwise so closely connected as virtually to form one town with it. The older portions of the town are poorly built, but great extensions have been made westward and southward, in which directions much ground has been laid out in new streets and detached villas. There are numerous dissenting as well as established churches, a grammar-school founded 1700, a mechanics' institute, and a hospital (King James's) consisting of the master (the rector of Gateshead for the time being) and three brethren who have residences, and 12 others who receive allowances without residence. G. has also an excellent dispensary, established after a dreadful visitation of cholera 1831-2, which carried off 1,028 of the population. The numerous coal-mines in the neighborhood, iron-works and foundries, glass-works, brick, tile, and soap works, ship-building, chemical-works, etc., furnish employment to the inhabitants. There are also extensive manufactures of anchors, machinery, chain-cables, iron-wire and other ropes. At Gateshead Fell are quarries from which the famous grindstones erroneously but proverbially known as 'Newcastle grindstones,' are obtained, and exported to all parts of the world. In 1854, Oct., a large portion of the lower part of G., as well as considerable property in Newcastle immediately opposite, was destroyed by an awful explosion and fire, which caused the death of more than 50 persons. G. sends one member to the House of Commons.—G. is supposed to have been a Roman station, or outwork to the Roman station at Newcastle, several coins and other relics having been found from time to time. The derivation of the name has been long matter of dispute, but the probability is, that it simply means the head of the *gate* or road with which the Romans connected Newcastle with the southern military divisions and defenses.—Pop. (1871) 48,027; (1881) 65,873; (1891) 85,709; (1901) 109,887.

GATH, *gāth* [Heb. 'wine-press']: one of the five chief cities of the Philistines. It was on the frontiers of Judah, and of much importance in the wars between the Philistines and the Israelites. It formed, in fact, the key of both countries, and was strongly fortified. The giant Goliath, slain by the stripling David, was a native of this place. Jerome describes it in his time as a 'very large village.' The site of ancient Gath is probably the little eminence, about 200 ft. high, now known as Tell-es-Sâfret, at the foot of what were anciently called the Mountains of Judah.

GATHER—GATLING GUN.

GATHER, v. *gáth'ér* [Ger. *gattern*; Dut. *gaderen*, to draw to a head]: to bring together; to collect; to accumulate; to assemble; to infer; to pick, as fruit; to draw together or pleat the width of the skirt of a dress to correspond to the width of the band at the waist; to generate matter, as in a sore: N. a pleat or pucker in the made-up trimming of a dress. **GATHERERS**, n. plu. *-érs*, trimmings for a dress made by the dressmaker in the form of frills and puffs. **GATHERING**, imp.: N. an accumulation; a collection; an assemblage; an accumulation of pus or matter; a small ulcer. **GATHERED**, pp. *-érd*: **ADJ.** drawn up in pleats, frills, or puffs, as a dress. **GATHERER**, n. one who. **GATHERABLE**, a. *-á-bl*, that may be collected. **TO GATHER BREATH**, to take time to recover breath after exhaustion or violent exercise; to have respite.—**SYN.** of 'gather, v.': to muster; congregate; call; pluck; harvest; amass; consolidate; bring together; pucker; plait; derive; conclude.

GATINEAU, *gá-tē-nō'*: river of Canada, in the province of Quebec; starting in a connected chain of large lakes n. of the 48th parallel of latitude. It flows in an almost undeviating course s.s.w., and falls into the Ottawa, 12 m. below the town of Aylmer. The length of this river has not been definitely ascertained, but it is said that canoes have navigated it more than 300 miles.

GATLING GUN: revolving battery gun invented by Richard Jordan Gatling, M.D. (1818, Sept. 12—1903), and in general use in the U. S. army and navy, in England, Austria, France, Russia, Italy, Turkey, and other countries. The idea of the gun was conceived 1861, and the first one was completed and tested 1862, when it discharged an average of 200 shots per minute. Dr. G. failed to induce the chief of ordnance to even examine his invention, but Gen. Butler was quick to perceive the advantages of the machine-gun and bought 12 of them for use on the James river, Va. Various improvements were made on the original gun, and after the close of the civil war Secretary Stanton ordered an official test at Washington and Fortress Monroe, which resulted in the adoption of the weapon into the U. S. service. As first conceived the machine threw 200 musket bullets per minute, but by improvements the speed of firing has been increased to 1,200 shots per minute and the range to 1½ m., and the machine is made of various calibres and weights for different kinds of service. In its perfected form it may be described as a number (usually 10) of ordinary breech loading rifled barrels grouped around a common axis with which they lie parallel and about which they revolve. In manipulating the gun one man places one end of a feed-case of cartridges into a hopper at the top of the gun, while a second man turns a crank by which the gun revolved. When the bullets are discharged the empty shells are thrown out automatically, and when one feed case has been emptied another is substituted without interfering with the revolution of the machine or the discharge of its barrels. Each barrel is fired once in a revolution, so that every turn of the crank discharges 10 shots.

GATSCHINA—GAUDEAMUS.

GATSCHINA, *gât-shě'nâ*: town of Russia, govt. of St. Petersburg; abt. 30 m. s. s. w. of St. Petersburg, on a small lake formed by the Ishora. It is charmingly situated and regularly built. It has some manufactures of porcelain; but is notable especially for its royal palace, a structure at once simple in style and imposing in effect. This palace, which contains 600 apartments, and is surrounded by one of the finest pleasure-gardens in Europe, was the favorite seat of the Emperor Paul I., who bestowed municipal rights upon the town of G. 1797. Pop. of G. (1892) 12,000.

GATTINE, n. *găt'tin* [a corruption of *catk'î*: It. *gattino*, a kitten]: a disease in silkworms caused by the fungus *Cladosporium herbærum*, so called from the dead caterpillars presenting the fancied appearance of a catkin; the disease *muscardine* presents that of a little cake or a kind of pastille.

GAU, *gow* [of doubtful origin, possibly allied to Gr. *ge*, land]: German word meaning, in a general way, country (as opposed to the town), district; but applied specially to a political division of anc. Germany, having relation to the arrangements for war and the administration of justice. A gau embraced several communities or villages, and had one or more grafs (q. v.) and judges over it. As the grafdom became more and more hereditary, the gau, as a political division, fell into disuse (about the 12th c.), and only in the names of some places do the traces of it remain. The Abbot Bessel gave a complete account of the geography of the German gaus in his *Chronicon Gottwicense*; and Spruner's *Historical Atlas* contains a map of them. The nature of the gau system is fully discussed in the works of Eichhorn, Waltz, and Bethmann-Hollweg. See HUNDRED.

GAUCHE, a. *gōsh* [F.]: 'left' as opposed to 'right'; clumsy; awkward. **GAUCHERIE**, n. *gōsh rē* or *gōsh'ēr-ē*, behavior inconsistent with the received forms of society; awkwardness; clumsiness.

GAUD, or **GAWD**, n. *gawd* [Dut. *goud*, gold: mid. L. *gaudĭŭm*, a large bead on a rosary: Gael. *gòdach*, showy, ornamental—from *gòd*, show, ornament]: in *Scot.* and *OE.*, an ornament; a jewel; a bauble or trinket: V. to decorate with gauds. **GAUD'ING**, imp. **GAUDED**, pp. *gawd'èd*, decorated with gauds; colored; painted. **GAUDY**, a. *gawd'ĭ*, showy; gay; ostentatiously fine. **GAUD'ILY**, ad. *-ĭ*. **GAUD'INESS**, n. *-ĭ-nēs*, showiness; tinsel appearance.

GAUD, n. *gawd* [F. *gaudir*, to be merry: L. *gaudĭŭm*, joy, gladness]: in *Scot.* and *OE.*, a feast; a trick; a bad custom or habit. **GAUDY**, n. *gawd'ĭ*, a feast; a festival; a day of plenty: **ADJ.** festive; frolicsome; tricky.

GAUDEAMUS, n. *gawd'ē-ā'mūs* [L. *gaudĕāmus*, let us rejoice]: a rejoicing; a triumph.

GAUDEN—GAUGE.

GAUDEN, *gaw'dén*, JOHN, D.D.: 1605–1662, Sep. 20; b. Mayland, Essex, England: Bp. of Exeter and Worcester and reputed author of *Eikon Basilike* (q.v.). He was educated at Bury St. Edmund's and St. John's College, Cambridge, obtained the vicarage of Chippenham and rectory of Brightwell 1630, preached before the house of commons 1640, and was granted by it the deanery of Bocking 1641; became master of the temple 1659, bp. of Exeter 1660, and bp. of Worcester through an applicant for the vacant see of Winchester 1662. He published a number of works but *Eikon Basilike; the Portraiture of his Sacred Majesty K Charles I. in his Solitudes and Sufferings*, is the most noted because of the disputed authorship. It was at first and by many is still believed to have been written by the King himself. Experts have pronounced in favor of both King and G., but Sir James Mackintosh, after carefully examining all the evidence, ascribes the authorship to Bp. Gauden.

GAUFFERING, n. *gawf'fēr-īng* [see GOFFER]: comp. F. *gaufre*, a honeycomb; *gaufre*, to figure]: a style of arranging frills, having somewhat the appearance of puffs, done by means of irons like the round thick blades of large scissors, or by a machine.

GAUGE, or GAGE, n. *gāj* [F. *jauger*; OF. *gauger*, to estimate the number of bowls in a vessel—from OF. *gauge*, a gauge; F. *jale*, a bowl—from mid. L. *gaugiā*, the standard in measure of a wine-cask]: a measuring rod; a measure in general; a standard of measure; on a *railroad*, the distance between the rails, usually 4 feet 8½ inches; a workman's tool; a mixture of certain stuff and plaster, used in finishing the best ceilings, and for moldings: V. to measure or ascertain the contents of a cask or vessel; to measure or ascertain, as the quantity, diameter, etc. GAUG'ING, imp.: N. the act or art of measuring the contents or capacity of a vessel; when the term is used without qualification, it refers to gauging the contents of casks, according to sliding-scales graduated by the mathematical rules for determining solid contents of regular solids approximating to the form of the casks. GAUGED, pp. *gāj'd*. GAUG'ER, n. *-ēr*, measurer; usually an excise officer who measures the contents of casks holding liquors. GAUGE'ABLE, a. *-ā-bl*, that may be gauged. GAUGE-COCKS, two or three small cocks in front of the boiler of a steam engine for ascertaining the height of the water. GAUGING-ROD, an instrument for ascertaining the liquid contents of casks.

GAUGE, or GAGE, apparatus for measuring any special force or dimension; e.g. *pressure-gage*, *wind-gage* (see ANEMOMETER), *rain-gage* (q.v.), *wire-gage*, *button-gage* etc. The simplest form of gage of dimension is the common *wire-gage*, by which the diameter of wire is measured. It is simply an oblong plate of steel, with notches of different widths cut upon the edge; these are numbered, and the size of the wire is determined by trying it in the different notches until the one is found which it exactly fits. The thickness of sheet-metal is tried by the same gage. There is great want of uniformity in these gages;—and it has been

proposed, in order to enable definite descriptions and orders to be given with accuracy, that instead of the arbitrary numbers of varying signification now in use, decimal parts of an inch, tenths, hundredths, thousands, or still smaller fractions, if necessary, be used, and that these be used for all diameters and thicknesses, such as wires, sheet-metals, buttons, watch-glasses, etc.; but such a scale has not yet come into general use. The gage commonly used for buttons, watch-glasses, and such like large diameters, is a rule with a groove cut lengthwise down the middle. Another metal rule, with a brass head slides in this, and by means of a thumb-pin, may be pushed out at pleasure. The object to be measured is placed between *a* and *b* (fig. 1), and that width of this space is measured by graduations on the middle metal slide.

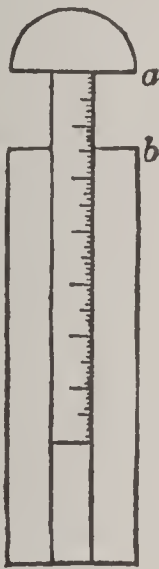


Fig. 1.



Fig. 2.

A very elegant and delicate gage has recently come into use for measuring watch-glasses, and is applicable to many other purposes. On an oblong piece of sheet-metal, two straight metal ridges are fixed in such a manner that they shall be inclined at a given angle to each other, as *ab* and *cd* (fig. 2). Now let us suppose the angle to be such that the distance between *a* and *c* is 2 inches, and that between *b* and *d* is 1 inch, while the lengths *ab* and *cd* are 10 inches. It is evident that for every inch of descent from *a* and *c* towards *b* and *d*, there will be a narrowing equal to $\frac{1}{10}$ of an inch; and for every tenth of an inch of such descent, there will be a narrowing of $\frac{1}{100}$ of an inch, and so on; thus we may, by graduating downward from *ac* to *bd*, measure tenths by units, hundredths by tenths, and so on to still finer quantities if required. This is applicable to lengths as well as diameters. By means of fine screws with large graduated heads, Messrs. Whitworth have measured small pieces of steel to the one-millionth of an inch (see MICROMETER). For pressure-gages, wind-gages, etc., see the special titles.—In railways, the gauge means the distance between the rails: see RAILWAY.

GAUL—GAULTHERIA.

GAUL, n. *gawł* [L. *Galliā*, Gaul; *Gallus*, a Gaul]: the anc. name of France; a native of.

GAUL: see FRANCE.

GAULEY, *gaw'lē*, **MOUNTAINS**: portion of the Appalachian chain in W. Va., continuous to the s.w. with the Cumberland Mountains, and having numerous local names; the name G. being applied also to the section of the chain in Nicholasco. The region is wild and full of grand scenery.

GAULT, or **GOLT**, n. *gōlt* [prov. Eng.]: in *geol.*, series of dark-blue marls or calcareous clays, a member of the Cretaceous Formation separating the Lower from the Upper Greensand. It consists of an upper part, hard and sandy, containing green particles scattered through it; and of a lower portion, a stiff dark gray, blue, or brown clay, smooth and uniform in texture, and very plastic, which is manufactured into tiles, bricks, and even common pottery. Concretions of iron pyrites and other nodules are frequent in the Gault. The contained fossils are for the most part beautifully preserved, having been protected from decay by being buried in the tenacious and compact mud which forms the Gault beds. The most abundant remains are those of cephalopodous mollusks, as ammonites, scaphites, and turrilites. In England the G. extends through several southern countries having its maximum thickness 150 ft. in Surrey, where it supplies phosphatic nodules largely used for fertilizing soils. **GAULT**, v. to dress land with clay: **GAULT'ING**, imp.: N. in *farming*, the process of dressing certain descriptions of soil with clay. **GAULTED**, pp. *gōlt'ēd*.

GAULTHERIA, *gawł-thē'rĭ-ā*: genus of small procumbent or nearly procumbent evergreen shrubs, of the nat. ord. *Ericaceæ*, the fruit of which is a 5-valved capsule, covered with the enlarged and fleshy tube of the calyx. They are natives of temperate regions. *G. procumbens* is



Procumbent Gaultheria (*Gaultheria procumbens*):
a, fruit; b, flower.

common in N. America as far south as Va., and bears the names of **PARTRIDGE BERRY**. **DEER BERRY**, **WINTER-**

GREEN, and MOUNTAIN TEA. It is four or five inches in height, with small whitish flowers and red 'berries,' which are eatable, but not safe for eating in any considerable quantity, because of the pungent volatile oil which they contain. Brandy in which they have been steeped is used as a tonic. The whole plant has an agreeable aromatic odor and taste, owing to the presence of volatile oil, which, when extracted, is used in medicine as a stimulant, also by druggists for flavoring sirups, and in perfumery, under the name of *Oil of Winter Green*. The leaves are used both as an astringent and as a stimulant; and an infusion of them is used as tea in some parts of America, for which purpose those of another species are employed in Nepaul.—The SHALLON (*G. shallon*) is a comparatively large species, two or three ft. high, with purple berries, which are agreeable to the palate, and form part of the food of Indians in the n. w. of America, of which the plant is a native. It grows well under the shade of woods, and has of late been planted in many places in Britain, to afford food for pheasants and other kinds of game.—*G. hispida* is a native of Van Diemen's Land, bearing snow-white berries, and known by the name of WAX-CLUSTER: the berries are eatable.—Other species, some of which are fragrant, some produce edible berries, and all are beautiful little shrubs, are found in the Himalaya Mountains, the mountains of S. America, Australia, etc. The Australian *G. antipoda* is said to be a finer fruit than *G. hispida*.

GAUNT a. *gánt* or *gawnt* [Gael. *gann*, poor, lean: prov. Sw. *gank*, a lean starved horse: AS. *gewaned*, diminished: W. *gewan*, weak]: lean; meagre; empty and thin after long fasting, or by disease; pinched and grim. GAUNT'LY, ad-*li*. GAUNT'NESS, n. leanness with grimness.

GAUNTLET: see GANTLET.

GAUNTLETT, *gánt'lét*, HENRY JOHN, MUS. D.: 1806–1876, Mar. 4; b. England. He became organist of Olney Church, Bucks, when 9 years old, and of St. Olave's, Southwark, when 21. He was one of the first to introduce the Bachorgan, edited the last two parts of the *Psalmist* (1836–41), together with Mr. Kearies the *Comprehensive Tune-Book* (1846–7), and with Rev. W. J. Blew the *Church Hymn and Tune Book* (1844–51), edited and composed the music in the *Congregational Psalmist* (1851), Carlyle's *Manual of Psalmody* (1860). *Tunes, Old and New*, and Harland's *Church Psalter and Hymnal* (1868). He received the degree MUS. D. from the abp. of Canterbury 1842, and was chosen by Mendelssohn to play the organ part in the *Elijah* on its first production at Birmingham 1846.

GAUR, or GOUR, *gowr*: ruined mediæval city of Bengal, British India, 50 m. n.w. of Moorshedabad. The name is derived from the ancient *Gauda*, 'country of sugar,' and in Mohammedan is *Jennatabad*, 'abode of paradise.' The names of the dynasties and partial lists of their kings have been preserved, and show that the last dynasty, the Senas or the Vaidyas, superseded its predecessor, the Palas, about the middle of the 11th c., and that Lakshmanasena, at the close

of that c., was its most eminent representative. In 1198-9 the Mohammedan gen., Bakhtiyar Khilji, after his victory at Nadiya, established himself as gov. of Bengal, fixed his capital at Lakhnaoti (Gaur), and founded mosques, colleges, and monasteries. That city was the seat of the rulers of Bengal and Behar during the next 140 years. In 1338 the kingdom of Bengal acquired an independence which it retained for more than two c.; and about 1350 the capital was transferred to Pandua, 16 m. n. by e. of Lakhnaoti, where other mosques and shrines were built. In 1446 the capital was restored to Lakhnaoti, and from that time the city was known by the name of Gaur. The earliest extant description of the city is found in meagre form in the Persian history *Tabaqát-i-Násirí*, whose author, visited it 1243. But it was not till the English discovered its extensive and interesting remains, that anything like a definite idea of its ancient greatness could be formed. The remains of G. are spread over an area of more than 20 sq. m., and comprise enormous earthen embankments, 200 ft. thick at base, 40 ft. high, and faced with brick; bridges and roads of the same material; two gateways of rich architectural construction; an extensive fort containing a mausolemn, seven or eight grand mosques, a lofty tower, and numerous large tanks and reservoirs, one, the great Sagar Dighi, or 'ocean tank,' a rectangular sheet of water, measuring nearly 1 m. by $\frac{1}{2}$ m. What is considered the site of G. proper is an oblong space $7\frac{1}{2}$ m. n. to s., and $1\frac{1}{2}$ to 2 m. e. to w. It lies between the Bhagirathi and Mahanada rivers, which are from 2 to 6 m. apart, and was defended n.w. and s. by a rampart and ditch and e. by a great double embankment with 2 and 3 immense ditches between. The citadel or royal fortress and the palace stood within the w. wall near the s. end. Near the former is a tower of stone and brick, 84 ft. high, 21 ft. in base diameter, a 12-sided polygon two-thirds its height and circular above. The entrance gate of small brick, with archway 34 ft. high, is ascribed to Barbak Shah 1466. The golden mosque, of dark gray stone, 180 by 80 ft. with 44 domes, was erected 1525, and that of the 'Footstep of the Prophet' 1530. Large quantities of brick and stone from the ruins of G. were used in building Malda, Moorshedabad, Hoogly, Rungpore, and Calcutta, and some of its finest buildings are said to have been destroyed to supply sculptured stone for the cathedral in the latter city. G. doubtless was a city of great political, strategic, and commercial importance, with numerous outlying villages. The site has been for centuries covered by dense forests and rank jungle.

GAUR, or GOUR, *gour* (*Bos Gaurus*): species of ox, inhabiting some of the mountain jungles of India. It is of very large size, though apparently inferior to the Arnee (q.v.). It resembles the Gayal (q.v.), but differs from it in the form of its head, and in the total want of a dewlap, in which it more nearly agrees with the Banteng of the Eastern Archipelago, though distinguished from that by important anatomical peculiarities: see BANTENG. The back is strongly arched, having a remarkable ridge of no great

GAURITZ—GAUSS.

thickness, which rises above its general line, owing to an unusual elongation of the spinous processes of the vertebræ. The hair is remarkably short and sleek. The G. is formid-



Gaur (*Bos Gaurus*).—From Routledge's *Natural History*.

able even to the tiger, and safe from his attacks. It is usually found in herds of 10 to 20. It is abundant in the high insulated table-land of Myn Pat, in South Baha, and in the adjoining steep and narrow valleys. It is supposed incapable of domestication; frequent attempts for this purpose are said to have been made in Nepaul.

GAURITZ, *gow'rīts*: river of the s. coast of Cape Colony, s. Africa, e. boundary of the dist. of Zwellendam, entering the sea a little w. of Mossel Bay. Like nearly all streams of this region, it is rapid, and almost useless for the purposes of navigation.

GAUSS, *gows*, KARL FRIEDRICH: 1777, Apr. 30--1855, Feb. 23; b. Brunswick: illustrious mathematician. In 1795, he went to the Univ. of Göttingen, where he made a number of important discoveries, one of which had had the attention of geometers from the time of Euclid, viz., the division of the circle into 17 equal parts. He soon afterward returned to Brunswick, and 1801, published his *Disquisitiones Mathematicæ*, treating of indeterminate analysis or transcendental arithmetic, which contains, besides other important theorems a new demonstration of that the Fermat concerning triangular numbers. At that time G. knew little of what had been done in the same subject by previous mathematicians, which accounts for the presence in his work of a number of old theorems. But the discovery of the planet Ceres on the first day of the 19th c. guided the energies of G. into a new field of research. He was one of the first to calculate the elements of its orbit, according to methods of his own invention, and his assiduous application, and the accuracy of his results, excited general admiration. On the discovery of Pallas by Olbers 1802, G. set himself to calculate its orbit; and his results, valuable at the time, are

even now models of ingenuity and research. For these labors, he received, 1810, from the French Institute, the medal founded by Lalande. In 1807, he was appointed director of the Observatory at Göttingen; and in 1809 issued his celebrated work, *Theoria Motus Corporum Cælestium in Sectionibus Conicis Ambientium*, developing a method of calculating, in the most simple and most exact manner, the orbits of the bodies in the solar system. To him chiefly the credit is due of discovering the great comet of 1811, the elements of whose orbit he calculated with surprising accuracy. In 1821, G. was charged by the Hanoverian govt. with the triangulation of the kingdom of Hanover, and the measurement of an arc of the meridian. In executing this work, G. was led to invent the Heliotrope (q.v.). About 1831, Wilhelm Edward Weber arrived at Göttingen, and communicated a part of his own enthusiasm for magnetic researches, to G., who invented a 'magnetometer' which measures the 'magnetic intensity' with great accuracy, and probably contributed more to the advancement of this branch of science than any one before him. La Place pronounced G. the greatest mathematician of Europe. He died at Göttingen. Among his most celebrated works, are the *Disquisitio de Elementis Ellipticis Palladis ex Oppositionibus Annorum 1803-99* (1810); *Theoria Combinationis Observationum Erroribus Minimis Obnoxie* (Göttingen 1823), containing a full explanation of his peculiar method above mentioned; *Intensitas vis Magnetica Terrestris ad Mensuram Absolutam Revocata* (1832), etc.

GAUSSEN, *gō-sōng'*, FRANÇOIS SAMUEL ROBERT LOUIS: 1790. Aug. 25—1863, June 18; b. Geneva, Switzerland: Prot. theol. writer. He received a university education, and was ordained to the ministry of the Swiss Ref. Church at Satigny, near Geneva, 1816. While there he became intimate with J. E. Cellérier, who had preceded him in the pastorate, and with members of the dissenting congregation at Bourg-de-Forer. In 1819 G. and Cellérier published in the interest of Calvinistic orthodoxy a French translation of the second Helvetic confession, with a preface defending the use of confessions of faith; 1830 he was censured and suspended by his ecclesiastical superiors for having discarded the prescribed (rationalistic) catechism of his church; and 1831 was deprived of his charge for taking part in the formation of the evangelical soc. for the establishment of a new theol. hall. He spent some time travelling in Italy and England, returned to Geneva 1834, and preached to an independent congregation till 1836, when he was chosen prof. of systematic theol. in the evangelical school which he had helped to found, and held the chair till 1857. His work *Theopneus* (1840), which in English translation has been republished in England and America, advocates the extreme view of verbal inspiration of the Bible. It is an able argument for a theory of orthodox speculation which, by its mechanical and extra-scriptural nature, is felt to depend on a strong philosophical advocacy.

GAUTAMA: see BUDDHISM.

GAUTIER—GAVAZZI.

GAUTIER, *gō-tē-ā'*, THEOPHILE: 1811, Aug. 31—1872, Oct. 23; b. Tarbes: French poet, novelist, and art critic. He attempted painting as a career, but without success. In 1830, he published a volume of poems that secured for him the fame of being a zealous romanticist and one of the most gifted disciples of Victor Hugo. After this time, he contributed articles on literary and art criticism, and also feuilletons, to *Figaro*, the *Presse*, the *Moniteur*, and other leading journals. He travelled much and wrote accounts of his experiences. *La Comédie de Mort* (1838) is one of his most original poems; and *Mademoiselle de Maupin* (1835) his most notable novel. Collections of his articles appeared as a *Histoire de l'Art Dramatique en France* (1859), and as a *Histoire de Romantisme* (1874). G. was a fertile writer, with a graceful and exuberant fancy, and stands in the first rank of art critics. He seems to have been without political opinions.

GAUZE, n. *gāwz* [F. *gaze*, a thin open canvas: Norw. *gisen*, open in texture: probably *Gaza*, in Palestine, from which first brought]: a very thin, light, transparent fabric of silk or linen. The openness of texture is obtained by crossing the warp-threads between each thread of the weft, so that the weft passes through a succession of loops in the warp, and the threads are thus kept apart, without the liability of sliding from their places, which would take place if simple weaving were left so loose and open. Inferior qualities of gauze are made of a mixture of silk and cotton. Large quantities of gauze are made in France and Switzerland. **GAUZE**, a. made of gauze. **GAUZY**, a. *gāw'zī*, thin as gauze; like gauze.

GAVAZZI, *gā-vāt-sē'*, ALESSANDRO: 1809—1889, Jan.; b. Bologna: popular Italian preacher and reformer. He became a monk of the Barnabite order, and was appointed prof. of rhetoric at Naples, where he speedily acquired great reputation as an orator. On the accession of Pius IX. to the papal chair, G. was one of the foremost supporters of the liberal policy which began with that pontiff's reign; and having repaired to Rome, he devoted himself to the diffusion of political enlightenment and patriotic aspirations among the masses of the Roman population. The pope sanctioned his political labors, and appointed him almoner of a body of 16,000 Roman troops, who volunteered for the campaign of Lombardy 1848. The Roman legion having been recalled by the pope, G. continued in Florence, Genoa, and Bologna to agitate in favor of the national movement. On the establishment of the republic at Rome, he was appointed almoner-in-chief to the national army. Under his superintendence, efficient military hospitals were organized and attended by a band of Roman ladies, who volunteered their services and co-operation in the care of the wounded. Rome having fallen, G. escaped to England, where, and later in Scotland, he delivered numerous addresses and lectures, illustrative of the political and religious aims of his country. In 1851, G. published his *Memoirs* in English and Italian: and, a few months later, a

GAVE--GAVIAL.

selection of his *Orations*. From Scotland he went to the United States, where he was rather coldly received; and when he went to Canada his public appearances, with his fiery and impassioned oratory, often strongly denunciatory of the papal claims, on more than one occasion nearly caused a riot. G was with Garibaldi at Palermo during the expedition of 1870. He repeatedly visited England, and Scotland, preaching and lecturing in aid of the (Prot.) Free Christian Church of Italy, which he had established. He again visited the United States 1873 and 80, delivering lectures in favor of this organization. By 1880 this church had so increased that it had 72 places of worship in Rome, Milan, Turin, Bologna, Naples, Venice, Florence, and many smaller cities, and over 2,000 communicants.

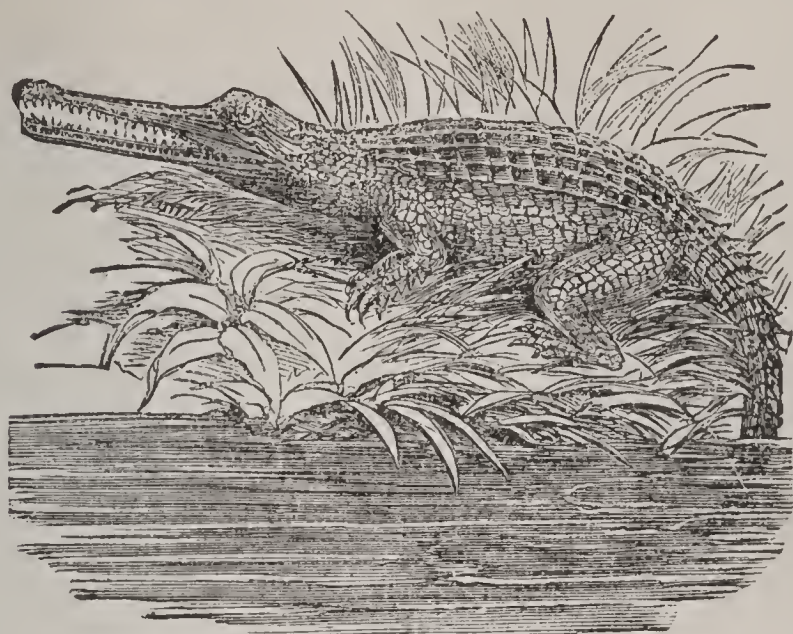
GAVE, *gāv*, pt. of GIVE, which see.

GAVEL-KIND, n. *gāv'ēl-kīnd* [W. *gafael*, a holding; *cededl*, a kindred, a clan: Ir. and Gael. *gabhail-cine*—from *gabh*. to receive, to hold; *cine*, a tribe, a family]: in *old Eng. law*, a custom in Kent, Wales, and parts of Northumberland, and still in force in Kent, by which land descended to all the sons. Some recent investigators, as Elton in his *Origins of English History* (1881), think that G., also Borough English (q.v.), and similar divergencies from ordinary English usage, may be derived, not from Celtic, but from Euskarian or pre-Aryan usage. It seems to be the general opinion of legal antiquaries (Selden, *Analect.* 1, 2, c. 7; Stephen, I., 213) that G. prevailed over the whole kingdom in Anglo-Saxon times, and that in Kent and elsewhere it was among the 'liberties' which the people were permitted to retain at the Conquest.

GAVIAL, n. *gāv'vī-āl* [an Indian name], (*Gavialis*): genus of reptiles of the crocodile (q.v.) family, conspicuously differing from true crocodiles and from alligators in the great length and slenderness of the muzzle. Another peculiar character is a large cartilaginous swelling at the extremity of the muzzle in the males, around the orifice of the nostrils; this probably gave rise to Ælian's statement that the crocodile of the Ganges had a horn at the tip of its snout. The teeth are very numerous, about 120; they are more equal in size than those of the other animals of this family, though some of the first are rather larger than the rest, the longest of the lower jaw being received into notches in the upper, as in the true crocodiles. The head is very broad, the narrow muzzle begins abruptly, and in it the branches of the bone of the lower jaw are united and prolonged as one. There are two great perforations in the bones of the skull behind the eyes, externally marked by depressions. The plates which cover the back and the nape of the neck are united. The crest of the tail is much elevated; the feet are webbed to the extremity of the toes, the habits are aquatic as those of the crocodile of the Nile. The only perfectly ascertained species, *G. Gangeticus*, inhabits the Ganges. It attains a greater size than any other of the recent *Crocodylidae*, frequently attaining the length of 25 ft.; but owing to the slenderness of its muzzle, it is es-

GAVILAN—GAWK.

teemed less dangerous than a true crocodile of smaller size. The form of the muzzle seems to adapt it for prey-



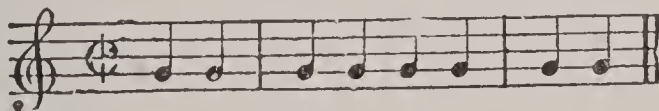
Gaviol (*Gavialis Gangeticus*).

ing on fish. Fossil gavials, different from existing species, have been found in Eocene deposits, as at Bracklesham England.

GAVILAN MOUNTAINS, *gâ-vê-lân'*: chain of hills in Monterey co., Cal., not far from the coast. Mt. Pacheco, highest point, has an elevation of 2,850 ft. above sea-level.

GAVINANA, or **CAVINANA**: small village picturesquely situated amid the Tuscan Apennines, in the valley of the river Lima; notable for the battle around its walls 1530, between the republican forces of Florence, led by their great captain, Ferruccio, and the imperialists headed by Philibert, Prince of Orange. The Florentines were defeated with the loss of their commander, and the death of Ferruccio, whose name in Tuscany has become synonymous with chivalry and patriotism, gave the final blow to the liberties of the republic.

GAVOTTE, *ga-vôt'*: piece of music of lively character, suitable for dancing, but adapted for the stage rather than for private performance. It consists of two repetitions of eight bars each, beginning with an up-beat, and is in alla-breve time. The fundamental rhythm of the G. is therefore



by which the second bar has a remarkable cæsura. Formerly the G. was often introduced into sonatas and other pieces, where its form was not so strictly adhered to; still the eight bar repetition was always considered necessary.

GAWK, n. *gawk* [AS. *geac*; Icel. *gaukr*; Scot. *gowk*; Ger. *gauch*, a cuckoo, a simpleton]: a fool; a simpleton.
GAWKY, a. *gaw'kî*, awkward; clownish; foolish; ungainly.

GAWLIN—GAYA.

GAWLIN, n. *gaw'lĭn* [etym. doubtful]: species of sea-fowl.

GAY, a. *gā* [F. *gai*; It. *gajo*, merry, jolly: Sp. *gayar*, to variegate]: merry; sportive; airy and cheerful; fine; showy; addicted to pleasure and loose in conduct. GAY'LY, or GAI'LY, ad. *-lĭ*. GAYETY, or GAIETY, n. *gā'ĭ-tĭ*, merriment; airiness with cheerfulness. GAY'NESS, n. *gayety*; finery. GAY'SOME, a. *-sūm*, full of gayety. GAY-FEATHER, popular name of a bulbous-rooted plant with showy purple flowers, a strong taste, and some medicinal properties—the *liatris scariosa*, also *spicata*; indigenous to America.—SYN. of 'gay': cheerful; sprightly; mirthful; jovial; lively; vivacious; gleeful; blithe; blithesome; airy; sportive; frolicsome; jolly; bright; animated.

GAY, DELPHINE: see GIRARDIN, ÉMILE DE.

GAY, *gā*, JOHN: 1688–1732, Dec. 4; b. Barnstaple, Devonshire, England. Although of ancient family, his father was in reduced circumstances, and G. was apprenticed to a London silk-mercantile; but disliking his occupation, he was finally released from it by his master. He published several poems, and comedies, and a volume of Fables—all now neglected; was sec. (1712) to the Duchess of Monmouth; afterward (1714) to Lord Clarendon, envoy-extraordinary to Hanover; published his poems by subscription 1720, and at the suggestion of Swift (1726) produced a 'Newgate Pastoral,' *The Beggars' Opera*, which had immense popular success, starting with a run of 63 nights. Soon afterward he went to reside with the Marquis of Queensberry. His burial was in Westminster Abbey.

GAYA, or GAYAH, or GYA, *gĭ'ā*: dist. of Bengal, Patna div., British India; bounded n. by Patna, e. by Monghyr, s.e. and s. by Hazáribagh, w. by Sháhábád districts; lat. 24° 17'—25° 19' n., long. 84° 4'—86° 5' e. The dist. in general is a level plain, with some isolated and grouped hills, the highest having an elevation of 1,620 ft. above sea-level; is highly cultivated in the e., less fertile n. and w., and in the s. full of hills, and jungles, with great numbers of wild animals; is drained by the Son, boundary between G. and Sháhábád and navigable throughout the year. Pimpún, Phalgú, and Jamná rivers; and is intersected by two branches of the Son canal system. The dist. contains many Brahminical sacred places in charge of Gayawals or priests, who extort large contributions from pilgrims; the ruined city of Buddh Gayá, residence of Sakya Sinha, founder of the Buddhist religion; a tree beneath which the sage is said to have set five years in meditation till he attained to the state of Buddha; and a temple of great antiquity on the highest peak of the Baraber hills where religious fairs are held every Sep. G. has 7 towns containing more than 5,000 inhabitants, of which Gayá is chief. Brass utensils, black stone ornaments, pottery, and tasar silk cloth are manufactured. The census of 1872 gave G. an area of 4,718 sq. m.; pop. 954,129 males, 995,621 females. 1,949,750 total: living in 6,530 villages or towns and 327,845 houses. Pop. (1881) 2,124,682.

GAYA—GAYBINE.

GAYÁ, or **GAYAH**, or **GYA**: capital of the province of Behar, in the presidency of Bengal; on the Phalgú, affluent of the Ganges: lat. 24° 4' n. and long. 85° 4' e. It contains (1901) 71,288 inhabitants; but as it is a place of great sanctity, being the birthplace of Buddha, founder of the Buddhist religion, it is annually visited by at least 100,000 pilgrims. It consists of two towns—the older reserved for the Brahmans and their immediate dependents. Silk and cotton manufactures are carried on, but the people rely chiefly on the expenditure of the superstitious visitors, some of whom have been known to leave behind them more than \$25,000.

GAYAL *gh'al* (*Bos Gavæus*): species of ox, found wild in the mountains of Aracan, Chittagong, Tipura, and Sylhet, and which has long been domesticated in these countries and in the eastern parts of Bengal. It is about equal in size to the Indian buffalo; and, like the buffalo, it carries the head with the muzzle projecting forward. The head is very broad and flat at the upper part, suddenly contracted toward the nose; with short horns, a little



Gayal Cow (*Bos Gavæus*).

curved, projecting nearly in the plane of the forehead, and a very wide space between at the base. There is no proper hump, but a sharp ridge on the shoulders and fore part of the back. The prevailing color is brown, generally dark. The Kookies keep herds of gayals, which they permit to roam at large during the day in the forests, but which return home at night of their own accord; to secure which the animals are occasionally supplied with a little salt, which has the greatest attractions for them. Their milk is extremely rich, but not abundant; the Kookies, however, do not use the milk, but rear them entirely for their flesh and skins.

GAYBINE, n. *gā'bin*: popular name for several showy twining plants belonging to the genus *Pharbitis*.

GAY-LUSSAC.

GAY-LUSSAC, *gā-lū-sāk'*, JOSEPH LOUIS: 1778, Dec. 6—1850, May 9; b. St Léonard (Haute-Vienne): distinguished French chemist. In 1794, he was sent to Paris to prepare for the Polytechnic School; was admitted to that institution 1797, Dec. 27, and after three years was promoted to the department *Des Ponts et Chaussées*. Berthollet, then prof. of chemistry in the Polytechnic School, having recognized his zeal and talents for original research, selected him as his assistant at Arcueil, where were the govt. chemical works. The study of Dalton's *Experimental Essays*, published 1801, directed his attention to chemical physics. In 1801, he published his first Memoir, on 'the dilatation of gases and vapors;' speedily followed by others on 'the improvement of thermometers and barometers;' on 'the tension of vapors, their mixture with gases, and the determination of their density, etc.;" and on 'capillary action.' He was commissioned, in association with Biot, by the Institute of France, to make a balloon ascent, for ascertaining whether the magnetic force existed at considerable heights, or only on the surface of the earth (see BALLOON). Alexander von Humboldt investigated with him the properties of air brought down from a height of more than 23,000 ft., and their joint Memoir to the Acad. of Sciences (read 1804, Oct. 1) contained the first announcement of the fact, that oxygen and hydrogen unite to form water in the simple proportion of 100 parts by bulk (volumes) of the former to 200 parts of the latter. The simplicity of the ratio in which these gases stood to each other in their combining proportions, induced him to study the combining volumes of other gases, and thus led him to the important discovery of the *law of volumes*, announced 1808, one of the most general and important laws in the whole domain of chemistry. Davy's discoveries of potassium and sodium, by the decomposing action of the voltaic pile, having excited much attention in France, Napoleon directed G. and Thenard to pursue this class of researches. The results of these investigations appeared in the r *Recherches Physico-chimiques*, two vols. 1811. Among the most important discoveries announced in these volumes, are a new chemical process which yields potassium and sodium much more abundantly than the voltaic pile, the determination of the composition of boracic acid both analytically and synthetically, and new and improved method of analyzing organic compounds. (Boron was, however, simultaneously discovered in England by Davy). Although the discovery of iodine (1811) is due to Courtôis, it was G. who (1813) first described its distinctive properties, gave it the name which it now bears, and proved that it is an elementary body; he was also the first to form synthetically the compounds of iodine with hydrogen and oxygen, known as hydriodic and iodic acids. In 1815, he announced the discovery of cyanogen, which presented the first known example of a compound body (C_2N) exhibiting many properties previously believed to pertain specially to simple or elementary bodies. His Memoir on this compound, in the 95th vol. of the *Annales de Chimie*, is a model of what a complete and exhaustive

GAYLUSSITE—GAZA.

chemical investigation should be. Among subjects of G.'s subsequent investigations were the fabrication of hydrated sulphuric acid, the bleaching chlorides, the alcohols, and the alkalies employed in commerce. In 1805, he was chosen a member of the committee of arts and manufactures, established by the minister of commerce; 1818, he was appointed to superintend the government manufactory of gunpowder and saltpetre; 1829, he received the lucrative office of chief assayer to the mint, where he introduced several important chemical changes; 1831, he became a member of the chamber of deputies; 1839, he was made a peer of France. He never was active in politics, and was diligently engaged in scientific research until his last illness. For many years, he was the editor, in association with Arago, of the *Annales de Chimie et de Physique*. He died at Paris, from atrophy of the heart.

GAYLUSSITE, n. *gā-lūs'sīt* [from Joseph Louis *Gay-Lussac*, chemist, 1778-1850]: monoclinic translucent mineral composed of carbonates of lime and soda in nearly equal parts with water; found in Maracaibo and in Nevada in salt lakes. It can be produced artificially.

GAYYOU, n. *gā'yó* [a native name]: narrow flat-bottomed fishing boat used in Anam, carrying two or three masts, and usually covered in the middle with a flat roof.

GAZA, *gā'zâ* [Heb. 'strong'], (now called **GUZZEH**): town in the s.w. of Palestine, about 3 m. from the sea, on the borders of the desert which separates Palestine from Egypt. It originally belonged to the Philistines, and was a place of importance at the conquest of Canaan by the Israelites. It is frequently mentioned in the story of Samson; and after many vicissitudes in the wars between the Israelites and the Philistines, it was allotted to the tribe of Judah, in whose possession it remained. In B.C. 333 G. was taken by Alexander the Great; and from that period to 1799, when it was taken by the French under Kleber, it has been the scene of many battles and sieges. Constantine the Great, who rebuilt the town, made it the seat of a bishop. The modern G. has the appearance of a collection of mere villages. It has no gates, no fortifications or defenses of any kind. The only building of interest is the great mosque, with its tall, octagonal minaret and peaked roof. G. has manufactures of soap and cotton stuffs; and, owing to its situation near the Mediterranean and on the caravan route to Egypt, it has a good trade both by sea and land. Pop. more than 15,000. 200 to 300 of whom are Christians, and the rest Mohammedans.

GAZA, *gā'zâ*, **THEODORUS**: d. 1478: Greek refugee, successor of Emanuel Chrysoloras as teacher of the Greek language and literature in the West. When his native city, Thessalonica, fell into the hands of the Turks, 1430, he fled to Italy, where he studied Latin under Victorinus of Feltre, at Mantua; after 1441, he was appointed rector of the newly established gymnasium, or high school, of Ferrara, and prof. of Greek. He was invited by Pope Nicholas V., with other learned Greeks, to Rome, and was employed in

GAZARI—GAZELLE.

making Latin versions of Greek authors. After the death of Nicholas, King Alfonso invited him to Naples 1456; but two years later, the death of this monarch also necessitated his return to Rome, where he found a patron in Cardinal Bessarion, who obtained for him a small benefice in s. Italy, either in Apulia or Calabria: here he died at an advanced age.

G. has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melanchthon. His principal writings are his *Introductivæ Grammatices*, libri iv. (on the elements of Greek grammar, published first by Aldus Manutius, Venice, 1495, and long held in high repute), a number of epistles to different persons on different literary subjects, and a variety of important translations into Latin of portions of Aristotle, Theophrastus, St. Chrysostom, Hippocrates, and other Greek writers.

GAZARI, n. *gāz'a-rī* [corruption of Gr. *katharoi*, pure]: in *chh. hist.*, name given, especially in Italy, to the Paulicians and sects confounded with them.

GAZE, v. *gāz* [prov. Sw. *gasa*, to stare: Norw. *glosa*, to gaze or stare: Russ. *glaz'*, eye; *glazyat'*, to stare]: to fix the eyes on steadily and earnestly; to look with eagerness and curiosity; to stare: N. intent regard; fixed look; that which is gazed on. GA'ZING, imp. GAZED, pp. *gāzd*. GA'ZER, n. *-zér*, one who. GAZE'FUL, a. *-fúl*, given to gazing. GA'ZINGSTOCK, n. one gazed at, generally used in an unfavorable sense. GAZEHOUND, n. a dog that follows the chase by sight; a greyhound. AT GAZE, with a dazed uncertain look, implying doubt; in *her.*, said of a beast of the chase, e. g., a hart or stag, represented as affrontée or full-faced; in a state of uncertainty as to the steps to be taken.—SYN. of 'gaze, v.': to gape; regard; look; view.

GAZELLE, n. *gā-zěl'* [F. *gazelle*; Sp. *gazela*, a kind of antelope—from Ar. *ghazāl*], (*Antilope Dorcas* or *Gazella Dorcas*): elegantly formed species of antelope, celebrated for the beauty of its eyes: about the size of a roebuck, but of lighter and more graceful form, with longer and more slender limbs, in these respects exhibiting the typical characters of the antelopes in their highest perfection. It is of light tawny color, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-color, with white and dark stripes. The horns of the old males are nine or ten inches long, bending outward and then inward, like the sides of a lyre, also backward at the base, and forward at the tips, tapering to a point, surrounded by 13 or 14 permanent rings, the rings near the base being closest together and most perfect. The horns of the female are smaller and obscurely ringed. The ears are long, narrow, and pointed; the eyes very large, soft, and black; there is a tuft of hair on each knee; the tail is short, with black hairs on its upper surface only, and at its tip. The G. is a native of the n. of Africa, and of Syria, Arabia, and Persia. Great herds frequent the northern borders of the Sahara; and notwithstanding their great powers of flight, and the resistance which they are capable

GAZETTE—GAZOGENE.

of making when compelled to stand at bay—the herd closing together with the females and young in the centre, and the males presenting their horns all around—lions and panthers destroy them in great numbers. The speed of the G. is such that it cannot be successfully hunted by any kind of dog, but in some parts of the East it is taken by the assistance of falcons of a small species, which fasten on its head, and by the flapping of their wings blind and confuse it, so that it soon falls a prey to the hunter. It is captured also in inclosures made near its drinking-places. Although naturally very wild and timid, it is easily domesticated, and, when taken young, becomes extremely familiar. Tame gazelles are very common in the Asiatic countries of which the species is a native; and the poetry of these countries abounds in allusions both to the beauty and the gentleness of the gazelle. It has been supposed that the gazelles of Asia may be of different species from the African, but there is reason to think that they are the same. The Ariel G. (*A. Arabica*) perhaps differs rather as a variety than as a species, and is even more symmetrical and graceful than the common kind. There are several species very nearly allied to the G., among which is *Antilope* (or *Gazella*) *Soemmeringii*, native of Abyssinia, with the curvatures of the horns very marked and sudden.—Some confusion has arisen among naturalists as to the application of the name G., originally Arabic; and it has not only been given to the *leucoryx* of the ancients, a very different species, but even to the *gemsboec* of s. Africa. The true G. was known to the ancients, and is accurately described by Ælian under the name *dorcas*, which was given also to the roe.

GAZETTE, n. *gǎ-zět'* [It. *gazetta*, a young magpie, all manner of idle chattings, running reports; *gazzettare*, to chatter as a young magpie: also is it said that *gazette* was a Venetian coin of value less than a farthing, for which a sort of gossiping sheet was sold in Venice, and that the coin's name became transferred to the paper]: in its English acceptation, the official newspaper, in which proclamations, notices of appointments, and the like, are published by the government; said to have been published for the first time at Oxford 1665. On the removal of the court to London, the title was changed to *London Gazette*. It is now published on Tuesdays and Fridays. Under the Bankrupt Act and other statutes, certain notices are directed to be given in the *Gazette*. This name is applied often generally to any newspaper: see NEWSPAPERS. GAZETTE, v. to insert or publish in the Gazette or official paper. TO BE IN THE GAZETTE, said in England of a bankrupt whose insolvency is announced in the official paper. GAZET'TING, imp. GAZET'TED, pp. published in the gazette. GAZETTEER, n. *gǎz-ět-tēr*, a geographical dictionary (see DICTIONARY: ENCYCLOPEDIA). TO BE GAZETTED, applied in England familiarly to the official announcements of appointments, promotions, etc., in the army, navy, peerage, church, etc.

GAZOGENE, n. *gǎz'ō-jën* [F. *gaz*, gas, air; Gr. *gennāō*.

GAZOLITE—GEARY.

I produce or generate]: apparatus employed in aerating liquids for domestic use: see AËRATED WATERS.

GAZOLITE, n. *găz'o-lît* [F. *gaz*, gas; Gr. *lithos*, stone]. same as AEROLITE (q.v.).

GAZOLYTES, n. *găz'o-lîts* [F. *gaz*, gas; Gr. *lutos*, soluble; *luō*, I dissolve]: name given by Berzelius to those simple substances capable by their union with other simple substances of forming permanent gases.

GAZONS, *ga-zônz'*, in Fortification: sods laid over newly made earthworks, to consolidate them, and prevent the soil from rolling down.

GEAN, n. *gên* [F. *guigne*; Sp. *guinda*]: a species of wild cherry, common in England and Scotland, of a deep purple or black when ripe.

GEAR, n. *gēr* [AS. *gearwa*; Icel. *gerfi*, whatever is required to set a thing in action]: accoutrements; harness; tackle; dress; ornaments; goods; in *OE.*, stuff; matter; subject; matters of business: V. to dress; to harness. GEAR'ING, imp: N. harness; a series of toothed wheels for effecting and directing motion. GEARED, pp. *gērd*. IN GOOD GEAR, in good working order. OUT OF GEAR, not in working order or connection; in bad health.

GEAR'ING, in Machinery: those parts by which motion in one portion of a machine is communicated to another; consisting generally of toothed-wheels, friction-wheels, endless bands, screws, etc., or of a combination of these. When the communication between the two parts of the machine is interrupted, the machine is said to be *out of gear*; and when the communication is restored, it is said to be *in gear*. In the case of a thrashing-mill, e.g., driven by a steam-engine, the gearing usually consists of an endless band which communicates motion from the axle of the fly-wheel to that of the drum. If the band were slipped off from one wheel, or slackened so that motion could not be communicated by means of it, then the machine would be *out of gear*. Gearing which can be put in and out of gear is called *movable gearing*; and that which cannot, as, for instance, the wheel-work of a watch, is called *fixed gearing*. Gearing which consists of wheel-work or endless screws (q.v.) is put out of gear either by means of one of the wheels sliding along its axis, or being moved out of its place horizontally or vertically by means of a lever. *Straight gearing* is used when the planes of motion are parallel to each other; *bevelled gearing*, when the direction of the plane of motion is changed. Gearing has for its object also the increasing or diminishing of the original velocity, and in reference to this, is distinguished by the term 'multiplying' or 'retarding.' See WHEELS, TOOTHED.

GEARY, *gā'rĭ* or *gē'rĭ*, JOHN WHITE: 1819, Dec. 30—1873, Feb. 8; b. Mt. Pleasant, Westmoreland co., Penn.: soldier. He studied a short time in Jefferson College, Penn., taught school, was a clerk in Pittsburgh, studied mathematics, civil engineering and law, and was admitted to the bar. In the Mexican war he was wounded at

GEASON—GEBIR.

Chapultepec and appointed first commander of the City of Mexico and col. of the 2d Penn. regt. In 1849 he was appointed first post-master of San Francisco, and organized the postal service of the Pacific coast dist.; became first American alcade of San Francisco, and first mayor of the city under the new constitution 1850. He was in private life in Penn. 1852-56; terr. gov. of Kansas 1856-7; in private life 1857-61; raised the 28th Penn. vols. and commanded it through the Shenandoah campaign 1861; was promoted brig.gen. 1862, Apr., and maj.gen. 1863; commanded 2d div. 20th corps in Sherman's march to the sea; was the first to enter Savannah and was appointed its milit. gov. 1864, Dec.; was elected gov. of Penn. as a republican, 1866, and re-elected 1869.

GEASON, a. *gē'zn* [Norw. *glisa*, to show interstices: Icel. *gisinn*, gaping, rare: Gael. *gaiseadh*, a deficiency or failure in crops]: in *OE.*, uncommon; rare; scarce; wonderful.

GEAT, n. *jēt* [AS. *geotan*, to pour; Low Ger. *geten*]: the hole or channel through which molten metal descends into the mold.

GEBANG PALM, *gā'bang pām* (*Corypha Gebanga*): fan-leaved palm, native of the E. Indies; one of the most useful palms of that part of the world. Its stem yields a kind of sago; its root is medicinal, being both emollient and slightly astringent, so as to be particularly adapted to many cases of diarrhœa; its leaves are used for thatch, for making broad-brimmed hats, and for various economical purposes; its young leaves are plaited into baskets and bags, in the manufacture of which many of the people of Java find employment; the fibres of the leaf-stalks are made into ropes, baskets, nets, cloth, etc.—To the genus *Corypha* belongs also the TALIPAT PALM (q.v.).—The fruit of *C. Pumas*, a Mexican species, is eatable, and has a sweet taste.

GE'BA RIVER: see SENEGAMBIA.

GEBER: see GHEBER.

GEBIR, *gā'bēr*, ABU-MUSSAH-JAAFER AL SOFI: founder of the Arabian school of chemistry; lived toward the end of the 8th, or the commencement of the 9th c. The place of his birth is uncertain. According to the majority of authorities, he was born at Tûs, in Khorassan, but Abulfeda supports the claims of Harran in Mesopotamia. He was greatly esteemed in the East, and subsequently in Europe, where the chemists, at the time of Van Helmont, did nothing more than repeat his experiments. Cardan reckons G. one of the 12 subtlest geniuses of the world, while Roger Bacon bestows upon him the epithet 'magister magistrorum.' He wrote an immense number of treatises on alchemy, of which many are extant in Latin versions. The library at Leyden contains many manuscripts of G.'s works which have never been published. In the Imperial Library at Paris are manuscripts of his two celebrated works, the *Summa Collectionis Complementi Secretorum Naturæ*, and the *Summa Perfectionis*—also of a work on

GECARCINUS—GECKO.

Astronomy, and a treatise on Spherical Triangles. The principle laid down by G. at the commencement of his works is, that art cannot imitate nature in all things, but that it can and ought to imitate her as far as its limits allow. An edition of his works in Latin was published at Dantzic 1682; another in English by Russell (London 1678). For G.'s opinion with regard to alchemy, see **ALCHEMY**.

GECARCINUS, n. *jē-kār-sī'nūs* [Gr. *gē*, land; *karkinos*, a crab]: land crab, typical genus of *Gecarcinidæ*, a family of short-tailed crustaceans, containing various tropical land crabs. At a certain season they migrate in numbers to the sea, to deposit their eggs.

GECINUS, n. *jē-sī'nūs* [Gr. *gē*, the earth; *kineō*, I move]: typical genus of the sub-family *Gecininae*: see **WOODPECKERS**.

GECK, n. *gĕk* [AS. *geac*, a uckoo]: in *OE.*, a fool; a simpleton; an object for jesting.

GECKO, n. *gĕk'kō* [imitative of the sound which the animal utters], (*Gecko*): genus of saurian reptiles, constituting a family, *Geckotidæ*, which some recent naturalists have divided into many genera. The geckoes are of small size, and generally of repulsive aspect; the colors of most them are dull, and the small granular scales with which



Gecko (*Platydactylus homalocephalus*):

1. Foot of *P. Cepedianus*; 2. Foot of *P. Hasselquistii*; 3. Foot of *P. Leachianus*; 4. Claw of *Gymnodactylus pulchellus*; 5. Foot of *Thecadactylus theconyx*; 6. Foot of *Gymnodactylus scaber*.

they are covered are in general mingled with tubercles. The legs are short, the gait usually slow, measured, and stealthy, although geckoes can also run very nimbly when danger presses, and often disappear suddenly when they seem almost to be struck or caught. The feet are remarkable, being adapted for adhering to smooth surfaces, so that geckoes readily climb the smoothest trees or walls, or creep

GED—GEDDES.

inverted on ceilings, or hang on the lower side of the large leaves in which tropical vegetation abounds. The body and tail are never crested, but are sometimes furnished with lateral membranes, variously festooned or fringed. The lateral membrane is sometimes even so large as to be of use to arboreal species in enabling them to take long leaps from branch to branch. The geckoes feed chiefly on insects. They are more or less nocturnal in their habits. They are natives of warm climates, and are widely distributed over the world. Two species are found in s. Europe, both of which frequently enter houses, as do the geckoes of Egypt, India, and other warm countries. Some of them are described as enlivening the night in tropical forests by a harsh cackle. The geckoes have, in almost all parts of the world where they are found, a bad reputation as venomous, and as imparting injurious qualities to food which they touch, but there is no good evidence in support of any such opinion, in accordance with which, however, an Egyptian G. is even known as *the father of leprosy*.

GED, n. *gǣd* [Icel. *gedda*, a pike; *gaddr*, a goad]: a pike, so named from its sharp thin head: see GARFISH.

GEDDES, *gǣd'ēs*: post village of Onondaga co., formerly part of G. township, N. Y.; now annexed to the city of Syracuse; on the Erie canal and the Oswego and Syracuse railroad. It has 4 churches, a pottery, works of the Onondaga iron company, and extensive salt works. Pop. (1880) 4,283; (1900) 4,387.

GEDDES, *gǣd'ēs*, ALEXANDER, LL.D.: biblical critic, translator, and miscellaneous writer: 1737–1802, Feb. 26; b. Arradowl, parish of Ruthven, Banffshire, Scotland. His parents were Rom. Catholics, and young G. was educated for a priest, first at Scalan, a monastic seminary in the Highlands, subsequently at the Scots College, Paris, where he learned Hebrew, Greek, Italian, French, Spanish, German, and Low Dutch. In 1764, he returned to Scotland, and, having taken orders, was appointed officiating priest to the Rom. Catholics of Angus, but after a short time went to reside with the Earl of Traquair. In 1769, he took charge of a Rom. Cath. congregation at Auchinhalrig, Banffshire, where he remained ten years, honorably conspicuous by his charities and extraordinary liberality of sentiment. He was at length deposed from all his ecclesiastical functions, on account of his occasional attendance at the parish church of Cullen, between the minister of which and himself there existed an intimate acquaintance. G. then betook himself to literature, and went to London 1780. He had long planned a translation of the Bible into English for the use of Rom. Catholics, and he was, through the munificence of Lord Petre, enabled to devote himself to the work. After various preliminary publications intended to pave the way for an impartial or favorable consideration of his *magnum opus*, there appeared 1792, *The First Volume of the Holy Bible, or the Books accounted Sacred by Jews and Christians, otherwise called the Books of the Old and New Covenants, faithfully*

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translated from Corrected Texts of the Originals, with Various Readings, Explanatory Notes, and Critical Remarks. In 1793, the second vol. was published, carrying the translation as far as the end of the historical books; and in 1800, a third vol, containing his *Critical Remarks on the Hebrew Scriptures*. The opinions enunciated in these volumes, especially in the last, are startlingly heretical, more especially when the training of their author is considered, and were calculated at the time of their appearance to offend both Rom. Catholics and Protestants. They exhibit as thorough Rationalism as is to be found in Eichhorn or Paulis. Moses is said to be inspired in the same sense as other good men; and in regard to his purpose, it is affirmed that 'he only did what all other ancient legislators had done—required a greater or less degree of implicit obedience to their respective laws, and for that purpose feigned an intercourse with the Deity, to make that obedience more palatable to the credulous multitude.' Miracles are explained away; and the account of the creation in Genesis is described as 'a most beautiful mythos or philosophical fiction, contrived with great wisdom, and dressed up in the garb of real history.' These opinions naturally exposed him to the charge of infidelity, and his criticisms were described as 'less scurrilous, perhaps, but not less impious than those of Thomas Paine.' All sorts of ecclesiastics united in their condemnation, and the undoubted effect of their hostility was to crush whatever hopes of literary fame G. may have entertained. He died at London. It is now generally admitted, even by those who utterly reject G.'s views, that his translation is in the main excellent. His labors have unquestionably advanced the science of Biblical Criticism. Among his other productions may be mentioned a poem on the *Confessional*; the *Battle of B—ng—r*, or the *Church's Triumph*, a comic-heroic poem in nine cantos; and *Bardomachia*, or the *Battle of the Bards*. See Life of G. by Good (1803).

GEDDES, JANET (known in Scottish ecclesiastical history as 'Jenny Geddes'): elderly woman said to have been prominent in resisting the introduction of a Service-book prepared by Laud, into the Church of Scotland. 1637, July 23. Sunday, was the day fixed for this innovation, so obnoxious to the Scottish Presbyterians; and an immense crowd filled the High Church of St. Giles's Edinburgh. On the Dean of Edinburgh beginning to read, his voice was lost in a tumultuous shout, and (the story is) an old woman, said to have been one Jenny G., who kept a green-stall in the High Street, bawling out; 'Villain! dost thou say mass at my lug?' (ear), launched her stool at the dean's head. Universal confusion ensued, and the dean, throwing off his surplice, fled, to save his life. The Bp. of Edinburgh, on attempting to appease the storm, was assailed by a volley of sticks, stones, and other missiles, accompanied by cries and threats that effectually silenced him. This tumult proved the deathblow of the liturgy in Scotland. It has been doubted, however, if there ever was such a person as Jenny Geddes. In 1756, a citizen of Edin-

burgh, of the name of Robert Mein (d. 1776), known for his exertions for the improvement of his native city, published a tract called *The Cross Removed, Prelacy and Patronage Disproved*, etc., in which he claims the exploit of Jenny G. for his great-grandmother, 'the worthy Barbara Hamilton, spouse to John Mein, merchant and postmaster in Edinburgh, who, in 1637, spoke openly in the church at Edinburgh against Abp. Laud's new Service-book, at its first reading there, which stopped their proceedings, and dismissed their meeting, so that it never obtained in our church to this day.' In the obituary notice of Robert Mein, *Weekly Magazine*, XXXIX., and *Scots Magazine*, XXXVI. (1776), this Barbara Hamilton is said to have been descended from the Hamiltons of Bardowie, 'but was better known in our history by the name of Jenny Geddes, though called so erroneously.' Jenny G.'s famous stool is said to have been burned by herself in the bonfires at the cross of Edinburgh at the Restoration, and what has been called hers in the Museum of the Soc. of Antiquaries at Edinburgh, has no claim to that name. See *Proceedings of the Soc. of Antiquaries of Scotland*, vol. III. part 2, pp. 179, 180.

GEE, v. impera. *jē* [AS. *gegan*, to go: It. *gio*, get on, addressed to a horse]: an exclamation by the driver of a cart or wagon, and the like, ordering his horse to get on, or go faster. GEE-HO, *jē-hō'*, an order to the horse to turn in a direction away from the driver.

GEEFS, *gāfs* or *chāfs*, GUILLAUME: 1806, Sep. 10—1860; b. Antwerp: Belgian sculptor. After studying there, he went to Paris, which he quitted during the revolution of 1830, returning to Belgium, and executing at Brussels a monument to the memory of the victims of the revolution of 1830. The most important of his other works are: *Colossal Marble Statue of King Leopold*; *Monument to Count Frederic de Merode*, now in the cathedral of Brussels; and *Statue of General Belliard*. He executed a group entitled *Le Lion Amoureux*, which was shown at the exhibition in Paris (1855).—JOSEPH G., younger brother of Guillaume (b. 1808), also has reputation as a sculptor. He has executed a number of statues, of which two, *Metabus* and *Thierry Maertens* were shown at the Exhibition 1855. In general character, his works resemble those of his brother.—ALOYS G. (d. 1841), youngest brother of Guillaume, also is known as a sculptor by means of his *Epaminondas Dying*, *Beatrice*, and the bas-reliefs for the *Rubens* of his eldest brother.

GEEL, *chāl*, JAKOB: 1789—1862, Nov. 11: b. Amsterdam: Dutch scholar. He was educated at the Athenæum of that city; lived at The Hague from 1811 as a family tutor; became second librarian at Leyden 1823, and head-librarian and honorary prof. 1833. He had made himself known as a philologist by editions of Theocritus, with the *Scholia* (1820), of the *Anecdota Hemsterhusiana* (1826), of the *Scholia in Suetonium* of Ruhnken (1828), of the *Excerpta Vaticana* of Polybius (1829); and his *Historia Critica Sophistarum*

GEELONG—GEESTEMÜNDE.

Græcorum (1823) had called forth several treatises on the same subject from German philologists. In 1840, appeared his edition of the *Olympicus* of Dio Chrysostom, accompanied by a *Commentarius de Reliquis Dionis Orationibus*; and in 1846 he issued the *Phænissæ* of Euripides, with a commentary in opposition to Hermann. All these works are models of scholarship, taste, and method. G. with others established the *Bibliotheca Critica Nova*, 1825. The national literature is indebted to him not only for the translation of German and English works into Dutch, but also for original treatises on various æsthetical subjects. He won the gratitude of the learned throughout Europe by his valuable *Catalogus Codicum Manuscriptorum, qui inde ab Anno; 1741 Bibliothecæ Lugduni Batavorum accesserunt* (1852).

GEELONG, *gē-larong'*: flourishing city of Victoria, in Australia, 38° 10' s. lat., and 144° 21' e. long.; picturesquely situated on the s. side of Corio Bay, 45 m. s.w. of Melbourne. It is well laid out, abounds in attractive shops, and has some handsome buildings. It is on the Victorian railway. The river Barwon forms the s. boundary of the city, and 3 m. farther spreads into the Connemare Lakes, falling into the sea at Point Flinders. The discovery of gold-fields in the neighborhood 1851 added to the prosperity of G., which had become a principal seat of the wool trade. The first woolen mill in Victoria was erected in G., and the govt. award of £1,500 gained. Alongside of the railway jetty, 1,000 ft. long, the largest ships can load and discharge, and there are three other jetties for smaller vessels. Through the bar at the entrance to Corio Bay, a channel has been dredged to a depth of 21 ft. 6 inches, at a cost of £60,000. The district is exceedingly fertile, and the Barabool Hills on the w. bank of the Barwon are covered with farms, orchards, and vineyards. Limestone and a kind of marble are found in the neighborhood. There are various industries carried on, especially the manufacture of woolen cloths, meat-preserving, tanning, fishing, etc. The city is lighted with gas, and supplied with water from the river, and has an excellent hospital, several asylums, a chamber of commerce, mechanics' institute, botanical garden, public park, grammar school, and newspapers. Pop. (1831) within the corporate boundary 9,719; including the suburbs, 21,157; (1891) 24,210; (1901) 25,017.

GEESE, n.: plu. of GOOSE, which see.

GEESTEMÜNDE, *gās'téh-mün-déh*: seaport, dist. of Stade, prov. of Hanover, Prussia, at the mouth of the Geeste river, affluent of the estuary of the Weser which separates it from Bremerhafen; 32 m. n. of Bremen; terminus of the G. and Bremen railroad. It was founded by Hanover as a rival of Bremerhafen, was made a free port 1847, and is noted chiefly for its naval and commercial importance. The construction of its grand harbor was begun 1857, and involved the creation of a great basin, 1,785 English ft. long, 410 ft. wide, and 23 ft. deep, opened 1865; a basin for petroleum shipping, 820 ft. long and 147 ft. wide, opened 1874; a canal on the e. of the great basin, 13,380 ft.

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long and 155 ft. wide, with a branch of similar proportions; and powerful fortifications. Since the annexation of Hanover to Prussia, G. has been made a German naval station. Pop. (1890) exclusive of garrison 3,436, including neighboring commune of Geestendorf, 15,452.

GEEZ: see ETHIOPIA: AMHARIC.

GEFFRARD. *zhā-frâr'*, FABRE: 1806, Sep. 19—1878, Dec. 31; b. L'Ause à Veau, Hayti: soldier and president. He was the son of Gen. Nicolas G., one of the founders of Haytian independence, was adopted by Col. Fabre, and educated in the college of Aux Cayes, enlisted as a private soldier, became lieut.col. and occupied Jeremie 1843, was promoted col. and defeated the troops of Pres. Boyer near Jacmel, was appointed brig.gen. and commander of Jacmel 1844, subdued a rebellion under Gen. Achaau and became gen. of division 1845, and was active in the Dominican expedition 1849. Soulouque, as emperor Faustin I., made him lieut.gen. and duke of Tabaro, and fearing his popularity deprived him of his command 1858. This led to an uprising in which a republic was proclaimed under the presidency of G. and Soulouque banished. G. was pres. 1858, Dec. 22—1867, Feb. 22, when he was banished and retired to Jamaica.

GEF'LE, *yěv'lā*: important town of Sweden, chief town of the län Gefleborg, at the mouth of the river G, on an inlet of the Gulf of Bothnia, about 100 m. n.n.w. of Stockholm. The stream upon which it stands is divided into three branches, forming two islands, united by bridges with the right and left banks of the river and forming portions of the town. G. ranks third among commercial towns of Sweden, Stockholm and Göteborg alone having more extensive trade. The chief buildings are a gymnasium; a castle, imposingly situated; a court-house, one of the finest in Sweden; a good public library, and an excellent harbor. G. carries on ship-building and has manufactures of sailcloth, linen, leather, tobacco, and sugar. Its exports are iron, timber, tar, flax, and linen; its imports chiefly corn and salt. Pop. (1878) 18,526; (1887) 21,508; (1901) 30,146.

GEHENNA, n. *gē-hēn'nā* [Gr. form of Heb. *Ge-hinnom*, 'Valley of Hinnom,' or *Ge-ben-Hinnom*, Valley of the Son of Hinnom]: valley or gorge, very narrow, with steep and rocky sides, s. and w. of the city of Jerusalem. Here Solomon built a high place for Molech (1 K. xi, 7), and it became a favorite spot with the later Jewish kings for the celebration of idolatrous rites. It was here that Ahaz and Manasseh made their children pass through the fire to Molech, 'according to the abomination of the heathen;' and at its s.e. extremity, specifically designated Tophet ('place of burning'), the hideous practice of infant sacrifice to the fire-gods was not unknown (Jer. vii, 31). When king Josiah came forward as the restorer of the old and pure national faith, he 'defiled' this place of idolatry by casting into it human bones; and after this it appears to have become 'the common cesspool of the city, into which sewage was conducted, to be carried off by the waters of the Kidron, as

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well as a laystall, where all its solid filth was collected. Hence, it became a huge nest of loathsome insects, whose larvæ or "worms" fattened on the corruption.' It is said that fires were kept constantly burning here, to consume the bodies of criminals, the carcasses of animals and whatever other offal might be combustible. Among the later Jews, G. and Tophet came to be regarded as symbols of hell and torment, and in this sense G. is employed by Christ in the New Testament: e.g., Mk. ix. 47, 48: 'It is good for thee to enter into the kingdom of God with one eye, rather than having two eyes, to be cast into Gehenna; where their worm dieth not, and the fire is not quenched.'

GEIBEL, *gî'bêl*, EMANUEL: popular poet of Germany: b. Lübeck, 1815, Oct. 18. He studied at the Univ. of Bonn, and 1836 went to Berlin. Two years afterward he obtained the tutorship in the family of the Russian ambassador at Athens, where he still prosecuted his studies. On his return to Lübeck 1840, he worked up the material he had collected in Greece, and studied Italian and Spanish literature. Soon after the publication of his first poems, a pension of 300 thalers a year was bestowed on him by the king of Prussia. G. resided alternately at St. Goar with Freiligrath, at Stuttgart, Hanover, Berlin, and Lübeck; till, 1852, he was appointed prof. of æsthetics in the Univ. of Munich by the king of Bavaria. He retired to Lübeck 1868. With Curtius, he published his *Classische Studien* (1840) containing translations from the Greek poets. These were followed in the same year by his *Gedichte* (82d edit. 1877), the beauty and religious tone of which made them at once great favorites with the Germans. The results of his Spanish studies were the *Spanischen Volkslieder und Romanzen* (Berlin 1843), followed by the *Spanische Liederbuch* (Berlin 1852), published in conjunction with Paul Heyse. In 1857, appeared his tragedy *Brunehilde*, and in 1864, *Gedichte und Gedenkblätter*. In 1868 he published another tragedy called *Sophonisbe*. His poems are distinguished by fervor and truth of feeling, richness of fancy, and a certain pensive melancholy, and have procured him a popularity—especially among cultivated women—such as no poet of Germany has gained since Uhland.

GEIC, a. *jê'îk* [Gr. *gê*, the earth]: earthy; pertaining to or derived from the earth; terrene.

GEIC ACID, *jê'îk* [Gr. *gê*, or *geiä*, the earth]: an acid obtained from earth; a constituent of vegetable mold.

GEIGER, *gî'gêr*, ABRAHAM: 1810, May 24—1874, Oct.; b. Frankfurt-on-the-Maine: Jewish scholar. According to old rabbinical practice, his teachers were his father and elder brother till he reached the age of eleven. After that, having received an advanced education for some years, he went, 1829, to the Univ. of Heidelberg, and shortly afterward to that of Bonn, for the study of philosophy and of the Oriental languages. 1732, Nov, he was called as rabbi to Wiesbaden, and there, under the impulse to the scientific study of Judaism which proceeded from Berlin, he applied himself to Jewish theology, especially in its relation

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to practical life. In 1835, he joined with several able men in editing the *Zeitschrift für Jüdische Theologie*. The spirit of inquiry, however, with which he discussed prevalent opinions and usages, brought him into collision with the conservative Jews, especially after 1838, when he became assessor of the rabinat at Breslau; but the great majority of educated men in his sect continued attached to him. He gave the first impulse to the celebrated assemblies of the rabbis, three of which have been held since 1844 at Brunswick, Frankfurt-on-the-Maine, and Breslau. At the second of these he was vice-pres., and pres. at the third. Though G. was thus active in the reform movement, he could not abandon his historical point of view, which made him unwilling to break entirely with the past; therefore he refused a call to be preacher to the Berlin Reform Society. Besides sermons, pamphlets, and numerous contributions to the above-mentioned periodical, G. published historical monographs, distinguished by thoroughness of investigation and many-sided learning: among these are *Melo Chof-najim* (Berlin 1840), on Joseph Salomo del Medigo, and the *Nite Naamanim* (Berlin 1847), on the exegetical school of n. France. His *Lehr- und Lesebuch zur Sprache der Mischna* (1845) is of great value to the Oriental philologist. In 1850 appeared the first number of *Studien* on Moses-Ben-Maimon; and 1851, a translation of the *Divan of the Castilian Abu'l-Hassan Juda ha-Levi*, accompanied by a biography of the poet and explanatory remarks. Besides some specimens of Jewish mediæval apologetics, and numerous articles in the reviews, G. published *Urschrift und Uebersetzungen der Bibel in ihrer Abhängigkeit von der inneren Entwicklung des Judenthums* (1857); *Das Judenthum und seine Geschichte* (1864–1865); *Unser Gottesdienst* (1868); *Israel. Gebetbuch*; etc. 1863–70 G. was rabbi in Frankfurt; thence until his death in Berlin.

GEIJER. *yī'ér*, ERIC GUSTAF: 1783–1847; b. Ransätter, in the Swedish læn of Wermland; historian. He was sent, at the age of 16, to the Univ. of Upsala; applied himself to the history of his native country; was nominated to a post in the Chamber of the National Archives, and 1810 was elected assistant to Fant, prof. of history in the Univ. of Upsala, succeeding to the chair on Fant's death, 1817. G.'s early lectures were listened to by crowds of students and of the general public; but at a subsequent period, his popularity diminished in proportion to the increased profundity of his views; while the suspicion that he harbored skeptical notions in regard to the Trinity, brought him into disfavor with a portion of the community. The examination to which charges against him gave rise terminated in his acquittal, and were even followed by the offer of the bishopric, which he declined. G. was poet as well as historian, and according to the testimony of his countrymen, his *Sista Skalden*, *Vikingen*, *Odalbonden*, and other heroic pieces, place him in the foremost rank of Swedish poets. He and his friends Alderbeth, Tegner, and Nikander, adhered to the 'Gothic' school of poetry, which they furthered by the establishment of 'the Society of the Goths,

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as early as 1810, with its magazine entitled *Iduna*, in which appeared several of G.'s best poems, and among other productions of merit, the early cantos of Tegner's *Frithiof*. Unfortunately G. did not complete any one of the vast undertakings which he planned: *Svea Rike's Hufder*, or Records of Sweden, intended to embrace the history of the country from mythical ages to the present time, did not proceed beyond the introductory volume. His next work, *Svenska Folkets Historia*, intended to form one of the series of European histories, edited by Leo and Uckert, was not carried beyond the death of Queen Christina; yet these incomplete works rank among the most valuable contributions to Swedish history. To G. was intrusted the task of examining and editing the papers which Gustavus III, had bequeathed to the Univ. of Upsala, with the stipulation that they were not to be opened for 50 years after his death: they appeared 1843, but were found of no value. During the last ten years of his life, G. was active in politics; but his versatility prevented him from applying his powers methodically to the complete elaboration of any one great object. G. was a musician and composer of no mean order. His numerous letters to his friend King Bernadotte, form part of the *Samlade Skrifter*, or collective works, which, with a biographical sketch, was published 1853.

GEIKIE, *gē'kē*, ARCHIBALD, LL.D., F.R.S.: geologist: b. Edinburgh, 1835. He was educated in the Edinburgh Univ., appointed to the geol. survey 1855, was associated with Sir Roderick Murchison in his geol. work in the Scottish highlands, was appointed director of the geol. survey of Scotland 1867, became first occupant of the chair of geol. and mineralogy in the Edinburgh Univ., founded by Sir Roderick Murchison and the Crown 1870, and was appointed director-gen. of the geol. survey of the United Kingdom, and director of the Museum of Practical Geol., London, 1881. He is a fellow or member of various scientific bodies, received the degree LL.D. from St. Andrews Univ. 1872, and from Edinburgh Univ. at its tercentenary celebration 1885, and is author of numerous works on geol. subjects.

GEIKIE, CUNNINGHAM, D.D.: clergyman and author: b. Edinburgh, Scotland, 1826, Oct. 26. He was educated at the Univ. of Edinburgh and Queen's College, Toronto, was pastor of the Argyle street Presb. Church, Halifax, 1851-54, Argyle street Presb. Church, Sunderland, England, 1860-67, and of Islington Chapel, London, 1867-73. In 1876 he was ordained deacon in the Church of England, and priest 1877; was curate of St. Peters, Dulwich, near London 1876-79, rector of Christ Church, Paris, 1879-81, vicar of St. Mary Magdalene, Barnstable, 1882-85, and since 1885 has been vicar of St. Martin-at-Palace, Norwich. His writings embrace *The Backwoods of Canada* (1864); *Great and Precious Promises* (1872); *Life and Words of Christ* (1877); *Old Testament Portraits* (1878); and *Hours with the Bible*, 6 vols., covering the Old Test. 1880-85). He received the degree D.D. from Queen's Univ. Kingston,

Canada, 1871. He is a clear and graphic writer, diligent in study of his subject; therefore interesting and instructive: his *Life of Christ*, and *Hours with the Bible*, have had immense circulation in Britain and America.

GEIKIE, JAMES: a Scottish geologist; b. 1839, Aug. 23, brother of Sir Archibald G.; received a collegiate education; served on the Geological Survey of Scotland, 1861-82. In the latter year he succeeded his brother as prof. of geology in Edinburgh University. His publications include *The Great Ice Age; Prehistoric Europe; Outlines of Geology; Earth Sculpture*; a translation of *Songs and Lyrics by H. Heine and other German Poets*, etc.

GEILER VON KAISERSBERG, *gī' lēr fōn ki' zers-berēh*, JOHANN: 1455, Mar. 16—1510, Mar. 10; b. Schaffhausen: famous pulpit orator of Germany. He studied at Freiburg and Basel, where he obtained his degree D.D.; and 1478 became preacher in the cathedral of Strasburg, where he died. G. ranks among the most learned and original men of his age. His sermons, usually composed in Latin, and delivered in German, are marked by great eloquence and earnestness; nor do they disdain the aids of wit, sarcasm, and ridicule. Vivid pictures of life, warmth of feeling, and a bold, even rough morality, are their leading characteristics. In fact, G.'s ethical zeal often urged him to a pungency of satire hardly in keeping with modern views of the dignity of the pulpit, but quite congruous with the taste of his own age. His style is vigorous, free and lively, and in many respects he may be regarded as a sort of predecessor of Abraham a Sancta-Clara. Of his writings, now very rare, are *Narrenschiff* (Lat., Strasb. 1511; Ger. by Pauli 1520), comprising 412 sermons on Sebastian Brandt's (q. v.) *Narrenschiff*; *Das Irrig Schaf* (Strasb. 1510); *Der Seelen Paradiess* (Strasb. 1510); *Das Schiff der Pönitēnz und Busswirkuna* (Augsb. 1511); *Das Buch Granatapfel*

GEITONOGAMY, n. *gī' tōn-ōg' ā-mī* [Gr. *geitōn*, neighboring, contiguous; *gamos*, marriage]: the fecundation of a flower by pollen from other flowers on the same plant.

GEK'KO: see GECKO.

GELA, *jē' la*: in ancient times, a very important town, on the s. coast of Sicily, on the river Gela. It was founded by a Rhodian and Cretan colony B.C. 690. Its rapid prosperity may be inferred from the fact that as early as B.C. 582, Agrigentum was founded by a colony from Gela. After Cleander had made himself tyrant B.C. 505 the colony reached its highest power under his brother Hippocrates, who subdued almost the whole of Sicily, with the exception of Syracuse. Gelon, successor of Hippocrates, pursued the same career of conquest, and Syracuse itself fell into his hands, and was made his principal residence, G. being committed to the government of his brother Hiero. At G. Æschylus died and was buried B.C. 456. During the Carthaginian wars it suffered greatly, but its ruin was completed by Phintias of Agrigentum, before B.C. 280.

GELALÆAN-ERA—GELATIGENOUS.

GELALÆAN-ERA, n. *jěl-a-lē'an-ē'ra* [named after *Gelal-u-Din*, Sultan of Khorassan]: era introduced by Gelal-u-Din, commencing 1079, March 4.

GELASIMUS, n. *jē-lās ĭ-mūs* [Gr. *gelasimos*, laughable—from *gelaō*, I laugh]: the calling crab, so named because they put out one of their claws, which is proportionately very large, as if they beckoned another animal to come to them, their real intention being, however, to threaten. They belong to the tribe *Brachyura* (short-tailed crustaceans), and the sub-tribe *Catometopa*.

GELASIUS, *jē-lā'shī-ūs*, I., POPE OF ROME: born in Africa, succeeded Felix III. as pope 492, Mar. 1; died 496, Nov. 19. During his pontificate the canonical books of Scripture were separated from the apocryphal. He is said to have confirmed the estrangement between the eastern and western churches by insisting on the removal of the name of Acacias, Bp. of Constantinople, from the diptycles, and to have been the first pope who asserted the supremacy of the papacy, over all imperial powers and all ecclesiastical bodies. Numerous extant writings are ascribed to him, but, excepting five, are believed to be spurious. He was canonized, and his day is the anniversary of his death.

GELATIGENOUS, a. *jël'ă-tĭj-ĕ-nūs* [Eng. *gelatin*; Gr. *gennāō*, I produce (see GELATIN)]: capable of producing gelatin. **GELATIGENOUS TISSUES**, substances resembling the proteine-bodies (albumen, fibrine, and caseine) in containing carbon, hydrogen, nitrogen, oxygen, and sulphur; but differing from them in containing more nitrogen and less carbon and sulphur. They consist of two principal varieties, viz., those which yield glutin (or ordinary *gelatin*), and those which yield *chondrine*.

Glutin is obtained by more or less prolonged boiling with water, from the organic matter of bone (the *osseine* of Frémy), from tendons, skin cellular tissue, white fibrous tissue, the air-bladder and scales of fishes, calves' feet, hartshorn, etc.; while chondrine is similarly obtained from the permanent cartilages, from bone-cartilage before ossification, from enchondromatous tumors, etc. Neither glutin nor chondrine appears to exist as *such* in the animal body, but is in all cases the result of the prolonged action of boiling water on the above-named tissues. Frémy's analyses (see his *Recherches Chimiques sur les Os*, in the *Ann. de Chim. et de Phys.*, 1855, XLIII., 51) show that osseine is isomeric with the glutin which it yields, and further, that the amount of glutin is precisely the same as that of the osseine which yields it. The following table exhibits the composition of osseine and the glutin yielded by it as determined by Frémy, and that of chondrine as determined by Mulder:

	Osseine.	Glutin.	Chondrine.
Carbon,	49.21	50.40	49.97
Hydrogen,	6.50	6.50	6.63
Nitrogen,	17.86	17.50	14.14
Oxygen with a little Sulphur,	25.14	26.00	28.97

Glutin, when perfectly pure and dry, is a tough, translucent, nearly colorless substance, devoid of odor and taste.

GELATIGENOUS.

It swells when placed in cold water, and loses its translucency; but in boiling water it dissolves, and forms a viscid fluid, which on cooling forms a jelly. A watery solution containing only 1 per cent. of gluten, gelatinizes on cooling. This property is destroyed both by very prolonged boiling and by the action of concentrated acetic acid. Gluten is insoluble in alcohol and in ether. A solution of gluten is abundantly precipitated by solutions of corrosive sublimate and of bichloride of platinum, as well as by infusion of galls, of which the active principle is tannin or tannic acid (the terms being synonymous). Tannic acid produces, even in very dilute solutions, a copious yellow or buff-colored precipitate of tannate of gluten. The gelatigenous tissues unite in a similar manner with tannin; they extract it from its watery solutions, and form compounds with it which resist the action of putrefaction. It is thus that hides are converted into leather (q.v.). The tests above mentioned also precipitate albumen, but gluten may be distinguished from albumen by its not being thrown down (as is the case with albumen) by the addition of ferrocyanide of potassium together with a little acetic acid. The gelatinizing property also serves to distinguish gluten when it amounts to 1 per cent. or more of the solution. On exposure to the atmosphere, gluten becomes putrid more rapidly than almost any other animal substance. Under the influence of oxydizing agents, it yields the same products as the proteine-bodies; treated with the mineral acids or with alkalis, it yields Glycocine (q.v.)—known also as glycine, glycoll, and sugar of gelatin—Leucine (q.v.), and other products. Isinglass, prepared from the air-bladder of the sturgeon, etc., when boiled with water, furnishes gluten in a nearly pure state. Glue and size are two well-known forms of impure gluten or gelatin.

Chondrine resembles gluten in physical properties, and especially in its property of gelatinizing. It differs, however, slightly from it in chemical composition (see the above table), and in behavior toward reagents. For instance, acetic acid, alum, and the ordinary metallic salts of silver, copper, lead, etc., which produce no apparent effect on a solution of gluten, throw down a precipitate from a solution of chondrine; while, on the other hand, corrosive sublimate, which precipitates gluten freely, merely induces a turbidity in a solution of chondrine.

Little is known regarding the physiological relations of these substances. Gluten (according to Scherer) exists usually in the juice of the spleen, but in no other part of the healthy animal body; it is found sometimes in the blood in cases of leucocythæmia, in pus, and in the expressed juice of cancerous tumors. Chondrine has been found in pus. The gelatigenous tissues rank low in the scale of organization, and their uses are almost entirely physical. Thus they form strong points of connection for muscles (the tendons), they moderate shocks by their elasticity (the cartilages), they protect the body from rapid changes of temperature by their bad conducting power (the skin), and they are of service through their transparency (the cornea).

GELATIN.

GELATIN or **GELATINE**, n. *jě'l'ă-tîn* [F. *gêlatine*—from mid. L. *gelatina*—from L. *gelātus*, congealed; *gělū*, icy coldness]: nitrogenous substance, forming glue, size, and isinglass, found in animals, chiefly in their connective tissues, but not found in vegetable substances; animal jelly; glue; glutin. **GELATINOUS**, a. *jě-lăt'î-nūs*, resembling or consisting of jelly. **GELAT'INATE**, v. *-î-năt*, or **GELAT'INIZE**, v. *-nîz*, to convert into jelly; to assume the form of jelly. **GELAT'INATING**, imp. **GELAT'INI'ZING**, imp. **GELAT'INATED**, pp.: **GELAT'INIZED**, pp. *-nîzd*. **GELAT'INA'TION**, n. *-nă'shŭn*, the act or process of converting into gelatin.—Gelatin is a term which though usually applied to only one variety of the substance, obtained by dissolving the soluble portion of the gelatinous tissues of animals, nevertheless properly denotes also **ISINGLASS** and **GLUE**, which are modifications of the same material. Vegetable jelly also is analogous.

Gelatin and glue signify the more or less pure and carefully prepared jelly of mammalian animals, but the term isinglass is applied only to certain gelatinous parts of fishes, which from their exceeding richness in G., are usually merely dried and used without any other preparation than that of minute division for facilitating their action.

GELATIN (proper) is prepared for commercial purposes from a variety of animal substances, chiefly from the softer parts of the hides of oxen and calves and the skins of sheep, such as the thin portion which covers the belly, the ears, etc.; also from bones and other parts of animals. Some of the best of the varieties of G. are made from carefully selected portions of ox and calf hides. Another excellent preparation is from calves'-feet, and is adapted for invalids.

The general method adopted with skin-parings or hide-clippings, is first to wash the pieces very carefully; they are then cut into small pieces and placed in a weak solution of caustic soda for a week or ten days, the solution being kept moderately warm by steam-pipes. When this process of digestion has been sufficiently carried on, the pieces of skin are then removed into an air-tight chamber lined with cement, and here they are kept for a time, determined according to the skill of the manufacturer and the kind of material employed, at a temperature of 70° F. They are next transferred to revolving cylinders supplied with an abundance of clean cold water, and afterward are placed still wet in another chamber lined with wood, in which they are bleached and purified by exposure to the fumes of burning sulphur; they next receive their final washing with cold water, which removes the sulphurous acid. The next operation is to squeeze them as dry as possible, and transfer them to the gelatinizing pots, which are large earthen vessels, inclosed in wooden cases, made steam-tight. Water is poured in with the pieces, and kept at a high temperature by means of the steam in the cases surrounding the pots. By this means the G. is quite dissolved out of the skin, and is strained off while hot; it is poured out in thin layers, which as soon as they are sufficiently cooled and consolidated, are cut into small plates, usually oblong, and laid on nets, stretched horizon-

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tally, to dry. The cross-markings observable on the plates of G. in the shops, are left by the meshes of the nets.

Another process consists in treating pieces of calf-skin by water alone, without the soda and sulphur processes; the pieces, after simple washing, being transferred at once to the pots to be acted upon by the steam; undoubtedly, this is the purest product, but the expense prevents its general use. Inferior G. is made from bones and other parts of animals, and it was stated by an eminent authority, that in Paris the enormous number of rats which are occasionally killed in the sewers and abattoirs, after being deprived of their skins, which are reserved for other purposes, all are used by the G.-makers. These materials are placed in cages of wire, which are placed in steam-tight boxes, where they are submitted to the direct action of steam of 223° F., but at a low pressure; and cold water, supplied by another pipe through the upper part of the box, is allowed to flow slowly and percolate through the contents of the cage, the water and condensed steam descend to the bottom charged with G. and are drawn off by a stop-cock placed there for the purpose. The French manufacturers succeed better than any others in clarifying these inferior gelatins, and they rarely make any others; they run their plates out very thin, which gives them greater transparency and apparent freedom from color; and they color them with most brilliant colors, and form very fine-rolled sheets, tempting the eye with an appearance of great delicacy and purity, which would at once disappear if the material were made up into the thicker plates of the manufacturers in other countries. The purity of G. may be easily tested; thus: pour upon dry G. a small quantity of boiling water; if pure it will form a thickish gluey colorless solution, free from smell; but if made of impure materials, it will give off a very offensive odor, and have a yellow gluey consistency. No article manufactured requires such careful selection of material and such nice and cleanly manipulation to insure a good marketable character; and those desirous of purity should avoid all artificially colored varieties, however temptingly prepared, unless they are required for merely decorative purposes and not for food. For the value of gelatin as food, see DIET.

ISINGLASS [supposed to be derived from the German *Hausenblase*, bladder of the sturgeon], the *Ichthyocolla* [*ichthus*, a fish; *kolla*, glue] of the classical and scientific writers, was formerly obtained only from the common sturgeon (*accipenser sturio*), and consisted of the dried air-bladder of the animal. The necessities of modern commerce have led to the discovery, that the same part in many other fishes forms good isinglass; and instead of Russia, as formerly, being almost the only producing country, large quantities are now obtained from S. America, chiefly imported from Maranhão, some from the E. Indies, the Hudson's Bay Territory, and Canada, also in New York.

The commercial varieties of isinglass are numerous, and a thorough knowledge of them can be obtained only by considerable personal acquaintance with them; therefore,

their names only are given, with those of the producing animals:

RUSSIA—

Long Staple Ural,*	1st quality.	}	Accipenser Guldenstadtii.
	2d "		
Short Staple Patriarch,		}	
Book Patriarch,	1st "		
" "	2d "	}	
Thin leaf Patriarch,	1st "		
" "	2d "	}	Accipenser Huso.
Belugo,	1st "		
" "	2d "		

The brown soiled and ragged ends called *Pickings*.

Sisane, Leaf,	.	.	?	}	
Kroski, or Krosky,	.	.	?		
Samovey, leaf,	"	.	1st quality.	}	Silurus Glanis (?)
" "	"	.	2d "		
" staple,				}	
" book,	1st "				
" "	2d "				
Siberian, Purse,	.	.	.		Accipenser Sturio (?)

SOUTH AMERICA—

Brazilian Pipe,	.	.	.	.	}	Probably a species of Pimelodus.
" Lamp,	.	.	.	.
" Honey-comb,	.	.	.	.	}	Probably a species of Silurus.

EAST INDIES—

Last Indian, Purse,	}	Probably a species of Polynemus.
" " Leaf,		

NORTH AMERICA—

Hudson's Bay, Purse	.	.	.	.	Accipenser.
New York, Ribbon,	.	.	.	.	Gadus Merluccius.
Canadian, leaf,	.	.	.	.	Accipenser Sturio.

Besides these now well-known commercial varieties, others are occasionally met with, as the *Manilla*, in thin cakes; the *Para*, most remarkable of all, resembling grapes of a reddish-brown color, growing from a straight thick stem; these are the dried ova of the *Sudis gigas*, a large fish common in the mouths of the Amazon. An inferior kind is made of cod-sounds and sole-skins, sufficiently good, however, to be used in fining beer and other liquids.

One of the qualities of G. is its power to form chemical combinations with certain organic matters; hence, when mixed and dissolved in a fluid containing such matters, it combines, and the compound is precipitated. It would appear that this combination, however, is threadlike in its arrangement, and that the crossing threads form a fine network through the fluid, which, in falling, carries down all floating substances, which, by their presence, render the liquid cloudy; hence its great value in clarifying beer and other liquids. For this reason isinglass, which has been found the best G. for the purpose, is very largely consumed by brewers.

Isinglass, strictly speaking, is not G., but its only value is from the excessive proportion of G. held in the tissues of the organ which yields it, greatly enhanced by the ease with which it is abstracted from the membrane when compared with the complicated process necessary for separating

* So called from the bladder being purposely bent into the form of a *staple* in drying.



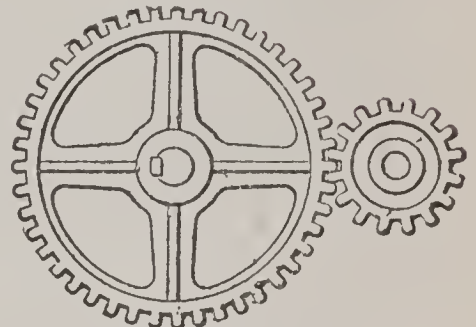
Gazelles (*Gazella Granti*).



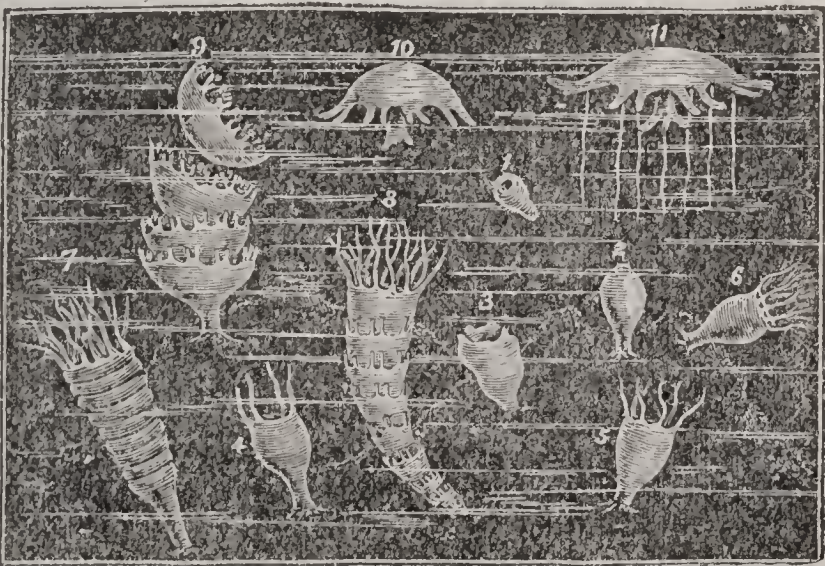
Gemshorn.



Gazelles (*Antelope Dorcas*).



Spur-gearing.



Generations.— Life-history of the common Jelly-fish: 1, Free-swimming embryo (*planula*); 2-6. The embryo fixed, developing into a 'hydratuba,' which (7-8) divides transversely into a pile of individuals; these in turn (9) are liberated, and grow (10-11) into jelly-fish. A.

GELATIN.

and purifying the G. from the skins, etc., of other animals. When separated, however, the substances are identical in composition, and, if pure, are undistinguishable from each other.

Besides the substances mentioned as yielding G., formerly hartshorn shavings were used, and ivory turnings and sawdust are still employed, both, however, chiefly for dietetic purposes for invalids; and various kinds of animal food are valued for the abundance of G. that they contain, as the Trepang and Beehe de Mer (species of *Holothuria*), sharks' fins, fish-maws, ray-skins, elephant hide, rhinoceros hide, and the softer parts, all of which are luxuries among the Chinese, Japanese, Siamese, Malays, etc. Turtle-shells, or the upper and lower parts of the shield (*carapace* and *plastron*), constitute the callipash and callipee of the epieure, and form, in the hands of the experienced cook, a rich gelatinous soup. The fleshy parts of the turtle, calves' head and feet, and many other things, might be enumerated as valuable, chiefly in consequence of their richness in this material.

GLUE differs from *gelatin* only in the care taken in its manufacture, and in the selection of the materials from which it is made; almost every animal substance will yield it, hence all kinds of animal refuse find their way to the glue-makers' boilers. Nevertheless, the impossibility of preserving, for any length of time, the materials required for this manufacture, renders it necessary to adopt some system in choosing and preserving them, until sufficient quantities are collected, without fermentation or decomposition. Hence the refuse of tanneries, consisting of the clippings of hides, hoofs, ear and tail pieces of ox, calf, and sheep are preferred, because they can be dressed with lime, which removes the hair, and acts as an antiseptic. For this purpose they are placed in tanks with quicklime and water for two or three weeks, during which the lime is several times renewed, and the pieces frequently turned over. They are afterward washed and dried, and are ready for use by the glue-maker, who usually gives them another slight lime-dressing, and subsequently washes them; they are afterward exposed to the action of the air for a time, to neutralize the caustic lime. When well-drained, the pieces are placed in flat-bottomed copper-boilers, which have a perforated false bottom a little distance above the true one, to prevent the burning of the materials, and which have been supplied with rain or other soft water up to two-thirds the depth of the boiler, the pieces being piled up to some height above the top of the open boiler. The whole is kept at a gentle boiling heat until all the gelatinous part has dissolved out, and the mass of material has sunk down into the fluid. The boiling is sustained until, by repeated trials of small quantities, the operator knows the fluid is of the right consistency, when it is drawn off carefully into the congealing boxes, and fresh materials are added to the residue left behind in the boiler, and the process is repeated.

The congealing-boxes are of wood, and are nearly square, slightly narrower at the bottom than the top; they are

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filled to the brim, and when their contents are sufficiently solidified, the glue, with a little management, turns out in the form of a cube, which is cut into thin slices by a wire in the same manner as soap; and these larger slices are subdivided into smaller cakes by a wet knife. Frames, with nets stretched upon them, are provided for drying the cakes upon; and these frames, when covered with the cakes of glue, are adjusted one over another at a little distance apart, supported between four uprights, and if in the open air, covered over with little wooden roofs, the whole being arranged so that the air can have free access to facilitate drying. This process occasions some anxiety to the manufacturer, as the changes of the weather have great and often completely destructive effects upon glue in this state; and in some countries only the spring and the autumn are available with any satisfaction. Generally, after the open air drying, the glue is taken to drying-rooms heated slightly, where it hardens effectually; but it is not yet finished; the cakes at this stage have a dull, unsightly look, to remedy which they are dipped into cold water, or are wetted with a brush dipped in hot water, and re-dried, this wetting giving the cakes a bright varnished appearance. Great Britain does not excel in the manufacture of glue, and British workmen usually prefer the dark variety. Superior glue is made by the Dutch and Germans, and by the Americans, by whom the light and more carefully made varieties are most prized, the adhesive qualities being lessened exactly in proportion to the impurities present in the material.

Besides its use in joinery, cabinet-making, and similar operations, glue is used by paper-makers and in dressing silks; and for these last two purposes fine light-colored kinds in thin cakes are made. Large quantities are used also by paper-hangers and others for sizing walls in the state called *size*, which is the glue simply gelatinized after boiling in the first process. A very fine and pure white *size* is made by some bonnet-makers of the skins of calves' head, ears, and the under part of the neck and belly; this is used for stiffening straw, cotton, horse-hair, and other plaits for making bonnets and hats.

VEGETABLE JELLY, analogous to animal gelatine, is obtained largely from some fruits, but never in pure state; it is of value only in preserving such parts of the fruit for culinary purposes; but several of the sea-weeds yield a large quantity of very pure jelly, which, in some instances, is applied to important purposes: thus, the jelly of *Fucus spinosus*, the agar-agar, or agal-agal, abundant on the shores of the eastern seas, is used by the E. Indians, Cingalese, and Chinese for dressing their silks; the Chinese also ingeniously form thin films of the jelly over a framework of bamboo, and thus make small windows for their houses. This, and another, *Gracillaria lichenoides*, are formed into a thick jelly, with sugar and other materials, and eaten as a delicacy; and both are supposed to supply the material for those wonderful birds'-nests, which constitute the most costly luxury known to the art of cooking. Another jelly-yielding sea-weed is found on American and British shores,

called Irish moss or carrageen (q. v.), which is often made into jellies for invalids, and the plant itself is extensively used in feeding cattle, especially in England.

GEL'BITE: see EXPLOSIVES.

GELD, v. *gæld* [Icel. *gelda*; Ger. *geilen*; Dan. *gilde*, to castrate]: to deprive of generative power; to castrate; to deprive of any essential part. GELD'ING, imp.: N. act of depriving of generative power; a castrated animal, chiefly a horse. GELD'ED, pp. castrated.

GELDERLAND, *chël'dér-lánt*: province of the Netherlands, between the Zuider Zee on the n.w., and the Prussian dominions on the s.e.; 1,948 sq. m. It is watered chiefly by the Yssel, and Rhine, and the Waal. The surface is undulating, and northward from Arnheim, the capital, are beautiful well-wooded districts; in the n.w., sandy ground, heath, and extensive tracts of oak trees, grown for bark and fire-wood. The climate is healthful, and the soil, on the whole good, though much of it is still uncultivated sand and marsh. Along the river valleys a rich loamy soil is found. Agriculture is prosecuted with great success. Wheat, rye, buckwheat, tobacco, fruit, etc., are extensively grown. Among the manufactures paper, and leather are the principal. Chief towns—Arnheim, Nimeguen, and Zutphen. Pop. (1901) 580,691.

GELÉE, CLAUDE: see CLAUDE LORRAINE.

GELID, a. *jěl'id* [L. *gelidus*, cold as ice—from *gělū*, ice, frost: It. *gelido*]: very cold. GEL'IDLY, ad. *-lī*. GEL'IDNESS, n., or GELIDITY, n. *jě-līd'ī-tī*, great coldness.

GELIDIUM, *jěl-īd'ī-ūm*: genus of *Algæ* (sea-weeds), of sub-ord. *Ceramiaceæ*, some of the species of which are believed to afford the material used by certain species of swallow in building the edible nests so much prized by the Chinese: see NESTS, EDIBLE. Several species of G. are used as food in the east. Like many other sea-weeds of this order, they are almost entirely gelatinous, and when boiled with condiments to give pungency and flavor, form a very wholesome and agreeable food.

GELL, *jěl*, Sir WILLIAM, Knight: antiquarian and classical scholar: 1777–1836, Feb. 4; younger son of Philip G. of Hopton, Derbyshire. He was educated at Jesus College, Cambridge, where he graduated B.A. 1798, and M.A. 1804, and was sometime a fellow of Emmanuel College in that university. He gave his time principally to antiquarian research and geographical studies, and published the following: *The Topography of Troy* (1804, folio); *The Geography and Antiquities of Ithaca* (1808, 4to); *The Itinerary of Greece* (1810, 4to); *The Itinerary of the Morea* (1817, 8vo); *Attica* (1817, folio); *Pompeiana, or Observations upon the Topography, Edifices, and Ornaments of Pompeii*—in conjunction with J. P. Gandy, an interesting and beautiful work, which first brought his name into notice (2 vols. 8vo 1817–19; second series, 2 vols. 8vo, 1832); *Narrative of a Journey in the Morea* (1823, 8vo); *The Topography of Rome and its Vicinity* (1834, 8vo); *Rome and its Environs* (Map

GELLERT—GELON.

1834). In his later years he resided in Italy, principally at Naples, having a house also at Rome. He died at Naples.

GELLERT, *gěl'ért*, CHRISTIAN FÜRCHTEGOTT: 1715, July 4—1769, Dec. 13; b. Haynichen, in the Erzgebirge, in Saxony; poet and moralist. He entered the Univ. of Leipsic 1734, where he applied himself mainly to theology. After some years as tutor, and teacher in a public academy, he obtained a professorship in the Univ. of Leipsic 1751. His lectures on poetry, rhetoric, and morals were numerous and were greatly admired. G. was a man of spotless virtue, but rather feminine in mind and character. He wrote fables, stories, didactic poems, spiritual odes and songs. His most popular writings were his fables and stories, marked by ease and naturalness. His spiritual odes owe their continued popularity to their devout fervor, and to a certain vigor and loftiness of flight not found in his other poems. G. was one of the pioneers of modern German literature. He marks, with others, the transition from the dulness and pedantry of the previous generation of authors, to that rich and superabundant life which Goethe and Schiller poured into the national literature. G.'s collective works (*Sämmtliche Werke*) appeared first at Leipsic, 10 vols. (1769–74), and have passed through various editions; the most recent, Berlin (10 vols. 1867). Compare *Gellert's Leben*, by J. A. Cramer (Leip. 1774), by Döring (1833), and by Ritter (1870); also *Gellert's Tagebuch* (2 ad., Leip. 1863).

GELLIUS, *jěl'ĩ-ūs*, AULUS: Latin author, who seems to have lived about A.D. 117–180: the exact date, of either his birth or his death, is not known. He is supposed to have been born at Rome, where it is known that he studied rhetoric. Subsequently, he went to Athens to undergo a discipline in philosophy. On his return to Rome, he entered upon a legal career, but not abandoning his literary pursuits. G.'s well-known work, the Attic Nights (*Noctes Atticæ*), begun during the long nights of winter in a country-house near Athens, and completed during the latter years of his life, is a collection of miscellaneous matter on language, antiquities, history, and literature, in 20 books, of which the 8th is wanting. It contains many extracts from Greek and Latin authors no longer extant. The work is destitute of any plan or arrangement, is disfigured by archaisms, and derives its value mainly from being a repertory of curious knowledge. The *Editio Princeps* appeared at Rome 1469; the earliest critical edition is that of Gronovius (Lug. Bat. 1706); the most important edition is that of Hertz (2 vols., Leip. 1853). G. has been translated into English by Beloe (Lond. 1795); into French by the Abbé de Verteuil (Paris, 1776); and (in part) into German by Von Walterstern (1785), also by Weiss (Leip. 1875–6).

GELON, *jěl'on*: 'tyrant' of Gela and Syracuse: b. Gela; son of Deinomenes; d. B.C. 485 (ruled B.C. 491–478). His family was one of the oldest and most distinguished in the place. G. himself figures in history first as one of the

GELONES--GELSEMIUM.

body-guards in the service of Hippocrates, tyrant of Gela. On the death of the latter, he contrived to obtain the supreme power, and about B.C. 485 he made himself master of Syracuse also, which then became the seat of his government, and to which he transferred the majority of the inhabitants of Gela. His influence soon extended itself over the half of Sicily. G. refused to aid the Greeks against Xerxes, as they declined to comply with his demand that he should be appointed commander-in-chief. About the same time, Terillus, ruler of Himera, in Sicily, invoked the aid of the Carthaginians against Theron of Agrigentum, who had dispossessed him of his state. G., who was in alliance with Theron, hastened to the assistance of the latter, and on the same day (according to tradition) on which the Greeks won the battle of Salamis, he gained a complete victory over the invaders at Himera. The consequence was an immediate treaty of peace between him and the Carthaginians, who were compelled to pay all the expenses of the war. His clemency and the wisdom of his measures rendered him so generally beloved, that when he appeared unarmed in an assembly of the people, and declared himself ready to resign his power, he was unanimously hailed as the deliverer and sovereign of Syracuse. The story current in later times, that one of the conditions on which he granted peace to the Carthaginians was, that their human sacrifices should be abolished, has probably no historical foundation, but illustrates the general belief in the humanity of his character. The people, who, contrary to his desire, had erected a splendid monument to his memory, paid him honors as a hero, and at a later period, when all the brazen statues were sold under Timoleon, his statue was made an exception to the general rule. He was succeeded by his brother Hiero.

GELONES, *jě-lō'něz*, or GELONI, *jě-lō'nī*: people of Scythia, descended from Gelonus, a son of Hercules, and occupying a region e. of the Borysthenes river. They were inured from their youth to labor and fatigue, and painted themselves to appear more terrible in battle.

GELOSCOPY, n. *jě-lōs'ko-pě* [Gr. *gelōs*, laughter; *skopeō*, I see]: an old kind of divination by the laughter of any person; the inferring or discovering the qualities, etc., of any person by the nature of his laughter.

GELSEMIUM SEMPERVIRENS: the Carolina or yellow jasmine, a clinging vine indigenous to the southern Atlantic sea coast of the United States, characterized by abundance of yellow and strongly perfumed flowers. It belongs to the family of Loganiaceæ and must not be confounded with the true Jasmine (q.v.) or with the Cape Jessamine. The stem is twining, smooth, and shining; the leaves are perennial, dark green above and lighter below, petiolate, lanceolate. The flowers about an inch across, grow in clusters; the calyx is five-leaved and the corolla is funnel-shaped and five-lobed. The fruit is a flat compressed capsule, two-celled, and contains a number of flat seeds. The flowers are reputed poisonous. The rhizomes or creeping

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stems are collected for use in medicine. They contain an alkaloid, gelsemine, and an acid, gelsiminic acid, both characteristic of the plant. Its aqueous or alcoholic extract may be used. In excess it produces narcotic and toxic effects, inducing muscular weakness and chilly sensations, and interfering with the circulation of the blood, probably by the disturbance of the heart's action. It is used as an antiperiodic and in spasmodic and neuralgic affections. A planter of Mississippi discovered its power accidentally, administering it to himself by mistake for the root of another plant. The dose of the tincture is 10 minims, of the fluid-extract 2 minims, to be repeated every 2, 4, or 6 hours until the desired or some definite effect is produced. The fatal dose is not well fixed; in one case 40 drops of the fluid-extract proved fatal, but less would probably have had the same effect. It has found a place in the U. S. Pharmacopœia under the title *Gelsemium*.

GELT, n *gëlt* [Gael. *geillte*, a coward—from *geill*, to yield]: in *OE.*, a cowardly, guilty person; a coward.

GEM.

GEM, n. *jēm* [AS. *gym*, a gem; Icel. *gim*, shining—from *gima*, to shine (see **GEMMA**)]: a precious stone of any kind; in *bot.*, a bud; anything exceedingly beautiful or attractive: V. to adorn with precious stones; to embellish; to bespangle; to put forth the first buds. **GEMMING**, imp. **GEMMED**, pp. *jēmd.* **GEMMY**, a. *jēm'mī*, resembling or adorned with gems; glittering. *Note.*—The origin of **GEM** is obscured by the loss of an *l*, thus Icel. *gimlir*, splendor—from *gima* for *glima*, to shine: L. *gemma*, in sense of 'a gem,' is an acquired sense.

GEM: usually a precious stone of small size, such as may be used for setting in a ring, or for similar purpose of ornament: sometimes in mineralogy, in an arbitrary sense for scientific classification, used to denote an *order* or *family* of minerals, generally hard enough to scratch quartz, insoluble in acids, infusible before the blow-pipe, without metallic lustre, but mostly brilliant and beautiful. Among them are included some of the minerals, which, in popular language, are most generally known as gems—ruby, sapphire, spinel, topaz, beryl, emerald, tourmaline, hyacinth, zircon, etc.—and some rarer minerals of similar character; but with these are ranked minerals, often coarser varieties of the same species, which are not *gems* in the popular sense of the word, e.g. emery and common corundum, while diamond and some other precious stones, much used as gems, are excluded. See **PRECIOUS STONES**.

The term *Gem*, in archeology, is applied to engraved stones of the precious kinds and even small engraved portions of hard and primitive rocks which have been set and worn as jewels by the ancients. Before entering on the subject of engraved stones, let us notice the principal kinds mentioned by ancient authors, or found by modern researches to have been used for engraving.

Although the principal varieties of precious stones were known to the ancients, yet owing to the absence of scientific and chemical analysis, they appear to have distinguished precious, and other stones, only by color, specific gravity and density. The different nomenclature, too, used by different authors, multiplied synonyms and caused confusion; so that it has become impossible to identify all the stones mentioned by Theophrastus, Pliny, and others. As a general rule, the ancients did not engrave such precious stones as the diamond, ruby, and sapphire, being content with those of less hardness and value. The principal stones used by engravers were: (1) The carnelian, and its more transparent variety the sard, *sardion*, in common use in the days of Plato (so called from Sardes in Lydia, but obtained chiefly from India and Babylonia): (2) The chalcedony, supposed to be the ancient calchedonion, used for seals and reliefs, of which two kinds have been found: (3) The *onyx* or nail-stone, variously described by Pliny and his predecessors, but distinguished by a white layer resembling the nail: (4) the nicolo or *Ægyptilla*, obtained from the onyx, a blue spot with a black zone encircling it: (5) The *sardonix*, which was a variety of the onyx, having black, blue, white, and red colors, and used particularly for cameos and vases, by cutting down the lighter colored layers to the darkest for a

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background to the figures, a stone much prized by the ancients; the signet of Scipio Africanus the Elder being of this material and Emperor Claudius esteeming it and the emerald above all other gems: (6) The agate or *achates*, so named from a Sicilian river, embraced many varieties, as the jaspachates, dendryachates, but confounded with the jasper, considered a charm against scorpions and spiders, used for whetstones, and a talisman by athletes; it was obtained from Egypt, Greece, and Asia: (7) Plasma or the *Prasius*, root of emerald, much used under the lower empire; its varieties were the *Molochates* and *Nilion*: (8) Numerous varieties of the jasper, *iaspis*, green, blood-red, yellow, black, mottled or porcelain, and even blue, were employed for signets at the Roman period, and procured from India, Persia, and Cappadocia: Pliny mentions a remarkable statuette of Nero, weighing 15 ounces in this material: (9) Garnets. the *granatici* or red hyacinths of antiquity, which were in use principally in the latter days of the Roman empire, and among Oriental nations—with which may be classed: (10) The *carbunculus*, supposed, however, by some to be the name given by the ancients to the ruby, was brought from India, Garamantia, Carchedon, and Anthemusia: (11) The *hyacinthus* or jacinth, yellow variety of the garnet, which was used for signets, and came from Ethiopia and Arabia: (12) The *Lyncurium*, or *Lychnis*, ancient name of the true modern jacinth: (13) Several varieties of the emerald or *smaragdus* are cited by the ancients, as the Bactrian or Scythian, supposed to be a green ruby, derived principally from the emerald mines at Zabora, in the neighborhood of Coptos, worked by conscripts, and described by Agatharcides. Many remarkable stories are told of this gem, which has been found with engravings of only a later period; one sent by a king of Babylon to a king of Egypt was 4 cubits long and 3 in width; an obelisk in the temple of Jupiter, 40 cubits high, is said to have been made out of four emeralds; and Theophrastus mentions an emerald column of great size in the temple of Hercules at Tyre. In the Egyptian labyrinths, according to Apion, was a colossal Serapis of great height, made of emerald. This stone was used by gem-engravers to 'refresh' the sight, or inlaid in the eyes of statues, as in the Lion at Cyprus, erected to Hermias; it was set in the ring of Polycrates; and used as a lens by Nero to behold the fights of the gladiators in the circus: (14) The Beryl or *Beryllus*, obtained from India, cut in shape of a hexagonal pyramid, was used at an early period for engraving: (15) The amethyst, brought from Arabia Petræa and Armenia Minor, is found used for intagli at all periods: (16) The *sapphirus* of the ancients, supposed by some to be *lapis lazuli*, came from Media, and appears in use among the Egyptians and Persians: (17) The *anthrax*, supposed to be the ruby, was not engraved; the hyacinthus has also been conjectured to be the blue sapphire: (18) The topaz, *topazon*, applied by the ancients to a green stone found by the Troglodytes in the island of Cytis, in the Arabian Gulf, and first sent by Philemon to Berenice, out of which also a statue of Arsinoe was made and placed in the so-

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called 'golden temple' by Ptolemy Philadelphus: (19) The *Chrysolithus*: (20) Chrysoprase, turquoise *callais*: (21) The *magnes* or loadstone, used for cylinders and gems of a late period: (22) The green tourmaline, or *avanturine*, *sandaresus*: (23) The obsidian, *obsidianus*, so-called after its founder Obsidius, four elephants made of which were dedicated by Augustus in the temple of Concord; and a statue of Menelaus, made of the same material, was returned to the Heliopolitans by Tiberius: (24) The *opal opalites*, or *pæderos*, obtained from India, the largest of which then known, of the size of a hazel-nut, belonging to the senator Nonius, was valued at about \$10,000, which he would not yield to M. Anthony; this stone was sometimes engraved: (25) The *adamas*, of which seven varieties were known to the ancients, was used only for cutting other gems, or worn rough, but was not engraved, or even faced, the art of polishing it having been discovered by Louis de Berghem, 15th c. The list of Pliny, indeed, contains many other stones, which have been confounded with those above noted—their names having been derived from different sources—or else they are species of the same. Many of these had fanciful names, as (26) the *Aromatites* of Arabia and Egypt, so-called from its fragrance: (27) The *alectorius*, worn by the wrestler Milo, so-called from being taken out of the gizzard of a fowl: (28) The *aspilates*, a fiery stone, said by Democritus to be found in the nest of Arabian birds. In the selection of stones for engraving, the gem-engravers adapted the material to the subject—Bacchanalian subjects were often engraved on amethysts; marine, on beryls; martial, on carnelians, sards, and red jaspers; rural, on green jasper; celestial, on chalcedonies. Superstitious virtues were attributed to the different varieties of gems—thus the amethyst was supposed to protect from the influence of wine; and according to Dioscorides, the jasper was adapted particularly for amulets; and Alexander of Tralles recommends the subject of Hercules engraved on a Median stone, to be worn on the finger as a remedy against the cholera.

The art of engraving precious stones at the earlier periods of the Egyptian monarchy was comparatively unknown, though these people made beads of carnelian, felspar, root of emerald, jaspers, lapis lazuli, amethyst, and other hard stones. For the purposes of seals, however, and for intagli, steatite scarabæi were generally used, and engraved gems are either of the greatest rarity or only suspected, till the time of the Ptolemies. A remarkable exception to this rule is a square signet of yellow jasper, engraved with the name and titles of Amenophis II. (about B.C. 1450) and his horse, in the British Museum. Under the Ptolemies and Romans, the Gnostic gems, called Abraxas, generally of lapis lazuli, blood-stone, and jasper, begin to appear, but these are made by the same process as the Greek, from which they were de-



Green Jasper Abraxas, with figure of Iao.

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rived. The Ethiopians, according to Herodotus, engraved signets. The same may be said of the neighboring Phœnicia, which either imitated the cylinders of the Babylonians, or the scarabæi of the Etruscans. In Assyria, the oldest gems are of cylindrical shape, from one to two inches long, and half an inch thick, pierced through their long axis for a cord to attach round the wrist. The earlier ones are of serpentine, the later of the time of Sargon or Sbalmaneser, of agate, jasper, quartz, and syenite, engraved with figures of the gods, and the names of their possessors in cuneiform. The inscriptions, indeed, are often difficult to read, but names similar to those of Assyrian and Babylonian monarchs occur, one cylinder having a name like that of Nebuchadnezzar. The Babylonian are of the same type, and chiefly of hæmatite, loadstone, steatite, and jasper; have also figures of deities, and the names of deities or the possessors, generally executed in a coarse rude style by the graver. Oval gems, indeed, appear, from the impressions on the clay tablets, to have been in use at the same time; that of cylinders passed to the Persians, under whom the art became much better, and chance has preserved the cylinder signet of Darius I.,



Chalcedony Cylinder: Signet of Darius I.

found in Egypt. These cylinders were abandoned for conical gems, principally of chalcedony, engraved on the base with figures of deities, in use prior to the conquest of Alexander, and were at a later period, commencing in the 3d c. after Christ, followed by hemispherical agate gems, with heads, animals, and Pehlevi inscriptions, generally of a rude and debased style of art. These at a later period, were succeeded by convex stones *en cabochon*, often garnets, sards, carbuncles, engraved on the upper surface, with rude figures of animals, heads, and other devices accompanied with Pehlevi inscriptions; and these probably continued till the rise of Mohammedanism in the East, when the art was confined to the engraving of cufic legends on the most valuable of oriental stones, often with great dexterity. In Judea, the use of signets (see SEALS) prevailed, and the most important known instance is the Urim and Thummim, or breastplate of the high-priest, consisting of 12 precious stones, engraved with the names of the 12 tribes;

but no Hebrew engraved stones earlier than the 5th or 6th c. are known. Among other oriental nations of antiquity, the Bactrians and early Hindus seem to have exercised the art of engraving on stones, though no works of great merit of these nations have been found, and those of a later age are mere seals engraved with sentences of the Koran, or the names of the possessors, and when smeared with black or colored inks, were impressed on documents as stamps. Of the other nations of antiquity, the Chinese only have had seals (see SEALS) of crystal, soapstone, porcelain, and other substances, with devices in relief for using as stamps, the subjects being mottoes from poetical and other works.

The Greeks, at the earliest period, are not supposed to have used engraved stones for their signets, the earliest rings being of solid metal, such as the legendary ring of Minos; but at a later period, those of Helen, Ulysses, and the legendary one of Gyges, are said to have had engraved stones. Orestes, in the tragedies, also is recognized as the son of Agamemnon by his engraved ring; and Mnesarchos, the father of Pythagoras, who lived about B.C. 700, was an engraver of gems. The earliest instance of an engraved gem is the emerald ring of Polycrates, set in gold or engraved by Theodorus of Samos about B.C. 740; while the laws of Solon against counterfeiting signets show that they may have been in early use. At the period of the Persian war they were common. Later, the writings of the Platonists and Stoics constantly allude to gems, and the flute-player Ismenias, B.C. 437, purchased an emerald engraved with a figure of Amymone. Still later, the poet Eupolis instances the extravagant prices given by the Cyrenæans for engraved stones in rings. Yet it is doubtful if any real Greek intagli earlier than the war of Peloponnesus can be identified, those hitherto cited in low relief, inclosed in a guilloche or engrailed border, and of a hard and stiff style of art, having been probably cut from the bases of scarabæi of Etruscan work.



Greek Sard,
with Indian
Bacchus.

At a later period their use was universal, and the names of celebrated engravers, such as Pyrgoteles and Apollonides, are known, the first named having the privilege of engraving the portrait of the monarch, Alexander the Great; Ptolemy V., presented as a most precious gift his portrait engraved on an emerald to Lucullus; and Cleopatra had a gem with a Bacchus. The style of engraving of this age is fine and noble, the hair indicated by fine wiry lines; the subjects are generally heroic, but busts and portraits of divine, regal, and historical personages appear. Sard, amethysts, and jacinths were in use.

Contemporaneous with the Greek school, if not earlier, was the Etruscan, consisting of scarabs entirely carved out of sard, carnelian, agate, with engraving often of exquisite work, but generally harsh, and sometimes of severe style, with subjects derived from the earliest Hellenic myths, and occasional inscriptions in the Etruscan language, the names

of the personages represented, seldom more than one figure appearing on the gem. The subject is surrounded with a guilloche or engrailed border, and the scarabs were pierced through their long axis, to set as rings or to wear as other objects of attire. Similar scarabs, but of green jasper, and of Phœnician workmanship, have been found in Sardinia. These gems probably were made from the beginning to the middle of B.C. 3d c., when Etruria fell into the power of the Romans, who derived their engraved stones from the Greek successors of Alexander, as engraved rings, with their subjects, are mentioned at the close of the republic, the device of Scipio Africanus being a head of Scyphax; that of Sylla, the submission of Jugurtha; of Pompey, a lion carrying a sword; and of Cæsar, Venus armed with a dart. So gréat had the passion for these charming little works of art increased, that Scarus, the step-son of Sylla, had even a collection of gems, *dactylitheca*. Pompey sent the collection of Mithridates as an offering to the Capitol; and Cæsar, to outvie his great competitor, presented six such collections to the shrine of Venus Genetrix; and Marcellus another to the cella of the Palatine Apollo. At the commencement of the Empire, the portraits follow the costume and art of the period; the hair is expressed by broad strokes, the compositions rarely contain more than two figures. Artists of great merit, as Dioscorides, Apollonides, and Chronios wrought in this age.



Carnelian Etruscan Scarabæus: Centaur and Deer.



Sard Portrait of Caligula.

The names of the artists who engraved the gems, and of the proprietors, are occasionally found upon them. The devices were various: Augustus had first a sphinx, then his portrait engraved by Dioscorides; Nero had Apollo and the Muses; Galba used first a dog, subsequently the head of Augustus. After the Antonines, indeed, the art rapidly declined, and portraits after Severus are rare, though even that of Mauricius is said to occur. At the middle period of the Empire, the work is exceedingly rude, often merely scratched out by a diamond point in carnelians, jaspers, and garnets. Some works, indeed, of the later or Byzantine period exist, but they are of little merit and poor execution, and the subjects are taken from Christian subjects. The gems of this later period are sometimes square, generally, however, the long or convex oval. The *camei*, or gems in relief, the ancient *ectypa sculptura*, appear at the period of the Roman Empire. This term *camei*, of uncertain origin, is applied to engravings on stones of two or more layers, such as the onyx or sardonyx, and niccolo, and is different from the relief-gems cut out of stones of one color. Ancient *camei*, indeed, are of the greatest rarity, and are not older

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than the imperial days of Rome. The smaller ones were used for rings: the larger, often perforated, are supposed to have been worn in the armor or dress, *phalera*. They were worked out with the diamond point; chiseled, so to say, out of the stone; and have, when examined, a rough appearance. The most remarkable ancient camei known are those of the Vienna collection, supposed to represent the apotheosis of Augustus, on which are Augustus, Jupiter, and Rome enthroned, the Earth, Ocean, Abundance, Germanicus, Victory, a triumphal car, Tiberius, and German captives; another, in the same collection, with Ptolemy II. and Arsinoe, the great cameo in the Bibliotheque at Paris, representing the apotheosis of Augustus; another in the collection of the Netherlands; and a fourth in the Vatican; a cameo at St. Petersburg, 12 inches long, and another, eight and a half inches wide by six inches high, in the Marlborough collection, with the heads of Didius Julian and Manlia Scantilla. At a later period, the art had considerably declined, and the Christians of the later days of the Empire were content with engraving inscriptions on camei. These gems were principally worn as objects of attire, and Heliogabalus is said to have placed intagli even in his shoes. The names of artists are rarely found upon camei; a celebrated one of the Marlborough collection, indeed, has the name of Tryphon, but there is considerable doubt about the authenticity of the inscription.

The subjects of ancient gems embrace the whole circle of ancient art, and follow the laws of its development, animal forms being succeeded by those of deities and subjects derived from the battles of Greeks and Amazons and Centaurs, the exploits of Hercules, and other heroes; then by scenes from tragedians and later myths; and, finally, by portraits, historical representations, and allegories. The inscriptions consist of the names of deities, heroes, and subjects: dedications to deities; the names of artists, sometimes in the genitive case, but often accompanied with the verb *epoei*, 'was making' (the affected imperfect used after the time of Alexander the Great); addresses to individuals: gnomic or other sayings, indicating that the gems are amulets against demons, thieves, and various evils; or charms for procuring love; the names of the possessors, and sometimes addresses, occasionally even distichs of poetry, and various mottoes. These inscriptions were often added by subsequent possessors, and are not of the age of the gem itself. The number of artists, though considerable, does not exceed 100 authentic names; and the true names are supposed to be distinguished from false ones by being placed at the side of the composition in very small letters terminating in dots; but even these have been successfully imitated by modern artists, and the keenest criticism and great learning have been employed to detect real ancient names by their orthography and palæography. The number of false antique stones produced by eminent engravers since the revival of the arts, has rendered the diagnosis of gems so difficult, that no branch of archæology requires greater judgment. All gems of high artistic merit and great finish are suspected,

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especially those with groups of many figures, regular edges, and polished faces, or too great a polish in the deep parts. Coarser imitations have been produced by backing pastes or colored glass (see GEMS, IMITATION) with stones, and mounting them in rings, so as to pass for a gem. The appearance of wear and friction has been produced by introducing them for awhile into the gizzards of turkeys, or in pierced boxes plunged in the beds of rivers. The judgment upon gems can be, however, matured only by a careful study and familiarity with all branches of ancient art. The coarser imitations of pastes, the tongue, the file, and the graver will detect; but old gems re-engraved, or new compositions invented, require the most careful investigation. The place or circumstance of discovery is only a feeble guarantee against deception, the commerce in false antiques being successfully plied upon the unwary even in the far East.

The chief implement used by the ancient engravers appears to have been made by splitting diamonds into splints (*adamantis crustæ*) by a heavy hammer, and then fixing these points like glaziers' diamonds into iron instruments, with which the work was executed by the hand (*ferra retusa*). The drill, *terebra*, was extensively used for hollowing out the deeper and larger parts of the work, and emery powder, the *smaris* or Naxian stone, for polishing. The so-called wheel, a minute disk of copper, secured to the end of a spindle, and moistened with emery powder or diamond dust, and driven by a lathe, does not appear to have come into use till the Byzantine epoch. It has been conjectured that the artist used lenses of some kind, or globes filled with water, to execute his minute work; but the ancient, like the modern engraver, rather felt than saw his way. All these processes were not employed by the same artist, for besides the engraver (*sculptor cavararius, dactylographus*), there was a polisher (*politor*), beside arrangers (*compositores gemmarum*), and merchants (*gemmarii mangones gemmarum*) who drove a flourishing trade in emeralds and pearls and engraved stones in the days of Horace.

The generally fall of the arts at the period of the Byzantine Empire, seems to have been accompanied by the decline of the art of engraving on gems; and the Merovingian and Carolingian monarchs were compelled to use antique gems, instead of those engraved by the artists of their day. Rock crystals, however, were engraved in a Byzantine style of art, with sacred subjects, in the 9th c.; but the art was nearly lost till the rise of Lorenzo de Medici, when Giovanni delle Corniole at Florence, and Domenico dei Camei at Milan, worked under his patronage. A subsequent school of gem-engravers originated with Pietro Maria de Pescia, who worked for Leo X.; the chief representatives of the school are Michelino, Matteo de Benedetti, the celebrated painters Francia, M. A. Moretti, Caradosso of Milan, Severo of Ravenna. Leonardo da Vinci, J. Tagliacarne, Bernardi of Castel Bolognese (died 1555) celebrated for a Tityus copied from M. Angelo. These were succeeded by Matteo del Nassaro of Verona, who worked for Francis I., and pro-

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duced a crucifixion on heliotrope, so that the red spot; seemed drops of blood issuing from the wounds of Christs Caraglio (in Poland 1569); Valerio dei Belli, who used rock-crystal chiefly; Marmitta, Domenico di Polo, Nanni, Anichini of Ferrara, and Alessandro Cesari, celebrated for a cameo head of Phocion; Dei Rossi, a Milanese, engraved the largest cameo of modern times; Jacomo da Trezzo, celebrated for his portrait, is said to have been the first to engrave on the diamond, 1564—an honor claimed, however, for Birago, another Milanese, both artists having been in the service of Philip II. of Spain, who made a portrait of Don Carlos and the arms of Spain on this gem.

The art, which had declined at the close of the 16th c. in Italy, flourished in the 17th c. in Germany under Rudolph II., for whom Lehmann engraved at Vienna; and in France, where Coldorê worked for Henry IV. and Louis XIII. In the 17th c. Sirletti (died, Rome, 1737), excelled in portraits, and copied antique statues with great excellence. The two Costanzi are celebrated in 1790; one for the head of Nero on a diamond. Rega of Naples is said to have come nearest to the antique. Natter of Nuremberg (died 1763) is celebrated for his intagli; Quay and Barrier were celebrated in the French school; and the English produced Reisen (died 1725); Claus (died 1739); Smart, celebrated for the rapidity of his works; and his pupil Seaton, a Scotchman, who engraved portraits of the great men of his day. The greatest artist of the age, however, was Natter. Of the subsequent Italian school, Ghinghi, Girometti, Cerbara, Bernini, and Putenati are much praised. The 19th c. produced many good English gem-engravers, as Marchant, Burch, Wray, and Tassie; while Pistrucci, celebrated for his charming cameo, Weigall, and Saulini, who made intagli, complete the list of modern gem-engravers.

Ancient gems in the dark and middle ages were preserved in shrines, châsses, and other ecclesiastical vessels in which they were set, the passion for collecting them as works of art having commenced with Lorenzo de Medici, who formed the Florentine collection, and had his name incised on his gems. The large camei of the European collections, however, appear to have been brought by the Crusaders from the East. The French collection dates from Charles IX., and was augmented by the successive kings of France; it is very rich in gems of all kinds: that of Berlin containing the united cabinets of the Elector of Bradenburg and the Markgraf of Anspach, collected by Stosch, consists of nearly 5,000 stones. The Vienna collection, far less numerous, is remarkable for its large camei. In England, the collection of the British Museum, gathered originally by Townley, Hamilton, Payne, Knight, and Cracherode, consists of about 500 stones, some of great beauty and merit, but is very poor in camei. The private collection of the Duke of Devonshire, formed in the last half century, comprises more than 500 intagli and camei, including some of the finest known. The Marlborough, still more numerous, comprises many fine camei and intagli, and numerous works of the renaissance. The Pulzky collection, now in Italy,

GEMARA—GEMELLARIA.

contains many rare and choice intagli. A celebrated collection, the Poniatowsky, formed on the base of the old collection of Stanislaus, last king of Poland, was so filled with forgeries by its last possessor, executed by Roman artists with inscriptions by Diez, that it entirely lost its value on dispersion. The Hertz collection, the last great one sold, was remarkably rich in fine Etruscan scarabæi and other intagli. There are probably about 10,000 gems reputed antique. Yet these are only a mere instalment of those formerly existing. The immense value placed by the ancients on their gems, may be seen by the scabbard of Mithridates, valued at 400 talents, or abt. \$37,500; the pearl given by Julius Cæsar to Servilia, worth abt. \$20,400; that swallowed by Cleopatra, valued at \$25,000; and the pearls and emeralds worn by Lollia Paulina, wife of Caligula, valued at more than \$1,500,000—all the spoils of provinces and the heirlooms of her family. These, indeed, were probably not engraved, but in modern times great sums have been paid to celebrated engravers, as much as \$4,000 for one cameo.

Although the acquisition of gems is too costly for private individuals, impressions in glass, called pastes (see GLASS), in sulphur, gutta percha, or plaster of Paris, can be easily obtained, and they answer almost all the purposes of study. Some ancient impressions in terra cotta, indeed, exist, and the poorer classes of Greece and Rome were content with glass pastes. The value of antique gems, owing to the great difficulty of discerning those really so, has considerably declined, and even their authority is very cautiously cited by archæologists. The principal writers of antiquity who treated of gems are, Onomacritus or the Pseudo-Orpheus, Dionysius Periegetes, Theophrastus, and Pliny, whose chapter is compiled from antecedent Greek and Roman authors. Isidorus, A. D. 630, gives an account of the principal stones: so do Psellus and Marbodius, 11th c.; Mariette, *Pierres Gravées* (4to, Paris 1750); Raspe, *Catalogue des Empruntes des Pierres Gravées* (4to, Lond. 1757); Millin, *Introduction à l'Étude des Pierres Gravées* (12mo, Paris 1796); Krause, *Pyrgoteles* (8vo, Halle 1856); King, *Antique Gems* (8vo, Lond. 1860); Bucher, *Gesch. der technischen Künste* (1875); Streeter's *Precious Stones and Gems* (1879).—See GEMS, ARTIFICIAL PRODUCTION OF: GEMS, IMITATION.

GEMARA, n. *gě-mār'ă* [Heb. *gemara*, tradition—from Chald. *gamar*, to finish or complete]: that portion of the two Talmuds which contains the annotations, discussions, and amplifications of the Mishna by the academies of Palestine on the one hand, and those of Babylon on the other. The Babylonian Gemara, more complete as well as more lucid than the Palestinensian, possesses a much more highly valued authority. The final redaction of this latter falls in the middle of the 4th c., while the Babylonian was not completed till A. D. 500: see MISHNAH and TALMUD. GEMARIC, a. *gě-mār'ik*, pertaining to.

GEMELLARIA, n. *jěm-ěl-lār'î-a* [L. *gemellaria*, *gemellar*, a vessel for holding oil]: typical genus of *Gemellaridæ*,

GEMINATE—GEMMA.

family of infundibulate polyzoa, sub-order *Cheilostomata*; founded by Prof. Burk.

GEMINATE: see under **GEMINI**.

GEMINI, n. plu. *jěm'î-nî* [L. *geminî*, twins; *geminātus*, doubled]: twins: one of the signs of the zodiac, being the third constellation in the zodiac; so named from its two brightest stars, Castor of the first magnitude, and Pollux of the second. **GEMINOUS**, a. *-î-nūs*, double; in pairs. **GEMINATE**, a. *-î-nāt*, in *bot.*, growing in pairs. **GEMINY**, n. *jěm'î-nî*, in *OE.*, a pair; a brace.

GEMISTUS, *jě-mîs'tūs*, **GIORGIOS**, called **GIORGIOS PLETHON**, and commonly **GEMISTUS PLETHON**: last of the Byzantine writers. The exact dates of his birth and death are uncertain, but he is known to have lived between 1350 and 1450. He was born probably at Constantiuople, but the greater part of his life was passed in the Peloponnesus. He was one of the deputies sent by the Greek church to the council at Florence 1438, for the purpose of arranging a union between the Latin and Greek churches. The council entirely failed in its purpose. G. was celebrated as philosopher more than theologian. In his time the Aristotelian philosophy was supreme, but it had degenerated into a mere science of words, from the study of which G. turned away disgusted, and applied himself to Plato. Plato's philosophy so charmed him, that thenceforward he labored for its propagation; and in furtherance of this view, G., when in Italy, induced Cosmo de Medici to embrace it. Cosmo's example was followed by others in Florence, and thus a Platonic school was founded in the west which flourished for nearly 100 years. During the latter part of his life G. was engaged in bitter conflict with the most eminent of the Aristotelians, among whom George of Trebizond held a high position, and the debate between the two was carried on with most unseemly violence. G. is heard of in history last in 1441, in the Peloponnesus in an official capacity. G. wrote a great number of works in history, philosophy, theology, etc

GEMITORES, n. *jěm-î-tôr'ěz* [L. *gemitus*, a sigh—from *gemo*, I sigh, I groan; name not appropriate, as *gemo* does not mean to coo, and the cheerful song of the pigeons is neither a sigh nor a groan]: cooers; the same as the sub-order *Columbacei*. It contains the pigeons.

GEMMA, n. *jěm'mă* [F. *gemme*—from L. *gemma*, a bud]: a bud. **GEMMA'CEOUS**, a. *-mă'shūs*, pertaining to leaf-buds or to gems. **GEM'MÆ**, n. plu. *-mē*, leaf-buds; bulbils or adventitious shoots. **GEM'MATE**, a. *-măt*, in *bot.*, having buds. **GEM'MATED**, a. having buds; adorned with gems. **GEMMA'TION**, n. *-mă'shūn*, the disposition of the buds on plants; the period of the expansion of buds on plants; in *zool.*, the reproduction of numerous species of the lower types of animals in which the process is akin to the budding of plants (see **REPRODUCTION**). **GEMMED**, pp. *jěmd*, adorned with buds or gems. **GEM'MEOUS**, a. *-mē-ūs*, connected with or having the nature of a gem. **GEMMIF'EROUS**, a. *-mîf'ér-ūs* [L. *fěro*, I bear]: bearing buds. **GEMMIP'A-**

GEMONA—GEMS.

ROUS, a. *-mǐp'ǎ-rŭs* [L. *pǎriō*, I produce]: reproducing by buds; multiplying by a process of budding (see REPRODUCTION). GEMMULE, n. *jēm'mŭl*, the first bud of the embryo; a little bud or gem.

GEMONA, *jā-mō'ná*: town of Venetia, 15 m. n. by w. from Udine, on a feeder of the Tagliamento. It lies in a deep basin among mountains. is well-built and surrounded by walls. G. has a large transit-trade, and two important annual fairs. Pop. 3,000.

GEMOTE, n. *gě-mōt'* [see MOTIF 2]: a meeting; an assembly usually in some sort official. Besides the great council of the nation—the *Witena-gemot*, usually spelled *Witenagemót* (q. v.) which corresponded to the Reichstage of the Franks, and which, though it took the place of the still more ancient meetings of the whole nation, to which Tacitus refers as characteristic institutions of the Teutonic tribes in his day, was a representative, though not perhaps an elective body (Kemble's *Saxons in England*, II. 194)—there were among the Anglo-Saxons various minor motes or moots, not representative. The existence of these is an instance of the manner in which the spirit of localization has always maintained its ground, and balanced that of centralization among the Germanic nations, particularly in England. There was the *shire-gemot*, or county court, which met twice a year; and the *burg-gemot*, thrice; the *hundred-gemot* (see HUNDRED), every month, and an extraordinary meeting of which was held twice a year; the *halle-gemot*, or *court-baron*. These institutions excluded not only central despotism, but local tyranny in the shape of individual caprice. The ealdorman decided only with the assent of the shire-gemote, just as the king was dependent upon that of the Witan.

GEMS, ARTIFICIAL PRODUCTION OF. Ever since the chemical composition of our most valued gems—diamond, ruby, opal, etc.—has been known, attempts have been made, with more or less success, to reconstruct them in the laboratory by the influence of intense heat, electrical action, etc. Among the most successful workers in this field are Ebelmen, Despretz, Sainte-Claire Déville, and Bequerel.

Boron was discovered simultaneously 1807 by Davy in England, and by Gay-Lussac and Thénard in France. This perhaps ought to be regarded as a step toward the artificial production of the diamond. The boron crystals possess a brilliancy, hardness, and refractive power scarcely inferior to those of the diamond.

There are at present no reasons for believing that diamonds of any appreciable size will be formed artificially; Despretz, however, by intense voltaic action, obtained minute, dark colored crystals of carbon. Mr. Hannay of Glasgow has recently succeeded in decomposing, by means of great heat and pressure, a gaseous hydrocarbon in such a way as to yield small fragments of crystallized carbon indistinguishable from the real diamond.

Sainte-Claire, Déville, and Caron published a very im-

GEMS.

portant Memoir of the *Comptes Rendus* (1858, XLVI.), in which they describe various processes by which they have succeeded in obtaining small crystals of white and green corundum, rubies, sapphires, etc. By the action of the vapors of fluoride of aluminium and boracic acid on one another, they obtained crystallized alumina (corundum) in large but thin crystals, some of which were about $\frac{1}{4}$ of an inch in length, and which in their hardness, and in all their optical and crystallographic properties, resembled natural corundum. When a little fluoride of chromium was added, a similar process yielded violet-red rubies of a perfectly natural tint; with rather more fluoride of chromium, blue sapphires were yielded; and with still more of this ingredient, green corundum was obtained, presenting the natural tint of the variety known as ouvaroffite. A mixture of equal equivalents of the fluorides of aluminum and glucinum when similarly acted on by boracic acid, yielded crystals of chrysoberyl or cynophane which, though very minute, were perfect in their form, and in all respects resembled the natural crystals. The action of fluoride of silicium on zirconia yields small crystals of zircon or hyacinth; and by the action of silicic acid on a mixture of the fluorides of aluminum and glucinum, hexagonal plates of extreme hardness were obtained, which in some respects resembled emerald (which they were attempting to form), but were not identical in composition with that gem.

Other researches on this subject are those of Becquerel, in the *Comptes Rendus* (1861, LIII, 1196). After having for many years tried to obtain gems from solutions of silicates, and by feeble electric currents, he then used intense currents, with high tension, and in this way succeeded in obtaining opals, etc. The latest and most successful processes are those of M. Ch. Feil of Paris, who, following out the experiments of Ebelmen, has by the use of more energetic heat-producing appliances succeeded in crystallizing alumina, and has thus, with the addition of a little coloring material, made sapphires and rubies identical in hardness and composition, although scarcely in brilliancy, with the real gems. See *Society of Arts Journal*, 1878, Mar. 1.

GEMS, IMITATION, OR PASTES (*Pierres Précieuses Artificielles*): imitations of the precious stones, made of glass specially prepared. It differs from ordinary glass in its greater density; at the same time it is made with the greatest possible amount of transparency and purity. Its composition, generally, may be said to be silica of very pure quality, probably rock-crystal, potash, and oxide of lead; but the exact proportions are varied by almost every maker, and each has a secret ingredient or two to add. The colors employed are usually the same as those for coloring ordinary ornamental glass, but on their careful admixture, and on the skilful cutting to represent the forms into which real gems are usually cut, the success of the manufacture chiefly depends. By some persons, the cutting is carried to such a marvellous perfection, that their work would de-

GEMS-BOK.

ceive the eye of most ordinary judges, when well set and foiled, or backed with silver or tinfoil: see FOIL.

The glass used for artificial gems is generally called *strass*, from the name of a German who claimed the invention. But if we seek the real inventor of factitious gems we must go far behind the time of Strass, for we find Pliny describing, under the name of *gemmae vitreae*, certain imitations of precious stones known in his time, some of which were certainly of colored glass, and others made by ingeniously cementing together layers of variously colored transparent stones. And Seneca (Epist. ix.) mentions that one Democritus had invented a process for imitating emeralds by giving a green color to rock-crystal. Other allusions are plentifully scattered through the works of classical authors; and ancient artificial gems themselves exist, two especially famous being imitations of a chrysolite and an emerald, among the Roman antiquities in the Museum Victorium at Rome.

The manufacture of factitious gems is carried on chiefly in Switzerland, and like the polishing of diamonds in Holland, is engrossed by a small community in the French commune of Septmoncel, on the Jura Alps, 16 m. from Geneva. More than 100 artisans are there employed in this manufacture, and they make almost enough to supply the whole world. Much common colored glass is cut up in Britain and America for the purpose of making the gilt-toy jewelry, but a few years ago scarcely more than one or two manufacturers were attempting imitations of precious stones with colored strass. The following are a few known formulas for imitating gems: *Amethyst*—Strass, 500 parts; oxide of manganese, 3 parts; oxide of cobalt, 2 parts. *Diamond*—Perfectly pure rock-crystal, 1,600 parts; biforate of soda, 560 parts; very pure carbonate of lead, 3,200 parts; oxide of manganese, 1 part. *Emerald*—Strass, 7,000 parts; carbonate of copper, 65 parts; glass of antimony, 7 parts. *Garnet, Oriental*—Strass, 1,200 parts; glass of antimony, 580 parts; Purple of Cassius, 3 parts; binoxide of manganese, 3 parts. *Ruby*—Strass, 45 parts; binoxide of manganese, 1 part. *Sapphire*—Strass, 3,600 parts; oxide of cobalt, 50 parts; oxide of manganese, 11 parts. *Topaz*—Strass, 1,050 parts; glass of antimony, 44 parts; Purple of Cassius, 1 part. The best kind of imitation gems for wear are those which consist of a layer of colored glass covered with colorless rock-crystal, which gives a hard protecting surface, less liable to be scratched than glass. See GLASS.

GEMS-BOK, *jěmz'bők* or *gěmz'bők* (*Antelope Oryx*, or *Oryx Gazella*): species of antelope, described by some naturalists as the Oryx, but which, being a native of s. Africa only, cannot be the Oryx (q.v.) of the ancients, though it is certainly a nearly allied species. It is a heavy, stout animal, about the size of a stag, with rough reversed hair on the neck and along the ridge of the back; large pointed ears; and almost perfectly straight horns, fully two ft. long, in the plane of the forehead, little diverging, and obscurely ringed at the base. The colors are harshly contrasted, dark

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rusty gray above, and white on the under parts, separated by a broad dark brown or black band; the head white, with black transverse bands; the thighs black, and the legs white.



Gems-bok (*Antilope Oryx*).

The hoofs are remarkably long, adapted to the rocky mountainous districts which the animal frequents. The G.-B. makes such use of its horns as sometimes even to beat off the lion. It inhabits districts free from wood, and is generally found in pairs or in very small herds.

GEMSHORN, *gēm'shawrn*: well-known organ-stop in German organs, the pipes of which are of tin, and conically shaped, being much narrower at the open end; while at the mouth, at the broad end, there are ears on each to regulate the tuning. It has a peculiarly pleasant tone, of a different character from either an open cylinder pipe or a stopped pipe. The pitch of the gemshorn is generally 8 ft. tone, sometimes it is 4 ft. and in the pedal organ 16 feet.

GEMÜNDER, *ghēh-mün'dēr*, GEORGE: violin-maker: b. Ingelfingen, Württemberg, Germany, 1816, Apr. 13. He learned his trade with his father and Baptiste Vuillaume, in Paris, came to the United States and settled in Boston 1847, and made his permanent residence in New York 1852. His violins, made out of natural woods treated with a varnish of his own make, and frequently mistaken for the productions of the old Italian masters, have taken prize medals at the World's Fair, London (1851), Paris Exhibition (1867), New York (1870), Vienna (1873), Philadelphia (1876), Amsterdam (1883), London (1884), New Orleans (1884-5), and London (1886). He d. 1895, Sep. 7.

GEN, n. *jēn* [Pers.]: a name for Persian manna, called also *Alhāgi manna*, obtained from the camel's-thorn, a plant indigenous in the East.

GENAPPE—GENDER.

GENAPPE, n. *jě-năp'* [from the place of its manufacture]: a worsted yarn, whose smoothness enables it to be conveniently combined with silk, and so well adapted for braids, fringes, etc.

GENDARMES, n. *zhâng'dârm* [F. man-at-arms]: in France, a sort of military police: originally, and to the time of the first French revolution, the most distinguished cavalry corps in the service of the Bourbon kings, to whom they formed a sort of body-guard. Under existing arrangements, the gendarmes constitute a military police, and comprise both cavalry and infantry. The force consists principally of soldiers taken from the army, generally on account of intelligence and good conduct. The men receive much higher pay than the rest of the army, of which, however, the corps is a part, and they are liable in cases of emergency to be sent on active service. The gendarmes amount to about 27,000 men, and are intrusted with the execution of many of the most delicate details of government.

GENDER, v. *jěn'dér* [F. *engendrer*, to engender]: for engender; to produce.

GENDER, n. *jěn'dér* [F. *genre*—from L. *genĕrĕ*, with a kind—from *genus*, kind or sort: It. *genere*]: sex: in gram., the difference in words expressing the distinctions between male, and female, and things destitute of life, the genders thus being accounted three in number.

In grammar, names applied to the male sex are said to be of the *masculine* gender, as *man*, *poet*; those applied to the female sex, *feminine*, as *woman*, *poetess*; words neither masculine nor feminine are, as it was expressed in Latin, *neutrius generis*, 'of neither gender;' and from this phrase grammarians have come to speak, somewhat incorrectly, of this class of words as being 'of the neuter gender,' and hence to reckon three genders. In English, the distinction of gender in nouns is chiefly marked in the pronouns substituted for them—*he*, *she*, *it*; and the lower types of life are generally comprised in the neuter gender: a *noun* or *name* is said to be of 'common gender' when it can be applied to a male or female indifferently. Gender, strictly speaking, is applicable only to living beings distinguishable as male and female; but by the figure of speech called personification (q. v.), inanimate objects are often spoken of as *he* and *she*. In the infancy of language, however, when every word was what we should now call a metaphor—when every thing that moved or was seen to produce any effect, was conceived as actuated by a conscious will, like that which the spectator felt within himself—every prominent or interesting object in the universe would be invested with one or the other sex, according to the analogy it suggested. In Latin, accordingly, *gladius*, a sword, was considered masculine; *navis*, a ship, as feminine; and *pomum*, a fruit or apple, was thought of as without sex. Similarly, in Sanskrit and Greek, the greater part of inanimate objects are either masculine or feminine, the others being neuter. In Hebrew, everything is either masculine or feminine, there being no neuter; and this is the case in the *modern*

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languages derived from the Latin viz., Italian, French, Spanish, and Portuguese—everything is either a *he* or a *she*. German resembles the classic languages in making some inanimate objects masculine, some feminine, and others neuter. Thus at table, a man must speak of the spoon (*der löffel*) as ‘he,’ of the fork (*die gabel*) as ‘she,’ and of the knife (*das messer*) as ‘it.’ English—in this more rational than any of its congeners—has banished the spurious distinctions of gender that encumbered the Anglo-Saxon like the other Teutonic tongues, and attributes sex only to living beings.

In the highly inflected languages, there are certain terminations distinctive of the different genders. It is probable indeed, that originally every noun, substantive or adjective, had a suffix indicative of the sex, real or imaginary, of the object designated, though like other inflexions (q. v.), these suffixes of gender were in process of time mutilated beyond recognition, or in many cases altogether worn off. The terminations most characteristic of the three genders in Latin are masc. *us*; fem. *a*; neut. *um*; corresponding to the Greek *os*, *ē*, *on*. In a great majority of the adjectives in both those languages, the genders are thus marked. In English, the gender of a noun affects only the personal pronoun substituted for it; in most other languages, the adjectives (including the articles) have different forms for the several genders—a useless complication, in the case of modern languages at least: see ADJECTIVE.

Of the terminations distinctive of gender observable in modern English, some are purely Latin, as in *executor*, *executrix*; the feminine *-ess*, as in *countess*, is borrowed from the French, and is also of classical origin. The prevalent feminine termination in German is *-inn*, as in *tänzerinn*, a female dancer (Fr. *danseuse*); of this there are two instances in English, in the provincial *carlin*, the fem. of *carl*, and *vixen* = Ger. *füchsin*, a female fox. This affix was already in use in Latin, as in *regina*, a queen (*reg(s)*, a king); and in this form it is used in Europe generally to femininize proper names; e. g., *Georgina*, *Wilhemina*, *Caroline*.

In such pairs as *son*—*daughter*; *man*—*maid*; *horse*—*mare*; *cock*—*hen*; there is no etymological relation between the words; they are from distinct roots. But with regard to *hen*, e. g., the Anglo-Saxon had the two forms, *han* for the male, and *hen* for the female; and *mare* was originally applicable to both sexes, as *horse* still is (Fr. *marechal*, originally an officer who had charge of the horses). The oldest known form of the Teutonic speech, the Gothic, had the two words, *magus*, son, and *magaths*, daughter, both from the root *mag*, to beget, or to make. *Magaths* has become in Ger. *magd*, in Eng. *maid*; *magus* has been lost in the Teutonic tongues, but it is represented by the Celtic *mac* (son), evidently from the same root. *King*, *queen*, were in Skr. *ganika*, father, and *goni*, mother, both from the root *gan*, to generate, produce. The masculine form appears in Old Ger. as *chunig*, in modern Ger. *könig*, in Eng. *king*; the feminine became the Greek *gynē*, a woman, as well as the Saxon *swen*, Sw. *quinna*, Old Eng. *quene* or

GENEAGENESIS—GENEALOGY.

quean, applied to a woman generally, and the modern *queen*, the chief woman of the land.

GENEAGENESIS: see PARTHENOGENESIS.

GENEALOGY, *n.* *jĕ'nĕ-ăl'ō-jĭ* [OF. *genealogie*—from Gr. *gĕnĕalōg'ŭ*, genealogy—from *gĕnōs*, birth, race; *logos*, discourse]: history of the descent of a person or family from an ancestor; pedigree; lineage. GE'NEALOG'ICAL, *a.* *-lĭj'ĭ-kāl*, pertaining to the descent of persons or families. GE'NEALOG'ICALLY, *ad.* *-lĭ*. GE'NEAL'OGIST, *n.* *-ăl'ō-jĭst*, one who traces descents of persons or families. GE'NEAL'OGIZE, *v.* *-jĭz*, to investigate the history of descents

GENEALOGY: science of the origin, sequence, and affinities of families, including the descent of persons. Although in itself is not of sufficient importance to rank as an independent science, yet so far as it has to do with remarkable and eminent families, it forms a very important part of history. It naturally divides itself into two parts, *theoretical* and *practical*. The former embraces the principles on which the science of genealogy is based, while the latter is occupied with tracing the course of particular families themselves. To render perceptible to the senses the descent and relationship of individuals, genealogical tables are made use of, whose arrangement depends on the special purpose for which they are constructed. Usually, however, such tables begin with the earliest ancestor (*Ger. stammvater*) of a family, from whom all the known members of both sexes are traced in the order of descent. The importance of this branch of human knowledge, however, is perhaps less obvious in a scientific than in a legal aspect, where it is concerned about the various claims or pretensions of persons based on real or alleged relationship, especially in regard to rights of succession. The earliest traces of genealogy are to be found in the ancestral catalogues of the heroes of the old world. Among the Hebrews, there were officials specially appointed to draw up genealogical tables. The progress of civilization in states, and in particular the institution of corporations and guilds in the towns, afforded a wider scope of genealogy. But the absence of criticism, and the desire to flatter the great, were the causes of introducing—especially after the 14th c.—the most ridiculous fables into genealogy. Ancestors were fabricated in the most impudently false manner, and families carried back in an unbroken line, not only to the age of Charlemagne, but even, in many cases to the heroes in the Trojan war. The fact, however, is, that scarcely any family, however distinguished, can trace its ancestors even to the middle of the 11 c. Among the earlier works on genealogy are Ruxner's *Turnierbuch* (Simmern 1527) and the genealogical tables of Reusner and Hennings, about the end of the 16th c., but these are not conceived in a historical spirit. A more luminous treatment of the subject was initiated in France by Duchesne, St. Marthe, Hozier, Chifflet, Lancelot le Blond, etc.; and in England by Dugdale. Rittershusius of Altdorf (died 1670) and Spencer of Wittenberg (died 1730) were the first in Germany to base genealogy on

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documentary evidence. The path entered on by them has been prosecuted by König, Von Imhof, and especially by Hübner in his *Genealogische Tabellen* (4 vols. Leip. 1725-33; new edit., 1737-66), to which Lenz added *Erläuterungen* (Elucidations, Lcip. 1756), and Sophia, Queen of Denmark, *Supplement-Tafeln* (Kopenh. 1822-24). Gatterer, in his *Abriß der Genealogie* (Gött. 1788), founded the scientific treatment of the subject, in which he was followed by Putter in his *Tabulæ Genealogicæ*, by Koch in his *Table Généalogiques* (1808), as also by Voigtel (1810), Hopf (1861), Von Behr (1870), Cohn (1871), and Oertel (1871), all in Germany.

In Great Britain, the chief printed collections of genealogical information are the *Peerages, Baronages, Baronetages*, and *County Histories*. The chief manuscript sources are the public records, heraldic registers, and the parish registers of births, marriages and deaths.

In the United States the chief publications on G. are *The New England Historical and Genealogical Register*, Boston; *The New York Genealogical and Biographical Record*; the printed transactions and archives of state and city historical societies; town, city, and state histories, family genealogies, *Appleton's Cyclopedia of American Biography*; and *The Heraldic Journal*. Genealogical research is daily growing in popularity and importance, and more care is now taken than formerly by church and municipal authorities to perfect their records.

GENERA, n. plu. *jěn'ěr-ă*: see GENUS.

GENERAL, a. *jěn'ěr-ăl* [F. *général*—from L. *gēnērālis*, belonging to a kind or species—from *gēnūs*, kind: It. *generale*]: relating to a whole class or order; not special or particular; public; common; extensive; usual: N. the whole; the total; the chief commander of an army; the commander of a division. GEN'ERALLY, ad. *-lī*, in the main; without minute detail. GEN'ERAL'ITY, n. *-ăl'ī-tī*, the main body; the bulk; the greatest part. GENERALSHIP, n. military skill. GENERALIA, n. plu. *jěn'ěr-ăl'ī-ă*, generalities. IN GENERAL, in the main; for the most part. LIEUTENANT-GENERAL, an officer second in rank to a general. BRIGADIER-GENERAL, the commander of a brigade. MAJOR-GENERAL, rank below lieutenant-general. GEN'ERAL AGENT: see AGENT: PRINCIPAL AND AGENT.—GEN'ERAL ASSEMBLY: see ASSEMBLY, GENERAL.—GEN'ERAL COUNCIL: see PRIVY COUNCIL.—GEN'ERAL DEMURRER, demurrer (q.v.) without showing special cause; formerly in English pleading, used when the objection was to a defect in substance; but the distinction between General and Special Demurrers was abolished 1852. GEN'ERAL VERDICT: see VERDICT: JURY.—GEN'ERAL-WARRANT, a legal writ in England, formerly issued by the sec. of state, for the arrest of an individual without any particular name being mentioned—declared illegal by parliament, 1766. GEN'ERALIS'SIMO, n. *-is'ī-mō* [It.]: the chief general of two or more armies acting in the same war. GEN'ERALIZE, v. *-īz*, to extend from particulars to whole kinds or classes; to infer from the nature of one or a few the

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nature of a number or the whole. GEN'ERALI'ZING, imp.. ADJ. tending to or consisting in generalization: N. the act or process by which we comprehend under a common name several objects agreeing in some point, and which that common name serves to indicate. GEN'ERALIZED, pp. -ized. GEN'ERALIZA'TION, n. -zā'shŭn, deducing a general principle from a series of facts; act or process of grouping particulars in a genus; act of comprehending under a common name several objects agreeing in some point: see below.

GEN'ERAL (of Religious Order), in the Roman Catholic Church: supreme head, under the pope, of the aggregated communities throughout Christendom belonging to a religious order. The governing authorities of the monastic orders in the Rom. Cath. Church may be arranged in three classes: (1.) The superiors of individual convents or communities, called in different orders by the various names of abbot, prior, rector, guardian, etc.; (2.) The provincials, who have authority over all the convents of an entire province—the provinces, in the monastic sense of the word, being usually coincident as to local limits with the several kingdoms in which the order is established; (3.) The general to whom not only each member of the order, but all the various officials of every rank, are absolutely subject. The general is usually elected by the general chapter of the order, which, in the majority of orders, consists properly of the provincials; with whom, however, are commonly associated the heads of the more important monasteries, as also the superiors of certain subdivisions of provinces. The office of general in most orders is held for three years. In that of the Jesuits it is for life; but in all, the election of the general chapter must be confirmed by the pope. In most orders, too, there is assigned to the general a consalter (*admonitor*) or associate (*socius*), who, however, is entitled only to advise, with no authority to control the superior. The general also is supposed to consult with and to receive reports from the various local superiors. He sends, if necessary, a visitor to inquire into particular abuses, or to report upon such controversies as may arise, and he holds a general chapter of the order at stated times, which differ according to the uses of the several orders. The general is exempt from episcopal jurisdiction, being subject to the immediate jurisdiction of the pope himself. He resides in Rome, where he enjoys certain privileges, the most important of which is the right to sit and vote with the bishops in a general council of the church.

GENERAL CONVENTION OF THE PROTESTANT EPISCOPAL CHURCH in the United States: chief governing body of that church. From the settlement of Jamestown, 1607, to the achievement of national independence, Episcopalians in this country were a part of the Church of England, and were under the supervision of the Bp. of London. But 1784, Oct., a convention of clerical and lay delegates from the states of N. Y., N. J., Penn., Del., and Md., met in the city of New York, and, having adopted a statement of general principles which prepared the way for the organization of

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all Episcopalians in the United States into a branch of the church of Christ, adjourned to meet in Philadelphia the following year. At that time and place additional delegates were present from S. C. and Va. The first General Convention (1789) chose as its president Bp. White, of Penn., who, with Bp. Provoost of N. Y., had been consecrated in England two years before. Bp. Seabury, of Conn., also, who had been consecrated by Scottish bishops, was recognized as a member of the convention. Under the constitution then adopted the convention, representing the entire Episcopal church in the United States, has continued to meet every three years. It is composed: I. Of all the bishops (numbering 86 in 1902), who constitute a separate house; and 2, of four clerical and four lay deputies from each diocese. In 1903, 60 dioceses and 17 missionary jurisdictions (prospective dioceses) were represented. Legislative action is accomplished by concurrent votes of both houses, and (when published) must be authenticated by both. The constitution amended from time to time by the convention, continues substantially as originally adopted. With the growth and extension of the Prot. Epis. church of the country, and of the domestic and foreign missionary work the convention, as the governing council, has greatly expanded and strengthened its jurisdiction and control. In doing so it has, as some writers think, transcended the powers originally conferred upon it: others maintain that those powers are general and have been lawfully expanded and strengthened to meet the exigencies and opportunities of the times. See EPISCOPAL CHURCH, PROTESTANT.

GENERALE, or GENERAL, n. *jèn'ër-âl'* [F. *générale*, the general: Sp. *generalá*, a beat of the drum to arms—from L. *generális*, of or relating to all (see GENERAL)]: the tune played by drums and fifes immediately before a battalion of infantry falls in for the march.

GENERAL IS'SUE, in Law: form in which the defendant traverses or meets with a simple denial all the allegations, or the principal fact on which the plaintiff relies in his declaration. Thus, in actions founded on wrongs, the general issue is 'Not Guilty;' in actions of debt, that the defendant never was indebted; in actions on a deed or bond, *non est factum*, i. e., that it is not the deed of the defendant. Under this issue, the defendant may prove that he never executed the deed; but not that it is bad in point of law. In *criminal proceedings*, the general issue is 'Not Guilty,' by which plea, without further form, every person, on being arraigned on any indictment for treason, felony, or piracy, is deemed to have put himself upon the country for trial: where a prisoner refuses to plead, a plea Not Guilty may be entered for him. Under the plea Not Guilty, the prisoner is entitled to give in evidence not only everything which negatives the charge, but also all matter of excuse or justification,

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GENERALIZATION: act or process of grouping particulars under one general head; the group thus formed: also, act or process of deducting a general principle from a series of facts: the principle thus reached. Our experience of the world leads us to recognize not only great variety, but also numerous instances of agreement in the midst of the variety. We do not call the continuance of the same fact an agreement; it is only when, amid difference of accompaniment, we recognize a common feature, that our attention is awakened, and our mind interested. Sometimes the common feature in a number of varying objects is obvious and universally noticed; as when we identify the round form amidst all disparities of size, color, and substance—classing together as *round*, a coin, a ball, an orange, a dew-drop, the earth, the stars. At other times, the resemblance is so obscured by the amount of difference, that it has lain for ages unperceived; the fall of a stone was never suspected, before the time of Newton, to have anything in common with the motions of the moon and planets. When we see the same property or effect repeated under great variety of circumstances and adjuncts, and when we indicate by a name or otherwise that this agreement exists, we are said to mark out a *general* or generalized property, or fact; while the individual instances are termed the *particulars*, on which the other is grounded.

To understand the full meaning of G. and the questions connected, we must advert to the distinction between two modes of the operation. In one, we generalize an individual or isolated property—as roundness, whiteness, weight, attraction, justice—and assign what we think the exact nature of the common feature thus singled out. A number of designations have been given to this process, according to the particular stage in the operation specially taken in view; these are Classification, General Notion, General Term, Definition, Abstraction, Concept or Conception, Idea. They all suppose that we have a plurality of objects with agreeing properties, and that agreement has been taken notice of, and embodied in such a form, that the mind can deal with it to the neglect of the points wherein the particular things differ among themselves. They suppose, further, that we make no affirmation beyond what is implied in the identifying of so many differing objects—namely, that they do agree in the point in question. No other matter for belief or disbelief is presented in the notion of roundness but that certain things have been compared, and have been found to agree in possessing that attribute. To attempt to form a general notion, or to mark a property not attaching to anything in nature, is a pure irrelevance and absurdity; and though by a bold stretch of imagination we might people the earth with chimerical objects, and find agreements among them, yet such generalities could not be introduced into any process of reasoning; it is presumed, that wherever a general property is specified, there are things in nature having this property in company with the others that make up the total characteristics of each.

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But the other kind of G. introduces belief in a totally different shape. When instead of identifying a property, we identify a union or *conjunction* of distinct properties, it has to be seen not merely whether the common features are correctly rendered in the general notion, but whether the alleged coupling always takes place. Thus, when we compare the sea coasts all over the globe, we find, with some exceptions, that twice a day the sea advances and recedes on the shore: this fact we express by the general name the tides. When, however, we go further, and note everywhere the *coincidence* between the tides and the positions of the moon, and generalize that coincidence, we attain a more complicated result: we are called upon to believe not merely in the accurate correspondence of a general notion with the particular objects, but in the constancy of the conjunction between two distinct properties, so that the occurrence of one shall always count as evidence of the other. The different aspects of this higher operation have given rise to another series of designations, contrasting with those given above for the simpler operation; these are Induction, Inductive Generalization, Conjoined Properties, Affirmation, Proposition, Judgment, Law, Order of Nature. These all involve truth or falsehood, inasmuch as they all pretend to give us a positive assurance that wherever we find one thing we shall find some other thing present or absent, and be enabled thereby to anticipate our individual experience of the course of nature. A general notion can often be expressed in a single word; the *noun* is the part of speech that names both particular objects and general notions. A general proposition is a complete thought, and requires a sentence for its enunciation; it involves the *verb* with the noun. Heat is a notion, and so is Light; but when we unite the two in the affirmation that heat is the cause of light, we indicate something that is true or false, that may be proved or disproved, believed or denied.

For this higher form of G., see INDUCTION. On the other and simpler form, some explanations follow. In the operation of forming a general notion, the first step is something of the nature of Classification. We must assemble in our view a number of particular objects, being moved to bring them together by the attractive bond or association of similarity. The objects thus assembled are a class. In Natural History, for example, we bring together in the mind all the quadrupeds that we have ever had any knowledge of, and the array constitutes a class, grounded on the peculiarity of walking on all-fours. Another class is made up of the animals that fly in the air; a third, of those that live in the sea. By such successive groupings of creatures that have a kindred nature in one or more respects, we gradually include the whole known animal kingdom in a series of classifications, whereby method and order are introduced into the otherwise heterogeneous mass. So in plants and minerals, and all through nature. According as likenesses have been discerned in the constituent parts of the universe of things, the individuals are placed with those related to them, and a great simplification of view and extension of

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knowledge are the results. For it happens very frequently, that likeness in one point is accompanied with likeness in other points, so that we can couple several peculiarities together, and rise to general truths as well as general notions. When a classification has been arrived at that leads to this consequence, we put a more than ordinary value upon it; we consider that we have seized upon some fundamental and pregnant point of resemblance, something that conveys the most essential nature of the objects classified, and we are accustomed to style the group that so arises a *natural* or a *philosophical* classification. The arranging of animals according to the element that they live in, as land, water, air, so very obvious to the first observers, has given place to one founded on other kinds of likeness—namely, the structure of the skeleton and the mode of bringing forth and rearing the young; it being proved that a greater number of important attributes are bound up with those characteristics than with the element that the animals inhabit. See Mill's *Logic*, book iv. chap. 7.

The forming of a class leads to the adoption of a Class Name, in other words, of a *general name*, which is a name applicable to every individual member of the class, in consequence of being understood to express no more than they all have in common. Thus we have the name 'round' to express all round objects, omitting any reference to other peculiarities that may attach to them. So the names 'bird,' 'cloth,' 'salt,' are applicable alike to a vast number of individual things. When the general name has been devised, we can by means of its peak of all the particulars in one breath, on condition that we intend only to refer to the points of community.

The process called Abstraction is further implied. When we bring together, or constitute a class, in virtue of a prevailing resemblance, we are said to 'abstract' from the individuals everything else except the points of agreement. In the language of Sir W. Hamilton, we *attend* to the likeness and *abstract* the differences. The notion that we have of the common quality is termed by the same philosopher the Concept; but it has been usual to employ the phrase 'abstraction' or 'abstract idea' for the same purpose, though a perversion of the original application of that word. The common attribute of round bodies, the round figure, or form, is the concept, or the abstract idea of roundness. The precise character of this mental element or process has been much disputed in philosophy, there being three different sects that have grown up in connection with it; the Realists, Nominalists, and Conceptualists: see CONCEPT: CONCEPTUALISM: NOMINALISM. The Realists gave an actual independent existence to the prototypes of our general notions, maintaining that apart from all circular bodies there existed in nature a circular *form*, having no other attribute soever, like a circle in Euclid bereft of the actual line required to mark the figure to the eye. The Nominalists considered that the only general thing was the common name; the Conceptualists allowed a mental existence to the generalized attributes, but no more.

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(Sir W. Hamilton's *Metaphysics*, II., 296.) The last are, no doubt, near the truth; for though we cannot, with Plato, affirm the existence in nature of 'generals' that have no embodiment in particulars (which would be to contradict the very essence of G., namely, likeness *among unlikenesses*), we must still grant to the mind the power of attending in thought to what is common, neglecting for the time the disagreements. We can think of all the consequences of the circular figure, without specially attending to the other peculiarities of any individual circle. This abstractive process is performed in different ways, according to the nature of the subject. In geometry, for example, we can draw diagrams that are little other than naked forms, although we must make them of a definite size; and in contemplating these, we are enabled to think of form without substance. We cannot use this method in Natural History; we cannot form a conception of a bird by a diagram that gives nothing but what is common to all birds. If we are reasoning upon the properties of the class, we may first call into view some one as an example, say a pigeon; from considering which, we can go so far as to note the common peculiarities of feathers, wings, bill, etc.; and when we have completed the description, we run over in our mind a number of other birds, to see that we have not mentioned points special to the pigeon. In fact, we must have within mental call all the members of the class, if we would reason generally respecting it. After we have thus checked and corrected our generalized description, we can embody the abstract idea in a form of very wide occurrence in our general reasonings, namely, a verbal statement of the common attributes. By means of this, we may often dispense with the reference to the particulars, except to know the precise meaning of the language, which meaning is still some sort of general conception of the objects. We must have a general notion of feathers, and of the structure of the bill in birds, upon the plan above mentioned of holding in the mind some typical instance subject to correction by a comparison of the all instances coming under the genus. So that, in point of fact, no general reasoning has ever been invented to supersede totally this reference to the particulars; the formal reasonings of mathematics require us still to have in the mind concrete quantity, or one thing as equal to, greater than, or less than, another.

These remarks lead us to the nature of Definition, one of the important designations leading out of the operation of generalizing. To define, is to limit, settle, and specify the exact compass of the properties common to a class. Usually this is done by means of language; but in reality it is, and must be done, by a reference, direct or remote, to the particulars themselves. This reference frequently has the appearance of being dispensed with. The reason is that many general notions are compounded of others, and we can understand the composite notion from its components, without going further; that is, without producing particulars. Thus, a circle in the abstract might be made intelligible by pointing to a number of concrete circles, such

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as are drawn in Euclid; we should then have to impress on our minds a sufficient number of these to prevent us from ever associating with the general idea any one size, or any one color of the outline (which of necessity is drawn in black, red, blue, or some other color). No one circle is really the general notion; this must be nothing less than a multitude of actual circles, which the mind apprehends by turns, so as to be sure of never affirming any attribute as common that is in fact peculiar to one or a few. But the concept, circle, can be reached in another way. If we determine first what is called a 'point' in space, and a 'line' proceeding from that point, and made to revolve around it, the other extremity of the revolving line will mark a course which is a circle. Here, if we possess ourselves of the simple notions or concepts, Point, Line, Revolution, we may attain the notion, Circle, without examining actual circles in the concrete. So we may define an oval, or ellipse, and many other figures. This practice of referring to a simpler order of concepts for the constituents of a given one, is the main function of the Definition, which applies, therefore, to complex notions, and not to such as are ultimate, or simple in the extreme degree. To define in the last resort, we must come to quoting the particulars. We cannot define a line by anything more elementary. To say, with Euclid, that it is length without breadth, is no assistance as we must still go to our experience for examples of length; and length is not a more simple idea than line, being, in fact, but another word for the same thing. Nevertheless, it has been often supposed that there are general notions independent of all experience, or reference to particulars; the form commonly given to the foundations of the science of mathematics having favored this view.

The name 'genus' also is connected with the present subject. It is co-relative with another word, 'species,' which, however, is itself to some extent a G.; for every species is considered to have individuals under it. Thus, in Zoology, *felis* is a genus of animals, and the lion, tiger, cat, etc., are among its species: but each of those species is the G. of an innumerable number of individual lions, tigers, etc., differing considerably from one another, so that to express the species we are still obliged to have recourse to the operations of comparison, abstraction, and definition. Genus and species, therefore, introduce to us the existence of successive generalizations, more and more extensive in their range of application, and possessing, in consequence, a smaller amount of similarity or community of feature (see EXTENSION).

GENERAL LIEN, in Law: lien 'which the holder thereof is entitled to enforce as a security for the performance of all the obligations, or all of a particular class of obligations, which exist in his favor against the owner of property. A G. L. does not necessarily arise (as does a specific lien) from some demand which the creditor has in respect to the property upon which the lien is claimed, but is one for a general balance of accounts. A G. L. may

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exist: 1, where there is an express contract; 2, where it is implied from the usage of trade; 3, from the manner of dealing between the parties in the particular case; or, 4, where the defendant has acted as a factor. The principal general liens are those of factors, brokers, bankers, of attorneys upon their clients' papers and money, and of warehouse men and wharfingers.' (Jones on Liens § 17). A specific lien is one which 'attaches to specific property as a security for some demands which the creditor has in respect to that property.' See LIEN: HYPOTHEC.

GENERAL OFFICER: officer of the general staff of an army to whom is intrusted the command of a body of men, not less in strength than a Brigade (q.v.). In a European army of very large proportions, the normal sequence of command would be the following: the general commanding-in-chief, generalissimo, or field-marshal, would command the whole force; the generals would have separate *corps d'armée*: the lieutenant-generals wings of those *corps-d'armée*; the major-generals, divisions in the wings; and brigadier-generals, brigades in the divisions. In practice, however, an army is rarely large enough for the application of this exact scheme of a military hierarchy.

In the British service, colonels become major-generals (except in cases of selection for very distinguished service) in order of seniority, provided each has served on full pay for a certain number of years; promotion to lieutenant-generals and generals follows in exact order of seniority. From the last, promotion to the exceptional rank of field-marshal is conferred in rare instances by special favor of the sovereign, who represents in person the sole command and possesses the patronage of all the land forces. The rank of brigadier-general is only temporary in the English service, conferred usually on the senior regimental officer of the corps composing the brigade: in addition to the colonels who become effective generals, officers who have retired on half-pay at earlier periods of their careers rise by seniority to the rank of general officers; but they continue, notwithstanding, to receive only the half-pay of the rank in which they retired: during duty as brigadier an officer receives extra pay. *Captain-General* is a rank very rarely conferred by the sovereign, who holds it *ex-officio*. There has been no capt. general, other than the sovereign, during the present century. —See BRITISH ARMY.

In the United States, the president is commander-in-chief of the army and navy, and his orders are issued through the offices of the sec. of the war and navy depts. Gen. officers of the army (1903) consist of 6 maj.-gens. and 14 brig.-gens.; grade of gen. and lieutenant-gen. expired 1888; the latter was revived for Gen. Schofield, 1895, and for Gen. Miles, 1901. Each of following officers had rank and pay of a brig.-gen.; adjutant general, judge advocate general, quartermaster general, commissary general of subsistence, surgeon general, paymaster general, chief of engineers, chief of ordnance, chief signal officer, inspector general. From time to time, and for a limited period, the rank of 'general of the army' is created and filled by act of congress, as may seem requisite; it is the

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highest military office under the president.—The active gen. officers of the navy are an admiral and 24 rear-admirals. The first grade was revived, 1899, for Admiral George Dewey.

GENERAL RULES OF THE METHODIST EPISCOPAL CHURCH: body of regulations in substance the same as drawn up by Mr. Wesley at London, 1739, at the beginning of his work in preaching the gospel. That he might be able to instruct carefully those who in increasing numbers sought his counsel, he appointed stated times at which they could meet him together. This was the origin of 'the United Society,' first in England, afterward in America. Such a society is simply a company of persons united to pray together, receive exhortation, and help each other to work out their salvation. Each society is divided into classes of about 12 persons, one of whom is called the leader. It is his duty, 1, To see each member of his class at least once a week; to instruct, exhort, reprove, and comfort them; and to receive their voluntary offerings for the support of the gospel and for the care of the poor: 2, To meet the minister and stewards of the society, also once a week, in order to give the former all required information, and to pay over to the latter the amounts received from their class during the preceding week. From those who ask admission into these societies only one condition is required—'a desire to flee from the wrath to come and to be saved from their sins.' But as this desire, if it be cherished in the soul, will be shown by its fruits, the members of the society are expected to show their continued seeking of salvation: 1, By shunning every kind of evil; 2, By doing all possible kinds of good and as far as possible to all men; 3, By attending upon all the ordinances of God. Under these three classes of requirements the rules give full and comprehensive particulars, illustrated and enforced by appropriate reference to 'the written word of God as the only and sufficient rule of faith and practice.' These are published as the general rules for the guidance of every member of a Methodist society. If any one habitually breaks them, still another rule directs that his brethren should admonish, pray for, and bear with him for a season; but if then he do not repent he can have no more place among them.

GENERAL SHIP: ship advertised by the owners to take goods from a particular port at a particular time, and not under any special contract to particular merchants. The owners, in this case, engage separately with each merchant who applies to them to convey his goods to the ship's destination. The contract between the owners or the master acting in their behalf, and the proprietors of the goods, may in the case of general ship be established by parole evidence, and, indeed, there is rarely any writing on the subject except the advertisement and the bill of lading. In a general ship the master being intrusted by the owners with full power to contract for and take in goods, no agreement for freight which any one may have made with the

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owners independently of him, will be effectual to secure room in the vessel. All such agreements must be intimated to the master, or those acting for him on board, before he has engaged freight for the whole vessel: by such intimation, a preference will be secured over the merchant who brings his goods to the ship's side on chance. If the owners of a general ship have advertised her as bound for a particular port, they must give specific notice to every person who may ship goods on board, of any alteration in her destination, and they will be liable for the consequences of neglecting to do so. Bell's *Com.* i. 433, Shaw's edition; Abbot on *Shipping*, p. 233.

GENERAL THEOLOGICAL SEMINARY OF THE PROTESTANT EPISCOPAL CHURCH in the United States: established by the general convention 1817. Instruction was commenced at New York 1819; in 1820 the institution was removed to New Haven, but two years later was taken back to New York and was incorporated by the N. Y. legislature. Its board of trustees is composed of the bishops of the church, the dean of the seminary, 25 persons elected by the house of deputies at each stated general convention, and 25 elected by certain dioceses on the basis of their former contributions to the seminary. The faculty now (1902) consists of a dean, 9 professors, and 5 instructors. The students this year number 145. The regular studies extend through 3 years, with additional courses for post-graduates and for special students. Under 'the Bishop Paddock foundation' a special course of lectures is annually delivered on subjects pertaining to the defense of the religion of Christ as revealed in the Bible and illustrated in the Book of Common Prayer. The buildings, substantial and commodious, are on Chelsea Square, 9th Avenue, between 20th and 21st streets. Among them are East and West Buildings, Sherred, Dehon, and Pintard Halls, the Library, Deanery, and Chapel of the Good Shepherd. The whole number of students from the establishment of the seminary has been over 1,500. The institution has been liberally supported, and is to a considerable extent endowed; but in the judgment of its guardians and friends it needs additional endowment for its highest usefulness.

GENERATE—GENERATION.

GENERATE, v. *jěn'ěr-āt* [L. *genērātūs*, begotten, engendered; *gēnērans*, begetting—from *genus*, race, kind]: to beget; to bring into life; to cause; to produce. **GEN'ERATING**, imp.: **ADJ.** producing; forming. **GEN'ERATED**, pp. **GEN'ERATOR**, n. *-tēr*, one who or that which. **GEN'ERABLE**, a. *-ā-bl*, capable of being generated. **GEN'ERANT**, n. *-ānt*, the begetting or productive power. **GEN'ERA'TION**, n. *-ā'shūn* [F.—L.]: the act of begetting (see **REPRODUCTION**): production; formation; an age; people of the same period; a family; a race; progeny: in *math.*, applied to one geometrical figure, when produced or formed by an operation performed upon the other: thus a cone is generated by making a right-angled triangle revolve about one of its sides adjoining the right angle as an axis.—In arithmetic, similarly, a number is said to be generated when produced by an operation performed on one or more other numbers. Thus, 36 is generated by the involution of 6 to the 2d power, or by the multiplication of 4 and 9. **GENERATIONISM**: see **TRADUCIANISM**. **GEN'ERATIVE**, a. *-tīv*, that generates or produces; having the power of producing. **ETERNAL GENERATION**: see **TRINITY**, **DOCTRINE OF THE**.

GENERATION, **SPONTANEOUS**: production of living organisms without parents. From the earliest period to the end of the middle ages, no one called in question the doctrine that, under certain favorable conditions, of which putrefaction was one of the most important, animals might be produced without parents. Anaximander and Empedocles attributed to this form of generation all the living beings which first peopled the globe. Aristotle, without committing himself to so general a view, maintains that animals are sometimes formed in putrefying soil, sometimes in plants, and sometimes in the fluids of other animals, and lays down the following general principle, 'that every dry substance which becomes moist, and every moist body which is dried, produces living creatures, provided it is fit for nourishing them.' The views of Lucretius on this subject are shown in the following lines:

Nonne vides quæcunque morâ, fluidoque liquore
Corpora tabuerint, in parva animalia verti?

And Pliny maintains that 'quædam gignuntur ex non genitis, et sine ullâ simili origine.' Virgil's directions for the production of bees are known to every reader of the *Georgics*, and an expression in the Old Testament (Judges xiv. 14) has been on vague reasons thought to point to a similar opinion as held by Samson. In the later period of the middle ages, and the two succeeding centuries, among advocates of this theory, were Cardan—who, in his treatise *De Subtilitate* (1542), asserts that water engenders fishes, and that many animals spring from fermentation—Aldrovandus, Licetus, Gassendi, Scaliger, Van Helmont, who gives special instructions for the artificial production of mice, and Kircher, who in his *Mundus Subterraneus* (in the chapter 'De Pan-spermia Rerum') describes, and actually figures, certain animals which were produced under his own eyes by the transforming influence of water on fragments of the stems of different plants!

GENERATION.

Redi, celebrated Italian naturalist, whose *Experiments on the Generation of Insects* were published 1668, seems to have been the first opponent that the doctrine of spontaneous generation encountered. In this work, he proves that the worms and insects which appear in decaying substances are in reality developed from eggs, deposited in those substances by the parents. Leuwenhoek, Vallisneri, Swammerdam, and other eminent naturalists, soon contributed additional facts and arguments in favor of Redi's view; and as from the time of Redi to the present day, the tide of opinion has generally turned strongly against the doctrine in question, it is unnecessary to carry the historical sketch further. The entozoa, however, continued to be a great stumbling-block. 'When,' says Prof. Owen, 'the entozoologist contemplated the *tænia* fixed to the intestine, with its uncinated and suctorious head buried in the mucous membrane, rooted to the spot, and imbibing nourishment like a plant—when he saw the sluggish *distoma* (or fluke, adhering by its sucker to the serous membrane of a closed internal cavity, he naturally asked himself how they got there; and finding no obvious solution to the difficulty of the transit on the part of such animals, he was driven to the hypothesis of spontaneous generation to solve the difficulty. It is no wonder that Rudolphi (1808) and Bremser (1824), who studied the entozoa rather as naturalists than physiologists, should have been led to apply to them the easy explanation which Aristotle had given for the coming into being of all kinds of Vermes—viz., that they were spontaneously generated. No other explanation, in the then state of the knowledge of the development of the entozoa, appeared to be adequate to account for the fact of their getting into the interior cavities and tissues of higher animals.' The recent investigations of Von Siebold, Küchenmeister, Van Beneden, Philippi, etc., regarding the development and metamorphoses of the entozoa, have, however, tended to remove nearly all the difficulties which this subject presented; and the advocates of spontaneous generation are fairly driven from this, one of the last of their battle-fields.

The only point at present in dispute is, whether microscopic organisms (animals or plants) may be spontaneously generated. It is well known that if we examine under the microscope a drop of water in which almost any animal or vegetable substances have been infused, and which contains the particles of such substances in a state of decay or decomposition, it is found to swarm with minute living organisms. The question at issue is this: Are these organisms developed in the water, if the necessary precautions have been taken to exclude every animalcule or germ capable of development both from the water and from the air that has access to it? A well-known experiment, devised by Prof. Schulze of Berlin (a description of which may be found in Owen's *Lectures on the Invertebrate Animals*, 2d ed. p. 44), shows that with due precautions in reference to these points, no animal or vegetable organisms are produced. This experiment was continued unio-

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interruptedly from May 28 until the beginning of August, 'and when, at last, the professor separated the different parts of the apparatus, he could not find in the whole liquid the slightest trace of infusoria or confervæ, or of mold; but all three presented themselves in great abundance a few days after he had left the flask standing open.' A vessel with a similar infusion, which he placed near the apparatus, contained vibriones and monads on the second day of the experiment, to which were soon added larger polygastric infusoria.

A few years ago, M. Pouchet announced that he had repeated Schulze's experiment with every precaution, but that animalcules and plants were invariably developed in the infusion on which he operated. To prove that the atmospheric air contained no germs, he substituted *artificial* air—that is to say, a mixture of 21 parts of oxygen gas with 79 of nitrogen. The air was introduced into a flask containing an infusion of hay, prepared with distilled water and hay that had been exposed for twenty minutes to a temperature of 212°. He thus apparently guarded against the presence of any germs or animalcules in the infusion or in the air. The whole was then hermetically sealed, so that no other air could gain access; yet after all these precautions, minute animal and vegetable organisms appeared in the infusion. He repeated the experiment with pure oxygen gas instead of air, and obtained similar results. These experiments are described by Pouchet in the *Annales des Sciences Naturelles* (1858, 4th series, IX., 372); and the same vol. contains important articles by Milne Edwards, and by De Quatrefages, in opposition to Pouchet's views.

A very large majority of physiologists of the present day reject the doctrine; most of the apparently exceptional cases, as, for example, the mysterious presence of the entozoa, have been found to admit of ready explanation; and if we do not positively deny a possibility that animalcules might be generated spontaneously, we may at all events assert that such a mode of generation is not probable, and has certainly never been proved. Haeckel in Germany and Bastian in England may be named as confident defenders of the doctrine of *Abiogenesis*, as spontaneous or equivocal generation is now technically termed. Those who wish to know fully the arguments for and against the doctrine, are referred, on the one hand, to Pouchet's *Hétérogénie, ou Traité de la Génération Spontanée* (1859), and to Bastian's *Beginnings of Life* (1872); on the other, to Pasteur's *Examen de la Doctrine des Générations Spontanées*; and to the admirable statement, expository and historical, in Huxley's *Critical and Addresses* (1873).

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GENERATIONS, ALTERNATION OF: phrase devised by Steenstrup, Danish naturalist, about 1840, to signify 'the remarkable and till now inexplicable natural phenomenon of an animal producing an offspring, which at no time resembles its parent, but which, on the other hand, itself brings forth a progeny which returns in its form and nature to the parent animal, so that the maternal animal does not meet with its resemblance in its own brood, but in its descendants in the second, third, or fourth degree or generation; this always taking place in the different animals which exhibit the phenomenon in a *determinate* generation, or with the intervention of a *determinate* number of generations.' The phenomenon has been observed in many of the *hydrozoa*, in various *entozoa*, in *annelids*, in *molluskoids* (*salpæ*), and in insects (*aphides*). An illustration is the development of the *medusæ* or *jelly fishes*, which belong to the class *hydrozoa*. The medusa discharges living young, which, after having burst the covering of the egg, swim about freely for some time in the body of the mother. When first discharged or born, they have no resemblance whatever to the perfect medusæ, but are little cylindrical bodies (fig. 1, *a*), covered with cilia, moving with consid-

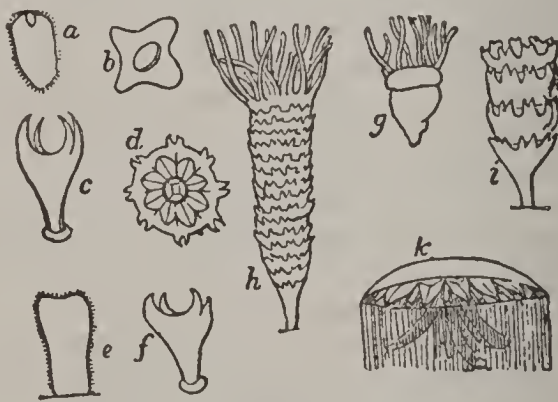


Fig 1.

erable rapidity, and resembling infusoria. After moving freely in the water for some days, each little animal fixes itself to some object by one extremity (*e*), while at the opposite extremity a depression is gradually formed, the four corners (*b, f*) becoming elongated, and gradually transformed into tentacles (*c*). These tentacles increase in number till the whole of the upper margin is covered with them (*g*). Transverse wrinkles are then seen on the body at regular intervals, appearing first above, and then extending downward. As these wrinkles grow deeper, the edge of each segment presents a toothed appearance, so that the organism resembles an artichoke or pine-cone, surmounted by a tuft of tentacles (*h*). The segments gradually become more separated until they are united by only a very slender axis, when they resemble a pile of shallow cups placed within each other (*i*). At length the upper segment disengages itself, and then the others in succession. Each segment (*d*) continues to develop itself until it becomes a complete medusa (*k*); while the basis of stalk remains, and produces a new colony. Here, then, we have the egg of the

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medusa gradually developed into the polypoid organism (*h*), to which the term *strobila* (from *strobilos*, a pine-cone) has been given. This polyp, by gemmation and fission, yields medusæ with reproductive organs.

The phenomenon of alternation of generations is presented in the Cestoid Worms (see under CESTOID) and in certain Trematoid Worms (see FLUKE); and is seen also in TAPE-WORMS (q.v.). The fission of certain annelids (*Syllis* and *Myrianida*) (see REPRODUCTION), presents an example, though at first sight a less obvious one, of alternation of generations, the non-sexual parent worm yielding by fissure progeny containing spermatozoa and ova, from which again a non-sexual generation is produced.

The *Salpæ* (*mollusca* or *molluscoids* belonging to the family *Tunicata*) are regarded usually as affording a good illustration of the phenomenon under consideration. It was in these animals that it was originally noticed by Chamisso, who accompanied Kotzebue in his voyage round the world (1815–18). The *Salpæ* (20 to 40 in number) are united together by special organs of attachment, so as to form long chains, which float in the sea, the mouth (*m*), however, being free in each. The individuals thus joined in chains

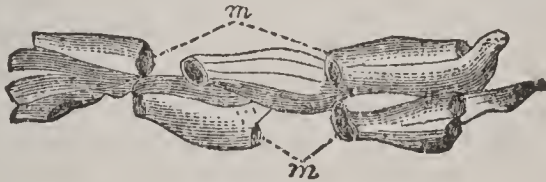


Fig. 2, A.

(fig. 2, A) produce eggs; one egg being generally developed in the body of each animal. This egg, when hatched produces a little mollusk (fig. 2, B), which remains solitary,



Fig. 2, B.

differs in many respects from the parent, does not produce an egg, but propagates by a kind of internal gemmation, which gives rise to chains already seen within the body of the parent, which finally bursts and liberates them. These chains

again bring forth solitary individuals.

The chief instance in which this phenomenon occurs in animals so highly organized as insects is in the *Aphides*, or Plant-lice. In many species of the genus *aphis*, which in the perfect state possess wings, a large proportion of the individuals never acquire these organs, but remain in the condition of larvæ. These without any sexual union (none of them, indeed, being males) bring forth during the summer living young ones resembling themselves; and these young ones repeat the process, till ten or eleven successive broods are thus produced; the last progeny, toward the end of the summer, being winged males and females, which produce fruitful eggs that retain their vitality during the winter, and give birth to a new generation in the spring, long after their parents have perished. Another instance is the *Cynips* or Gall-fly. Hofmeister discovered an alternation of generations in plants. For generation other than by

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impregnation, Owen invented the term PARTHENOGENESIS; but this term is now usually restricted to a special signification.

Cycle of Generations is a truer term than alternation of generations; as there may be four changes between one several generation and the next for several series. Many authorities object to the term 'alternation of generations.' The detached portions of the stock originating in a single generative act are termed *Zöoids* by these writers, while by the term *animal* or *entire animal* (the equivalent of *Zöon*) they understand in the lower tribes, as in the higher, *the collective product of a single generative act*. Here they include under the title of *one generation* all that intervenes between one generative act and the next. 'If,' says Dr. Carpenter, 'the phenomena be viewed under this aspect, it will be obvious that the so-called "alternation of generations" has no real existence; since in every case the whole series of forms which is evolved by continuous development from one generative act repeats itself precisely in the products of the next generative act. The alternation, which is very frequently presented in the forms of the lower animals, is between the products of the *generative act* and the products of *gemmation*, and the most important difference between them usually consists in this—that the former do not contain the generative apparatus which is evolved in the latter alone. The generating zöoid may be merely a segment cast off from the body at large, as in the case of the *Tape-worms* (q.v.), or it may contain a combination of generative and locomotive organs, as in the self-dividing *Annelide*. It may possess, however, not merely locomotive organs, but a complete nutritive apparatus of its own, which is the case in all those instances in which the zöoid is cast off in an early stage of its development, and has to attain an increased size, and frequently also to evolve the generative organs, subsequently to its detachment; of this we have examples in the *Medusæ* budded off from Hydroid Polypes, and in the aggregate *Salpæ*.' For fuller details see Belfour's *Embryology* (1880-1).

GENERIC, a. *jě-ně'r'ík* [L. *genus*, race, kind, *genèris*, of a race or kind: F. *générique*: It. *generico*]: pertaining to a genus or kind; consisting in the classification of objects under genera, as opposed to species; also GENER'ICAL, a. *-ně'r'-ík-ál*. GENER'ICALLY, ad. *-lí*. GENERIC-AREA, in *bot.*, *zool.*, and *geog.*, an area to which a genus is limited. When there is one spot within this area where representatives of the genus abound more than they do in other parts, it is called the metropolis.

GENEROUS, a. *jě'n'ěr-űs* [F. *généreux*—from L. *geněrō-sűs*, of good or noble birth, generous—from *genus*, kind, race: It. *generoso*]: liberal; bountiful; excellent; open-hearted; strong or invigorating in its nature. GEN'EROUSLY, ad. *-lí*. GEN'EROUSNESS, n. *-něs*. GEN'EROS'ITY, n. *-űs'ík-tű*, a disposition to give liberally, or to bestow favors; a quality of the heart opposed to meanness or parsimony.—SYN. of 'generous': beneficent; munificent; benevolent; noble;

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honorable; magnanimous; spirited; abundant; plentiful; overflowing; strong; exciting.

GENESEE, *jěn-é-sē'*: river, rising, about 10 m. s. of the boundary between Penn. and N. Y. It flows n. through the w. portion of N. Y., and after a course of 145 m. falls into Lake Ontario, 7 m. n. of the city of Rochester. The G. is notable not only for the varied and romantic character of its scenery, but also for its extraordinary falls. Of these falls, five in number, three, occurring within a distance of two miles, in the vicinity of the town of Portage, about 90 m. from the mouth of the river, are respectively 60, 90, and 110 ft. high. The other two, one immediately above Rochester, and the other about 3 m. below that city, are each about 100 ft. high.

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GENESIS, n. *jěn'ě-sīs* [Gr. *genēsis*, origin, source—from *gēnnāō*, I cause or produce]: the first book of the Old Testament Scriptures, giving the history of the creation of the world and of man, etc.; the act of producing; a production or formation; evolution. **GENETIC**, a. *jě-nět'ik*, pertaining to origin or mode of production of a thing. **GENETICAL**, a. *jě-nět'ī-kāl*, same as *genetic*. **GENETICALLY**, ad. *-kāl-lī*, in reference to the origin, descent, or mode of production.

GEN'ESIS, or more fully **GENESIS KOSMOU** (Origin, Generation of the World): name given first by the Septuagint to the opening book of the Pentateuch and of the Old Testament. In the Hebrew canon it is called *Bereshith* (In the Beginning), from the initial word; in the Talmud, it is sometimes referred to as 'The Book of Creation,' or 'The Book of Abraham, Isaac, and Jacob.' Its Masoretic division into 50 chapters, followed in the English Bible, or into 12 large or 43 small encyclical sections (*Sedarim, Parshioth*), has been grounded rather on convenience than on any corresponding division of the subject-matter. The book seems of itself to fall most naturally into two totally distinct parts; the first of which would extend from the beginning to the call of Abraham (i.—xii.), and embrace the account of the creation, paradise, fall, the generations between Adam and Noah, together with their religion, arts, settlements, and genealogy, the deluge, the re-peopling of the earth, the tower of Babel, the dispersion of the human race, and the generations between Noah and Abraham; thus forming an introduction to the second part (xii.—1.), or the history of the patriarchs (Abraham, Lot, Ishmael, Isaac, Jacob, Esau, and Joseph); the whole concluding with the settlement of Jacob's family in Egypt. Another division seems indicated by the inscription *Toledoth* (Origin, Generation), which occurs ten times in the course of the book, introducing at each repetition a new cycle of the narrative, and which would thus divide the whole (after ii. 4) into ten distinct sections of disproportionate length.

The period of time over which the Book of G. extends has been variously computed; the number of years commonly assigned to it is about 2,300; Bishop Hales, following the Septuagint, reckons 3,619 years. In truth, however, the book gives no chronology: it purports to relate not dates of the events but the *order* of events (see **CHRONOLOGY**).

Being a portion, and the introductory portion of the Pentateuch—at the same time that it forms a complete whole in itself—G. cannot but be considered as laying down the basis for that theocracy of which the development is recorded in the succeeding books. While the design and plan of the Pentateuch is thus also that of G., the latter, however discordant its constituent parts may seem, does not lack the necessary unity. Beginning with the cosmogony, or rather geogony, i. e., the generation of the earth with its animate and inanimate products, and all created things which bear upon and influence it visibly (see **COSMOGONY**), the record gradually narrows into the history of man, and with the distinct aim of tracing the

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fate of the one chosen family and people, it singles out Noah, Abraham, Isaac, Jacob. The narrative dwells with careful minuteness upon their fortunes, laying especial stress on their recognition of the living God and their confidence in Him, and in the case of the last three, on the reiterated promises of the land which they should inherit: 'they and their seed after them.' The remainder of the human race is summarily treated of; the various founders of tribes and peoples that represent it being generally but briefly named. It is only in the case of brothers, or very near relations of the elect, that certain incidents of their lives are more fully recorded; plainly with the intention of proving the inferiority of their claims to divine consideration, or even of representing them as meet objects of the displeasure of the Almighty: e.g. Ham, Ishmael, Esau. From chap. xxxvii. to the end of the book, we have exclusively the one chosen family of Jacob and his children before our eyes; and the strictly national character, which the narrative now assumes, excludes everything but the fortunes of this particular house. Here, also, an unbroken, flowing style takes the place of the former apparently sketchy and sometimes abrupt manner. With the occupation by Jacob's rapidly developing tribe of the land of Goshen, this first great patriarchal period is brought to a fitting close, and the second ushered in, when the tribe reappears after a lapse of time as a people. The Maker of all things, having by the creation of one man and one woman in His own likeness placed all mankind on an equal footing, from which they voluntarily fell into ungodliness—He in the sovereignty of His grace selected from the mass of human corruption one righteous man—one man who recognized God in faith; and through this man's progeny—whose history is told at length—mankind is in the end to be reclaimed:—this seems the pith of the book, considered as a religious history of man.

A certain apparent difference of style and language; the occurrence of what seemed gaps on the one, and repetitions and contradictions on the other hand; the special headings (*Toledoth*) above mentioned; and lastly, the use of different terms for the divine name, led very early to the question of the integrity of Genesis. Celsus, Isaac, C. Jasos, Aben Esra, Karlsstadt, Spinoza, all assumed smaller or larger interpolations; that is, pieces evidently not written by the author of the book himself, but added afterward. It was not before 1753 that the 'Hypothesis of Documents,' based on the alternate use of the word *Jehova* (Self-existent, and Ever-manifesting) and *Elohim* (Almighty) was broached. While the Talmud, Tertullian, St. Augustine, Chrysostom, Jehudah Hallewi, etc., all had endeavored to explain how the individual word was always necessary in the special passage where it occurred, Astruc, a Belgian physician, published in that year his *Conjectures sur les Mémoires originaux dont il paroît que Moïse s'est servi pour composer le livre de Genèse*, in which he endeavored to show that this writer, or rather editor of the book, had made use of two large and ten small—respectively 'Elohistic' and 'Jehovis-

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tic'—documents for his composition. This theory was at first received with silent contempt in the writer's own country. The only man who took any notice of it was Charban, who at the same time excused himself for refuting this 'absurd but dangerous' theory. It soon, however, found its way to Germany, where it was warmly advocated and developed by Eichhorn (*Repert.* and *Introd.*), Ilgen, and Gramberg. A further step was taken by Vater and Hartmann, to whom belongs the 'Hypothesis of Fragments,' or of the whole Pentateuch being a Mosaic of fragments by various authors. Both these notions have now been generally rejected, for various reasons, but chiefly on account of their incompatibility with the evident unity of the whole work and its single parts. The theory adopted by the majority of biblical critics of our day, among whom are Wette, Lengerke, Knobel, Stähelin, Bleek, Tuch, Deltizsch, and Bunsen, with a host of others, is the 'Complementary,' according to which the author of the Pentateuch—the Jehovist—had worked upon an old Elohist fundamental record which embraced the time from the creation to the death of Joshua, altering, enlarging, and completely rewriting it. Ewald and Hupfeld, however, assume four writers; the former two Elohists and two Jehovists, the latter three Elohists and one Jehovist; while the apologetic school of Hengstenberg, Hävernick, Keil, attempts to uphold the primitive theory of a single author.

Considered from the remotest time as a book written under the influence of divine inspiration—a term very differently understood—and thus raised above all doubt as to its truthfulness, various efforts were made, from the days of the earliest interpreters to our own day, to explain, by allegory and symbol, such of its statements as in their plain sense seemed incomprehensible to human understanding. Philo and the Alexandrines generally, Papias, Irenæus, Justin Martyr, and others, in all seriousness spiritualized into divine parable that which was given as history; so much so, that St. Augustine—exemplifying the spirit of the times—shortly after his conversion, explains paradise to represent nothing more than the happiness of mankind, the four rivers the four virtues, the serpent the devil, the coats of skin immortality, etc. In more recent times, however, after Luther had restored the belief in the literal meaning of the text, some have returned to the ancient theory of allegory and symbol, above noted; and some have gone so far as to refer all that is not within the grasp of their reason and the sphere of their present knowledge, to the region of myth, and to point to the obvious similarity between the biblical narrative of the paradise, its four rivers, the serpent, the apple, the fall, etc.; and certain legends, common to most eastern nations in the remotest times, as a proof that they all were derived from one and the same mythical source. Since the revival of science in the 16th c., and especially since the first quarter of the present century, another, and what was at first deemed a much graver difficulty, has arisen—viz., how certain distinct and explicit statements of the Scripture were to be reconciled with certain undeniable

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physical facts; and in particular, the Mosaic cosmogony, in the opening chapters of Genesis, has been brought into violent controversies. The age of the world, supposed to be given by Moses at 6,000 to 8,000 years; its creation and the formation of the whole system of the universe in six of our common days; these were declared by astronomers and geologists to be narratives of the impossible and absurd. This phase of controversy has already passed by: many believers in the biblical record conceding that the book was given not for scientific but only for religious instruction (these have tended often to the spiritual or allegorical interpretation); while others have set forth a reconciliation between Genesis, literally interpreted, and science. Two principal methods of reconciliation have been advanced: Dr. Buckland and his followers adopted and amplified the Chalmerian interpolation of the geological ages before the first day of Genesis (an opinion, strange to say, to be found already in the Midrash (q.v.): 'Before our present world, the Almighty had created worlds upon worlds, and destroyed them again'): Hugh Miller adopted the Cuvierian expansion of the six days into geological ages; some have combined the two schemes. On the other hand, it is asserted both by many of those who hold that the Bible is entirely the work of man, and by those who take it as a mixture of the divine and the human element, that the biblical notion of the cosmogony, as well as of all the other physical phenomena, are simply in accordance with the state of science in the days when the book was compiled. Meanwhile it is pointed out by eminent biblical scholars and men of scientific attainments that the very words of the record in Genesis, so far from being in contradiction to the *facts* of science, convey either directly or by natural implication all that is essential in those facts. It is not claimed by them that all the unproved theories or hypotheses of scientific writers are in consonance with Genesis: thus evolution, so far as it is a fact in nature, with its wide range and important bearings—these Christian scholars say—is not at any point contradicted in Genesis; while the full hypothesis known as "evolution" with its brilliant speculations and assumptions may wait till it is proved before it ranks as science requiring reconciliation with the Scriptures. See COSMOGONY (Biblical).

The apologists adduce, as a further proof of the authenticity of Genesis the surpassing sublimity and moral superiority of its cosmogony as compared with all others. The dualism of God and matter, which, according to the different pagan systems, are either eternally coexistent or fused into each other, is exchanged for the august and moving idea of one personal God, who first created, then molded, and everlastingly sustains the universe, lavishing his highest gifts on man, made in his own image and standing toward God in the living relation of a son to a father. The occurrence of similar traditions in the religious records of other primeval nations is taken as corroborating the historical truth of the biblical account. Recent investigations likewise have affirmed the division of mankind into three prin-

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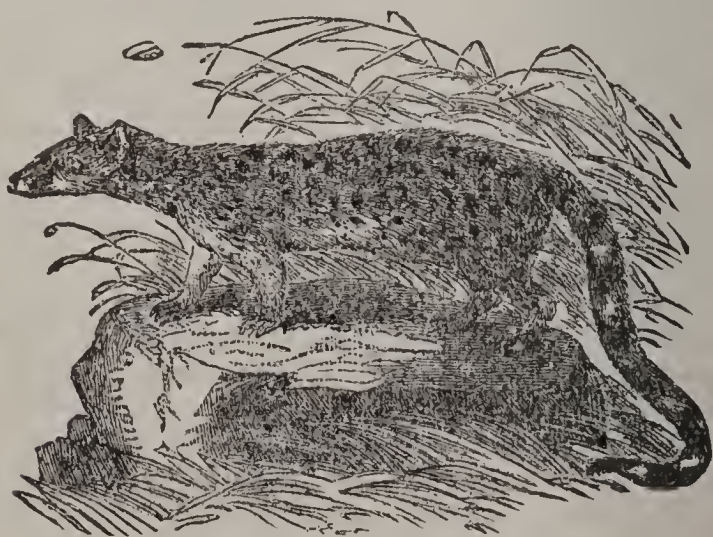
cipal races, corresponding to Shem, Ham, and Japhet, to be substantially correct, as far as language is concerned.

The question whether Moses was author or compiler of G. has been negatived by some, chiefly on the ground that certain apparently obsolete names mentioned are explained by others which first came into use at a much later time, and that there are allusions made to events which happened centuries after Moses. Graves, Faber, Rosenmüller, and others, consider such passages late additions. On further question whether Moses wrote G. while at Midian, or during the 40 days on Mount Sinai, or during the 40 years' sojourn in the desert, see PENTATEUCH, where also some connected points are glanced at. Of opinions on the other side, are notable that of Lengerke, who holds the Elohist to have written under Solomon, and the Jehovist under Hezekiah; of Tuch, who places the former in the time of Saul, the latter in that of Solomon; and of Bleek, who assigns to the Elohist the time of Saul or the Judges, and to the Jehovist the beginning of David's reign.

Of the countless ancient and modern writers who have commented on Genesis, the following are notable: Cyril of Alexandria, Ephraem Syrus, Theodoret, Procopius, Chrysostom, Jerome, Augustine, Jitzchaki (commonly, but wrongly, called Jarehi), Aben-Ezra, Levi b. Gershom, Abrabanel, Mendelssohn, Michaelis, Vater, Bohlen, Rosenmüller, Eichhorn, Augusti, Faber, Graves, Tuch, Knobel, Herder, Delitzsch, Hengstenberg, Keil, Kurtz, De Wette, Bleek, Ewald, Schrader, Wellhausen, Kuenen, Colenso, Davidson. See also Hugh Miller's *Testimony of the Rocks*; Pye Smith's *Relation between Scripture and Science*; Dr. Whewell's *Bridgewater Treatise*; Goodwin's *Mosaic Cosmogony*; Guyot's *Creation*, etc.

GENET, or GENNET, n. *jën'ët* [F. *genet*—from Sp. *ginete*, a light-armed horseman]: a small Spanish horse.

GENET, or GENETTE, n. *jën-ët'* [Fr. *genette*, a genet—from Ar. *djerneith*], (*Genetta*): genus of quadrupeds of the fami-



Genet (*Genetta vulgaris*).

ly *Viverridæ*, nearly allied to the Civets (q.v.), but having only a rudimentary odoriferous pouch, and claws perfectly

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retractile, as in the *Felidæ*. The approximation to that family appears also in the vertical contraction of the pupil of the eye. The species are numerous; smaller and more slender animals than the civets, natives mostly of Africa and the warmer parts of Asia. One, the common G. (*G. vulgaris*), is found in s. Europe, as well as throughout Africa. It is gray, with small round or oblong black or brown spots; the tail, as long as the body, ringed with black and white. It frequents the banks of brooks. Its fur is a considerable article of commerce. It is easily domesticated, and is kept in houses in Constantinople to catch mice.—The GENET is sometimes met with in Heraldry. There was an order of knighthood in France, founded by Charles Martel, called the order of the G., but it has long ceased to exist.

GENETIC, GENETICAL: see under GENESIS.

GENEVA, n. *jě-ně'vǎ* [F. *genièvre*, the juniper-tree: OF. *genèvre*—from L. *junĭpĕrus*]: gin; a spirit distilled from grain or malt and juniper-berries, now often flavored with the oil of turpentine—GIN is said to be a contr. for *Geneva*; the name of a town in Switzerland. **GENE'VAN**, a. of or pertaining to Geneva. **GENE'VANISM**, term applied to Calvinism, from the fact that its founder so long lived at Geneva. **GENEVESE**, n. *jěn'ě-věz*, the people of Geneva. **GENEVA CROSS**, red Greek cross on a white ground: see **GENEVA CONVENTION**. **GENEVA-GOWN**, the ordinary preaching-gown worn by Presbyterian ministers, usually in Britain, and sometimes in the United States, and by some 'Low Church' Episcopal clergymen. It is of black silk, and in shape resembles the gown of a Cambridge D.D. It was adopted by the followers of Calvin, and by the reformers who took refuge in Geneva, as a protest against the use of the alb, which is essentially a sacrificial vestment: see **ALB: SURPLICE**.

GENE'VA: village in N. Y., delightfully situated at the n.w. extremity of Seneca Lake 200 m. w. of Albany, 50 m. s.e. of Rochester. It is handsomely built, and commands a magnificent view of the lake and the surrounding country, and is noted for charming residences and extensive nurseries. It is the seat of Hobart College (Prot. Episc.), chartered 1825, which had (1901-2) 19 instructors, 103 students, 39,600 vols. in library, grounds and buildings \$168,957, and productive funds \$483,415. It has a graded union school with branches, water-works, water-cure, and two public parks. Pop. (1900) 10,433.

GENEVA: canton of Switzerland, in the s.w. of that country; bounded on the n. by the canton of Vaud and the Lake of Geneva, and on the s., e., and w. by the territories of France; 109 sq. m.; watered by the Rhone and the Arne, which unite about two m. from the s.w. extremity of the Lake of Geneva. The surface is hilly, and the soil, not naturally fertile, has been rendered so by the industry of the inhabitants. The political affairs of the canton and city have undergone various changes, the last being a revolution 1847, when the old aristocratic party was overthrown, and a democratic and progressive party at

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tained to power. Long inert, and in a backward condition, the administration is now most active in developing the resources of the canton. According to the constitution of 1847, all male citizens of 21 years of age exercise the right of electing representatives to the cantonal council; the age of members of which must be at least 25 years. There is a representative for every 666 inhabitants. The executive is confided to a council of state composed of 7 members, nominated for 10 years, but eligible for re-election. The constitution guarantees civil and religious liberty, all forms of worship being allowed by law; but the majority of the citizens pertain to the Reformed Calvinistic Church. The chief branches of industry are agriculture, and the manufacture of articles of *bijouterie* and watches. About 200,000 watches are made annually, and exported to France, England, Italy, and elsewhere. Musical-boxes, chronometers, mathematical instruments, etc., also are made. The chief town is Geneva (q.v.). Pop. of canton (1880) 101,595; (1888) 105,509; (1900) 132,609.

GENEVA (Fr. *Genève*, Ger. *Genf*, Ital. *Ginevra*): most populous and flourishing town of Switzerland, cap. of the canton of G., on the s. extremity of the Lake of Geneva, 70 m. n.e. from Lyon, in France. At the time of the contests between the Helvetii and the Romans, G. belonged to the country of the Allobroges. It was afterward included in the Roman *Provincia Maxima Sequanorum*, and was a place of some importance under the Burgundian kings. On the dissolution of the kingdom of Burgundy, G. fell under the dominion of the Ostrogoths; in 536, under that of the Franks; and toward the end of the 9th c., under the new kingdom of Burgundy. It had been made a bishop's seat in the 5th c., and from the 12th c. continual feuds arose between the bishops and the Counts of Savoy with regard to the supremacy. The citizens took advantage of these dissensions to obtain fresh liberties and privileges for themselves. In 1518, the Genevese concluded an alliance with Freiburg, and shortly afterward with Bern; thus G. became a member of the Swiss confederation.

The doctrines of the Reformation, boldly and enthusiastically preached by William Farel, met general acceptance in Geneva. In conjunction with Bern, the citizens expelled the adherents of the Dukes of Savoy—the so-called Mamelukes—from the town, and declared the bishopric vacant. In 1535, Aug., the Reformed religion was established by law; and 1541, Calvin was invited to take up his residence permanently in G., as public teacher of theology. It was he who chiefly impressed the stamp of rigid morality, not unalloyed with pedantry, on the minds of the citizens of G., and awakened a taste for the exact sciences. The town, previously merely a place of trade, thus acquired an important influence over the spiritual life of Europe, and became the centre of education for the Prot. youth of Great Britain, France, Germany, and Spain. In 1602, the last attempt of the Dukes of Savoy to recover the town was frustrated by the energy and resolution of the citizens. During the 18th c., G. was distracted by a continued feud

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between the aristocratic and popular parties, until in 1782, Bern, Sardinia, and, in particular, France, interfered in aid of the aristocracy. The French Revolution led to a new crisis; the govt. was overthrown 1794, July; equality in the eye of the law was established, a national convention appointed, and a reign of terror commenced. In 1798, G., and its territory, was annexed to France, under the name of the dept. 'Du Leman.' After the overthrow of Napoleon, G. recovered its independence, and the Congress of Vienna increased its territory considerably.

The situation of the town on both sides of the lake where it is narrowed and forms the Rhone, is exceedingly pleasant and advantageous for traffic. Formerly, G. was surrounded by walls, and consisted of clusters of narrow and ill-drained streets; but since the accession of the democratic party to power 1847 (see GENEVA—canton), an extraordinary change has been effected, chiefly through the energy and enlightened views of M. James Fazy, a wealthy native proprietor. The ancient ramparts have been removed, streets widened and well paved, new and commodious quays constructed along the shores of the lake and river, and a spirit of improvement introduced which points to a great extension of the city. Among the latest improvements is the construction of a breakwater, within which, as in a harbor, steamboats are received and lie in safety, and from which they depart several times daily to the principal ports on both sides of the lake. The two divisions of the town are connected by several wooden bridges, and by a handsome new stone bridge completed 1863. In rushing through the town, the Rhone parts into two branches, forming two islands, on one of which still stands an antique and picturesque cluster of buildings; on the other island, laid out as a public pleasure-ground, there is a statue of Jean Jacques Rousseau, native of the town. Stretching along a part of the new quay, on the left side of the Rhone, there is now a public promenade laid out as a *jardin Anglais*. As forming a central terminus for French and Swiss railways, G. is a favorite resort of travellers, for whose accommodation there are several large and splendid hotels, commanding fine views of the lake and mountain scenery in the environs. The language spoken is French. The principal edifices are the cathedral church of St. Pierre, which dates from 1124; the town-hall; the college founded by Calvin 1558, with a library of 75,000 vols. the magnificent theatre, opened 1879, next in size to the Paris Opéra and the theatre of Vienna; the Musée Rath; the observatory; and the museum of natural history, containing De Saussure's geological collection, Haller's herbarium, the fossil plants of Brogniart and Decandolle, etc. The *Académie* (established 1368, reorganized by Calvin and Beza 1539) was raised 1875 to the rank of a university by the addition of a medical faculty. Among many handsome new public buildings are the post-office, a Rom. Cath. and an English church, the last accommodating the large number of English residents and casual visitors. The staple manufactures of the town are watches, musical-boxes, and jewelry; and

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for the sale of these and other fancy articles, there are many attractive shops. Altogether, G. is to be considered as one of the most prosperous towns on the continent. Pop. (1885) 51,537, with suburbs 74,453; (1901) 105,139.

GENEVA, LAKE OF, or the LEMAN LAKE (*Lacus Lemanus*): between Switzerland, to which its larger portion belongs, and the recently acquired territories of France. It lies 1,150 ft. above the sea, and extends more than 50 m. from e. to w. in the form of a crescent; greatest breadth eight m.; depth between Evian and Ouchy 920 ft. This lake at some periods of the year presents a curious phenomenon, not yet sufficiently accounted for—the surface, especially near Geneva, rising and falling from two to five ft. in the course of about 25 minutes. The lake, never entirely frozen over, abounds in fish, and several steamers ply upon its waters. The shore on the side of the Pays de Vaud is celebrated for beauty of scenery; the French shore rises solemn and stern, with the mountains of Savoy in the background. From the Lake of G. Mont Blanc is visible, and though 60 m. distant, is often reflected in its waters. The Rhone enters the lake at the upper end, turbid and yellow, and leaves it at the town of Geneva as clear as glass, and of deep blue tint. The lake receives about 20 unimportant streams from its shore.

GENEVA ARBITRATION: action taken at Geneva, Switzerland, 1871, by five arbitrators, under provisions of the treaty of Washington between the United States and Great Britain, for the settlement of various claims of the United States and its citizens against the govt. of Great Britain for losses and damages growing out of the civil war, and historically grouped as 'the Alabama claims.' A diplomatic correspondence had been in progress between the two governments since the early part of the war, the United States at first protesting against the fitting out of armed vessels for the Confederacy in British ports, and afterward asserting claims for damages inflicted by such vessels on its merchant-marine. The first practical step toward adjusting the international disputes—for by this time each govt. disputed the claims and constructions of responsibility of the other—was taken 1869, Jan. 14, when Reverdy Johnson, U. S. minister to Great Britain, and Lord Clarendon, British sec. for foreign affairs, signed a convention in London which provided that all claims upon the part of individuals, citizens of the United States, against the govt. of her Britannic majesty, and all claims on the part of individuals, subjects of her Britannic majesty, against the govt. of the United States, arising since 1853, Feb. 8, should be referred to commissioners for settlement. Public opinion in both countries appeared friendly to negotiation, and it was hoped that this treaty would result in a permanent settlement of all matters at issue. But when the treaty went to the U. S. senate for ratification it received but one favorable vote. Early in 1871, Jan., Hamilton Fish, U. S. sec. of state, renewed the correspondence with Sir Edward Thornton, British minister to

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the United States, with a view to securing a further conference; and the appointment of the joint high commission and its negotiation of the treaty of Washington, May 8, resulted. The first articles of this treaty provided that five arbitrators should be appointed, one each by the pres. of the United States, her Britannic majesty, the king of Italy, the pres. of the Swiss Confederation, and the emperor of Brazil, who should meet at Geneva, Switzerland, as soon as convenient, and examine and decide all questions that should be laid before them on the part of the govts. of the United States and Great Britain respectively, and make such award as should appear just. The tribunal consisted of Charles Francis Adams (U. S.), Sir Alexander E. Cockburn (Gt. Brit.), Count Edward Sclopis (Italy), Jacob Staempfli (Switz'd), and Viscount d'Itajuba (Brazil). The counsel on the part of the United States were William M. Evarts and Caleb Cushing, and for great Britain Sir Roundell Palmer. Count Sclopis was chosen pres. of the tribunal. On Sep 14 the tribunal rendered its final decision, holding that Great Britain was responsible for the original fitting out and escape of the *Alabama*, and her subsequent free admission into British ports; was similarly liable in the case of the *Florida*; was liable for captures made by the *Shenandoah* after she was permitted to leave Melbourne; but was not responsible for the acts of the *Georgia*, *Sumter*, *Nashville*, *Tallahassee*, *Chickamauga*, and *Retribution*. The tribunal overruled the claim of Great Britain that its statute was the only criterion of its power and duty, and the claims of the United States for indirect and national losses, and awarded \$15,500,000 as compensation to American private citizens for losses of ships, cargoes, freight, and wages. After the award the U. S. govt. presented a beautiful service of silver to each of the arbitrators.

GENEVA CONVENTION: agreement entered into by the representatives of Switzerland, Baden, Belgium, Denmark, Spain, France, Hesse, Italy, Holland, Portugal, Prussia, and Würtemberg, at Geneva 1864, Aug. 22, for the relief of the wounded in war. The name is applied also to the assembly which adopted the agreement. After the articles of the convention had been signed the govts. signatory thereto formally ratified the act of their representatives. Efforts were then made to secure the adhesion to the convention of all govts. not represented at the first conference, and between 1864 and 81, Greece, Great Britain, Mecklenburg-Schwerin, Turkey, Bavaria, Austria, Persia, Salvador, Montenegro, Servia, Bolivia, Chili, the Argentine Republic, and Peru signed the articles. In 1868, Oct., additional articles, chiefly explanatory and particularizing, were proposed and signed at Geneva on behalf of Great Britain, Austria, Baden, Bavaria, Belgium, Denmark, France, Italy, Holland, North Germany, Sweden and Norway, Switzerland, Turkey, and Würtemberg, and were subsequently approved by all the signatory states of the convention of 1864, except the ex-pontifical states. In 1870, July, the Swiss govt. announced that, Rome and

GENEVA CONVENTION.

Spain excepted, all the original states had accepted the additional articles, that Russia proposed a further supplement with the view of preventing the abuse of the distinguishing flag of neutrality, and that both France and Germany had acceded to the proposal of the federal council of Switzerland to recognize the original and supplementary articles of the convention in the war then in progress between them. During that struggle Red Cross Societies were organized in both countries under the provisions of the G. C., and the beneficence of the undertaking was indisputably established. It seems strange that the United States govt. should have been the last to give its adherence to the convention, in view of the facts that it had passed through an extraordinary war and that in that war the virtual antitype of the G. C.—the U. S. Sanitary Commission—had rendered incalculable service to the govt., its medical dept., and the sick and wounded soldiers on field and hospital. The attention of the govt. was called to the G. C. by Clara Barton, who performed field and hospital service during the civil war, assisted the grand-duchess of Baden in the preparation of military hospitals 1870, superintended the supplying of work to the poor of Strasburg 1871, and had charge of the public distribution of supplies to the destitute people of Paris 1872. Unsuccessful in inducing congress to consider the proposition, she organized the American Red Cross Soc. and was elected its pres. 1881. In his message 1881, Déc., Pres. Arthur favored her proposal. Within a few days all the documents in the state department bearing on the G. C. were transmitted by the pres. to the senate in response to a resolution, and 1882, Mar. 16, the United States gave its adhesion to this international work of humanity. The uniform and distinctive flag adopted for all hospitals and ambulances, neutralized in accordance with the G. C., bears a red cross on a white ground and must be displayed beside the national flag. An arm-badge (brassard) with red cross on white field is provided for all individuals neutralized for field and hospital service. Turkey displays the crescent instead of the cross. Beside the Red Cross Societies organized at the outbreak of the Franco-German war, similar ones were in service in the Balkan states during the military operations that preceded and followed the Russo-Turkish war, in the latter war, in Constantinople after the insurrections 1876, and in Alexandria after its bombardment by the British 1882.

RED CROSS SOCIETIES: organizations effected under the provisions of the G. C. for the purposes therein indicated. The delay of the U. S. govt. in becoming a party to the convention was due to the consideration that from the location of the country and the policy of its govt., there was no apparent probability that the nation would be plunged into war. Hence, when the bill authorizing the adhesion of the U. S. govt. to the G. C. was introduced into the senate, it met unlooked-for opposition, till Miss Barton organized the American Red Cross Soc., not exclusively for service in time of war, but to 'provide a system of national relief and apply the same in mitigating suffering caused

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by war, pestilence, famine, and other calamities.' In the United States these societies are organized much after the plan and on the scope of the town, city, and state auxiliary associations and branches of the former U. S. Sanitary Commission. Through the national soc. they would coöperate with the medical depts. of the army and navy on the field and in the hospital, and supplement the work of the surgeon and physician in nursing, etc., in case of war. Since the American Red Cross Soc. was established its services have often been utilized with great advantage. In 1884 Miss Barton had charge of the expedition for the relief of the sufferers by the flood in the O. and Miss. rivers, and 1888 furnished nurses, specially skilled physicians, and various articles for the relief of the victims of the yellow fever epidemic in Fla. Other notable relief work of this soc. was the distribution of food and clothing during the persecutions in Armenia, 1894-96, and especially that in Cuba prior to, during, and after the war with Spain.

GENEVIEVE, SAINT: 422-512; b. in the village of Nanterre, near Paris: saint of the Rom. Cath. Church, subject of many popular and highly poetical legends, and regarded with special veneration in France and particularly in Paris, of which city she is deemed patroness. From a nearly contemporary life of St. G., we learn the facts of her history. As a mere child, she attracted the notice of Germanus of Auxerre, who passed a night at Nanterre on his return from Britain 429. Germanus is said to have marked her out as specially destined to a life of holiness and purity; and the child, partly from her natural tendency, partly, perhaps, under the influence of the counsel of so holy a bishop, devoted herself to a life of virginity and conventual seclusion. On the death of her parents, she was removed to Paris; and her active charity, and the extraordinary reputation for sanctity which she acquired there and in other cities of France, which she visited on missions of Christian benevolence, won for her the admiring veneration, not alone of her own people, but even of the heathen or half-converted tribes, which, about this period, after a long series of struggles, had begun to amalgamate with the ancient population of the Roman province of Gaul. During the Frank invasion under Childeric, G., with her sisters in religion, set out on an expedition for the relief of the starving city, and successfully conveyed to Paris an abundant supply of provisions. The city, when taken, was treated with special leniency through her intercession with the king, and many captives obtained their liberty at her prayer. On the new alarm for the safety of Paris, created by the tidings of the march of Attila and his army of Huns, it was proposed to abandon the city; but G., assembling the matrons and consecrated virgins in one of the churches, exhorted them to avert, by prayer and fasting, the threatened calamity. The unexpected alteration of the direction of Attila's march added greatly to her reputation and to her influence; and it is agreed that her personal example, and that of the sisterhood to which she belonged, appealed, with considerable

GENGA.

effect, to the natural sensibilities of the rude races which now found themselves, for the first time, in contact with the humanizing influences of the Christian religion. St. G. enjoyed, to an extreme age, the reverence and love of the entire people. She died at the age of 89, and her memory is still affectionately described as the type of all that is purest and most elevating in the conventual life, as well as of all that is most admirable in the works of charity and benevolence. Under her patronage, and with her name, a religious congregation of priests was founded in the 12th c., which, with some vicissitudes, continued until the Revolution. A religious congregation of women, under the name of 'Sisters of St. Genevieve,' was established 1636, devoted chiefly to the care of the sick and the education of young females.

GENGA, *jèn'gá*, BARTOLOMMEO: architect: 1518-58; b. Cesena, Italy; son of GIROLAMO G. He studied architecture with his father, was appointed intendant of public buildings by the Duke of Urbino, was architect of the Church of San Pietro de Mondovi, and, commissioned to put the island of Malta in a state of defense, traced the plan of Valetta, and designed several churches, but died before the work was completed.

GENGA, GIROLAMO: 1476-1551; b. Urbino, Italy: architect and painter. He studied art with Perugino and Raphael, with whom he became very intimate, executed the greater part of his work in Sienna, Rome, and Urbino, was architect of the ducal palace near Pesaro, restored the archiepiscopal palace at Mantua, and was author of numerous treatises on fine arts. His masterpiece in oil painting was *The Resurrection of Christ* at Sienna.

GENGHIS KHAN.

GENGHIS (or JENGUEIZ, or TCHINGGIS, or ZINGIS) KHAN, *jěn'gīs-kán*, originally called TEMUJIN, Emperor of Mongolia, and conqueror of a great part of Asia: 1155, Jan. 25—1227, Aug. 24; b. at Deylun-Yeldâk, near the n. bend of the Feramuran (Hoang-Ho); son of Yesukai Bahâdûr, Mongol chief, who ruled over 30 or 40 families or clans, called the tribe of Neyrun, dwelling between the Amur and the great wall of China, and paying tribute to the Khan of East Tartary. On his father's death he did not hesitate to assume the reins of government, though only 13 years of age. Some of the subject tribes refused to obey him, and chose another chief belonging to the same family. A war through several years was the result, at the termination of which he was compelled to retire to Karakorum, cap. of Toghrul Ungh-Khan, monarch of the Keraeit, and place himself under that monarch's protection. Ungh-Khan gave him his daughter in marriage, and appointed him to the command of his army, in which capacity G. gave proof of great military talent, conquering the Mekreit, Tanjût, Jellâeir, and other neighboring tribes. But Ungh-Khan, becoming jealous of his growing reputation, and urged on by envious courtiers, ordered G. to be assassinated. The latter, having taken counsel with his relative and chief councilor, Karatchâr Nuyan, a youth of his own age but renowned in Tartar history for his wisdom, resolved to depart for his native country, which, after many hair-breadth escapes, he reached at the head of 5,000 cavalry. Raising an army, he marched against his father-in-law; and Toghrul, vanquished in battle 1203, sought refuge among the Naymans, but was slain by the guards stationed on the frontiers. G. immediately seized Toghrul's dominions. In the following year, a number of Tartar tribes, alarmed at his increasing power, formed a powerful league against him. The command was given to Tai-Ungh-Khan, chief of the Naymans; but in a battle on the banks of the Amur, G. utterly routed his enemies, slew their leader, and became at once master of almost all Mongolia. Grander views of conquest seem now to have opened before his vision. In 1206 he convoked a kouriltai, or general assembly, on the banks of the Onan, a tributary of the Amur, flowing through his native land. This meeting was attended by deputies from all the subjugated hordes of Tartary, and G. contrived to obtain a religious confirmation of his designs. Up to this period, he had borne the name of Temujin; but a renowned magician or priest, surnamed Bout-Tangri ('Son of Heaven'), venerated by all the Mongols, now came forward and pronounced him *Genghis Khan*—i.e., greatest of khans, or khan of khans, declaring that he should rule over the whole earth. The deputies were duly impressed. About this time the Eighurs, an agricultural and civilized people, inhabiting the country at the sources of the Hoang-Ho and Yang-tse-Kiang, voluntarily submitted to his sway. From this people, who professed Buddhism, the Mongols appears to have acquired a knowledge of writing. They adopted the Eighur characters, but preserved their own language; and

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G. selected one of the newly-submitted tribe to instruct his children. The next important incident in his career was the conquest of the n. portion of China, called Khatai. The immediate cause of the war between G. and the emperor of China, Tchong-Héi, was the refusal of the former to recognize the latter as his suzerain, or liege-lord. Most of the Tartar tribes which G. had subdued were really tributaries of the Chinese empire; and Tchong-Héi, though not interfering to prevent the conquests of the Mongols, now wished G. to acknowledge his superiority by paying tribute. G. immediately prepared for war, scaled the great wall 1211; and after a series of bloody and protracted campaigns, Peking fell into the hands of the barbarians 1215. Meanwhile G. was called back to Tartary to quell certain insubordinate tribes, headed by Gutchluk, son of the chief of the Naymans, who had recovered his ancestral dominions, and also conquered those of the Gûr-Khân of Kara-Khatai. These tribes were nearly exterminated in a great fight near the sources of the Yenissei. Gutchluk, however, had some time before taken refuge in Turkestân, a vast region stretching from Lake Lob, in the middle of Tartary, westward to the Sea of Aral. Here he succeeded in making himself supreme ruler, but only to be swept away by the victorious Mongols, now pressing westward in an irresistible torrent. At length G. reached the Sihon, n.e. boundary of the empire of Khaurezm or Kharism, whose ruler, Ala-ed-dim Mohammed, was one of the most powerful sovereigns in Asia. The dynasty to which he belonged had risen into power through the weakness of the Seljuk sultans; and its sway extended from the borders of Syria to the river Indus, and from the river Sihon to the Persian Gulf. The murder of some Mongol merchants at Otrâr, a town on the Sihon, afforded G. a pretext for invasion. He immediately dispatched his eldest son, Jûjy, at the head (according to Eastern chroniclers) of 700,000 horse, who accordingly burst like a storm into Khaurezm 1219; and after having overthrown the Tartar allies of Sultan Mohammed, and fought a long and bloody battle with the sultan himself with no decisive result, captured Samark, Bokhara (the valuable library of which he destroyed), and all the other important cities of the country. The Mongols, in three separate divisions, now scoured and ravaged Khaurezm in all directions. In the course of five or six years, they overran the whole of Persia, subdued the inhabitants of the Caucasus, crossed into Russia, and plundered the land between the Wolga and the Dnieper. Nor were they less successful in the east; the whole of s. Asia, as far as the Sutlej, experiencing the miseries of their devastations. Sicknes, disease, and exhaustion at length enfeebled the Mongol hordes, and compelled G. to return to Karakorum, in Tartary, capital of his empire, 1224. During his absence, his generals had been prosecuting the Chinese war with the greatest success. G., though well-advanced in years, was still possessed by the old thirst of conquest; and having recruited his forces, he led them across the great desert of Gobi to the kingdom of Tanjout,

GENIAL—GENII.

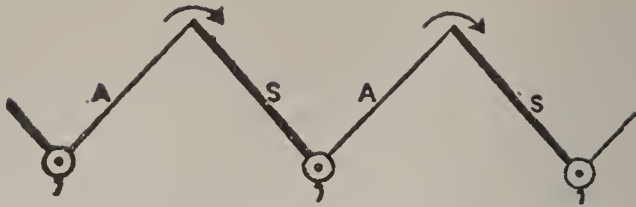
in the n.w. of China, whose capital Nin-hia, he besieged. Disheartened by the loss of the greater part of his army, the king of Tanjout promised to capitulate at the end of a month; but in the interval G., worn out with years and toils, died, on the hill Liou-pan. He is said to have had 500 wives and concubines, and to have left a great number of children, among three of whom he divided his enormous possessions. The third son, Oughtai, was appointed 'Grand Khan,' and received for his share the country now called Mongolia, with Khatai or N. China as far n. as the mouth of the Amûr. The second son, Tcheghatai, received Turkestân n. of the Amû or Jeyhûn, and was committed to the guardianship of Karatchûr Nuyan. Jûjy, for his share, obtained Keptehâk, and all the country w. and n. of Turkestân, an immense tract extending from the Caspian Sea almost to the Northern Ocean.

In the course of his sanguinary career, G. is said to have destroyed, by wars and massacres, no fewer than five or six millions of human beings. His conquests were generally accompanied with acts of appalling barbarity, yet we seem to trace through the dreadful history of the man some indications of a civilizing tendency. Himself a Monotheist, a stern believer in God after the fashion of Mohammed, he nevertheless tolerated all religions; exempted from taxes and military service physicians and priests; made obligatory the practice of hospitality; established severe laws against adultery, fornication, theft, homicide, etc.; organized a system of postal communication throughout his enormous dominions (mainly, no doubt, for military purposes); and so thoroughly organized what we may call the police or civil authority, that it was said one might travel without fear or danger from one end of his empire to the other. He would also appear to have had a respect for men of learning and virtue, and to have retained several such about his person. The only memorial of G. now known to exist is a granite tablet, with a Mongol inscription (commemorating his conquest of Kara-Khatai), discovered among the ruins of Nertsehinsk. See *Life of Jenghiz Khan*, from Chinese sources, by Prof. R. K. Douglas (1877).

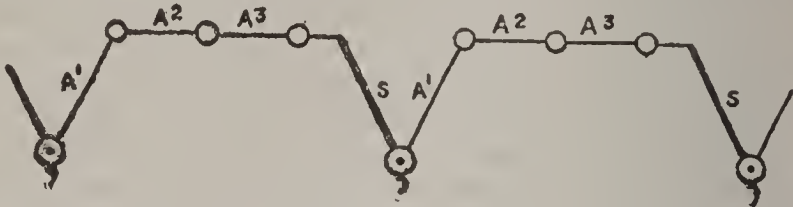
GENIAL, a. *jě'nî-ăl* [OF. *genial*—from L. *geniâlis*, merry, pleasant: It. *geniale*]: cheering; enlivening; contributing to life and cheerfulness; pleasantly warm and cheering, as genial weather. **GENIALLY**, ad. *-lî*. **GENIALITY**, n. *-î-tî*, gayety; cheerfulness.

GENICULATE, v. *jěn-ik'û-lăt* [L. *geniculātus*, having knots, jointed—from *gēnū*, the knee]: in *OE.*, to form joints or knots on: **ADJ.** in *bot.*, bent like a knee. **GENICULATING**, imp. **GENICULATED**, pp.: **ADJ.** having joints like the knee. **GENICULATION**, n. *-lā'shŭn*, the state of having knots or joints like the knee. **GENICULATE GANGLION**, in *anat.*, a gangliform enlargement on the facial nerve.

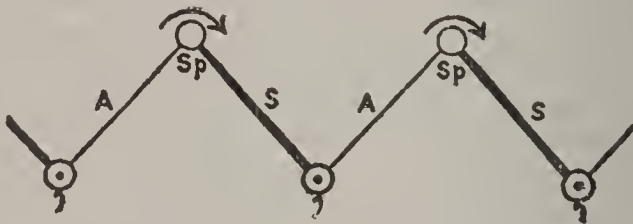
GENII, n. plu. *jě'nî-î* [called by Eastern nations *ginn* or *djinn* (see **GENIUS**)]: race of imaginary beings in Eastern tales, said to have been created from fire, and endowed



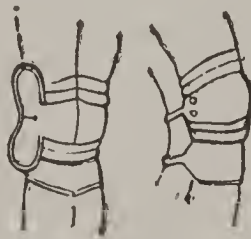
Generations.—A, asexual, produces S, sexual, from fertilized ovum of which A again arises.



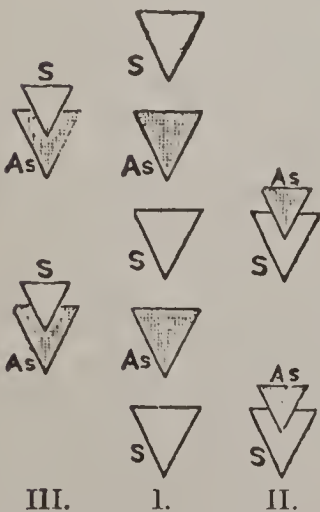
Generations.—A2 and A3 represent two of the interpolated asexual generations.



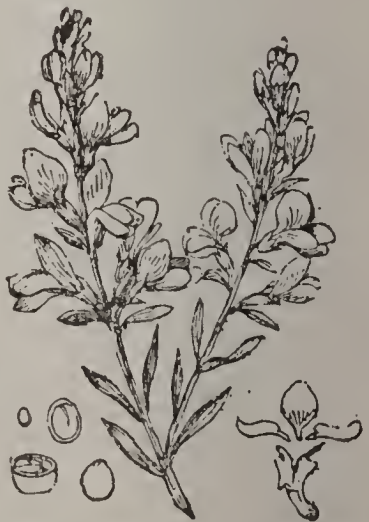
Generations. — A, the vegetative sexless fern-plant, produces a spore (Sp) from which the sexual 'prothallus,' S, arises, giving origin to fertilized egg-cells, and thereby recommencing the cycle.



Genouillères.



Generations.—I. expresses ordinary alternation between sexual (S) and asexual (As) generations; in II. the asexual is increasingly subordinated to the sexual (as in mosses); in III. the sexual is subordinated to the asexual (as in flowering plants).



Dyer's Greenweed (*Genista tinctoria*)

GENII.

with certain bodily forms which they can change at pleasure, and to have possessed superhuman powers. According to the belief of the old Italian races, genii were protecting spirits, who accompanied every created thing from its origin to its final decay, like a second and spiritual self. They were appropriated not only to men, but to all things animate and inanimate, and especially to places. They were regarded as effluences of the Divinity, and were therefore worshipped with divine honors; sacrifices were annually made to them on various occasions, especially on birthdays, and during the period of harvest. Indeed Jupiter himself was called the genius of men, and Juno of women. Not only had every individual his genius, but likewise the whole people. The statue of the national genius was placed in the vicinity of the Roman forum, and is often seen on the coins of Hadrian and Trajan. The genius of an individual was represented by the Romans as a figure in a toga, having the head veiled, and the cornucopia or patera in the hands; while local genii appear under the figure of serpents eating fruit set before them. (Compare Hartung *Die Relig. der Röm.* l. p. 32, etc., and Schömann *De Diis Manibus, Laribus, et Geniis*, Greifswald, 1840.)—The GENII of the East bear no resemblance to the old Italian genii. Their proper Arabic name is *Djinn* or *Jinn*; and their seems to have been no better reason for translating the word by the Latin term *genius*, than the casual similarity of the sounds. The word *Djinn* is from an Arabic root, signifying ‘to veil’ or ‘conceal,’ and properly denotes an ‘invisible being.’ The djinns, or Eastern genii, are, in fact, regarded by the Arabs and Persians as an intermediate class of beings between angels and men, inferior in dignity to both. They are described in poetry as the subjects of a certain *Ján Ibn Ján*, and as inhabiting the world before the present race of human beings; but they having excited the anger of God by their rebellion, he sent his favorite angel, *Hhâris*, or according to others, *Azazel*, to punish and govern them. Some time afterward *Hhâris* himself rebelled, whereupon God condemned him to eternal punishment. From this period, on account of his despair or his apostasy, he was called *Eblis* or *Iblis*. It is believed that the djinns can assume, in an instant, any form that they please, whether of man, brute, or monster, the last—in accordance with the popular view of their wicked character—being the one most frequently selected. Such as have read the *Arabian Nights* will have a vivid recollection of the hideous and gigantic shapes under which the genii are wont to manifest themselves, accompanied at times with smoke and thunders, to terror-stricken mortals. They are in no degree whatever *guardian* spirits like the genii of the old Italians; on the contrary, they are inimical to man’s happiness, and can be subdued only by the spells of powerful magicians: see FAMILIAR SPIRITS. The better-informed Easterns, however, do not believe, it is said, in the actual existence of such beings. The Mussulman doctors, it is true, affirm the existence of djinns as an invisible race of supernatural beings, who carry out the purposes of Deity, but they re-

ject altogether the grotesque and repulsive inventions of the Arab and Persian romancers and poets.

GENIPAP, *jěn'î-păp*: much esteemed fruit of the W. Indies and warm parts of S. America. The tree which yields it is *Genipa Americana*, of nat. ord. *Cinchonacea*. It is a 2-celled berry, containing many seeds; about as large as an orange, of a whitish-green color, with a dark purple juice of agreeable vinous taste.

GENISTA, *jě-nîs'ta*: genus of leguminous plants, for whose characters, see BROOM. Some of the species are popularly known by the name Broom, some as GREENWEED (q.v.). *G. Anglica*, much branched, very spiny shrub, not above 12 inches high, is called PETTY WHIN and NEEDLE FURZE in England, where it is regarded as indicating a very poor soil. The G. of Virgil and other Roman classics is supposed to be *G. Hispanica*, native of the s. of Europe, with branched stiff spines. *Gen* is said to be a Celtic word, signifying a shrub. The name Plantagenet is from *Planta Genista*; but what plant was intended, and whether the common furze or a species of G. is not certain.

GENITAL, a. *jěn'î-tăl* [F. *génital*—from L. *genitālis*, serving to beget—from *gigno*, I beget: It. *genitale*]: pertaining to generation or the act of begetting. GEN'ITALS, n. plu. *-tălz*, in *animals*, the organs of generation.

GENITIVE, n. *jěn'î-tiv* [F. *génitif*, the genitive case—from L. *genitīvūs*, pertaining to generation or birth, genitive case—from *gigno*, I beget: It. *genitivo*]: in *grammar*, name of one of the 'cases' (see DECLENSION); applied to a noun or other word inflected to indicate possession. GENITIVE, a. pertaining to source, origin, or possession; possessive.—*Genitive case in Grammar*. In such an expression as (Lat.) *regis filius*, (Eng.) the *king's son*, the form *regis* or *king's* is called the genitive case; and according to the usual explanation, this name was given it, because it indicates the source or origin of the thing joined with it. But a much more satisfactory account of the origin of the name, and of the real nature of the genitive case, is given by Max Müller (*Science of Language*, I. 121). The terms of grammar were originally applied, not to the parts of speech, but to the elements of thought; they were logical terms before they were grammatical. Long before the now familiar grammatical distinctions of singular and plural, of gender, case, voice, etc., had been thought of, the Greek writers on dialectics, in analyzing the different parts of an expressed thought, had distinguished the principal notion—the subject or nominative as it is called—from secondary or dependent notions; the dependency of the latter they expressed by the word *ptosis* (Lat. *casus*), a fall or leaning of one thing upon another; and in such a proposition as, 'the king's son is dead,' they indicated the exact nature of the dependence by calling it the *genikē ptosis*, i.e., the case showing the genus, kind, or class—the generic case; for while the name 'son' is applicable to every man having parents, 'king's son' is limited to the class of sons having kings for their fathers. One name joined to another

GENITIVE.

in this relation has thus the same effect as an adjective (q.v.) in limiting its application. It seems probable, indeed, that the termination of what we now call the genitive case, was originally the same as that by which adjectives were formed from nouns. The names thus applied to ideas were by the Greek grammarians of Alexandria transferred to the words expressing them, and were afterward translated into their Latin equivalents by the Greek grammarians who taught their language to the youth of Rome. But by this time the terms had become strictly technical, and their original signification little thought of; and this may account for the Greek *genike*, the Latin equivalent for which is *generalis*, being rendered erroneously by *genitivus*, generating or producing, which would have been expressed in Greek by *gennetikē*.

In English, the genitive is the only case or relation among nouns expressed by a difference of termination, and even it is often expressed by the preposition *of*; as the *river's* brink, or the *brink of the river*. From the frequency with which the form in *'s* indicates that one thing belongs to another, it is often called the *possessive* case. But this name is little applicable in such expressions as a *day's* journey; still less in many cases where the genitive is used in the ancient languages; e.g., *fons lactis*, a fountain of milk. The *generic case*, however, meaning that which limits the other noun to a class or kind, will be found to express the real relation in every conceivable combination.

The termination *'s* has been erroneously supposed to be a contraction for *his*, as if 'the king's son' = 'the king his son.' But this might not account for 'the queen's son,' or for 'men's sons.' Besides *his* itself is the genitive of *he*, and formed in the same way as *king's*, for the apostrophe (') is a mere artificial expedient of writing to distinguish the possessive from the plural, and does not belong to the spoken language. The English genitive in *'s* is a genuine relic of the inflections (q.v.) common at an early stage to all the Aryan languages. *s* was the prevalent ending of the genitive singular in the Anglo-Saxon, and in modern English it has been extended by analogy to all nouns and even to the plural. When the plural ends in *s*, the additional *s* of the genitive is omitted, for the sake of the sound, as *kings' sons*.

GENIUS.

GENIUS, n. *jĕ'nĭ-ŭs* [L. *gĕnĭŭs*, the good or evil spirit supposed to attend on a man or woman, taste, inclination: It. *genio*: F. *génie*]: supposed protecting or ruling power of men or places; an imaginary spirit (plu. *Genii*): *jĕn'yŭs*, the natural bent or disposition of mind by which a person is qualified for some particular employment; high mental powers or faculties; a person possessed of uncommon intellectual faculties: peculiar character, as 'genius of the place.' GENIUSES, n. plu. *-yŭs-ĕz* (see GENIUS, below). GENII, n. plu. *jĕ'nĭ-ĭ*, good or evil spirits presiding over men's destiny in life; imaginary spirits (see GENII, above). GENIUS-LOCI, *-lŏ'sĭ*, the presiding or tutelary deity of a place; hence, the pervading spirit of a place or institution.—SYN. of 'genius': ability; skill; capacity; capability; cleverness; talent.

GENIUS: high mental, especially originaive and artistic, powers and faculties. This word, which conveys the most lofty eulogium that can be applied to intellectual excellence, meant originally the tutelary god or demon anciently supposed to preside over the birth and destinies of every individual human being. The peculiarities attending the character and career of each person came thus to be attributed to the higher or lower nature of his attendant genii. Thus arose one of the meanings now attached to the word—namely, the special bent, aptitude, or faculty, which any one possesses; as a genius for poetry, for music, for mathematics, for statesmanship, and so forth. But this is not the chief or most prominent idea implied in the usual application of the term. If we consult usage, we shall find that genius is more frequently spoken of in connection with the poet, painter, orator, architect, inventor, etc., than with the man of deep learning or science or the man of trained practical skill; as if there was something in the regions of fine art that came more directly home to the susceptibilities of men, and evoked their expressions of admiration and praise. The term is given rather to a high degree of native power than to training and acquisition. The artist's function is to touch immediately and as it were instinctively and unconsciously, the chords of human feeling: the men of practical life, the physician, lawyer, or engineer, have more to do with the deliverance from pains or from obstacles to pleasure; and even though their work were proved more important, it may not command such instant and admiring tribute.

Undoubtedly, the most important meaning of the term, as pointing to a fundamental peculiarity in which human minds differ, is that connecting it with originality, invention, or creative power, in any department of intellectual activity, artistic, scientific, or practical. Not poetic creativeness alone, but every effort of the inventive faculties of man, by which new and superior combinations and devices are introduced into the world with a view to diminish the pains and add to the pleasures of mankind, may be properly designated 'genius.' Sufficient authority exists for this more extended use of the word, and we may justify it also by the consideration, that there is a common

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fact in all these different modes of intellectual superiority, while it is further possible that there may be a common foundation for them all in the constitution of the mind. We mark off the department of original power from other departments or modes of the intellect, still of positive value and of great and constant importance—namely, the powers of acquiring and reproducing what has been already produced. Amassed learning, extensive acquisitions in science, educated skill in the common arts or in fine art, may exist in a high degree, and may even confer distinction on the individual and serve useful purposes in life, without the accompaniment of originality. The praise implied in the name 'talent' would be conceded to the best examples of acquired power short of the aptitude for actual origination. This furnishes the most respectable contrast to genius, being itself something admirable and meritorious. A less esteemed contrast is furnished by the crowd of *imitators* that follow in the wake of any great and original mind, who aim at producing similar effects without the inward spontaneity of the master, and with only the resource of copying his external form and peculiarities. There is a kind of ability amounting to talent in this power of imitation, and literature always contains both good and indifferent examples of it. We are accustomed to speak of poetasters, playwrights, and copyists among the writers of every literary period. The imitators of Homer in his own time have not survived; but he, as well as every other great genius, may be tracked in subsequent compositions. Spenser's school of poetry makes the largest section of the published poems of the century succeeding him. Pope impressed his style on the 18th c., and Johnson's balanced prose continued to be reproduced long after his death.

The meaning of genius being thus understood as referring to original creativeness, or inventive power, it has been considered a problem of interest to trace it to its foundations in the mind, with a view to determine whether it be a distinct faculty, or only a superior degree of other recognized powers. Johnson's definition is well known; 'large general powers turned in a particular direction.' This negatives the idea of a specific endowment, and seems to imply that the man of genius could be anything that he pleased; that Aristotle might have been Pindar, and Homer have discovered the forty-seventh of Euclid; an assumption in the last degree improbable, if not verging on absurdity. There is a class of minds noted for versatility, but they are only a select class. Cæsar was a general, an orator, and a writer, besides being a politician of mark, whether successful or unsuccessful. But, according to the most enlightened theories of the present day, it is usual to consider human beings as born with distinctive endowments; and though there is a common mental organization at the basis, yet this is supposed to have a plurality of distinct functions, any one of which may rise in degree without the rest. Thus, intellect may be powerful on the whole, without involving a proportionate intensity of the feelings or the volition; the sensibility of the ear may be acute, and that of

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the eye only average. Now it would be fair to suppose that genius in one line—as, for example, painting—would result from the unusual augmentation of the susceptibilities and powers specially exercised in the art; the sense of color and of form, skill of hand, and a good recollection of those objects of nature and human life, that are the fitting material of a painter's compositions. So a poet should have a more than common ear for verse, plenty of language, taste for the appropriate images of poetry, and so on. In this way we might, by a kind of analysis, determine which of the faculties common to all men should be exalted to a superior pitch, in order to furnish a genius in each separate walk. This is probably now the received mode of handling the subject. Examples may be seen in Bain on the *Study of Character*.

GENLIS, zhǒng-lēs' STÉPHANIE FÉLICITÉ, Comtesse de: 1746, Jan. 25—1830, Dec 31; b. Champcéri, near Autun, Burgundy; of an ancient but reduced family named Ducrest. At the age of 15 she was married to the Comte de G. (who afterward became Marquis of Sillery, and perished on the scaffold, 1793, in the Revolution), and in 1770, through the influence of her aunt, Madame de Montesson (who had been privately married to the Duc d'Orleans), was made a lady-in-waiting in the household of the Duchesse de Chartres. Here she soon became known for wit and brightness. In 1782, the Duc de Chartres, afterward known as Egalité, appointed her 'governor' of his children. This appointment gave rise to certain scandalous reports, the truth of which various circumstances subsequently transpiring, have been deemed to confirm. In this year she was separated from her husband. Madame de G. wrote a variety of works for her pupils, among others, *Théâtre à l'usage des jeunes personnes, ou Théâtre d'Education* (Paris, 1779-80); *Adèle et Théodore, ou Lettres sur l'Education* (1782); and *Les Veillées du Château, ou Cours de Morale, à l'usage des Enfants*. On the breaking out of the Revolution, Madame de G. took the liberal side, but was ultimately compelled to seek refuge in Belgium. Afterward she went to Switzerland, and in the same year to Altona, in Germany, where she wrote a romance, entitled *Les Chevaliers du Cygne, ou la Cour de Charlemagne*; and also *Précis de la Conduite de Madame de Genlis pendant la Révolution*, as a sort of reply to the accusations of her numerous enemies. When Bonaparte became consul, she returned to Paris, and received from him a pension. From this time she resided constantly in Paris, publishing in rapid succession one book after another till her death. Madame de G.'s writings amount to about 90 vols., chiefly descriptions of incidents in fashionable society, with which she was thoroughly acquainted, and which she painted in lively colors. As she advanced in life, her writings became more and more polemical and ill-natured. Her *Observations Critiques pour servir à l'Histoire littéraire du 19^{me} siècle* (2 vols. Paris 1818); and her *Dictionnaire Critique et raisonné des Etiquettes de la Cour, des usages du Monde, etc.*; and her *Dîners du Baron d'Holbach*, subjected her to severe criticism. The last of

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these contains much curious but malicious information concerning the freethinkers of the 18th c. Nevertheless, her writings have been very popular, and have passed through several editions. Her voluminous *Mémoires* were written after she had reached her 80th year.

GENNADIUS, *jěn-nā'dī-ūs* (GEORGIUS SCHOLARI or SCHOLARIUS), Patriarch of Constantinople: a learned Greek: date of birth and death unknown. He participated in the great council at Ferrara (1431), later at Florence (see FERRARA, COUNCIL OF: FLORENCE, COUNCIL OF), exerted himself to bring about a union of the Greek and Latin churches, and drew up a plan for union so vague and ambiguous that it might have been accepted by both parties without binding either to extreme or inconvenient concessions. His chief opponent in the council was the Platonist, George Pletho Gemistus, the most vigorous worker against the then dominant Aristotelianism, who strongly maintained the principles of the Greek Church. After the council had been removed to Florence, Pletho published a work exhibiting the difference between Aristotle and Plato, to which G. replied. After the capture of Constantinople by the Turks, Mahomet chose G., then described as a layman, to fill the vacant patriarchal chair, 1453, and while holding the episcopal office G. drew up a confession of faith, regarded as the earliest expression of the principles of the Greek Church; and he condemned to the flames Pletho's treatise on *Laws*. It is believed that he soon resigned the episcopal chair and spent the remainder of his life in a convent.

GENNES, *zhěnn*, JULIEN, Count de: 1652-1704; b. Vittré, France: navigator. He entered the French navy at an early age, and for eminent services was promoted capt., and appointed chevalier of the Order of St. Louis 1677. In 1695 he sailed from La Rochelle in command of an expedition of 6 vessels placed at his disposal by the king. He entered the Straits of Magellan 1696, Feb., and after rounding Cape Forward discovered and named French Bay, and called a river emptying into it after himself. He founded a colony there, returned to France, and was appointed gov. of the part of the Island of St. Christopher under French jurisdiction. With a force of 160 men he defended his dist. against a body of 2,000 Englishmen till forced to surrender, 1702, July 16. Charges were preferred to the king against him, and while awaiting a decision on his reports he was captured by a Dutch cruiser, taken to Martinique, and there tried, declared guilty of cowardice, and deprived of all his honors. While on the way to France to appeal to the king in person, he was captured by the English and taken to Plymouth, where he died. On learning the facts the king pensioned his widow and children and restored his titles to the family.

GENNESARET, *gěn-nēs'a-rět* or *jěn-nēs'a-rět*, SEA OF; called also in the New Testament, *The Sea of Galilee*, and *The Sea of Tiberias* (from the city of Tiberias), and in the Old Testament *The Sea of Chinnereth* or *Cinneroth*, from an

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ancient town of that name on or near its shores: lake in n. Palestine. The word G. is supposed by some to be merely a corruption of Chinnereth; but others derive it from *Gannah*, a 'garden,' and *Sharon*, the name of a plain, between Mount Tabor and the lake. The lake is about 13 m. long and 6 broad, in the bottom of a great basin, undoubtedly of volcanic origin. Although the Jordan runs into it red and turbid from the n., and many warm and brackish springs also find their way thither, its waters are cool, clear, and sweet. Its shores are enlivened with sparkling pebbles. Now, as formerly, it abounds in fish; but the fisheries are almost entirely neglected. The surrounding scenery is not very beautiful, but its associations are among the most sacred in Palestine. 'Like Jerusalem, the Sea of G. is enshrined in the heart from childhood. The home of Christ—"His own city"—Capernaum, lay on its shores; many of His miracles were performed around and upon it; He taught the multitudes that followed Him, on the heights over it, along its pebbly beach, and from a boat on its surface: most of the apostles were fishermen, who here gained their daily bread; and one of Christ's last earthly interviews with them, after the crucifixion, was on that occasion when, driven probably by necessity, they had temporarily resumed their old occupation, and had toiled a long night without success' (Porter, *Hand book for Syria and Palestine*, Part ii, 418). In the time of Christ, the region of the lake was the most densely populated in Galilee. Nine cities and towns stood on the shores of the lake, while the neighboring plains and eminences were dotted with numerous large villages. Of the nine cities, seven are now uninhabited ruins; half-a-dozen mud-hovels are sufficient to house all the human life at Magdala, and only Tiberias shows some feeble traces of its former prosperity.

GENNET: for GENET, a Spanish horse

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GENOA, *jěn'o-a*: province of Italy, in Liguria, bounded on the s. by the Gulf of G.; 1,588 sq. m. It is divided into four districts, has in general a rough surface with little cultivable soil, yields large quantities of grapes, olives, and fruits, and has considerable silver, copper, lead, manganese, and slate interests. It is drained by a number of short rivers rising in the Apennines, comprises some of the most picturesque portions of the kingdom, and has its gulf coast skirted with a great highway, the Cornice road, and a railroad. Cap. Genoa. Pop. (1901) 934,627.

GENOA *jěn'o a* [Ital. *Genova*; Fr. *Gênes*; anc. *Genua*]: city of Italy, on the Mediterranean Gulf of G., at the foot of the Apennines, 79 m. s.e. of Turin; capital of a province, and a very important seaport; lat. of light-house, 44° 24' 18" n., long. 8° 54' 24" e. Pop. (1881) town 138,081, (1891) 210,000; (1901) 234,710.

From the sea the aspect of G. is a splendid panorama; the slopes of the hills down to the shore are covered with palaces, churches, hotels, and private dwellings, relieved by terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges are capped with forts, batteries, and outworks, which constitute a line of fortification of great strength and extensive circuit. The fine harbor, of which the diameter is rather less than a mile, is semicircular, and formed by two piers, at the extremity of one of which stands a light-house tower, 300 ft. high. Vessels of the largest class can enter, and, notwithstanding the heavy swells occasioned by s.w. winds, the harbor is remarkably safe. As yet, however, there is no landing-pier for passengers, all of whom, at considerable inconvenience, are carried ashore a distance of nearly half a mile in row-boats. Subject to this drawback, the harbor is visited daily by French and Italian steamers in communication with other ports in the Mediterranean. There is railway communication between G. and Turin, Arona, Alessandria, Nice, etc. In 1873, a new line of railway along the coast was completed to Spezzia, and so connects G. with Florence and Rome. Several important establishments are grouped around the port—viz., the arsenal, the convict prison, the custom-house, and the *Porto Franco* or free-port warehouses, where merchandise may be stored previous to its re-exportation free of duty. G. is the great commercial dépôt of a wide extent of country, of which the chief raw exports are olive oil, rice, fruits, cheese, steel, etc.; the manufactured goods exported are velvets, silks, damask, gloves, flowers, paper, soap, jewelry in silver and coral, in all of which industrial branches the excellence of the Genoese workmen is incontestable. The imports are principally cottons, raw cotton, woollens, cochineal, indigo, grain, hides, etc. The annual exports of G. are valued at abt. \$20,000,000; imports at abt. \$50,000,000.

While strikingly grand as viewed from the sea, and so far worthy of being entitled *La Superba*, a closer examination of G. tends materially to lower its character for beauty and magnificence. Hemmed within walls, and built awkwardly on irregular rising grounds, it has never been subjected

to any comprehensive plan of improvement, and remains very much a labyrinth of narrow and intricate lanes, accessible only to foot-passengers, or to the pack-mules by use of which a large portion of the internal goods traffic is conducted. These thoroughfares, into which the light of day imperfectly penetrates, are lined with tall buildings, some of marble and of handsome architecture, but with difficulty seen from the limit of the space in front; and all their grandeur fails of effect. Many of them—former residences of merchant-princes—are transformed into hotels or business establishments; in some the superb lobbies, environed by marble columns, are occupied by petty traders, and shabby in the extreme. Only a few streets are wide enough for carriages, and in these the aspect is more like that of modern cities. Several *palazzos* still belong to persons of distinction who have the means of maintaining them in their original splendor, or they are appropriated as public buildings. The two most famous are the Palazzo Ducale, formerly inhabited by the doges, now appropriated to the meetings of the senate; and the Palazzo Doria, presented, 1522, to the great Genoese citizen Andrea Doria, whose residence it was during his presidency of the republic. The palaces Brignole Sale, Serra, Reale, Pallavicini, Spinola Balbi, Negroni, and many others, possess great interest both for historical fame and architectural beauty. Many contain galleries of paintings, which are shown for a fee. Some of the churches are particularly fine; the most noticeable being the cathedral of St. Lorenzo, a grand old pile in the Italian Gothic style. G. contains many excellent public institutions, almost all dating from the period of the republic. The great hospital, and the asylum of the poor (*Albergo de' Poveri*), are especially worthy of mention. The later makes provision for 1,600 persons, orphans and old people: the orphans are trained up to useful employments, and such girls as marry out of the hospital receive a small dowry. The deaf and dumb institution, and the hospital for the insane, are the best in Italy in extent and regulation. There are numerous excellent foundations called *conservatorie*, devoted to various philanthropic purposes, the chief of which is called the Fieschine, an asylum for female orphans. The public library contains 50,000 vols., and is unrestrictedly open to the public. The Acad. of Fine Arts was founded by the Doria family. The theatres of G. are very fine, that of Carlo Felice ranks among the best in Italy.

The Genoese are a shrewd, active, laborious class, with all the qualities of a commercial and maritime community. They make skilful and hardy seamen, energetic traders, and thrifty husbandmen, and are still remarkable for the spirit of enterprise and freedom which so strongly characterized the period of the republic. Claiming Columbus as a native of their city, they have recently erected a handsome public monument in honor of that distinguished navigator. While the main business of the town is evidently maritime, there is also an extensive trade in the manufacture and sale of a peculiar kind of jewelry. This

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consists of remarkable fine filigree-work in silver and silver gilt, which resembles that of India, and is equal in intrinsic value. Few of the many tourists who pass through G. fail to purchase one or more of these pretty and cheap articles of bijouterie.

History.—The early history of G. and of its ancient inhabitants is observed with fabulous traditions. The Ligurian tribes, who held possession of G. previous to its incorporation with ancient Rome, are of disputed origin. By some historians, they are classed with the Celtic race, while others deem them of Greek extraction. G. is mentioned in history first during the Second Punic War, but it then appears to have had considerable importance. B. c. 205, it became for a short time the head-quarters of Mago, the Carthaginian general, who destroyed it before leaving the country; but B. c. 203, the Roman pretor, Sp. Lueretius, was commissioned to rebuild it. After Liguria was conquered by the Romans (B. c. 109), G. does not figure much in ancient history; but as a Roman *municipium*, it obviously prospered, for Strabo speaks of it as a 'flourishing town, and the chief emporium of the Ligurians.' Under the Romans, the Genoese retained a degree of internal independence, and were distinguished in the Roman legions by their valor and great physical vigor. On the dismemberment of the Latin empire, G., in common with the chief division of Italy, fell under the sway successively of the Lombards, the Franks, and the Germans; but amid all these vicissitudes, preserved, in a singular degree, both its privileges and its prosperity. Navigation and commerce were the two natural sources opened to the Genoese by the maritime situation of their country, and for these pursuits they have at all times had special aptitude. Their mercantile interests served to foster the instinctive valor of the race. The rich merchandise of the Genoese galleys offered an alluring prize to the piratical hordes by which the Mediterranean was universally infested; consequently, from the rise of their commercial importance the Genoese were compelled to defend by the sword the precious freight of their merchantmen. Unhappily, a bitter intolerance of all maritime competition was a leading feature of early Genoese policy, in regard to the other important Italian states; and to this source may be traced the fierce and prolonged wars sustained by G. against the rival maritime republics of Pisa and Venice. The frequent incursions of the Saracens, by whom G. was sacked and pillaged about 935, led the Genoese to form an alliance with Pisa, with the object of extirpating these barbarous aggressors from the islands of Corsica and Sardinia, their strongholds in the Mediterranean. This being effected (1016–21), the Genoese obtained, by papal arbitration, the grant of Corsica, while Sardinia was assigned to the Pisans, a distribution which sowed the seeds of future discord between the two states. At the close of the 11th c., G. commanded large land and naval forces, and already ranked as a powerful maritime state, governed by annual magistrates, named consuls. The Genoese vigorously seconded the Crusades, and in return for their effective co-operation, obtained

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several important maritime possessions and commercial privileges in the Holy Land (1109). The chief events of the three following centuries are : the capture of Minorca (1146), of Almeria (1147), and Tortosa (1148) from the Moors ; the wars with Pisa and Venice, and the civil dissensions by which G., in common with all Italy, became distracted by the Guelph and Ghibelline factions. In 1284, at the great naval battle of Meloria, the Pisan republic sustained such destructive losses that her maritime influence and public spirit never revived. The wars with Venice originated, about 1244, in mutual jealousies respecting the commercial supremacy of the Levant, and continued, with various vicissitudes, till the end of the following century, when the Genoese, at the blockade of Chiozza, were compelled to submit to disadvantageous terms by the peace of Turin (1381).

Co-existent with these suicidal wars, the civil dissensions of G. exhausted and demoralized the state, and occasioned continual changes in the primitive form of government. In 1190, the consuls were superseded by a magistracy termed *podesta*, an office for which natives of G. were declared ineligible. This institution, founded in the hope of restraining local Genoese animosities and ambitions, lasted till 1270, when two of the great Guelph leaders of the state resolved to subvert the popular authorities, and, under the title of 'captains of liberty,' assumed irresponsible authority, which, for 21 years, they contrived to retain. During their sway, civil feuds raged inveterately, not alone between the Guelph and Ghibelline factions, but also between the citizen ranks of patricians and plebeians. Various other modifications of the government preceded the election of the first Genoese doge 1339. This supreme magisterial office, from which all nobles were excluded, continued in force for two centuries, its tenure being for life.

The ambitious contentions of four leading democratical families—viz., the Adorni, the Fregosi, the Guarci, and the Montaidi—succeeded those of the patrician houses of Doria, Spinola, Grimaldi, and Fieschi, and engendered such disastrous civil strife in the state under the early doges, that, in 1396, the citizens, in despair, invoked the protection of the French king, Charles VI., and finally submitted to the rule of the Visconte, the tyrannical and ambitious lords of Milan (1464). After the invasion of Louis XII. in 1499, G. long remained subject to the French; but in 1528, the genius and resolution of a great citizen, Andrea Doria, freed his country from foreign invaders, and restored to G. its republican institutions. The last important exploit of the Genoese was the expulsion, 1746, of the Austrians, who were driven from G. after an occupation of three months. In 1768, G. ceded to France the Island of Corsica; and 1796 Bonaparte invaded Italy, and conferred on G. the name of the *Ligurian Republic*, which was abolished 1802 and *Genoa la Superba* became the chief town of a dept. of France. In 1815, by a decree of the Congress of Vienna, the state of G. became a province of Piedmont. Following the fortunes of that state, it has latterly become a portion of the king-

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dom of Italy, and with the enterprise of its people there are marked indications of improvement. Canale's *Nuova Storia della Repubblica di Genova*; Dinena's *Rivoluzioni d'Italia*; Sismondi's *Italian Republics*.

GENOA, GULF OF: large indentation in the n. shore of the Mediterranean, n. of Corsica, may be said to have the shape of a bay rather than of a gulf. The towns of Oneglia on the w. and Spezia on the e., seem to indicate the points at which the entrance of the Gulf commences: with this entrance the Gulf of G. extends 90 m. across, and 30 m. inland.

GENOESE, n. *jěn'ō-ēz*: the inhabitants of *Genoä*, a town of Italy.

GENOUILLÈRE, n. *zhěn'ûl-yér'* [F. top of a boot, knee-piece—from F. *genou*; L. *genu*, the knee: referring to the construction being about knee-high]: in *fort.*, that part of the parapet reaching from the platform to the sill of the embrasure, and covered by the fore part of the gun-carriage; in a *barbette battery*, height of the parapet above the banquette (see FORTIFICATION): metal armor for the knee.

GENRE-PAINTING or -SCULPTURE, *zhâng'r-* [F. *genre*, kind, species]: in *painting* and *sculp.*, representation of the scenes and manners of everyday life, in distinction from historical or landscape painting. Originally, the term distinguished any special branch of art, as *genre historique* (historic painting), *genre du paysage* (landscape painting), etc. In a more special sense it denotes any picture containing human figures not included in the so-called historical or romantic class, particularly pictures with figures much below the size of life—cattle, architectural pieces, flower pieces, and representations of still life. Under the term genre-pictures are comprehended all pictures with figures representing individuals only as types of a species or class, in distinction from historical compositions, which present certain individuals, or, as it were, *nomina propria*. The mode of conception and style of execution in genre-painting may resemble the historical style; and on the other hand, historical personages may be represented merely in situations of everyday life: The term *historic-genre* is applied to both cases. The French likewise distinguish the *genre-historique* from the lower genre, strictly so called; they also occasionally apply the term *peinture du style* to historical painting. Genre pictures are usually of limited dimensions, while in historical pictures the figures are commonly the size of life or even colossal. In either case, however, there are many exceptions to the general rule, and the proper designation, depends rather on the style of subject than on the size. It is evident that the term is comprehensive and somewhat indefinite. A species of genre-painting with a distinct style was practiced even in ancient times, but the birthplace of the present genre-picture is the north, and more particularly the Netherlands. The Italians, especially Paul Veronese, had previously showed a leaning to the genre style in biblico-historical pictures, by making the principal figures and the action

subordinate to the accessories and locality—as, for example, in his *Marriage at Cana*: and Van Eyck's school in the Netherlands had introduced the same element into the delineation of incidents in sacred history. Lucas Van Leyden and Albert Dürer then began to represent actual scenes from the everyday life of the people in paintings and engravings. Genre-painting was brought to perfection in the Netherlands by a series of admirable painters, such as Terburg, Brower, Ostade, Rembrandt, the younger Teniers, Metz, Gerard Dow, and others. Though the characteristic and humorous conception of many of the works of these masters gives them a peculiar value, it was found in other cases that a certain delicacy of imitation and skill in using the brush was capable of imparting a singular charm to the most ordinary scenes and figures. In the British school this style of art is generally understood to be limited to pictures with figures, and many works of the highest excellence have been produced in it, elevated in treatment by the introduction of an important element—viz., the dramatic.

GENS, *jènz* [allied to Lat. *genus*, Eng. *kin*; from the root *gen*, to beget or produce]: Latin word, to which, many important political and social meanings came to be attached; signifying properly, a race or lineage. From it the English words gentleman (q.v.), gentility, etc., have come through the French *gentilhomme*, the primary meaning of which was, one who belonged to a known and recognized stock. By the Romans G. was used sometimes to designate a whole community, the members of which were not necessarily connected by any known ties of blood, though some such connection was probably always taken for granted: in this sense we hear of the *gens Latinorum*, *campanorum*, etc. But it had a far more definite meaning in the constitutional law of Rome. According to Scævola, the Pontifex, those alone belonged to the same *gens*, or were 'Gentiles,' who satisfied the four following conditions—viz., 1. Who bore the same name; 2. Who were born of freemen; 3. Who had no slave among their ancestors; and 4. Who had suffered no *Capitis Diminutio* (reduction from a superior to an inferior condition) of which there were three degrees. Maxima, Media, Minima. The first (Maxima Capitis Diminutio) consisted in the reduction of a free man to the condition of a slave, and was undergone by those who refused or neglected to be registered at the census, who had been condemned to ignominious punishments, who refused to perform military service, or who had been taken prisoners by the enemy, though those of the last class, on recovering their liberty, could be reinstated in their rights of citizenship. The second degree (Media Capitis Diminutio) consisted in the reduction of a citizen to the condition of an alien (*Latinus* or *peregrinus*), and involved, in the case of a *Latinus*, the loss of the right of legal marriage (*connubium*), but not of acquiring property (*commercium*); and in the case of the *peregrinus*, the loss of both. The third degree (Minima Capitis Diminutio) consisted in the change of condition of a *paterfamilias* into

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that of a *filius familias*, either by adoption (*adrogatio*) or by legitimation. In the identity of name, some sort of approach to a common origin seems to be here implied. The gens thus consisted of many families, but all these families were supposed to be more or less nearly allied by blood—to be, as we should say, kindred. A Roman G. was thus somewhat nearly identical with a Celtic clan, the identity or similarity of name being always supposed to have arisen from relationship, and not from similarity of occupation as in the case of the Smiths, Taylors, Lorimers, etc., of modern Europe, and in the United States. There was this peculiarity, however, about the G. which did not belong to the clan—viz., that it was possible for an individual born in it to cease to belong to it by *capitis diminutio*, or by adoption, or adrogation as it was called when the person adopted was *Sui Juris* (q.v.). If the adoption was by a family of the same G., the gentile name, of course, remained unchanged. In the case of a person dying intestate, his gentiles, failing nearer relatives, were his heirs, and they undertook the duties of guardianship in the like circumstances. The G. was further bound together by certain sacred rights, imposed on the whole of its members, and for the celebration of which it probably possessed, in common property, a *sacellum* or sacred spot inclosed, and containing an altar and the statue of the god to whom it was dedicated. According to the traditional accounts of the old Roman constitution, the gentes were a subdivision of the curiæ, as the curiæ were subdivisions of the tribe. In this view, the original idea of the G. becomes simply that of the smallest political division, without any relation to kindred or other ties.—See an excellent article on the G. by George Long, with reference to the principal German authorities, in Smith's *Dictionary of Roman Antiquities*.

GENSAN (locally known as *Won-san*): seaport of Corea, province of Ham-gyong-do. at the s. extremity of Broughton Bay, on the sea of Japan. It is south of Port Lazarus, s.e. of Yong-heung, e. of Kowon, n. of Tok-won. There is considerable fertile ground in its vicinity, and gold is found in the mountains w. and n w., but there is a long stretch of low ground on the Broughton Bay coast. G. was opened to Japanese trade and residence by treaty 1876.

GENSERIC, *jěn'sér-ík*, or GENSERICH, King of the Vandals: abt. 406–477 (reigned 427–477); b. Seville; illegitimate son of Godigiselus, who led the Vandals into Spain. After the death of his brother Gonderic, G. became sole ruler. In 429, he invaded Africa on the invitation of Count Boniface, viceroy of Valentinian III., Emperor of the West, who had been goaded on to rebellion through the machinations of his rival Aetius, conqueror of Attila. G.'s army at first amounted to 50,000 warriors, full of barbarian valor, and hungry for conquest and plunder. As they swept along through Mauritania, the Kabyle mountaineers, and the Donatist heretics, maddened by persecution and fanaticism, swelled the terrible horde, and more than

GENT—GENTEEL.

equalled their savage associates in acts of cruelty and bloodthirstiness. The friends of Boniface, astonished that the hero who alone had maintained the cause of the emperor and his mother Placidia during their exile and distress, should have been guilty of such a crime, attempted with ultimate success, to bring about an interview between the Count of Africa and an agent of the empress. Then, when too late, were the imaginary provocations which Count Boniface had received explained, and the fraud of Aetius detected; for the army that the count had hurriedly collected to oppose the Vandals, having been twice defeated by G., he was compelled to retire to Italy, where he was soon afterward slain by Aetius. All Africa w of Carthage fell into the hands of G., who shortly afterward seized Carthage itself, and made it (439) the capital of his new dominions. Part of Sicily, Sardinia, and Corsica likewise were taken possession of by him. In 451, he encouraged Attila to undertake his great but fatal expedition against Gaul. Tradition states that, at the request of Eudoxia, widow of Valentinian, who was eager for revenge upon her husband's murderer Maximus, G., 455, marched against Rome, which he took, and abandoned to his soldiers for 14 days. On leaving the city, he carried with him the empress and her two daughters, one of whom became the wife of his son Huneric. The empire twice endeavored to avenge the indignities that it had suffered, but without success. First the Western emperor, Majorian, fitted out a fleet against the Vandals 457, which was destroyed by G. in the bay of Carthagenæ; second, the Eastern emperor, Leo, sent an expedition under the command of Heraclius and others, 468, which also was destroyed off the city of Bona. G. died in the possession of all his conquests, leaving behind him the reputation of the greatest of the Vandal kings. His appearance was not imposing; according to Jornandes, he was 'of low stature, and lame on account of a fall from his horse,' but 'deep in his designs, taciturn, averse to pleasure, capable of being transported into fury, greedy of conquest, and cunning in sowing the seeds of discord among nations, and exciting them against each other.' Strange to say, a rude, even a savage religiosity burned in the heart of G., and, it may be, grimly sanctified, in his own eyes, his wide-spread devastations. He seems to have regarded himself as a 'scourge of God.' Once when leaving the harbor of Carthage on an expedition, the pilot asked him whither he was going. 'Against all who have incurred the wrath of God.' In creed, G. was a fierce Arian, and inflicted the severest persecutions on the orthodox or Catholic party.

GENT, n. *jěnt*: in *familiar slang*, a contracted form of 'gentleman'; in a depreciative sense, a man who has vulgar show and pretensions, but not the position, birth, education, or manners of a gentleman.

GENT, a. *jěnt* [contraction of *gentle*]: in *OE.*, gentle; delicate; fair; fine.

GENTEEL, a. *jěnt-ěl* [*F. gentil*, graceful, genteel—from

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L. gentilis, belonging to a nation or family—from *gens*, race, family]: polite; refined; well-bred; easy and graceful in manners. GENTEEL'LY, ad. -ly. GENTEEL'NESS, n. quality of being genteel. GENTIL'ITY, n. -tīl'ī-tī, good birth; the manners of well-bred people.—SYN. of 'genteel': polished; well bred: elegant; fashionable.

GENTIAN, n. *jěn'shan* [OF. *gentiane*, gentian: L. *gentiānā*, after *Gentiūs*, King of Illyria (vanquished by the Romans abt. B.C. 160), who first experienced the virtues of the plant]: (*Gentiana*): genus of plants of nat. ord. *Gentianaceæ*, with five-cleft—sometimes four-cleft—calyx, and one-celled capsule. The species are numerous, natives of temperate parts of Europe, Asia, and America, many of them growing in high mountain pastures and meadows, which they adorn by their beautiful blue or yellow flowers. —The species chiefly used in medicine, COMMON G., or YELLOW G. (*G. lutea*), is abundant in the meadows of the Alps and Pyrenees, at an elevation of 3,000–6,000 ft. It has a stem about three ft. high, ovate-oblong leaves, and numerous whorls of yellow flowers. The part employed in medicine is the root, which is cylindrical, ringed, and more or less branched; and which appears in commerce in a dried state, in pieces varying from a few inches to more than 12 inches in length, and from half an inch to two inches in thickness. It is collected by the peasants of the Alps. Although G. root has been examined by various



Common Gentian:

a, capsule; *b*, capsule cut across; *c*, vertical section of seed, magnified.

chemists, its constituents are not clearly known; it contains, however (1), an oil in small quantity; (2), a pale yellow crystalline matter, termed gentisin or gentisic acid; (3), a bitter principle, gentianite, on which its medicinal prop-

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erties mainly depend; (4), pectin or pectic acid, which probably causes the gelatinization that sometimes occurs in infusion of *G.*; and (5) sugar, in consequence of which an infusion is capable of undergoing vinous fermentation, and of forming the 'bitter snaps' or 'engiaugeist' much used by the peasants on the Swiss Alps, to fortify the system against fogs and damps. (As 'bitter snaps' contains a narcotic principle, due probably to the oil of *G.*, those unaccustomed to its use should not take it except with caution.) *G.* is a highly valued medicine, a simple tonic bitter without astringency, much used in diseases of the digestive organs, and sometimes as an anthelmintic. It may be administered in the form of infusion, tincture, or extract. The *Compound Mixture of G.* of the London Pharmacopœia, consisting of six parts of compound infusion of *G.* (Ph. L.), three parts of compound infusion of senna (popularly known as *Black Draught*), and one part of compound tincture of cardamoms, forms, in doses of from one to two ounces, a safe and moderately agreeable tonic and purgative medicine in cases of dyspepsia with constipation. An imitation of the *Compound Tincture of G.*, known as Stoughton's Elixir, is very much used in the W. Indies before meals as a pleasant bitter, to give tone to the languid stomach. The *Extract of G.* is very commonly used as the vehicle for the exhibition of metallic substances (such as salts of iron, zinc, etc.) in the form of pill. *Powdered G.* is one of the chief constituents of an empirical medicine known as *The Duke of Portland's Gout Powder*. The bitter principle on which its virtue depends exists also in other species of this genus, probably in all, and appears to be common to many plants of the same order. The roots of *G. purpurea*, *G. punctata*, and *G. Pannonica*, are often mixed with *G.* of commerce. They are deemed inferior.—*G. Catesbevi*, N. American species, is extensively used in its native country, as a substitute for Common *G.*, and *G. Kurroo* is employed in the same way in the Himalaya.—Several species of *G.* are common ornaments of gardens, particularly *G. acaulis*, a small species with large blue flowers, native of the continent of Europe and of Siberia, often planted as an edging for flower-borders. Of N. American species, *G. crinita*, 'Fringed Gentian,' is particularly celebrated for the beauty of its flowers, which are large, blue, and fringed on the margin. It has a branched stem, and grows in wet ground. The brilliancy of the flowers of the small alpine species has led to many attempts to cultivate them, generally unsuccessful, apparently from the difficulty of imitating the climate and seasons of their native heights.

GENTISIC, a. *jèn-tiz'ik* contained in, derived from or in any way connected with gentian. GENTISIC-ACID, same as GENTISIN. GENTISIN, n. *jèn'ti sìn*, substance occurring in the root of *Gentiana lutea*, from which it is extracted by alcohol, forming large yellow, silky needles, which sublime between 300° and 400° with partial decomposition.

GENTIANACEÆ, *jèn shì-an-ā'sē-ē*, or GENTIANEÆ, *jèn-shì-ā'nē-ē*: natural order of exogenous plants, chiefly herbaceous, but containing also a few small shrubs. The leaves

GENTIANELLA—GENTILESCHI.

are opposite, rarely alternate, destitute of stipules. The flowers are terminal or axillary, generally regular. The calyx is divided usually into 5, sometimes 4, 6, 8, or 10 lobes; the corolla is hypogynous (q.v.), has the same number of divisions with the calyx, and a plaited or imbricated twisted æstivation. The stamens are inserted upon the corolla, alternate with its segments, and equal to them in number. The ovary is composed of two carpels, 1-celled or imperfectly 2-celled, many seeded. The fruit is a capsule or berry.—The species are numerous, about 450 being known. They are natives both of warm and of cold climates, but rather of elevated regions in the torrid and temperate zones, than of cold regions near the poles. Many have flowers of great beauty, both of color and form, the corolla being often most delicately fringed. Many are medicinal: see GENTIAN: CHIRATA: FRASERA: BUCKBEAN: CENTAURY.

GENTIANELLA, *jěn-shǎ-an-ě'l'a*: name sometimes given to the small-flowered or autumnal Gentian (*Gentiana Amarella*), the beautiful blue flowers of which adorn some of the dry pastures of Britain; but more commonly to the species of *Cicendia*, another genus of the order *Gentianaceæ*. *C. hyss. pifolium* is much used as a stomachic in India.

GENTIL, a. *jěn'til* [F. *faucon-gentil*—that is, a falcon-genteel. L. *gentilis*, of a nation or family]: handsome; graceful; applied to a female falcon which has attained her mature plumage.

GENTILE, n. *jěn'til* [F. *gentil*, a gentile, a heathen—from L. *gentilis*, belonging to the same clan or house—from *gens*, a race, a stock; It. *gentile*]: one belonging to the nations of the world in general, as opposed to the Jews; a heathen. The apostle Paul classes the Greeks as Gentiles. The Mormons of Utah give the name Gentiles to all who are not Mormons, Jews, or Indians (the Indians they believe to be descendants of the lost tribes of Israel).—In the usage of anc. Rome, gentiles were those belonging to the same *gens* (q.v.), therefore accounted as akin: ADJ. of or pertaining to pagans or heathens. GEN'TILISM, n. *-izm*, heathenism; paganism. GEN'TILITIOUS, a. *-tǐ-lǐsh'ŭs*, peculiar to a people or nation; hereditary.

GENTILESCHI, *jěn tē-lěs'kē*, ARTEMISIA DE: painter. 1590–1642; daughter of Orazio de G. She studied with her father and Guido, became renowned for portrait-painting—her fame in this line exceeding her father's; accompanied her father to England where she painted portraits and other pictures, declined an offer of marriage by Agostino Tasi, married Pier Antonio Schiattesi, and passed the greater part of her life in Bologna and Naples. Her best known work is *Judith and Holofernes* in the Pitti Palace, Florence, and next to this is ranked *David with the Head of Goliath*, painted for Charles I of England.

GENTILESCHI, ORAZIO DE. 1565–1646; b Pisa: Italian painter. He studied painting with his half-brother, Aurelio Lomi, and on removing to Rome became associated with Agostino Tasi, landscape painter. He painted the figures for the landscape backgrounds of Tasi in the

GENTILITY—GENTLE.

Palazzo Rospigliosi, and, according to some authorities those in the great hall of the Quirinal Palace, though Lanfranchi also is credited with the latter work. At an advanced age he went to England on the invitation of Charles I. and was employed in decorating Greenwich Palace at the time of his death. Vandyck included G.'s portrait in his collection of 100 illustrious men. G.'s best works are in the Palazzo Borghese, Rome, *St. Cecilia* and *St. Valerian*; in the Palazzo Doria, Genoa, *David after the Death of Goliath*; and in the royal palace, Turin.

GENTILITY, n.: see under GENTEEL.

GENTILLY, *zhǒng-tē-yě*: populous town of France, in the metropolitan dept. of Seine; near Paris, toward the south of that city. The great bastioned wall of Paris passes through the town, separating it into two portions, called Great and Little Gentilly. The people are employed in the manufacture of chemicals, in quarrying, and in laundry-work. Pop. (1881) 12,353.

GENTLE, n. *jěn'tl* [unascertained]: the larva of the flesh-fly, as well as other insects, found in carrion—used by anglers as bait.

GENTLE, a. *jěn'tl* [F. *gentil*, genteel, graceful—from L. *gentilis*, belonging to a race, clan, or house: It. *gentile*, of a noble race or family]: well-born; mild; amiable; meek; soothing; pacific; not rough or violent: N. in *OE.*, a gentleman; a man of birth: V. in *OE.*, to make gentle; to ennoble. GENT'LY, ad. *-lī*, softly; tenderly. GENT'LENESS, n. *-nēs*, softness of manners; mildness of temper; tenderness. GENTLEMAN, n. *jěn'tl-mǎn* [from *genteel*, and *man*: F. *gentilhomme*]: in *England*, in a general sense, every educated person above a laborer, an artisan, or a tradesman; an individual possessed of the conduct, character, habits, and outward appearance which belong, or are expected to belong, to persons born and educated in a high social position; a man in any station of life who is possessed of good breeding and refined manners, strict integrity and honor, kindness of heart, and like qualities; in a limited sense, a person of fortune and good family, whether titled or not; one who bears a coat of arms; a term of complaisance or respect, as in the plural—*gentlemen*, when addressing a number of persons; the legal term in *England* for any one not engaged in business; in the *United States*, any man of respectable character and behavior.—See below. GENT'LEMANLY, a. *-lī*, becoming a gentleman; also GENT'LEMANLIKE, a. GENT'LEMANLINESS, n. *-lī-nēs*. GENTRY, n. *jěn'trī* [OE. *gentrise*—from OF. *genterise*, rank—from OF. *gentilise*]: the persons possessed of landed property, holding rank between the nobility and the middle classes; in *OE.*, civility; the manners of gentlemen. GENTLEWOMAN, n. *jěn'tl-wǎm'-ǎn*, a woman of good family, or of good breeding. GENTLEHEARTED, a. kind. GENTLEFOLKS, n. plu. *-fōks*, persons distinguished by their birth or position. GENTLEMAN-COMMONER: see UNIVERSITY: OXFORD: CAMBRIDGE.—GENTLEMAN-USHER, one who ushers persons into the presence of a sovereign. GENTLEMAN-USHER OF THE

GENTLEMAN.

BLACK ROD, an officer belonging to the Garter whose duty it is to attend the house of lords while parliament is sitting, and to carry messages to the house of commons. **GENTLEMAN-USHER OF THE GREEN ROD**, an officer of the Order of the Thistle. **GENTLEMEN-AT-ARMS** (formerly the *Gentlemen Pensioners*), a corps of 40 gentlemen, with a capt., lieut., standard-bearer, and clerk, the body-guard of the British sovereign on state occasions; with the exception of the yeomen of the guard, the oldest corps in the British service; instituted 1509 by Henry VIII. The commissions are now given only to military officers of service and distinction.—**SYN.** of 'gentle': soft; bland; tame; placid; quiet; peaceful; tractable; docile; well-born.

GEN'TLEMAN: in its large sense, any man of respectable character and behavior. For more limited meanings, see above, **GENTLEMAN**. This word is an example of those compromises so frequent in English between the language introduced by the Normans, and that in possession of the country at the period of the Conquest. The Norman word was, as the French word is now, *gentilhomme*. The first syllable was retained, while the second was abandoned in favor of its Saxon equivalent, *man*. Though commonly translated into Latin by **GENEOSUS**, which means a generous, liberal, manly person, in short, a gentleman, the word gentleman is derived from *gentilis*, and *homo*, or man; and *gentilis* in Latin did not signify gentle, generous, or anything equivalent, but *belonging to a gens*, or known family or clan. See **GENS**. A gentleman was thus originally a person whose kindred was known and acknowledged; which is the sense in which it is still employed when it is not intended to make any reference to the moral or social qualities of the particular individual. One who was *sine gente*, on the other hand, was one whom no *gens* acknowledged, and who might thus be said to be ignobly born.

The term gentleman is continually confounded with esquire (q. v.), even by such learned authorities as Sir Edward Coke. But they are not equivalent; and while some attempt can be made to define the latter, the former seems in England, from a very early time, to have been a mere social epithet. 'Ordinarily, the king,' says Sir Thomas Smith, 'doth only make knights and create barons, or higher degrees; as for *gentlemen*, they be made good cheap in this kingdom; for whosoever studieth the laws of the realm, who studieth in the universities, who professeth the liberal sciences, and (to be short) who can live idly, and without manual labor, and will bear the port charge, and countenance of a gentleman, he shall be called Master, for that is the title which men give to esquires and *other gentlemen*, and shall be taken for a gentleman.'—*Commonwealth of England*, i. c. 20. But though such was the real state of matters, even in the beginning of the 17th c., the word was still held to have a stricter meaning, in which it was more nearly synonymous with the French *gentilhomme*, for in the same chapter the same writer remarks that 'gentlemen be those whom their blood and race doth

make noble and known.' Even here, however, it scarcely seems that he considered any connection with a titled family to be necessary to confer the character, for he afterward speaks of it as corresponding not to nobility, in the English sense, but to *nobilitas*, in the Roman sense, and as resting on 'old riches or powers remaining in one stock.' There can be no doubt that, in still earlier times, patents of gentility were granted by the kings of England. There is one still in existence by Richard II. to John de Kingston, and another by Henry VI. to Bernard Angevin, a Bourdelois. But these patents determine very little, for they seem to have carried the rank and title of esquire; and there is no doubt that esquires, and all persons of higher rank, were held to be gentlemen, on the principle that the greater includes the less. The difficulty is to say whether in England, between an esquire, who certainly was entitled to the character, and a yeoman, who was not, there was an intermediate class who could claim it on any other grounds than courtesy and social usage. These patents corresponded to the modern patents of arms issued by the Heralds' Colleges in England and Ireland, and by the Lyon Office in Scotland, and were probably given on the very same grounds—viz., the payment of fees. A patent of arms confers the rank of esquire, and there probably is no other legal mode by which an untitled person can acquire it, unless he be the holder of a dignified office. In present, as in former times, it is common to distinguish between a gentleman by birth and a gentleman by profession and social recognition. By a gentleman born is usually understood either the son of a gentleman by birth, or the grandson of a gentleman by position; but the phrase is loosely applied in England to all persons who have not themselves 'risen from the ranks.'

GENTOO, n. *jěn-tó'* [Port. *gentio*, gentile, pagan]: old name for the pagan natives of India, now obsolete, or applied only to the savage Indians of the interior. The word Hindu is now used instead.

GENTRY: see under GENTLE.

GENTZ, *gěnts*, FRIEDRICH VON: 1764, May 2—1832, June 9; born Breslau, Germany: political writer. His father was employed in the Prussian civil service and his mother was a distant relation of the statesman Ancillon. On his father's promotion to the directorship of the mint at Berlin, he was sent to a gymnasium at the capital and afterward to the Univ. of Frankfurt-on-the-Main. He was considered more than ordinarily stupid intellectually till his 21st year, when his mind was quickened by listening to Kant's lectures at Königsberg, and he rapidly mastered the Greek and Latin languages and became familiar with French and English. He returned to Berlin, gained a footing in the highest social and diplomatic circles, and became noted for his gallantries, passion for gambling, and political authorship. In 1786 he was appointed private sec. to the royal general directory and soon afterward promoted to war-councilor; 1793 published a translation into

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German of Burke's *Essay on the French Revolution*: 1794 translated and annotated Mallet du Pau's work on the same subject, and 1795 Monnier's; 1797 published a pamphlet addressed to Frederick William III. of Prussia on his accession, indicating the duties of the new sovereign; and 1797–1800 published a series of articles, *On the Origin and Character of the War against the French Revolution*. Subsequently he prepared numerous papers on taxes and finances for various British ministries; negotiated an alliance between Great Britain and Austria; drew up the Austrian manifesto of 1805, and, under Prince Metternich's instructions, that of 1809; was first sec. to the congress of Vienna 1814, Paris 1815, Aix-la-Chapelle 1818, Carlsbad and Vienna 1819, Troppau and Laybach 1820–21, and Verona 1822; and at one time was paid by Prussia, Austria, and England to write pamphlets against Napoleon.

GENUANT, a. *jěn'û-ant*: in *her.*, kneeling.

GENUFLECTION, n. *jěn'û-flĕk'shŭn* [F. *gĕnuflexion*—from mid. L. *gĕnuflexiōnem*—from L. *genu*, the knee; *flecto*, I bend or incline]: act of kneeling or bending the knee, particularly in worship. GENUFLECT, v. *jěn'û-flĕkt*, to bend the knee as in worship. GENUFLECT'ING, imp. GENUFLEC'TED, pp.—As an act of adoration, or reverence, there are frequent allusions to genuflection in the Old and New Testament; as Gen. xvii. 3, 17; Num. xvi. 22; Luke xxii. 41; Acts vii. 60. and ix. 40; Philip. ii. 10. That the use continued among the early Christians is plain from the *Shepherd* of Hermas, from Eusebius's *History*, ii. 33, and numberless other authorities; and especially from the solemn proclamation made by the deacon to the people in all the liturgies—'Flectamus genua' (Let us bend our knees); whereupon the people knelt, till, at the close of the prayer, they received a corresponding summons—'Levate' (Arise). It is worthy of remark, however, that in celebration of the up-rising (resurrection) of our Lord, the practice of kneeling down at prayer, as early as the age of Tertullian, was discontinued throughout the Easter-time, and on all Sundays through the year—these being deemed seasons of joyful worship. The kneeling posture was especially assigned as the attitude of penance, and one of the classes of public penitents in the early church took their name, *gĕnuflectentes*, from this circumstance. In the modern Rom. Cath. Church, the act of genuflection belongs to the highest form of worship, and is frequent during the mass, and in the presence of the consecrated elements when reserved for subsequent communion. In the Anglican Church, the rubric prescribes the kneeling posture in many parts of the service; and this, as well as the practice of bowing the head at the name of Jesus, was the subject of much controversy with the Puritans. The same controversy was recently revived in Germany.

GENUINE, a. *jěn'û-ĭn* [L. *gĕnŭĭnŭs*, peculiar, natural—from *gĕnō*, I beget, I bring forth: It. *gĕnuino*]: real; natural; not spurious; not adulterated. GEN'UINELY, ad. -*lĭ*. GEN'UINENESS, n. -*nĕs*, purity; reality; freedom from

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adulteration or mixture: see AUTHENTIC.—SYN. of 'genuine': authentic; true; unadulterated; pure; unalloyed; native; unsophisticated.

GENUS, n. *jě'nūs*, GENERA, n. plu. *jěn'ěr-ǎ* [L. *genus*; Gr. *genos*, birth, descent]: that which has several species under it; a number of groups of individuals having certain characters in common, each group being called a species; a group; a kind. GENERIC, a. *jě-něr'ik*, pertaining to a genus, race, or kind.

GENUS, in Natural History: a group of species (q. v.) closely connected by common characters or natural affinity: see GENERALIZATION. In all branches of zoology and botany, the name of the genus forms the first part of the scientific name of each species, and is followed by a second word—either an adjective or substantive—which distinguishes the particular species. Thus, in *Solanum tuberosum* (the potato), *Solanum* is the generic, and *tuberosum* the specific (sometimes styled the trivial) name. This method was introduced by Linnæus, and has been of great advantage to the progress of science, simplifying the nomenclature, and making names serve, in some measure, for the indication of affinities. The affinities indicated by the generic name are often recognized even in popular nomenclature—thus, Elm and *Ulmus* are perfectly synonymous; but there are many instances in which this is very far from being the case, as that of the genus *Solanum*. The arrangement of species in groups called genera has no real relation to any of the important questions concerning species.—Genera are arranged in larger groups called *orders*, which are often variously subdivided into *sub-orders*, *families*, *tribes*, etc. Genera themselves are grouped together in *classes*, which are assigned to *divisions* of one or other of the *kingdoms* of nature. Some genera contain hundreds of species; others no more than one; and though future discoveries may add to the number in many of the smallest genera, yet doubtless a great difference exists in the number actually belonging to groups equally distinct and natural. Some of the larger genera are, by some authors, divided into sub-genera; and too many naturalists show extreme anxiety to multiply generic divisions and names, perhaps forgetting that while certain affinities may be thus indicated, the indication of others is necessarily lost, while the memory of every student of science is more and more heavily burdened. To a certain extent the fluctuations of nomenclature, so often felt to be annoying, mark the progress of science and the removal of errors.—In Mineralogy, the generic name is not adopted as the primary part of the name each of species. *Gem* (q. v.) is an example of a mineralogical genus.

GENZANO, *jěn-zá'nō*, or GENSANO, *jěn-zá'nō*: town of the province of Rome, Italy, 17 m. s. by e. from Rome, in a district of hills and ravines. G. has several broad and straight streets, proceeding from a handsome square ornamented with a beautiful fountain. On one of the hills above the town is the feudal mansion of the Cesarini fam-

fly. G. is notable for an annual festival, on the eighth day after *Corpus Christi*, called the *Infiorata di Genzano*, from the custom of strewing the streets with flowers to represent arabesques, heraldic devices, figures, etc. The festival attracts many visitors from Rome. Pop. 5,000.

GEO-, prefix, *jē-ō-* [Gr. *gea*, *gē*, the earth]: frequent prefix in words derived from the Greek, and referring to the earth, as geography, geology, etc.

GEOCALYX, n. *jē-ō-kā'lik*s [prefix, *geo-*; L. *calyx* (q.v.)]: in bot., typical genus of *Geocalycidae*, a family of *Jungermanniaceae*, sub-ord. *Jungermannae*.

GEOCENTRIC, a. *jē-ō-sēn'trik*, or GE'OCEN'TRICAL, a. -*tri-kāl* [Gr. *gē*, the earth; *kentron*, the centre]: having the centre of the earth for its centre—applied to the position of a celestial object as viewed from the earth; thus the moon's motions are geocentric; also, though no other of the heavenly bodies revolves round the earth, yet their motions are spoken of as geocentric when referred to, or considered as they appear from, the earth.—The G. latitude of a planet is the inclination to the plane of the ecliptic of a line connecting it and the earth; the G. longitude being the distance measured on the ecliptic from the first point of Aries to the point in the ecliptic to which the planet as seen from the earth is referred.

GEOCORES, n. *jē-ōk'o-rēz* [prefix *geo-*; Gr. *koris*, a bug]: land-bugs; type of *Geocorizæ*, a section, group, or tribe of insects, sub-order *Heteroptera*. The antennæ are always visible, and the legs are formed for running. The bed bug is one of them. Westwood calls them *Auricorizæ* (air-bugs) rather than *Geocorizæ* (land-bugs), for some are found on the surface of the water, going far out even on the sea. There are nine sub-tribes or families.

GEOCYCLIC, a. *jē-ō-sī'klīk* [prefix *geo-*; *cyclic*]: of or belonging to the revolutions of the earth; periodically encircling the earth. GEOCYCLIC-MACHINE, machine for exhibiting the natural processes by which day and night and the seasons are produced.

GEODE, n. *jē'ōd* [F. *géode*, eagle-stone: Gr. *gaiōdēs*, earthy—from *gē* or *gaiā*, the earth]: round or roundish lump of a stony substance, a hollow concretion or indurated nodule, often empty, sometimes containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals. Geodes are called sometimes 'potato stones,' from their size and shape. The name may have been given them because they are occasionally found filled with a soft earthy ochre.

GEODEPHAGA, n. *jē-ō-dēf'a-ga* [prefix *geo-*; Gr. *adēphagos*, gluttonous, greedy]: one of the two leading tribes of carnivorous beetles, comprehending those which live on land as distinguished from hydradephaga, those inhabiting water. It contains the two families of *Carabidæ* and *Cicindelidæ*.

GEODESY, n. *jē-ōd'ē-sī* [Gr. *gēōdaisiā*—from *gē*, the earth; *daiō*, I divide: F. *géodésie*]: branches of mathematics

GEODESY—GEOFFREY OF MONMOUTH.

applied to the determination of the magnitude and figure of the whole earth, or of any large portion of its surface, and to the construction of maps. GEODESIC, a. *jě'ō-dēs'ik*, and GE'ODES'ICAL, a. *-i-kāl*, also GEODETIC, a. *jě'ō-dět'ik*, and GE'ODET'ICAL, a. *-i-kāl*, pertaining to the art of measuring large portions of the earth's surface, ascertaining its figure, etc.

GEOD'ESY: science of the measurement of the earth's surface, and of great portions of it. For the principal results of geodetical measurements, see EARTH: for some methods of obtaining them, see TRIANGULATION. G. has many physical difficulties to contend against. In measuring a particular length with a view of obtaining a base line for calculating other lines by trigonometrical observations, there is first a difficulty in the use of the unit of length, whatever it may be, whether rod or chain. In the use of rods, it is difficult to lay them all precisely in the same direction, and to prevent error arising from intervals between the rods. In the use of chains the greatest care is needed to keep all the links stretched, while the difficulty of avoiding error through not preserving the line of direction is but little diminished. Further, in all cases, the tendency of the units to change magnitude with changes of temperature, and the unevenness of the earth's surface, are sources of error. After all these difficulties have been overcome, and a sufficient base line obtained, a new class of difficulties are encountered. In taking trigonometrical observations of distant objects, it is found that the three angles of any triangle which we may form are together in excess of two right angles; the angles are, in fact, more of the nature of spherical than plane angles: for this, in using the angles as plane angles (for greater simplicity), a correction has to be made. Further, a correction is required for the effect of horizontal refraction on the results of observations on distant objects—a most fluctuating source of error—to evade which, so far as possible, it is usual to make observations when the atmosphere has been for some time undisturbed. See Puissant's work on Geodesy.

GEOFFREY OF MONMOUTH, *jěfri ov mōn'mūth*, called also JEFFREY AP ARTHUR: born at Monmouth; consecrated Bishop of St. Asaph 1152; d. abt. 1154. His chief work, *Chronicon sive Historia Britonum*, seems to have been completed about 1128. It is a tissue of the wildest fables, interwoven with some historic traditions. 'In later times,' says Dr Lappenberg, 'authors seem to have unanimously agreed in an unqualified rejection of the entire work, and have therefore failed to observe that many of his accounts are supported by narratives to be found in writers wholly unconnected with, and independent of Geoffrey. He professes to have merely translated his work from a chronicle in the British tongue, called *Brut y Brenhined*, or History of the Kings of Britain, found in Brittany, and communicated to him by Walter, Archdeacon of Oxford [not, as has been supposed, Walter Mapes, but an earlier Walter Calenius]. The *Brut* of Tysilio has, with some probabili-

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lty, been regarded as the original of G.'s work, though it is doubtful whether it may not itself be rather an extract from Geoffrey. That the whole is not a translation appears from passages interpolated, in many places verbatim, from the existing work of Gildus, of whom he cites another work *De Vita Ambrosii*, no longer extant.' G.'s work was first printed by Ascensius, Paris 1508, and has been reprinted more than once. An English translation, by Aaron Thompson, appeared London 1718, reprinted by Dr Giles 1842, and in Bohn's Antiquarian Library 1848. Whatever its value as a historical record, the Chronicle has been of great use to literature. Versified in the Norman dialect by Wace, and again in English by Layamon, we are indebted to it for the story of Lord Sackville's tragedy of *Ferrex and Porrex*, for Shakespeare's *King Lear*, for some of the finest episodes in Drayton's *Polyolbion*, and for the exquisite fiction of Sabrina in Milton's masque of *Comus*. A metrical *Life and Prophecies of Merlin*, printed first at Frankfurt 1603, reprinted for the Roxburghe Club 1830, has been attributed to Geoffrey of Monmouth, but without sufficient grounds.

GEOFFRIN, *zho-fräng'*, MARIE THÉRESE: 1699, June 2—1777, Oct.; b. Paris; daughter of a valet-de-chambre named Rodet, native of Dauphiné. In her 15th year she was married to a very rich manufacturer in the Faubourg St. Antoine, who died not long afterward, leaving her an immense estate. Madame G., though imperfectly educated, had a genuine love of learning, and her house soon became a rendezvous of the philosophers and *littérateurs* of Paris. No illustrious foreigner visited the city without obtaining an introduction to her circle; even crowned heads were among her visitors. Her liberality to men of letters, and especially the delicacy with which she conferred her benefits, reflect honor on her character. Among those who frequented her house was Poniatowski, afterward king of Poland. He announced to her his elevation to the throne in these words: '*Maman, votre fils est roi.*' In 1766, he prevailed on her to visit Warsaw, where she was received with the greatest distinction. Subsequently, in Vienna, Empress Maria Theresa and her son, Joseph II., honored her with a most gracious reception. She left legacies to most of her friends. Toward the publication of the *Encyclopédie* she contributed, according to the calculations of her daughter, more than 100,000 francs. D'Alembert, Thomas, and Morellet wrote éloges upon her, which are in the *Eloges de Madame Geoffrin* (Paris, 1812). Morellet likewise published her treatise *Sur la Conversation*, and her *Lettres*.

GEOFFROY SAINT-HILAIRE, *zho frwól' säng-te-lär'*, ETIENNE: 1772-1844; b. Etampes, France: zoologist and physiologist. He was intended for the clerical profession, and was sent to the college of Navarre, where the lectures of Brisson speedily awakened in him a taste for natural sciences. He became a pupil of Haüy (q.v.) and of Daubenton; and his relations with his teachers decided the future prospects of G. and saved the life of Haüy, who had been

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imprisoned as a refractory priest, and whom G. rescued from prison on the very eve of the massacres of 1792, Sep. A few months afterward, Haüy obtained for him the post of sub-keeper and assistant-demonstrator at the Jardin de Plantes; and 1793, June, on the reorganization of the institution, he was nominated, at the age of 21, prof. of the zoology of vertebrated animals. He immediately commenced the menagerie at the Jardin des Plantes, its beginning being three itinerant collections of animals that had been confiscated by the police, and were conveyed to the museum. His vigorous administration soon made the zoological collection the richest in the world. In 1795, G. invited Georges Cuvier—then an obscure young man in the wilds of Normandy of whose investigations he had heard—to come to Paris, ‘and assume the place of a new Linnæus, and become another founder of natural history.’ This prophetic summons was the beginning of an intimate friendship.

In 1798, G. formed one of the scientific commission that accompanied Bonaparte to Egypt, and he remained in that country until the surrender of Alexandria 1801. In 1807 he was elected into the Acad. of Sciences; 1808 was charged with a scientific mission to Portugal; on his return was appointed prof. of zoology in the Faculty of Science at Paris. In the latter years of his life, he was stricken with blindness, but the physical repose to which he was consequently condemned, seemed to increase his intellectual activity; and to the very last days of his life he was occupied with those abstruse questions of biology which had influenced his whole scientific career. He died in Paris. His writings aim to establish one great proposition—the unity of the organic plan of the animal kingdom. This was the point on which he and Cuvier mainly differed in their very warm discussions in the Acad. of Sciences, 1830. In addition to numerous memoirs in scientific periodicals, his published works include these with others: *Philosophie Anatomique* (2 vols. 1818–20), an exposition of his theory; *Principes de la Philosophie Zoologique* (1830), synopsis of his discussions with Cuvier; *Etudes Progressives d'un Naturaliste* (1835); *Notions de Philosophie Naturelle* (1838); and (with Frédéric Cuvier), *Histoire Naturelle des Mammifères* (3 vols. folio 1820–42). His son has published an excellent history of his life and labors, under the title, *Vie, Travaux, et Doctrine Scientifique d'E. Geoffroy Saint-Hilaire* (1848); see also *L'Eloge Historique de Geoffroy Saint-Hilaire* by Flourens; and an admirable sketch of his life and doctrines in Appendix to De Quatrefages's *Rambles of a Naturalist*, I. 312–324.

GEOFFROY SAINT-HILAIRE, ISIDORE: physiologist and naturalist: 1805–61; b. Paris; son of Etienne G. Educated in natural history by his father, he became asst. naturalist at the museum when only 19 years of age, and in 1830 he delivered the zoological lectures in that institution as his father's substitute. The science of Teratology (q. v.), or of the laws which regulate the development of monstrosities, which had occupied much of his father's attention,

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was taken up with great zeal by the son; and 1832 he published vol. I. of his *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux, ou Traité de Tératologie*, the third and concluding volume of which did not appear till 1837. This work is of extreme value, and will always serve as the starting-point for those who may occupy themselves with this branch of biology. Valuable are also his *Domestication et Naturalisation des Animaux Utiles* (1854), and (papers of) *Société pour l'Acclimatation des Animaux Utiles*. In 1852, he published vol. I. of a great work, *Histoire Générale des Règnes Organiques*, in which he intended to develop the doctrine of his father, but which was left unfinished at his premature death, which occurred at Paris. He was a strong advocate of the use of horse-flesh as human food, and published his *Lettres sur les Substances Alimentaires et particulièrement sur la Viande de Cheval* (1856).

GEOGLOSSUM, n. *jē-ō-glōs'sūm* [prefix *geo-*; Gr. *glossa*, the tongue]: in *bot.*, earth tongue; genus of ascomycetous fungi, sub-order *Elvellacei*. They occur chiefly in Europe, on closely shaven lawns, on pastures, and sphagnous (mossy) bogs. None are eatable.

GEOGNOSY; n. *jē-ōg'nō-sī* [F. *géognosie*—from Gr. *gē*, the earth; *gnōsis*, knowledge—from *gnōō*, I know]: term now little used by British and American writers, but still employed in Germany as a synonym of geology, or, more properly, as restricted to the observed facts of geology, apart from reasonings or theories built on them. **GE'OGNOST**, n. *-nōst*, one who examines the large features of a country, its mountain ranges, valleys, water-system; and the nature and position of the rocks, without grouping them in the order of succession. **GE'OGNOS'TIC**, a. *-nōs'tik*, pertaining to.—Of necessity, geognosy preceded geology; it was indeed geology in its early imperial condition when it was merely a record of observed facts; but as soon as these assumed scientific form, and were arranged into a system, then geognosy disappeared; for even in the examination of new and unexplored territories, the data supplied by the science of geology enable us to refer the strata with certainty to their true chronological position.—The word geognosy has been employed to designate also that department of geology which treats of the physical characteristics of rocks; that is, of their chemical composition, internal structure, planes of division, position and other properties, and peculiarities belonging to them simply as rocks.

GEOGONY, n. *jē-ōg'ō-nī* [Gr. *gē*, the earth; *gonē*, generation]: the doctrine of the formation of the earth; **GEOGONIC**, a. *jē'ō-gōn'ik*, pertaining to geogony.

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GEOGRAPHICAL DISTRIBUTION OF PLANTS AND ANIMALS: branch of scientific inquiry whose interest and importance have grown rapidly in recent years. In chief measure this is due to the totally different complexion given to the inquiry by the Darwinian views of the Origin of Species. See SPECIES. also FAUNA. FLORA. As long as it was held that each species must have been created, as a general rule, within the geographical area which it now occupies, the most curious facts of distribution could be regarded only with 'sterile wonder;' but when the theory came to be entertained that allied species have had a common origin, it was inferred that they or their ancestors must have had a common birthplace; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire as to the cause. Thus, when it is observed that all the W. Indian mammals, with one exception, are allied to those of America, it is inferred that the ancestors of these animals were derived from that continent, and the question arises how the passage was made from the mainland to the islands. The problem becomes much more difficult when we find that the single exception referred to 'belongs to an Order, *Insectivora*, entirely absent from S. America, and to a family, *Centetidae*, all the other species of which inhabit Madagascar only. (Wallace, *Geographical Distribution of Animals*.) Similarly, we have to explain how the tapirs are confined to the Malayan region and S. America; the *Camelidae* to the deserts of Asia and the Andes; marsupials to the Australian region and America; how the mammals and birds of N. America resemble those of Europe more than those of S. America; how the flora of Japan presents greater affinities to that of the Atlantic than to that of the Pacific States of N. America; and so on. The considerations that must be taken into account in dealing with these problems are numerous and complex. The nature of the more important facts affecting the solution, is here indicated. One of the principal sources of light on this subject is in the consideration of the means by which animals and plants are able to disperse themselves across the barriers at present existing.

It is scarcely necessary to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, especially among land animals those having the power of flight; and important in this respect is the fact that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in an earlier stage of existence; e.g. univalve and bivalve marine mollusks, all developed from free-swimming larvæ.

But besides the normal means of locomotion, there are many other important modes of dispersal. First, there is the power of winds as distributing agents. The carrying power of winds is known to be sufficient to bear fine dust across seas many hundreds of miles in width; thus, this agency alone is adequate to account for the dispersion of all plants propagated by minute spores; and the distribution of most cryptogamic plants hardly forms part of the problem under consideration, and is generally left out of

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account. What part winds may have had in carrying the seeds of phanerogamous plants across arms of the sea, is more doubtful; but there are observations which show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as means of transport for very long distances. Thus, Berthelot records, that after a violent hurricane he saw an annual belonging to the *Compositæ* (*Erigeron ambiguus*), widely distributed throughout the Mediterranean region, suddenly appear at various spots on the Canary Islands, where it was previously unknown, so that there could be hardly any doubt that the seeds had been blown across from Portugal or n. Africa. Nevertheless, De Candolle, has shown that seeds provided with a pappus are not on an average more widely distributed than those members of the *Compositæ* which are not so provided, so that such a case as that just mentioned must be looked upon as quite exceptional. But the exceptional means of transport are those most important to consider with reference to the problems of distribution, since these often serve to explain peculiarities otherwise inexplicable. The effect of wind in distributing plants on land is well known.

But in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course; and to this cause, for instance, is due the arrival every year of American birds on the Bermudas. Insects blown from land have been caught on ships more than 300 m. from land. Further, there are well-authenticated cases of even crabs, frogs, and fishes carried long distances by storms; and in this way, it is possible to account for the transference of fish, etc., from one river system to another. Still more frequent probably is such transport of the eggs of these creatures.

Next, marine currents are an important agency of dispersal for plants and animals, in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still fit for germination. The well-known experiments of Darwin to determine the vitality of seeds in sea-water, first showed the importance of this factor in the distribution of plants. In one experiment, he found that of 87 kinds of seeds, 64 germinated after an immersion of 28 days, and a few survived an immersion of 137 days; and in another, that of 94 dried plants, 18 floated for above 28 days; and combining the results of the two experiments, he concluded that 14 plants out of every 100 in the flora of a country might be floated by currents moving at the average rate of the several Atlantic currents, a distance of 924 m. and might, on being stranded furnish seeds capable of germinating.—Further, marine currents often carry on their surface various kinds of natural rafts, which may be means of transport for plants and animals. In polar regions, icebergs and icefloes may serve this purpose; elsewhere, trunks of trees, and even fragments torn from the land. Such floating fragments, forming small islands with

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erect trees upon them, have been seen 100 m. from the mouth of the Ganges and other rivers. Mr. Wallace points out that ocean waifs of one kind or another are almost the only means we can imagine by which land-shells can have acquired their remarkably wide distribution. These mollusks perish very readily in sea-water, but are very tenacious of life in other circumstances; and this tenacity of life favors their chance of being carried in chinks of floating timber, or otherwise, across the ocean.

Again, locomotive animals are very frequent agents in dispersing both plants and other animals. Seeds may be attached to the fleece or fur of mammals or the plumage of birds or may be inclosed in clumps of earth clinging to the feet, or some other part of bird or beast, even of insects. To Darwin we are again indebted for an instance showing how likely a mode of transport this is. He informs us that he received from Prof. Newton the leg of a red-legged partridge (*Caccabis rufa*) with a ball of hard earth weighing $6\frac{1}{2}$ ounces adhering to it. The earth had been kept for three years; but when broken, watered, and covered by a bell glass, as many as 82 plants sprang from it. Hooked fruits, such as those of agrimony, gum, etc., and fruits covered with a viscous substance, like those of some thistles, mistletoe, and others, are the most likely to be transported in this way. It seems probable that aquatic birds and water-beetles have been the means of distributing aquatic plants and fresh-water mollusks, remarkable for their wide diffusion; and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means.

Again, seeds with hard shells are known in many cases to be capable of passing through the digestive organs of birds uninjured; consequently fruits inclosing such seeds, or, like the strawberry, covered with them, may be devoured by birds in one place, and deposited by them in a state fit for germination at another, hundreds of miles distant. And what is of still more importance, seeds which would be destroyed if they passed through the digestive organs of a bird, are quite uninjured as long as they remain in the crop, where they may be retained 12 to 18 hours; thus birds killed with food in their crop may be the means of scattering seed which has travelled 500 miles. It is obvious that the migratory habits of certain birds are of great importance with reference to both the means of transport just mentioned.

Further, the parasitic habits of certain animals, enable them to be carried about from place to place, when they have themselves no power, or only a very feeble power of locomotion. For the question now in hand, it is indifferent whether the animals are truly parasitic, feeding at the expense of the host to which they are attached; or merely commensalists, gaining their own food independently, like the sea anemones frequently attached to the shells of hermit-crabs.

Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another.

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The foreign plants found growing on ballast-heaps are instances of this, and so are the plants which sprung from seed introduced with imported grain or other articles of import. Since the discovery of America, the whole of the n. part of the continent is said to have been more or less overrun by European weeds, and according to Agassiz, the roadside weeds of the New England States, to the number of 130, all are European. Wherever European sailors have gone, the European rats, both black and brown, have accompanied them; and the shrew, the death's-head moth, the *Sphinx convolvuli*, etc., also are known to have been introduced into various countries in ships.

In the preceding summary of the more important means of diffusion for plants and animals, some of the obstacles to diffusion have been incidentally referred to; but it will be convenient to make a general survey of these also.

For all land-plants and land-animals, the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide, it is seldom passable except with the aid of man. For land mammals, the ocean is an absolutely impassable barrier; hence native mammals are always absent from oceanic islands (that is, islands that have never been connected with the mainland); and this barrier is almost equally effective for serpents and amphibians, which also are nearly always lacking where there are no native mammals. Lizards are more frequently found indigenous on oceanic islands, though their means of transit from the mainland is unknown. Arms of the sea and broad rivers likewise are generally impassable for the creatures mentioned, though some have greater powers of swimming than is generally supposed. The jaguar, the bear, and the bison, are capable of swimming the widest rivers; pigs have been known to swim ashore when carried several miles out to sea; and even a boa-constrictor is reported to have swum to the island of St. Vincent from the S. American coast—200 miles.

Mountains, especially high mountains, are frequently effective barriers to the migration of land plants and animals; but it must be noticed that in some cases they serve for both, as a means of communication between one region and another, enabling plants and animals belonging to a cold climate, for example, to spread into latitudes where, in the plains, the climate is too hot for them. Again, deserts act as a barrier to the majority of plants and animals; forests are a barrier to the camel, hare, zebra, giraffe, etc.; treeless regions to apes, lemurs, and many monkeys; plains to wild goats and sheep.

Another important barrier is climate; but with reference to this, it must be observed that the question of climate affects the problems of geographical distribution in the proper sense of that term, only so far as climatic conditions may shut off plants and animals from means of communication between one region and another, and not where climate merely limits the range of a species or group within a continuous area.

Another set of barriers may be classed under the general

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head of organic, inasmuch as they all are connected with the vegetable or animal life of the region where such barriers exist. Under this head is to be noted first the fact that certain animals require for their subsistence a special kind of vegetable food. The range of insects is peculiarly liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason, insects, in spite of the exceptional facilities for dispersal which, as above shown, they enjoy, are remarkable, as a rule, rather for the restriction than for the width, of their areas of distribution. Again, the presence of enemies is sufficient in some cases absolutely to exclude certain forms from certain areas, as the well-known tsetse fly excludes horses, dogs, and cattle from a well-defined area in s. Africa; and another kind of fly prevents horses and cattle from running wild in Paraguay, as they do in abundance both to the north and to the south of that region.

A more important, because more generally operative, organic barrier consists in the fact of a region being already fully occupied by a native flora and fauna, so that there is no room for newcomers. Hence it happens that seeds may be wafted in plenty from one country to another without a single plant growing from these seeds being able to establish itself; and there may even be, as in S. America, a free communication with another region while the fauna remains strikingly distinct, simply because that portion of the American continent is already completely stocked with a fauna perfectly adapted to the physical conditions there prevailing.

The barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it impossible to mark out any marine zoogeographical regions, though many seas and coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is a complete barrier for fishes requiring warm seas.

If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birth-place. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change. Of changes of sea and land, geology supplies abundant evidence. Portions of the mainland now continuous were at one time severed by arms of the sea; and islands have been formed by the severance of portions of land that once belonged to the mainland. Such islands are known as continental islands, and the study of their faunas and floras is one of peculiar interest in connection with geographical distribution. These faunas and floras show, as might be expected, a greater or less correspondence with those of the mainland from which the islands have been cut off; and the resemblance is the closer, the

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more recently the land connection has been destroyed. The relative date of the disunion is usually approximately indicated by the depth of the sea which now separates island and mainland, shallow seas dividing portions of land that have only recently been disconnected, and deeper seas separating those which have been longer apart.

Of such continental islands, no better example could be given than the islands of Britain, a group separated by one of the shallowest of seas from the mainland of Europe, with which it was connected even in post-pliocene times. Both flora and fauna of these islands present, accordingly, the closest correspondence with those of the neighboring parts of the mainland, being almost exactly what would be expected if the connection with the mainland still subsisted. The W. Indies are another interesting example of the same class of islands, but in this case the severance is of older date; and a still more interesting example is the island of Madagascar, the fauna and flora of which, while markedly peculiar, yet exhibit decided affinities with those of s. Africa, and appear to indicate a former land connection of the island with the neighboring continent, but a connection at a remote period, when the flora and fauna of the latter were differently constituted from what they are at present.

A still more remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands east of a deep channel between the islands of Bali and Lombok, a channel the significance of which, as a boundary line for plants and animals, was first pointed out by Mr. A. R. Wallace, the great authority on animal distribution; whence it is known as Wallace's Line. The great feature of this region (so far as animal distribution is concerned), is 'the almost total absence of all the forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials.' The marsupials, though now restricted, as stated at the beginning of this article, was at one time spread over the whole world, but has in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about. The early severance of the Australian region from the Asiatic continent (a severance which must be referred to some period in the Secondary Age of geologists), saved the Australian marsupials from the competition which almost extinguished the group elsewhere.

Turning to marine distribution, we find evidence of the former absence of a land-barrier at the Isthmus of Panama, in the identity of many species of fish on both sides of the isthmus.

Changes in the climatic barrier also have had an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the n. polar regions, that the affinities between the floras

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of Japan and eastern N. America may be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation—namely, that in former geological epochs, a genial climate must have prevailed even within the polar circle, so as to allow the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the north, this flora was driven southward, and became differentiated according to the differences of climate in the latitudes to which it advanced. Hence the e. parts of America and Asia, as they largely correspond in climate, came to correspond more closely than other tracts in the same latitude in their floras also. The soundness of this surmise was afterward confirmed by the discovery of abundant plant remains of the Miocene age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere. For the effects on distribution, of the changes of climate belonging to this period known as the Ice Age, see GLACIER: GLACIAL PERIOD.

The present distribution of plants and animals is such as to enable us to divide the terrestrial surface of the globe into more or less defined regions. For animals, the regions adopted by Mr. Wallace are nearly the same as those first suggested by Mr. Sclater as applicable to the distribution of birds; for in spite of the exceptional facility which birds have for crossing barriers impassable by mammals, Mr. Wallace finds that the distribution of mammals (which afford the best means of marking off zoogeographical regions) corresponds with that of birds to an extent that would scarcely have been anticipated. But with regard to these regions, it must be remembered, first, that it is impossible in most cases to give them any clearly marked boundary; secondly, that the degree of divergence between different regions is different in different cases; thirdly, that when any two regions are compared, we have not the same degree of divergence between different groups of the animal kingdom, or between animals and plants belonging to the two regions. Obviously, the degree of correspondence depends largely on the facilities for dispersal, and largely also on the geological age of different groups; and both of these are varying factors. These considerations being premised, the following may be stated as the limits of the six zoological regions adopted by Mr. Wallace, in his *Island Life*. For details of the characteristic life of the different regions, see works cited at the end of the article.

1. Palæarctic Region, comprising Europe and n. temperate Asia and Africa to the n. borders of the Sabara.

2. Ethiopian Region, comprising all tropical and s. Africa; with Madagascar and the Mascarene Islands.

3. Oriental Region, comprising all Asia s. of the Palæarctic limits; and the Malay Islands as far as the Philippines, Borneo, and Java.

4. Australian Region, comprising Australia; with New Guinea and all the Malayan and Pacific islands e. of the deep channel between the islands of Bali and Lombok: Celebes might be referred with almost equal right to either

this or the preceding region: New Zealand is treated by Mr. Wallace as a highly peculiar sub-region of this great region.

5. Nearctic Region, comprising all temperate and arctic N. America, including Greenland, and extending on the south to an irregular line running from the Rio Grande del Norte on the e. to a point nearly opposite Cape St. Lucas on the west.

6. Neotropical Region, comprising the American continent s. of this line; with the W. Indian Islands.

On plant distribution, the most important recent work is that of Engler, in which there is an attempt to trace the history of the vegetable kingdom since the tertiary period. (See references at end of article.) Engler comes to the conclusion, that already in the tertiary period four different 'floral elements' (*Florenelemente*) could be distinguished, as follows:

1. The Arcto-tertiary element, characterized by an abundance of conifers and numerous genera of trees and shrubs now prevalent in N. America, or in extra tropical e. Asia and in Europe.

2. The Palæotropical element, characterized by the presence of the families and sub-families dominant in the tropics of the old world; and still more by the absence of certain families, groups, and genera found in the territory of the Arcto-tertiary element.

3. The Neotropical or S. American element, which according to Engler, must have had in tertiary times much the same character as that now possessed by tropical Brazil and the W. Indies.

4. The old Oceanic element, consisting of forms which possessed the power of traversing considerable stretches of ocean and developing further on islands.

The modern provinces of the vegetable kingdom are subordinated by Engler to these great divisions.

See P. L. Sclater's paper on the Geographical Distribution of Birds, in the *Jour. Linn. Soc. (Zool.)*, II.; and his Address to the Biological Section of the Brit. Assoc. at Bristol, 1875; A. R. Wallace's *Geographical Distribution of Animals* (2 vols Lond. 1876), and his *Island Life* (Lond. 1880); A. Murray's *Geog. Distribution of Mammals* (Lond. 1866); Bentham's Presidential Address to the Linnean Soc., *Jour. Linn. Soc.*, X. (Botany, introd.); A. de Candolle's *Géographie Botanique* (2 vols., Paris 1855); Sir J. Hooker's *Introduction to the Flora of Tasmania*, and *Handbook of the Flora of New Zealand*; also a paper by him On the Distribution of Arctic Plants, *Trans. Linn. Soc.*, XXIII.; Grisebach's *Vegetation der Erde* (Leipzig 1872-78); and French version of the same with notes, by P. de Tschihatchef (2 vols., Paris 1875-78); Ad. Engler's *Entwicklungsgeschichte der Pflanzenwelt seit der Tertiärperiode* (2 vols., Leipzig 1879-82); Asa Gray's Forest Geography and Archæology, in *Amer. Jour. of Science and Arts*, ser. iii., XVI. (1875); and the chapters on Geographical Distribution in Darwin's *Origin of Species*, as well as chapters xxxviii-xlii. of Lyell's *Principles of Geology*.

GEOGRAPHY.

GEOGRAPHY, n. *jĕ-ŏg'ră-fĭ* [F. *gĕographie*—from Gr. *gĕ*, the earth, and *graphĕ*, a writing or description]: a description of the surface of the earth, of its artificial divisions into countries, states, kingdoms, cities, towns, etc., and of its natural divisions into oceans, rivers, continents, islands, mountains, etc.; a book containing such description. **GEOG'RAPHER**, n. *-fĕr*, one versed in geography; a writer on the subject. **GE'OGRAF'IC**, a. *-ŏ-grăf'ĭk*, and **GE'OGRAF'ICAL**, a. *-ĭ-kăl*, of or relating to geography. **GE'OGRAF'ICALLY**, ad. *-lĭ*. **MATHEMATICAL GEOGRAPHY**, that branch of geography which treats of the size, form, and planetary relations of the earth, and which teaches us how to determine the position of places on its surface in relation to one another, as well as how to inscribe them on globes, maps, and charts. **PHYSICAL GEOGRAPHY**, the branch which treats of the general surface-structure of the terrestrial globe, its varied climates and soils with their productions, the atmosphere by which it is surrounded, and the distribution of living beings on its surface. **POLITICAL GEOGRAPHY**, the branch which treats of the various artificial divisions of the earth's surface into empires, kingdoms, and republics, with their industries, and the social, civil, and religious conditions of each.

GEOG'RAPHY: science of the description of the earth, with its natural and its artificial divisions and products, and its various populations. It is divided into *Mathematical* or *Astronomical* Geography, *Physical* Geography, and *Political* Geography, which all admit of further subdivision into numerous subsidiary branches.

Mathematical or *Astronomical* Geography describes the earth in its planetary relations as a member of the solar system, influencing and influenced by other cosmical bodies. It treats of the figure, magnitude, and density of the earth; its motion, and the laws by which that motion is governed; together with the phenomena of the movements of other cosmical bodies, on which depend the alternation of day and night, and of the seasons of the year, and the eclipses and occultations of the sun, moon, and planets; it determines position, and estimates distances on the earth's surface, and teaches methods for the solution of astronomical problems, and the construction of the instruments necessary for such operations, together with the modes of representing the surface of the earth by means of globes, charts, and maps. For the numerous subjects comprised in this portion of geographical science, see such titles as **ASTRONOMY: LATITUDE AND LONGITUDE: MATHEMATICAL INSTRUMENTS: OBSERVATORIES: ETC.**

Physical Geography considers the earth in its relation to nature and natural or physical laws only. It describes the earth, air, and water, and the organized beings, whether animal or vegetable, by which those elements are occupied, and considers the history, extent, mode, and causes of the distribution of those beings. This may be regarded as the most important branch of geographical science, since it involves the consideration and study of phenomena, which not only tend to further the material interest of man, by

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teaching him how best to promote the development of the products of nature, but also conduce to general intellectual advance, by stimulating the faculties of observation, and exercising the powers of thought. The vast sphere of inquiry included in physical geography necessarily embraces the consideration of all the natural sciences generally: see such titles as CLIMATE: HEAT: LAKES: RIVERS: MOUNTAINS: OCEAN: WINDS: RAIN: CLOUDS: ETHNOLOGY: GEOGRAPHICAL DISTRIBUTION OF PLANTS AND ANIMALS.

Political Geography has been well defined as 'including all those facts which are the immediate consequences of the operations of man, exercised either on the raw materials of the earth, or on the means of his intercourse with his fellow-creatures.' Thus considered, it embraces, primarily, the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and, secondarily, that of the laws, modes of government, and social organization which prevail in the several countries. For details of this branch of geography see the titles of COUNTRIES: CITIES: ETC.: for more general information, see the various historical, political, and statistical sources.

The following are among the leading works that afford the best aid in studying the three main branches of geography. In *Mathematical Geography: Manual of Geographical Science* (Part I. *Mathematical Geography*, by Mr. O'Brien); Herschel's *Outlines of Astronomy*; Klöden's *Erdkunde* (Part I.): in *Physical Geography*, Ritter's *Erdkunde*; Klöden's; A. Maury's *La Terre et l'Homme*; Mrs. Somerville's *Physical Geography*; F. Maury's *Physical Geography of the Sea*, etc.: in *Political Geography*, the great works of Ritter, Berghaus, Stein, Wappäus, Klöden, Hellwald, and Reclus, and the ordinary geographical manuals and maps.

Geographical Discovery.—The earliest idea formed of the earth by nations in a primeval condition seems to have been that it was a flat circular disk, surrounded on all sides by water, and covered by the heavens as with a canopy; in the centre of the disk their own land was supposed to be situated. The Phœnicians are thought to have been the first people who communicated to other nations a knowledge of distant lands; and though little is known as to the exact period and extent of their various discoveries, they had, before the age of Homer, navigated all parts of the Euxine, and penetrated beyond the limits of the Mediterranean into the Western Ocean, and they thus form the first link of the great chain of discovery which, 2,500 years after their foundation of the cities of Tartessus and Utica, was carried by Columbus to the remote shores of America. Besides various settlements nearer home, these bold adventurers had founded colonies in Asia Minor about B.C. 1200, and a century later they laid the foundation of Gades, Utica, and several other cities, followed, in the course of the 9th c. by that of Carthage, whence new streams of colonization continued for several centuries to flow to previously unknown parts of the world. The Phœnicians, though less highly gifted than the Egyptians, rank next to them in regard to the influence which they exerted on the progress of

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human thought and civilization; for their knowledge of mechanics, their early use of weights and measures, and what was of still greater importance, their employment of an alphabetical form of writing, facilitated and confirmed commercial intercourse among their own numerous colonies, and formed a bond of union which speedily embraced all the civilized nations of Semitic and Hellenic origin. So rapid was the advance of geographical knowledge between the age of the Homeric poems (which may be regarded as representing the ideas entertained at the commencement of the 9th c. B.C.) and the time of Hesiod (B.C. 800), that while in the former the earth is supposed to resemble a circular shield, surrounded by a rim of water, spoken of as the parent of all other streams, and the names of Asia and Europe applied only, the former to the upper valley of the Caïster, and the latter to Greece n. of Peloponnesus, Hesiod mentions parts of Italy, Sicily, Gaul, and Spain, and has knowledge of the Scythians, and the Ethiopians of s. Africa. During the 7th c. B.C., certain Phœnicians, under the patronage of Neku or Necho II., King of Egypt, undertook a voyage of discovery, and are supposed to have circumnavigated Africa. This expedition is recorded by Herodotus, who relates that it entered the Southern Ocean by way of the Red Sea, and after three years absence, returned to Egypt by the Pillars of Hercules. The fact of an actual circumnavigation of the African continent has been doubted, but convincing proof of its reality is afforded by the observation which seemed incredible to Herodotus, viz., 'that the mariners who sailed round Libya (from e. to w.) had the sun on their right hand.' The 7th and 6th c. B.C. were memorable for great advance in knowledge of the form and extent of the earth. Thales, and his pupil Anaximander, reputed to have been the first to draw maps, exploded many errors, and paved the way for attainment of a sounder knowledge. The logographers contributed at this period to the same end by the descriptions which they gave of various parts of the earth; of these, perhaps the most interesting to us is the narrative of the Carthaginian Himilco, who discovered the British Islands, including the Æstryrnides, which he described as being a four months' voyage from Tartessus.

With Herodotus of Halicarnassus (b. B.C. 484), who may be regarded as the father of geography as well as of history, a new era began in regard to geographical knowledge, for though his chief object was to record the struggles of the Greeks and Persians, he has so minutely described the countries which he visited in his extensive travels (which covered an area of more than 31° or 1,700 m. from e. to w., and 24° or 1,660 m. from n. to s.), that his History gives us a complete representation of all that was known of the earth's surface in his age. This knowledge, which was extremely scanty, consisting in believing that the world was bounded s. by the Red Sea or Indian Ocean, and w. by the Atlantic, while its e. boundaries, though admitted to be undefined, were conjectured to be nearly identical with the limits of the Persian empire, and its n. termination

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somewhere in the region of the amberlands of the Baltic, which had been visited by Phœnician mariners, and with which the people of Massilia (modern Marseille) kept constant intercourse by way of Gaul and Germany. In the next century, the achievements of Alexander the Great tended materially to enlarge the bounds of human knowledge, for while he carried his arms to the banks of the Indus and Oxus, and extended his conquests to n. and e. Asia, he also promoted science, by sending expeditions to explore and survey the various provinces which he subdued, and to make collections of all that was curious in regard to the organic and inorganic products of the newly visited districts; hence the victories of the Macedonian conqueror formed a new era in physical inquiry generally, as well as in geographical discovery especially. While Alexander was opening the East to the knowledge of western nations, Pytheas, an adventurous navigator of Massilia, conducted an expedition past Spain and Gaul through the Channel, round the east of England into the Northern Ocean, where after six days' sailing, he reached Thule (conjectured to be Iceland), and returning, passed into the Baltic, where he heard of the Teutones and Goths. Discovery was thus being extended in the north and east into regions whose very existence had never been suspected, or which had hitherto been regarded as mere chaotic wastes. An important advance in geography was made by Eratosthenes (b. B.C. 276), who first used parallels of longitude and latitude, and constructed maps on mathematical principles. Though his work on geography is lost, we learn from Strabo that he considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one centre. He believed that only about one-eighth of the earth's surface was inhabited, while the extreme points of his habitable world were Thule in the n., China in the e., the Cinnamon Coast of Africa in the s., and the Prom. Sacrum (Cape St. Vincent) in the west. During the interval between the ages of Eratosthenes and Strabo (b. B.C. 60), many voluminous works on geography were compiled, which have been either wholly lost to us, or only partially preserved in the records of later writers. Strabo's great work on geography, said to have been composed when he was 80 years of age, has been considered as a model of what such works should be in regard to the methods of treating the subject; but while his descriptions of all the places that he visited are interesting and instructive, he seems unduly to have discarded the authority of preceding writers.

The wars and conquests of the Romans had a most important bearing upon geography, since the practical genius of the Roman people led them to the study of the material resources of every province and state brought under their sway; and great service was done to geographical knowledge by the survey of the empire, begun by Julius Cæsar and completed by Augustus. This work comprised a description and measurement of every province by the most celebrated geometricians of the day. Pliny (b. A.D. 23),

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who had travelled in Spain, Gaul, Germany, and Africa, left a compendium of the geographical and physical science of his age in the four books of his *Historia Naturalis* which he gives to the subject. He collected with indefatigable industry the information contained in the works of Sallust, Cæsar, Tacitus, and others, to which he added the results of his own observations, without, however, discriminating between fact and fiction. The progress since Cæsar's time in geographical knowledge is evinced by Pliny's notice of arctic regions and of the Scandinavian lands, and the accounts which he gives of Mount Atlas, the course of the Niger, and of various settlements in different parts of Africa; while his knowledge of Asia is more nearly correct than that of his predecessors, for he affirms that Ceylon is an island, and not the commencement of a new continent, as had been generally supposed. The study of geography in ancient times may be said to have terminated with C. Ptolemy, in the middle of the 2d c. of our era. His work on Geography, in eight books, which continued to be regarded as the most perfect system of the science through the dark and middle ages till the 16th c., gives an approximately correct account of the well-known countries of the world, and of the Mediterranean, Euxine, and Caspian, together with the rivers which fall into those seas; but it added little to the knowledge of n. Europe or the extreme boundaries of Asia or Africa. Yet, from his time till the 14th c., when the records of the travels of the Venetian Marco Polo opened new fields of inquiry, the statements of Ptolemy were never questioned, and even during the 15th c. it was only among a few German scholars at Nürnberg that the strange accounts by the Venetian traveller of distant eastern lands were received as trustworthy where he differed from Ptolemy. Marco Polo had, however, unfortunately made no astronomical observations, nor had he even recorded the length of the day at any place; hence the Nürnberg geographers, who had no certain data for estimating the extent of the countries which he had traversed, were the means of propagating errors which led to results destined to influence the history of mankind; for taking Ptolemy's tables as their basis, they had incorporated on their globes and maps the results of their own rough estimates of the length of Marco Polo's days' journeys, and they had thus represented the continent of Asia as extending across the Pacific, and having its eastern shores somewhere in the region of the Antilles. These erroneous calculations misled Christopher Columbus to the false assumption that, by sailing 120° west, he would reach the wealthy trading marts of China; and the result of this conviction was his entering upon that memorable expedition which terminated in the discovery (1492) of the continent of America. Although there is no reason to doubt that the American continent was visited in the 9th and 10th c. by Northmen, the event remained without influence on the history of discovery, and cannot therefore detract from the claims of Columbus. This momentous discovery, which had been preceded in 1486 by the exploration of the Afri-

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can coast as far as the Cape of Good Hope (which was doubled by Vasco da Gama 1497), was followed by a rapid succession of discoveries; and within 30 years of the date of the first voyage of Columbus, the whole coast of America from Greenland to Cape Horn had been explored, the Pacific Ocean had been navigated, and the world circumnavigated by Magellan (q.v.); the coasts of eastern Africa, Arabia, Persia, and India had been visited by the Portuguese, and numerous islands in the Indian Ocean discovered. The 16th c. was marked by continued attempts, successful and unsuccessful, to extend the sphere of oceanic discovery; and the desire to reach India by a shorter route than those by the Cape of Good Hope or Cape Horn, led to many attempts to discover a northwest passage, which, though they signally failed in their object, had the effect of materially enlarging the knowledge of the arctic regions. The expeditions of Willoughby and Frobisher (1553 and 76), of Davis (1585), Hudson (1607), and Baffin (1616), were the most important in their results toward this end. The 17th and 18th c. gave a new drift to the study of geography, by bringing other sciences to bear upon it, which, in their turn, derived elucidation from the extension of geographical knowledge; and it is to the aid derived from history, astronomy, and the physical and natural sciences, that we owe the completeness which has characterized modern works on geography. In the 17th c., the Dutch, under Tasman and Van Diemen, made the Australasian islands known to the civilized world. And in the latter half of the 18th c., Captain Cook extended the great oceanic explorations by the discovery of New Zealand and many of the Polynesian groups; but he failed to find the antarctic continent, which was visited first in 1840 by American, English, and French expeditions, under their respective commanders, Wilkes, Ross, and Dumont d'Urville. Polar exploration, after having been for a time in abeyance, has within late years been vigorously prosecuted by the United States and various European countries. In America, the travels of Humboldt, Lewis and Clark, Fremont, and others, have done much to make us acquainted with broad general features, but much remained to be done in regard to special districts of Central and S. America. In Asia, numerous travellers, geographers, and naturalists have contributed to render our knowledge precise and certain in respect to a great part of the continent, whose natural characteristics have been especially presented by the great physicist Ritter; while a large debt of gratitude is due to the Jesuit missionaries, whose indefatigable zeal has furnished us with a rich mass of information in regard to minor details of Asiatic life and nature. In Africa, the combined influences of a deleterious climate and religions hostile to European advance have hitherto retarded explorations into the interior; nevertheless, much light has been thrown on the character and condition of the African continent by many of its greatest explorers—as Bruce, Park, Clapperton, Adanson, the Landers, Burton, Speke, Barth, Vogel, Livingstone, Cameron, and Stanley. In Australia, though

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much remains to be done, the obscurity which had hung over the interior has been to a great extent removed by the explorations of Sturt, Eyre, Leichhardt, and the brothers Gregory; and still more by the highly important labors of Burke and Wills, who in 1860 crossed the Australian continent from Melbourne to Carpentaria. The establishment in 1872, of a telegraph line from Adelaide to Port Darwin, across the continent, and the maintenance of stations along the line, formed an admirable base for further exploration. Giles, Warburton, and Forrest forced their way in nearly parallel lines to the w. coast. The labors of these and other explorers prove that about half of the continent of Australia, though often covered with dense growth of spinifex, acacia, and eucalyptus, is not habitable or available by Europeans.

The progress of recent discovery has been aided by the encouragement given to exploration by the governments of different countries, and by the efforts of the numerous geographical societies (of which there were between 60 to 70 in 1880); while the constantly increasing mass of information collected by scientific explorers is rapidly diffusing correct information in regard to distant regions. On the subject of geographical discovery, see the following works: Bunbury's *History of Ancient Geography* (1880); Kiepert's *Manual of Ancient Geography* (1881); *Précis de Géographie Universelle*, by Malte Brun; Humboldt's *Hist. crit. de l'Hist. de la Géographie*, and the *Cosmos*; Ritter's *Asien*; Kloeden's *Erdkunde*; Reclus, *Nouvelle Géographie Universelle* (5 vols.); *Stanford's Compendium of Geography and Travel*, based on Hellwald (6 vols.). The recent progress of geographical discovery may be traced in Petermann's *Mittheilungen*, and the *Proceedings of the Geographical Society*.

GEOGRAPHY, MEDICAL: branch of medical science dealing with the liability of particular localities to become the centres of special diseases, or groups of diseases. This liability has been observed from the ancient periods, as we have excellent evidence in the Hippocratic treatise, *On Airs, Waters, and Places*, one of the undoubtedly genuine works of the great Greek physician, and one of those which best sustains his traditional reputation. In recent years medical geography has become a most elaborate and carefully investigated branch of medical science, the details of which, though of considerable popular interest, are very complicated and technical: for incidental illustrations of the subject, see **ENDEMIC: CLIMATE: AGUE: DYSENTERY: GOITRE: LEPROSY: YELLOW FEVER: PLAGUE: REMITTENT FEVER.** Generally, the tropics are subject to diarrheal diseases, with acute affections of the liver, and severe remittent or pestilential fevers, caused by the high temperature acting on the soil, and producing emanations very destructive of health; the like causes in temperate climates causing ague and diarrhea, especially during the summer and autumn, in low-lying, ill-drained localities. Temperate climates are subject in a peculiar degree to pulmonary diseases, and to all manners of contagious fevers, the result of overcrowding and confined air. Certain diseases as goitre,

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leprosy, and some animal parasites (see ENTOZOOON), appear to have no relation to climate, but are found to affect, more or less exclusively, certain well-defined districts of country; as in the case of the Guinea-worm, the Egyptian ophthalmia, the pellagra of Lombardy, the beri-beri of Ceylon and the Malabar coast, and the elephantiasis of the Indian peninsula generally. The best works on medical geography are those of Mühry in Germany, and Boudet in France, which are remarkably learned and complete treatises on the whole subject. A more recent one is that of Dr. August Hirsch of Danzig, a work of immense labor and erudition, not yet completed. On tropical diseases generally, the English works of Annesley, Twining, Morehead, and Sir Ronald Martin are of confirmed reputation.

GEOLATRY, n. *jē-ōl'ă-trī* [Gr. *gē*, the earth; *latreia*, worship]: the worship of terrestrial objects.

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GEOLOGY, n. *jě-ŏl'ŏ-jŏ* [F. *géologie*—from Gr. *gē*, the earth; *logos*, a discourse]: the science which treats of the structure of the earth, and the substances of which it is composed. **GE'OLOGICAL**, a. *-ŏ-l'ŏj'ŏ-kāl*, pertaining to geology. **GEOL'OGIST**, n. *-ŏl'ŏj'ŏst*, one versed in the science of geology. **GEOL'OGIZE**, v. *-jŏz*, to study or pursue the science of geology. **GEOL'OGIZING**, imp. **GEOL'OGIZED**, pp. *-jŏzd*.

GEOL'OGY: science of the description of the earth with its structure and the substances composing it. It should include all the sciences that treat of the constitution and distribution of the inorganic matter of the earth, as well as those which describe the living beings that inhabit and have inhabited it, as astronomy includes the whole science of the heavenly bodies. In this wide sense, as comprising all the physical sciences, it has sometimes been used. As usually employed, however, it has a much more limited meaning, being confined to that section of the sciences which takes cognizance of the hard crust of the earth—of the materials of which it is constituted, and of the manner of its formation and of the order in which the materials composing it are arranged.

The structure of the earth received little attention from the ancients; the extent of its surface known was limited, and the changes upon it were neither so speedy nor violent as to excite special attention. The only opinions deserving to be noticed, that have come down to us, are those of Pythagoras and Strabo. They both observed the phenomena which were then altering the surface of the earth, and proposed theories for explaining the changes that had taken place in geological time. The first held that, in addition to volcanic action, the change in the level of sea and land was owing to the retiring of the sea; while the other maintained that the land changed its level, and not the sea, and that such changes happened more easily to the land below the sea because of its humidity. From the fall of the Roman empire, during the dark ages, the cultivation of the physical sciences was neglected. In the 10th c., Avicenna, Omar, and other Arabian writers, commented on the works of the Romans, but added little of their own. Geological phenomena attracted attention in Italy in the 16th c., the absorbing question then being as to the nature of fossils. On the one side, it was held that they were the results of the fermentation of fatty matter, or of terrestrial exhalations, or of the influence of the heavenly bodies, or that they were mere earthy concretions or sports of nature; while only a few maintained that they were the remains of animals. Two centuries elapsed before the latter opinion was generally adopted. At the outset, it was unfortunately linked to the belief that the fossils were relics of the Noachian deluge.

Steno (1669) observed a succession in the strata, and asserted that there were rocks in which no organic remains occur older than the fossiliferous strata; he also distinguished between marine and fluviatile formations. He was **not able**, however, to free himself from the absurd hypoth-

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eses of his day. In England, the diluvialists were busy framing idle theories, to give a plausibility to their creed, that the Noachian deluge was the cause of all the past changes on the earth's surface. Differing somewhat in detail, they all agreed in the notion of an interior abyss, whence the waters rushed, breaking up and bursting through the crust of the earth, to cover its surface, and whither, after the deluge, they returned again. Such absurd notions, obviously opposed to the observed order of nature, greatly hindered the progress of science.—Leibnitz (1680) proposed the bold theory, that the earth was originally in a molten state from heat, and that the primary rocks were formed by the cooling of the surface, which also produced the primeval ocean, by condensing the surrounding vapors. The sedimentary strata, he held, resulted from the subsiding of the waters that had been put in motion from the collapse of the crust on the contracting nucleus. This process was several times repeated, until at last an equilibrium was established.—Hooke (1688), and Ray (1690), differing as much from Burnet as from Leibnitz, advocated views similar to those of Pythagoras. They considered the essential condition of the globe to be one of change, and that the forces now in action would, if allowed sufficient time, produce changes as great as those of geological date. They were followed in the same direction by Valisneri (1720), Moro (1740), Buffon (1749), Lehman (1756), and Fuchsel (1773), each contributing something additional. Werner (1780) greatly advanced the science by establishing the superposition of certain groups, by giving a system and names, and by showing the practical applications of geology to mining, agriculture, and medicine. He had very crude notions regarding the origin of the strata, supposing that the various formations were precipitated over the earth in succession from a chaotic fluid; even the igneous rocks he held to be chemical precipitates from the waters. Hutton (1788), rejecting all theories as to the beginning of the world, returned to the opinions of Pythagoras and Ray. He held that the strata which now compose the continents were once beneath the sea, and were formed out of the waste of pre-existing continents by the action of the same forces which are now destroying even the hardest rocks. He introduced the notion of a periodical elevation of the sedimentary deposits from the internal heat raising the bed of the sea. Lyell, in our own day, adopted and improved these views, eliminating the baseless theories mingled with them, and demonstrating that existing forces might produce all the phenomena of geology.

The determination of the order of the strata, and the grouping of them in chronological order, were begun by Lehman (1756), and carried on by Fuchsel (1773), Pallas (1785), and Werner. Smith made the most important contribution to this subject when, in 1790, he published his *Tabular View of the British Strata*. He showed their superposition, and characterized the different groups by their peculiar fossils. The publication of his *Geological Map of England* (1815) may be said to form an epoch in the history

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of geology. Since then, the science has advanced by rapid strides; and it is not too much to expect that ere long all the chief geological features of the accessible parts of the world will be known and published.

Geology, in its restricted and usual sense, takes cognizance of the solid substance of the earth, or rather of as much of it as is accessible to man's observation. He has not, by his own efforts, penetrated at any point more than a few hundred yards from the surface; but natural sections, and the peculiar arrangement of the stratified rocks (the key to which he has to some extent obtained), have given him an acquaintance with a greater thickness than could have resulted from his own labors. He has thus by actual observation, coupled with reasonings upon them, been able to construct an ideal section representing a depth of perhaps ten miles, or about a 400th part of the distance from the surface to the centre. He does not, and cannot with certainty, know anything of the structure or condition of what is deeper. This does not, however, prevent the attempt to know something of what is beyond: and in making the attempt, there are many facts which serve as bases for inductions, or at least theorizings, as to the condition of the interior of the globe. As the conclusions depend upon the balancing of evidence, upon the value given to one set of facts as against another, they will differ according to the importance given by each individual to the one or other set of facts. The long entertained opinion of the existence of a central heat, though still not entirely unquestioned, seems on the whole fairly established, and upon such facts as these: 1. There is a more or less regular and gradual increase in the temperature of all deep mines, equal to 1° F. for every 55 ft. of descent after the first 100. 2. Deep wells have always a high temperature. This has been carefully determined in artesian wells, not only by applying the thermometer to the water at the surface which has risen from a known depth, but also by sinking the instrument to various depths. The results have shown an increment similar to that exhibited in mines. At the Grenelle artesian well in Paris a temperature of 85° F. was observed at a depth of 2,000 ft. equal to 1° F. for every 60 ft. descent. Arago and Walferdin estimated that at a depth of 3,000 ft. the water would have a temperature of 200° F. and might be used as a source of heat for the zoological gardens and even for the residences of Paris. Hot or boiling natural springs rise also through great and deep fissures. 3. Igneous rocks—rocks which have cooled from a state of fusion by heat—invariably come from below upward, and thus testify to an amount of internal heat able either to retain these rocks in a state of fusion, or to convert them into a fluid condition before their ejection. 4. Volcanoes are cited by the highest authorities as evidences of the same. The volcanic regions are said by Dana to exceed in area a whole hemisphere. On the other hand, physics raises difficulties which militate against the fluid condition of any considerable portion of the earth's interior, and in these difficulties it is supported by astronomy. But though we

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may admit that the rate of increase of heat from the surface downward goes on as indicated by observation in mines and wells, we need not draw the conclusion that the interior is fluid below 25 m. or even 2,000 m.; for we are ignorant of the effects of enormous pressure in altering the point of fusion. Recent mathematical calculations have given 800 miles as the thickness of the crust, but it is quite uncertain. Volcanoes may be fed by seas or reservoirs of liquid matter within the thickness of the crust.

The strict province of geology is the observed or observable portion of the earth's crust. The early geologists were no more than geognosts—they observed and described the rock-mineralogy of districts, and thus laid the foundations for those generalizations which have raised geology to its present position. The materials of the earth's crust were at first grouped together according to their composition, structure, and origin; but gradually it became evident that the rocks themselves occurred in groups, and that they had a particular order in nature; until at last, all the sedimentary strata were arranged in a single continuous and chronological series, from characters drawn less from their lithological structure than from their organic contents. Both systems of classification are important—that of the geognost as well as that of the modern geologist. The one is the result, to a large extent, of work in the laboratory and the study, and may be accomplished by the examination of hand specimens; the other must be determined in the field, and only from the examination of rocks in the mass, and in their natural position. The term lithology has been applied to the one aspect, while stromatology (*strōma*, a layer) may with equal fitness be given to the other.

Lithology.—All rocks are either igneous or sedimentary; that is, have either been produced by the action of heat, or been arranged by mechanical or other means in layers or beds.

1. The Igneous rocks differ among themselves in composition, structure, and age: they are of different materials, they have various textures, as granular, compact, or glassy; and they have been ejected at different periods of the earth's history. From these characteristics, they have been grouped thus: 1. The Volcanic Rocks (q.v.), comprising all that have been formed during the present and tertiary periods, and which are popularly known as lavas and volcanic ash. They have been ejected from volcanoes either in a fluid state, spreading over the land, and cooling as compact lavas; or spreading below shallow water, and becoming vesicular pumice, or as ash scattered in layers over the country; or they have risen into cracks and crevices of rocks as dykes and veins. Their principal constituents are felspar and augite, and the different varieties depend on the predominance of the one or other of these ingredients. The feldspathic lavas are generally light-colored, and have a rough prickly feel to the finger. The chief varieties are Trachyte, Pearlstone, Phonolite, Obsidian, and Pumice. The augitic lavas are of a dark-green

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r black color, weathering brown externally, and are generally heavier than the feldspathic lavas. The most common forms are Dolorite, Basalt, and Leucite. 2. The Trappean Rocks (q.v.) which generally belong to the primary and secondary strata, and are composed of the same materials as the volcanic rocks, except that the silicates of magnesia and lime crystallize in the latter as augite, while they assume the form of hornblende in the trappean rocks. Trap-rocks are always associated with a pipe or dike connecting them with the underlying mass from which the materials were obtained. They have either overflowed the surface, and formed a bed conformable to, and contemporaneous with the subjacent strata, or inserted themselves between already formed strata, or through great fissures in the same, in both the latter cases forming injected sheets that are not contemporaneous. The predominance of the one constituent material over the other gives the basis for grouping the trappean rocks into the feldspathic traps, which are light-colored and generally compact rocks, the chief varieties being Felstone and Pitchstone; and Hornblendic traps or Greenstones, containing the most abundant and best known rocks of this division. They are of greenish color, varying from very light, when the felspar is white and abounding, to almost black, when the constituent minerals are finely divided and colored with iron. In texture, also, there is considerable difference, some being fine-grained and compact, while in others the crystalline structure is very evident. The principal varieties are Greenstone, Basalt, and Melaphyre. Porphyry occurs in both the volcanic and trappean rocks when the felspar is aggregated in large and evident crystals, scattered through the body of the rock. 3. The Granitic Rocks (q.v.). The striking characteristic of these rocks is the abundance of silex in a separate and uncombined state as pure quartz. Granites are associated with the primary strata; they form also the support of the sedimentary deposit, wherever their base has been exposed to view. They occur in beds overspreading the sedimentary deposits or intercalated with them, in dikes, or as the apparent fundamental and unstratified rock. The chief varieties are true Granite, Syenite, and Protogenc.

II. The Sedimentary Rocks occur in layers or strata. They are either aqueous, aërial, chemical, or organic in their origin. 1. The Aqueous Rocks (q.v.) are Argillaceous (q.v.), composed more or less of clay, as kaolin shale and clay-slate; or Arenaceous (q.v.), in which the constituent portions are so large as to be evident to the eye, as in sandstone. The aqueous rocks were deposited in thin layers, which, however, frequently cohere, so as to form solid masses or beds of considerable thickness. Originally deposited horizontally, they have in many cases been subjected to disturbances that have elevated or depressed them; hence have arisen Faults (q.v.) and Dislocations (q.v.), as well as the exposing of the edges of the strata on the surface of the earth (Strike, q.v.) at various angles (Dip, q.v.). 2. The Aërial Rocks, which cannot be easily separated

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from aqueous rocks, except by their anomalous stratification (see DRIFT). They are of such importance on sandy coasts and arid interiors at the present day, that it cannot be doubted that they helped in former periods to bring the earth into its present condition. 3. The Chemical Rocks have been formed from the evaporation of liquids containing substances in solution. Among materials thus deposited are salt, gypsum, lime, and silex. Salt is generally associated with gypsum, and occurs in a great range of formations from the Devonian or Carboniferous, to the most recent. Rock-salt occurs in a coarsely crystalline mass, generally colored with iron, and more or less mixed with clay and other impurities. The deposits are often of great thickness, but apparently of limited extent, and were probably precipitated in isolated brine-lakes. Gypsum seems to have been formed under similar circumstances. It is abundant in the Magnesian Limestone, in the London Clay, and in the Paris Basin, from which city the name plaster of Paris for ground and calcined gypsum arose. Lime has not been deposited in masses, like gypsum, but only from the exposure to the atmosphere of small quantities of liquid saturated with it, which, by evaporation, have left stalagmitic or tufaceous deposits. Silicious sinter has been deposited in a similar manner as it is at the present day around the hot springs of Iceland and the geysers and hot lakes and springs of the Yellowstone basin in the United States. 4. The Organic Rocks are those which have been entirely, or to a large extent, formed from the remains of animals—as chalk and other more compact limestones and diatomaceous deposits—or from vegetables, as coal and lignite.

Changes are continually taking place in the sedimentary rocks, altering their structure and texture, which class of changes are specifically termed *metamorphism*. Among the chief agents including these metamorphic changes are chemical attraction, the infiltration of water, the pressure of the superincumbent strata and heat and time. Some of the older strata have been so much altered that they are generally spoken of as Metamorphic Rocks (q.v.).

Historical Geology.—This title is applied by Dana to that division of geology which considers the stratified rocks in their chronological order, as exhibiting different phases of the history and development of the globe itself, and in their fossil contents setting forth the progress of life upon its surface. For a notice of the animal and vegetable organisms preserved in the rocks, see PALÆONTOLOGY. Following is a sketch of the various periods in the earth's geological history.

The original, and, as it is supposed, molten condition of the globe is hid in mystery. The geologist takes up the history at the point where air and water make their appearance, and where the inorganic substances were subject to the same influences as those now in operation. It is very doubtful whether the fundamental crust is in any place exposed or has ever been uncovered by man. The earliest rocks observed, though probably not the oldest, are those

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described by Logan as the *Laurentian System* (q.v.). The typical beds occur in Canada; strata of the same age were subsequently detected in Scotland by Murchison and Geikie. The strata have been very much metamorphosed by the action of heat, and by the many chemical and physical forces which have been set in motion, so that their original condition is entirely altered, the whole series being converted into gneissose strata. A structure supposed to represent a great foraminifer (*Eozoon Canadense*) has been detected in these rocks, as well as indistinct traces of other fossils. Even in the succeeding *Cambrian Series* (q.v.), fossils are very rare, consisting of a few zoophytes, crustaceans, and annelids. The rocks of this period consist of thick masses of sandstones and slates or shales. The *Silurian Period* (q.v.) is represented by immense marine deposits, which in some districts are rich in the remains of invertebrate animals, while other extensive tracts have not yielded a single fossil. No certain evidence of plants has yet been observed, except the round spore-cases in the upper transition beds, yet the economy of life would seem to require then, as now, oxygen producers and carbonic acid consumers. Probably the anthracite of the graptolitic shales, and the oil from the bituminous Silurian shales of N. America, may be in part or in whole of vegetable origin. Early traces of the existence of dry land occur in the *Old Red Sandstone* (q.v.). The great mass of the strata of this period consist of immense thicknesses of limestone, composed of the remains of corals and shell-fish, of beds of shale and of sandstone, crowded in some places with fish-remains. A few land-plants and air-breathing animals, tenants of the dry land, are preserved in the strata of the middle and upper divisions. The *Carboniferous Measures* (see CARBONIFEROUS SYSTEM) are ushered in by a great thickness of deep-sea limestone. The coal-bearing strata occurring in this system are alternately sea, estuary, or lake deposits of sandstone, shale, and limestone, and dry land surfaces with the vegetation converted into coal. The waters teemed with fishes of great size and strange form; and the dry land was covered with a rank and luxuriant vegetation of ferns and coniferous trees, and strange forms like gigantic mares' tails and club-mosses. A few air-breathing reptiles and shells have been found in these strata. The *Permian Period* (q.v.) exhibits a group of organisms differing little from those of the preceding epoch, with the exception of a few added reptiles. The Permian strata are sandstones, gypseous marls, and common and magnesian limestones.

With these beds terminate the Palæozoic Rocks. Before the commencement of the Secondary Epoch, great disturbances and depressions took place in the districts whose geological structure has been examined; and accompanying it a great change in the character of the animal and vegetable life.

Typical rocks of the *Triassic Period* (q.v.), earliest of the Secondary Epoch, are seen in Germany. The name alludes to a threefold division discernible in the German rocks but

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quite unessential and not found in America. They are highly fossiliferous, containing the remains of marine animals of various kinds. In Britain, the rocks are chiefly red sandstones and red marls, the coloring matter of which seems to have been destructive to life; the only fossil remains in them are a few land-plants, and some footprints and fragments of bones of reptiles.

The *Lias* (q.v.), which follows, and forms the base of the Oolite formation, consists of extensive clay deposits, with argillaceous limestones and sandstones—strata which indicate the existence of large tracts of land. The contained fossils have a mixed land, fresh-water, and sea character. With considerable numbers of plants and insects, there are also marine brachiopods and cephalopods, and the remarkable swimming reptiles, that are so perfectly preserved as to supply materials for nearly perfect restorations.

The *Oolite Series* (q.v.) consists of alternating beds of limestone and clay, with very little intervening sandstone. The abundance of dry land is evinced by the number and variety of the air-breathing fossils (among which mammalia begin to appear), and even by the occurrence of strata that have been ancient soils. The group is highly fossiliferous,

The *Cretaceous Strata* (see CRETACEOUS SYSTEM), which, as a whole, have had a deep-sea origin, are introduced by fresh-water and estuary deposits, showing that great tracts of land were traversed by mighty rivers actively abrading and carrying off materials for delta deposits. The life of the period was abundant. The immense thicknesses of chalk, which give the name to the group, are composed to a very large extent of the perfect or comminuted shells of foraminifera and mollusca. The Ammonite family (see AMMONITES) cease to appear after the cretaceous period. Besides these, land-plants, fresh-water and marine shells and fish, and large terrestrial and marine reptiles, occur. Birds and mammalia have not yet been observed, but it is most probable that they did exist, as they have been found in older strata.

In passing to the Tertiary Epoch, there is not found so striking a change in the life of the globe as that which characterized the division between the Palæozoic and Secondary strata. From the Trias, the fossils have been gradually assuming the appearance of existing organisms: many strange forms have existed and passed away without leaving representatives in the later strata or in the living inhabitants of the earth. Still, the *facies* of the organic remains gradually approaches that of the present fauna and flora, until the *Eocene Period* (q.v.), when some fossils appear, which, if not identical with recent species, so nearly approach them as to make it impossible to distinguish them. The proportion of such species is from $3\frac{1}{2}$ to 5 per cent. The seas in which the Eocene beds were deposited were comparatively small, and consequently the deposits occur in scattered and isolated basins. The earlier strata are marine, but toward the middle of this period they become lacustrine or fluviatile.

The *Miocene Period* (q.v.) is said to contain above 25 per

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cent. of living forms. The strata are largely developed in France and Belgium. Besides abounding in marine mollusca, the Miocene strata contain the remains of many large mammalia. The deposits of the *Pliocene Period* (q.v.) contain from 50 to 70 per cent. of existing forms. The strata are marly sands and gravels abounding with sea-spoils.

In the *Pleistocene Strata* (q.v.), the proportion of existing forms is still greater—indeed, all the principal generic forms now alive, except man, seem to have been in existence during this period. The strata consist of the sands, gravels, and boulder clay left by glaciers and icebergs, of marls and raised sea-beaches.

The newer strata belong to the human period, and have been, and are continuing to be, formed by agents now in operation. They contain the remains of species of plants and animals which still live on the globe.

The following is the division of geological time adopted by American geologists. The divisions and their relative importance have a national variation, which necessarily obtains if the science is restricted to or made to apply principally to one region. Five grand divisions of times or eras are in turn divided into six ages, and these into a varying number of periods and epochs. Starting with the most ancient strata the order of division is the following:

Time.	Age.	Period.	Epochs and Sub-Epochs.
Azoic.	Azoic.	Azoic.	Azoic.
Palæozoic.	Silurian.	Potsdam.	Potsdam. Calciferous.
		Trenton.	Chazy. { Birdseye. Black River. Trenton.
		Hudson.	Utica. Hudson River.
		Niagara.	Oneida. Medina. Clinton. Niagara.
		Salina.	Saliferous.
		Low'r Helderberg.	Lower Helderberg.
	Devonian.	Oriskany.	Oriskany.
		Upp'r Helderberg.	Cauda Galli. Schoharie. Upper Helderberg.
		Hamilton.	Marcellus. Hamilton. Genesee.
		Chemung.	Portage. Chemung.
		Catskill.	

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Time.	Age.	Period.	Epochs and Sub-Epochs.
Palæozoic.	Carboniferous.	Sub-Carboniferous.	Lower. Upper.
		Carboniferous.	Millstone Grit. Lower Coal Measures Upper " "
		Permian.	Permian.
Mesozoic.	Reptilian Age.	Triassic.	Bunter Sandstein. Muschelkalk. Keuper.
		Jurassic.	Lower Lias. Marlstone. Upper Lias. Lower Oolite. Middle " Upper " Wealden.
		Cretaceous.	Lower Cretaceous. Middle " Upper "
		Tertiary.	Eocene. Miocene. Pliocene.
Cenozoic.	Mammalian Age.	Post-Tertiary.	Pleistocene or Post-Tertiary.
Era of Mind.	Age of Man.		

'Eozoic' is sometimes used instead of 'azoic,' as referring to the ancient Archæan rocks. The International Geological Congress will eventually do much to unify the nomenclature of the science. The above represents the American system of division.

GEOMANCY, n. *jě'ō-măn'sě* [F. *géomancie*—from Gr. *gē*, the earth; *manteia*, divination]: divination by points or circles drawn on the ground, and afterwards on paper. **GE'OMAN'TIC**, a. *-tik*, pertaining to. **GE'OMAN' CER**, n. *-sēr*, one who.

GEOMET'RIC, or **GEOMETRICAL**: related to Geometry (q.v.), as a geometrical line, demonstration, construction, etc. As to geometrical lines, see **CO-ORDINATE**: **CURVE**: **DEMONSTRATION**. Geometrical constructions and solutions were anciently such as were effected by means of the straight line and circle—the only lines regarded as properly geometrical—and according to the strict rules of geometry. The ancient geometers employed two methods of reasoning in their inquiries and demonstrations, known as *geometrical analysis* and *synthesis*. Of these, the synthetical method was the older and more generally employed. It is abundantly illustrated in Euclid's *Elements*, in which new truths are deduced from combinations of truths already established, so that every proposition depends on others preceding it: see **SYNTHESIS**. Though admirably suited for the demonstration of truth once ascertained,

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this method was found of little use in the discovery of truth, or of the mode of its demonstration. For these purposes, the analytical method is admirably adapted: see ANALYSIS. According to this method the proposition which is to be proved is assumed to be true, or the construction required is supposed to be effected; and then the conditions of the proposition being true, or the construction effected, are investigated by reasoning backward till some elementary truth or simple construction is reached, on which the truth or construction under inquiry is seen to depend. The analytical method of reasoning in geometry is said to have been invented by Plato. The Greeks have left on record many proofs of the power and beauty of the method as a means of discovery.

GEOMETRICAL PROGRESSION: denoting a series of numbers, in which each term of the series is equal to that which precedes it multiplied by some constant factor, i.e., some factor which is the same for all the terms; or, in other words, when the ratio of any two successive terms is the same. Thus $a, ar, ar^2, ar^3 \dots$ and $2, 6, 18, 54 \dots$ are geometrical series. The sum of n terms of the former series may be easily obtained. Let it be S . Then $S = a + ar + ar^2 + \dots + ar^{n-1}$. Multiply both sides by r , we have $rS = ar + ar^2 + \dots + ar^n$. Subtracting the former of these expressions from the latter, we have $(r-1)S = ar^n - a$. Whence we have $S = a \cdot \frac{r^n - 1}{r - 1}$. If the series be one whose terms constantly diminish, i.e., if $r < 1$, and then if we suppose n indefinitely great, r^n will be indefinitely small, and we shall have $S = \frac{a}{1 - r}$ for the sum of the series extended *ad infinitum*: e.g. the sum of the series $\frac{3}{10} + \frac{3}{10^2} + \frac{3}{10^3} + \dots$ *ad infinitum* is $\frac{3}{9}$; it is obvious that any three of the four quantities a, r, n, S being given the equation $S = a \cdot \frac{r^n - 1}{r - 1}$ will enable us to find the fourth.

GEOMETRINA, n. *jê-ô-mêt-rî'na*: group or tribe of moths of which the *Geometridæ* is the type. It includes all the emerald moths.

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GEOMETRY, n. *jē-ōm'ě-trī* [F. *géométrie*—from Gr. *gē*, the earth; *metron*, a measure]: that branch of mathematics which treats of the measurement of lines, surfaces, and solids, with their various properties and relations. **GEOM'ETER**, n. *-tēr*, one who is skilled in geometry; also **GE'OMETRICIAN**, n. *-trīsh'ān*. **GEOMETRIC**, a. *jē'ō-mět'rik*, and **GE'OMETRICAL**, a. *-rī-kāl*, relating to geometry, or according to its rules and principles. **GE'OMETRICALLY**, ad. *-lī*. **GEOMETRIC MEAN**, or **GEOMETRICAL MEAN**, of two numbers is that number the square of which is equal to the product of the two numbers; thus, the geometrical mean of 9 and 16 is 12, for $9 \times 16 = 144 = 12^2$; hence the geometrical mean of two numbers is found by multiplying the two numbers together, and extracting the square root of the product; the second term of a geometric progression consisting of three terms, or the second of three continued proportionals. **GEOMETRICAL PROGRESSION**, a series of numbers, each of which is obtained from the preceding one by being multiplied by a constant number called the common ratio. **GEOMETRIC PEN**, an ingenious instrument for drawing curves.

GEOM'ETRY: the science of space, which discusses and investigates the properties of definite portions of space under the fourfold division of lines, angles, surfaces, and volumes, without regard to any physical properties which they may have. It has various divisions, e.g., Plane and Solid G., Analytical or Algebraical G., Descriptive G., and the Higher Geometry. Plane and solid G. are occupied with the consideration of right lines and plane surfaces, and with the solids generated by them, as well as with the properties of the circle, and, it may be said, the sphere; while the higher G. considers the conic sections and curved lines generally, and the bodies generated by them. In the higher G., immense advances have recently been made through improved methods, the application of modern analysis, and the various calculi in algebraical G., for the nature of which see **CO-ORDINATE**. Descriptive G., a division of the science so named by Monge (q.v.), is properly an extension or general application of the principle of Projections (q.v.), its object being to represent on two plane surfaces the elements and character of any solid figure. It has many practical applications. When one surface penetrates another, for instance, there often result from their intersection curves of double curvature, the description of which is necessary in some of the arts, as in groined vault-work, and in cutting arch-stones, etc., and this is supplied by descriptive geometry.

The history of G. is full of interest. Herodotus, earliest authority on the subject, assigns the origin of the art to the necessity of measuring lands in Egypt for the purposes of taxation, in the reign of Sesostris, about B.C. 1416-1357 (Herodotus, book ii. chap. 109). This is probable, not only as resting on such authority, but also because, *a priori*, we should expect the necessity of measuring lands to arise with property in land, and to give birth to the art. Of the state of the science, however, among the Chaldeans and

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Egyptians, we have no record. The story of Herodotus is further confirmed by tradition. Proclus, in his commentary on Euclid's *Elements* (b. ii. c. 4), says that the art was brought to Greece from Egypt by Thales, himself a great discoverer in geometry. The Greeks at once took keenly to the study; various disciples of Thales excelled in it, chief among them Pythagoras, who, according to Proclus, first gave G. the form of a deductive science, besides discovering some of its most important elementary propositions, among others, it is said, the 47th Prop. Euc. b. i. (See PYTHAGORAS.) Pythagoras had illustrious successors: Anaxagoras of Clazomenæ; Ænopidis, the reputed discoverer of Euc. b. i. 12, 23; Briso and Antipho; Hippocrates of Chios, who 'doubled the cube,' and quadrated the lunula, which bear his name, and is said to have written a treatise on G.; Zenodorus; Democritus of Abdera; and Theodorus of Cyrene, said to have been one of the instructors of Plato, whose name marks an epoch in the history of the science. Over his Academy at Athens, Plato placed the celebrated inscription, *Medeis ageometretos eisito* ('Let no one ignorant of geometry enter here'), thus recognizing it as the first of the sciences, and as the proper introduction to the higher philosophy. He is the reputed inventor of the method of geometrical analysis, and of geometrical loci and the conic sections, called in his time the higher geometry. From his Academy proceeded many who advanced the science, of whom Proclus mentions 13, and more than one of them as having written treatises on the subject, that have been lost. Of these, Eudoxus, is said to have brought into form and order in a treatise the results of the studies at the Academy, and to have invented the doctrine of proportion, as treated in the 5th book of Euclid's *Elements*; and the great Aristotle assigned G. as high a place as Plato did, and wrote a treatise on it, as did at least two of his pupils, Theophrastus and Eudemus, from the latter of whom Proclus took most of his facts. Autolycus, disciple of this Theophrastus, wrote a treatise on the movable sphere, yet extant: while Aristæus, reputed instructor of Euclid in geometry, is said to have written five books on the conic sections, and five on solid loci, all of which are lost.

The name of Euclid marks another epoch in the history of G., and the chief interest of the vague sketch above given of the labors of his predecessors lies in its demonstrating the great mass of materials from which he constructed his *Elements*—the variety of treatises which prepared the way for that great work whose pre-eminence has now for over 2,000 years been undisputed. In the *Elements*, Euclid collected all the theorems which had been invented by his predecessors in Egypt and Greece, and digested them into 15 books, accurately demonstrating and arranging the whole (see EUCLID). Next to Euclid, of the ancient writers whose works are extant, must be named Apollonius Pergæus, abt. B.C. 230; and about 100 years later than Euclid; he was called 'the Great Geometrician,' on account of his work on the Conics, and other ingenious geometrical writings. About the same time with Apollonius lived

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Archimedes, celebrated not less for his geometrical than for his mechanical inventions (see ARCHIMEDES: APOLLONIUS OF PERGA). Apollonius first gave the names of *ellipse* and *hyperbola* to two of the conic sections, the third of which had previously been called the *parabola* by Archimedes.

For a long period after Archimedes, we find names of note in connection with geometry: among these are Nicomedes, Hipparchus, and Theodosius of Tripoli. The Greeks, however, never intermitted their attention to the science; they continued it even after their subjugation by the Romans, and we find them producing many excellent geometers after the translation of the Roman Empire, and within the Christian era; Ptolemy (q. v.), (died A. D. 147); Pappus (q. v.), in the time of Theodosius (379–395); Proclus, in the 5th, and Eutocius, in the 6th century. The works of all these are extant. Meantime the Romans, the dominant race, even in the most flourishing time of the republic, were so ignorant of the science that, according to Tacitus, they gave the name of Mathematicians (q. v.) to those who practiced divination and judicial astrology. As may be supposed, their domination was not favorable to the science and only one Roman name is eminent—Boëthius, toward the close of the 5th c.; and of his writings, it must be said, as of the Roman literature generally, that they were but compilations and reflections of Greek thought. The Roman empire was unfavorable; but its downfall, and the consequent inundation of ignorance and barbarism, were still more so. The rise of the Mohammedan power in the 7th c., and the rapid and desolating consequences which followed, further hastened the extinction of the Greek sciences. The time now came when those who devoted themselves to science were everywhere branded as magicians, and exposed to popular fury. It was in these times that, fortunately for civilization, an asylum was found for the spirit of inquiry in Arabia. An acquaintance with the science of the Hindus prepared the Arabians for the reception of the writings of the Greek astronomers and mathematicians; and the dispersion of the scientific coteries of Alexandria gave to Bagdad many preceptors in the learning of the West. In little more than a century after that event, the Arabians were the most zealous patrons and cultivators of Greek science; from the 9th to the 14th c., they produced many astronomers, geometricians, etc.; and through them the mathematical sciences were restored to Europe toward the close of the 14th c., being received first in Spain and Italy. The revival of ancient literature in Europe, and the discovery of the art of printing about the middle of the 15th c., concurred to diffuse a knowledge of the science of the Greeks, which came into notice with their general literature; and from this date, many names occur of eminent geometricians. During the 16th c., Euclid was held in such estimation, that no attempts were made to advance the science beyond the point at which he left it. Commentaries and translations of the *Elements* of Euclid were rife; but till the time of Kepler there was no movement to improve or extend the methods of geometry. Kepler

(q. v.) introduced the principle of infinity into geometry. Next, Descartes, seizing the results of Vieta's discoveries in the use of symbols, invented the new or analytical algebraical geometry, which vastly extended the domains of the science. It then required but the invention of the calculus to give G. that grand sweep and power which it now possesses. For a notice of some recent improvements in geometrical methods, see TRANSVERSALS: POLARS: PROJECTIONS. An excellent view of the growth of the science is in the introduction to Pott's *Euclid* (London 1845); also under the various titles of writers mentioned in this article, are fuller notices of their contributions to the science. No full list can be given of the contributors, but it would be unjust not to refer here to Johann Müller (called Regiomontanus), Copernicus, Tartaglia, Vieta, Galileo, Fermat, Roberval, Pascal, Huyghens, Barrow, Newton, the Gregories, Lagrange, Clairaut, Euler, Robert Simson—whose translation of *Euclid* may be regarded as the standard text in English—Mathew Stewart, Brook Taylor, Maclaurin, Monge, Poncelet, Carnot, Chasles, and Sir William Hamilton of Dublin. See also QUATERNIONS.

GEO-NAVIGATION, n. *jě-ō-nǎv'ī-gǎ-shŭn* [Gr. *gē*, the earth, and *navigation*]: a term proposed for that branch of the science of navigation in which the place of a ship at sea is determined by referring it to some other spot on the surface of the earth.

GEONOMY, n. *jě-ōn'o-mĭ* [Gr. *geō* for *gēios*, belonging to the earth; *nomos*, law]: science of the physical laws relating to the earth, as geology and physical geography.

GEOPHAGISM, n. *jě-ōf'a-jĭzm* [Gr. *gē*, the earth; *phagein*, to eat]: act or habit of eating earth. The habit is common among the Ottomac Indians of S. America, the Indians in the Hudson Bay region, the blacks in the W. Indies, some classes in Lapland and n. Scandinavia, and the lowest order of whites in several of the Southern States of the American Union. In Md. they are called 'clay-eaters;' N. C., 'crackers;' Ga. and S. C., 'sand-hillers.'—A particular kind of ferruginous clay is sold largely in Bolivia as an article of food. GEOPH'AGIST, n. *jĭst*, one who practices geophagism; one who eats dirt.

GEOPHILIDÆ, n. *jě-o-fĭl'ī-dē*: in *zool.*, family of centipedes, order *Chilognatha*, *Geophilus* being the type.

GEOPONICS, n. plu. *jě-ō-pōn'īks* [Gr. *gē*, the earth; *ponos*, labor]: the art or science of cultivating the ground. GE'OPON'ICAL, a. *-ī-kāl*, relating to agriculture. GEOPON'IKA, collection of agricultural treatises by various Greek authors, published in Constantinople during the reign of Emperor Constantine. Varro, writing in the c. preceding the Christian era, said there were more than 50 authors who could be consulted on the subject of agriculture, all of whom were ancient Greeks except Mago, the Carthaginian. Among these authors he included Democritus, Xenophon, Aristotle, Theophrastus, and Hesiod, and said that the writings of all the others had been destroyed. Only a few extracts from the agricultural writings of Democritus have

GEORAMA—GEORDIE.

been preserved, and they are found in the *Geoponika*. Theophrastus wrote on natural history and is considered the father of botany. But for a detailed knowledge of Grecian agriculture recourse must be had to Hesiod's writings. The *Geoponika* is divided into 20 parts, and each chapter bears the name of the author from whose works it was taken. The subjects are very comprehensive, are treated with more or less detail, and form a complete exposition of the industry by the best Grecian authorities.

GEORAMA, n. *jĕ-o-râ'ma* [Gr. *geō* for *gēios*, belonging to the earth; *horama*, view]: concave globe on the inside of which the countries, oceans, etc., of the earth are represented to the spectators, who stand on a framework inside.

GEORDIE, n. *jawr'dĭ* [Scotch dimin. of George]: a guinea. **GEORDIE SAFETY-LAMP**, safety lamp invented for use in coal mines by George Stephenson. .

GEORGE—GEORGE I.

GEORGE, *n. jörj*: a figure of St. George on horseback worn by knights of the Garter. GEORGE-NOBLE, English gold coin, current at six shillings and eight pence in the reign of Henry VIII.; so called from the figure of St. George on the reverse.

GEORGE: district of the Cape Colony, separated from that of Zwellendam on the w. by the Gauritz (q.v.); 4,032 sq. m. and about 11,000 inhabitants. It is valuable chiefly for its pasturage and its timber. On its coast is the port of Mossel Bay. Pop. of dist. 11,000.

GEORGE I. (GEORGE LOUIS), King of Great Britain: 1660, May 28—1727, June 10 or 11 (reigned 1714—27); son of Ernst August, Elector of Hanover, and of Sophia, a granddaughter of James I. of England. According to the theory that the blood of James II. in the direct line was 'corrupted,' he was the nearest heir to the crown. On the death of Queen Anne, 1714, July 31, he was instantly proclaimed king, and arrived in Britain from his electorate of Hanover at the age of 54. To him Britain was to the last a foreign country, for which he had no love, and of whose language, feelings, and thought he was profoundly ignorant. His affections remained with Hanover, but to Britain his alliances, experience, and fair abilities for business, resolutely exercised, were of considerable value. A king of more brilliant abilities might have been an impediment in the way of constitutional government adjusting itself to habits of domestic peace and order after the dethronement of the Stuarts, whose ruined fortunes excited the pity of the people, and afforded a convenient cry for the minority that declaimed in private, and wrote songs, and plotted against the imported king, whom they called a 'foreign tyrant.' Supported by the whigs, and undisguisedly partial to them, G. was an object of dislike both to tories and to jacobites, and they associated together to bring about a revolution. In Scotland, 1715, the Earl of Mar raised the standard of rebellion; and he had collected about 10,000 men, when he engaged the Duke of Argyle with about half that number of men at Sheriffmuir, near Dunblane. It was a drawn battle, the left wing of both armies being victorious; but to the rebels it was not a victory, and it caused delay and checked their progress, and that was equivalent to a defeat, for the Highlanders, seeing little prospect of fighting and plunder, returned home; and in that part of the island the rebellion may be said to have burned out of itself. In England, it did not succeed so well; and it was ended miserably by the unconditional surrender of the insurgents at Preston. For this outbreak the Earl of Derwentwater and Viscount Kenmure were beheaded on Tower Hill, several officers were shot, many persons of distinction were attainted, about 30 of the less conspicuous rebels suffered death, and more than 1,000 were transported to the plantations. The Earl of Mar and the Pretender both escaped to France.

The next most notable and calamitous event of this reign was the failure of the South Sea Company (q.v.). A quar-

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rel with the Spaniards began 1726, which issued in a somewhat unsuccessful expedition of Admiral Hosier to their American possessions, and a fruitless attempt on Gibraltar (q.v.) by the Spaniards. In 1727, George I., who had, amid the splendors of British royalty, sighed for his fatherland and his family, set out for Hanover, and died of apoplexy on his way to visit his brother, the Bishop of Osnabrück, on the night of June 10th or the morning of the 11th. His life was not happy. His wife, who was his cousin Sophia Dorothea of Zell, to whom, after the fashion of the low profligacy then prevalent in the German courts, he was untrue, had solaced herself by yielding to the attentions of Philip von Koningsmark. 1604, July 1, the latter disappeared forever in a mysterious way, and Dec. 28 Sophia was divorced. The remaining 32 years of her life she spent as a prisoner in the fortress of Ahlden, where she died at the age of 60. The credit for various wise measures of public policy during the reign of George I. is due not so much to the king as to his prime minister in the later years, Sir Robert Walpole (q.v.). There are clear glimpses of George I. in Carlyle's *Life of Frederick the Great*. Carlyle commends his talent for silence, and thinks him, in spite of appearances, a man of more human faculty, 'chiefly of an inarticulate kind,' than he generally gets credit for. His daughter Sophia Dorothea (1687-1757) married, 1706, Frederick William, afterward king of Prussia: she was mother of Frederick the Great.

GEORGE II. (GEORGE AUGUSTUS), King of Great Britain: 1683, Oct. 30—1760, Oct. 25 (reigned 1727-60); b. Hanover; only son of George I., whom he succeeded on the throne. He married Carolina Wilhelmina, daughter of the markgraf of Anspach. She is said to have been a woman of uncommon attainments in literature, theology, and politics, and her death in 1737 was reckoned a public loss. The king himself did not aspire to a code of morals different from his fathers, nor to any intellectual accomplishments except those of a soldier. He was present at the battle of Dettingen 1743, and with the assistance of the Earl of Stair he gained it: the French being entirely defeated, and very efficient service rendered to Maria Theresa of Hungary, who had besought aid against the partition of her dominions. The king's second son, the Duke of Cumberland, was not so fortunate, for the English forces under him were defeated with great loss 1745, at Fontenoy by the French under the famous Marshal Saxe. In the same year Prince Charles Stuart, son of the old Pretender, landed in Scotland with seven officers, and arms for 2,000 men. After some transient success, he was completely defeated at Culloden, 1746, Apr. 16, and what is known as the *Second Rebellion* was brought to an end. (See STUART, CHARLES EDWARD.) The Duke of Cumberland, whose barbarities in the suppression of the insurrection earned him the name of the 'Bloody Butcher,' returned to the command of the English forces on the continent, and was repeatedly beaten by Marshal Saxe and the French; much that Marlborough had gained being lost. In India, Colonel,

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afterward Lord, Clive, gained various victories, the chief being the victory at Plassey 1756, which laid the foundations of the British E. Indian Empire; and during the next three years the British dominion in N. America was extended and strengthened by the victory of Wolfe on the heights of Abraham, and the subsequent surrender of Quebec. British allied troops contributed to the Hanoverian victory at Minden 1739. Generally the reign of George II. was prosperous: according to Hallam, 'the most prosperous period that England had ever known;' and this, not less from the acquisition of new territory, than from the conquest of new fields of thought effected by Pope, Hume, Samuel Johnson, Fielding, Smollet, Reynolds, Hogarth, and many others. During this reign the comparative power of the monarchy among the forces of the British government was reduced. The king was economical, methodical, mechanically regular, with no capacity beyond the petty details of business.

GEORGE III. (GEORGE WILLIAM FREDERICK), King of Great Britain: 1738, June 4—1820, Jan. 29 (reigned 1760—1820); son of Frederick Lewis, Prince of Wales (1707—51) and grandson of George II., whom he succeeded on the throne. His reign was eventful as well as long. 1761, Sep. 8, he married Princess Charlotte Sophia, daughter of Charles Duke of Mecklenburg-Strelitz, and was by her the father of 15 children. His intellect was not of the strongest, but, like his two predecessors, he had tenacity of purpose, with a conscientiousness and sense of decorum unknown to them; while both friends and enemies could rely on him—the friends for favors, the enemies for opposition. His mind gave way several times—in 1764, 88, 1801, 04; and 1810, when the British were fighting behind the lines of Torres Vedras, his final insanity supervened. He had abundance of cares, like most sovereigns. The *Letters of Junius* and the invectives of Wilkes annoyed him; so did the proposals to emancipate the Rom. Catholics and the terrible French Revolution of 1789. His life was attempted by the maniacs Margaret Nicolson and a man named Hatfield. The marriages of two of his brothers with the widows of subjects displeased him, and led to the passing of the Royal Marriage Bill, 12 Geo. III. c. 11, prohibiting members of the royal family from contracting marriage without consent of the king, if under twenty-five years of age, and consent of parliament if older; and afterward the undoubted debts and dissipation of his eldest son (who became George IV.), with his hardly doubtful marriage with Mrs. Fitzherbert, Rom. Cath. widow of two husbands, and the scandals of his public marriage with his cousin, Caroline of Brunswick, must have led the 'good old king' to reflect that not even a 'marriage bill' could cure all the domestic miseries of monarchs. Matters of national excitement and magnitude were not lacking. A bill, imposing certain stamp-duties upon the American colonies, which had been resolved to be inexpedient 1764, was passed 1765, March, and repealed 1766 by the Marquis of Rockingham's ministry; and 1767 the chancellor of the exchequer, Mr.

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Townshend, brought forward a plan for the taxation of these colonies, which led to their revolt, the colonies naturally objecting to be taxed by a parliament in which they were not represented. In 1770, Lord North, the premier, brought in a bill for the repeal of all the recently imposed American duties, except the duty on tea, which was retained to assert the English right to impose taxes on these colonies. In 1773, Dec., 'Boston harbor is black with unexpected tea,' cargoes of it being destroyed by the colonists; and 1775, Apr. 19, hostilities commenced with the indecisive battle of Lexington, followed June 16, by that of Bunker Hill, which was a victory to the colonists, and helped to give them boldness to renounce the dominion of Great Britain and publish the declaration of independence 1776, July 4. George Washington, col. of militia, who had been appointed gen. of the insurgent colonists, took possession of Boston in that year, having compelled Gen. Howe and the British troops to retire, and next year he gained an important advantage by the capture of Burgoyne's army of 10,000 (some accounts give a smaller number) fine troops, British and German. The French, Spanish, and Dutch all threw their weight into the American scale, and the checkered and disastrous struggle ended in America by the surrender of Lord Cornwallis, with a British army of 6,000 men, to Washington and the Marquis de la Fayette. The French suffered at sea by the gallantry of the British under Byron, Hood, and Rodney, the last having, in the W. Indies 1782, obtained over them a naval victory by the previously untried method of breaking the enemy's line. In that year, also, Gen. Elliott repulsed the grand attack of the French and Spaniards, and put an end to their chances of success in the obdurate siege of Gibraltar. At Versailles, 1783, Sep. 3, a peace was concluded with France and Spain, in which the independence of the American States was recognized, not a little to the satisfaction of many of the English people, who, besides being tired of the struggle, had throughout the contest sympathized with the American colonists, whose cause, originally good, had had its merits kept before the public mind by the eloquence of Chatham, Fox, and Burke, three of the greatest political orators of all time. The king, always inflexible and plain-spoken, had held out to the last against the loss of his colonies. To John Adams, first minister of the United States accredited to him, he said:—"Sir, I wish you to believe, and that it may be understood in America, that I have done nothing in the late contest but what I thought myself indispensably bound to do by the duty which I owed to my people. I will be very frank with you. I was the last to consent to the separation; but the separation having been made and having become inevitable, I have always said, as I say now, that I would be the first to meet the friendship of the United States as an independent power.

Meanwhile, the British rule in India was consolidated, largely under the gov.-genership of Warren Hastings, a most able but somewhat unscrupulous man. His trial for

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misrule and oppression, famous for the eloquent accusations of Burke and Sheridan, began 1786, and was protracted for nine years. Wars with Hyder Ali and his son Tippoo Saib were ended by the storming of Seringapatam 1799.

The after-swell of the French Revolution broke over all the continent of Europe in wave after wave of war. The aversion of Britain to the insane democracy of France was not concealed, and 1793, a few days after the execution of their king, the French declared war against Britain. In the confused warfare that followed, the English under Lord Howe, 1794, defeated the French fleet in the Channel; under Sir John Jervis they defeated the Spanish fleet off Cape St. Vincent 1797; also in that year, under Lord Duncan, they defeated the Dutch off Camperdown; and 1798 Nelson was victorious on the Nile over the French fleet that had conveyed Napoleon Bonaparte and his troops to Egypt. In 1801, Nelson bombarded Copenhagen and partially destroyed the Danish fleet; and the forces under Sir Ralph Abercromby—who was mortally wounded—gained the victory of Alexandria over the troops which Napoleon had left in Egypt to menace the power of Britain in the East. 1802, March 25, the treaty of peace of Amiens was signed, but, within a year, hostilities were renewed. In 1803, Hanover was occupied by the French. 1805, Oct. 21, Nelson lost his life and gained his greatest victory, at Trafalgar over the French and Spanish fleets. Napoleon's splendid victory of Austerlitz over the Austrians and Russians, 1805, Dec., was survived only a few weeks by the great statesman Pitt, whose broken constitution and breaking heart could not sustain the shock of this last disappointment. Napoleon's Berlin decree 1806, and his Milan decree 1807, declaring the British dominions in a state of blockade on purpose to destroy British commerce, were not supported by a sufficient navy to carry them into execution by capturing vessels trading with Britain; but they did considerable damage. In 1808, Sir Arthur Wellesley landed in Portugal, and defeated the French at Vimieira; but the advantage of this victory was thrown away in the Convention of Cintra. Four months later, the retreat, to Corunna of the English army under Sir John Moore, from overwhelming odds, and its safe embarkation, 1809, Jan., after the repulse of Marshal Soult, has secured a reputation for the general who fell there hardly inferior to that of those who have died in the moment of victory. In April of that year, Sir Arthur Wellesley returned to the command in the Peninsula, and after conquering at Talavera July 8, wearing out the powers of the assailing French behind the lines of Torres Vedras during the last months of 1810, and conquering at Fuentes de Onoro 1811, Salamanca 1812, Vittoria 1813 (as Lord Wellington), and in other battles and sieges, he drove the French out of the peninsula. The long and stupendous struggle was terminated on the eventful field of Waterloo (q. v.), 1815, June 18.

Ireland was united to Great Britain, 1801, Jan. 1, and its separate legislation was abolished. During this reign many

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Scotchmen had made their way to the first places in the state; all the Jacobite feelings had died out; and the Union had become not legislative merely, but also of society, literature, thought, and enterprise. The most original and vigorous thought of this period found its expression in poetry, and most noteworthy among its poets are Byron, Coleridge, Wordsworth, and Walter Scott, the last of whom is at the head also of the writers of prose-fiction in this reign. In spite of the depressing effects of war, commerce greatly increased during the 60 years of this reign; and the revenue, which at the beginning was under nine millions sterling, had, during the years of the French war, been increased more than sevenfold, thus showing, though by an undesirable method, the vast increase of the resources of the country. Chemistry and the steam-engine were beginning to alter the face of society. Among legislative reforms, the most conspicuous was the abolition of the punishment of death for minor crimes; and generally the statute-book, which had greatly increased, became more and more favorable to individual liberty.

The abilities of the prime-minister Pitt, gave this reign a glory which cannot be credited to the king. The king was a man of routine, without brilliancy of mind, without literary or artistic taste. But the purity of his domestic life in contrast to the disgraceful profligacy of his predecessors should be counted as a high honor to his name, as it was also a help to national morality.—His fourth son, Edward Augustus, Duke of Kent (1767–1825) was father of Queen Victoria.

GEORGE IV. (GEORGE AUGUSTUS FREDERICK), King of Great Britain: 1762, Aug. 12—1830, June 26 (regent 1811–20; reigned 1820–30): son of George III. That he should have lived so long as 67 years is not the least notable fact of a life that has supplied as much foul material for scandal as any in English history. G. had considerable intellectual ability and address, could tell stories well, and enjoy every day without thinking of the next. His personal attractions and a singular ease and graciousness of manner, led many in his lifetime to style him 'the first gentleman of Europe;' but the decay of king-worship, and the growth of morality, have either made that appellation absurd, or have changed the compliment to a bitter irony. His vices and those of some of his royal namesakes, have been mercilessly exposed by Thackeray in his 'Four Georges' (1861). G. IV. was false and heartless, grossly licentious and profligate, and wildly extravagant as a gambler and for his sensual pleasures. At the age of about 25 he received from the government a sum equal to about \$800,000, for payment of his debts, having had an annual income of about \$250,000. Before this time he had married (fictitiously) Mrs Maria Fitzherbert (q. v.), whom he repudiated, and to whom he returned after his separation from his lawful wife; the woman was afterward compelled to leave him on account of his excesses.

His lawful marriage was specially unfortunate. He entered into it 1794, Apr. 8, with his cousin, Caroline

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Amelia Elizabeth, second daughter of the Duke of Brunswick, under the pressure of debt, and of his father's promise of financial help, as a condition. Their conjugal happiness, if it ever existed, did not last many weeks. The Princess Charlotte Augusta was born of the marriage 1796, Jan. 6; and shortly afterward her parents separated, having ceased to speak to each other months before: see CAROLINE, AMELIA ELIZABETH. The princess Charlotte married Prince Leopold, afterward king of Belgium; and died 1817, Nov. 6, greatly to the grief of the whole nation.

Royal visits to Scotland and Ireland; the aid rendered to the Greeks by the British fleet in the battle of Navarino (1827) which secured the independence of Greece; and the passing (1829) of the Rom. Cath. Relief Bill (q. v.) (so odious to his father), are the most notable incidents of this king's reign. He was succeeded by his brother William, Duke of Clarence, who had entered the navy in his youth.

GEORGE I. (CHRISTIAN WILLIAM FERDINAND ADOLPHUS GEORGE), King of Greece: b. 1845 (began reign 1863); second son of the king of Denmark; and brother of Alexandria, Princess of Wales, and of Mary Feodorovna, formerly Princess Dagmar, Empress of Russia. He served in the Danish navy, and after the popular tender of the crown of Greece had been declined for political reasons by Prince Alfred of England, and by Duke Ernest of Saxe-Coburg Gotha, G. accepted it with the consent of the great powers. He relinquished his rights in Denmark, was permitted to remain a Lutheran on a pledge that his children should be brought up in the Greek faith, was crowned as King of the Hellenes, and married the Grand Duchess Olga, niece of the late emperor Alexander II. 1867, Oct. 27.

GEORGE (the Bearded), Duke of Saxony: 1471–1530 (ruled 1500–30); eldest son of Albert (the Brave), who was the founder of the Ducal or Albertinian Saxon line. He early showed strong desire for religious knowledge, and 1484 was sent to Meissen to study for the priesthood. On the death of his father, 1500, G. succeeded to the whole dukedom, consisting of the half of Thuringia and Meissen, except the lately acquired country of Friesland, which fell to his younger brother Henry; who, however, soon after exchanged it with G. for Freiberg and Wolkenstein. Though G. and William, Duke of Lower Bavaria, were the two pillars of Rom. Catholicism in Germany, yet G. did not appear much displeased with the proceedings of Luther previous to the Leipsic controversy; on the contrary, they were at one in regard to the many abuses which had crept into the church, but G. wished to remedy them through papal edicts, or the decisions of a general council. The ill-feeling between G. and Luther began during the Leipsic controversy, from a misapprehension of Luther's doctrine of justification by faith; it necessarily increased in strength in a man remarkable for obstinacy, especially as it was carefully fostered by John Eck and others of Luther's enemies. Yet when the emperor seemed likely to violate his safe conduct given to Luther, G. strongly

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protested against such a breach of good faith. The later years of his reign were imbittered by a succession of domestic calamities: first his wife died, then all his children in succession; thus his brother, Henry of Freiburg, a zealous Protestant, became heir-apparent; and such was G.'s antipathy to being succeeded by one of that religion, that he attempted to break the line of succession, but did not live to do so. He was succeeded by Henry.

GEORGE, Prince of Denmark: 1653–1708; second son of Frederick III., and husband of Queen Anne of England. He fought in person, with his brother Christian V., against Charles XI. of Sweden on the renewal of the war after his father's death 1670; married Princess Anne 1683, July 28, who bore him 17 children, all of whom died before her accession; was naturalized and created Duke of Cumberland after the triumph of the Prince of Orange; accompanied the king to Ireland and took part in the battle of the Boyne; and on the accession of his wife to the throne 1702 was made generalissimo of all the queen's forces and lord high admiral of England.

GEORGE, PRINCE: second son of George I., King of Greece; b. in Corfu, Ionian Islands, 1869, June 24; was made lieut. in the Greek army, 1889, July 19. In 1891 while traveling in Japan with his cousin, the Grand Duke of Russia (afterward Nicholas II.), he saved the latter from assassination at the hands of a religious fanatic. Made high commissioner of Crete, 1898.

GEORGE, HENRY: political economist: 1839, Sep. 2—1897, Oct. 29; b. Philadelphia; son of an Episcopalian book-publisher. He attended the common school, and had the benefit of one year at high school before he was 13 years of age. Then he served as office-boy in a crockery-store, and at the age of 14 went to sea as cabin-boy on the ship *Hindoo*, sailing for London, Melbourne, Calcutta, and back to New York. After his return home he learned to set type in his father's printing-office, but left the trade in 1858 to become a sailor before the mast on a ship that sailed around the Horn to California, where, in Sacramento and San Francisco, he worked as a compositor, and in the latter place became a reporter, writing for the *Journal* and the *Herald*. Afterward he became editor of a small paper in Oakland, and subsequently managing editor of the *Sacramento Recorder*. While editing this paper he was in harmony with the democratic party, but bitterly opposed to the railroad and other monopolies in the state; and when a candidate for the assembly 1869 was not only defeated but lost his paper by the sale of its controlling stock interest through railroad influence. He kept up his editorial connections in Sacramento and San Francisco till 1876, when he was appointed state inspector of gas meters for a term of four years, and just before its expiration he became a trustee of the Free Public Library of San Francisco. His first publication on the subject of land-ownership was *Our Land and Land Policy* (San Francisco 1871). The attention which this attracted led him to a very detailed and laborious in-

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vestigation into the causes of industrial depressions and the increase of want with the increase of wealth. In 1879 he published the results of his investigations under the title *Progress and Poverty*. Of the origin of this work he has given an interesting account, to the effect that while out driving one day in the neighborhood of Oakland he casually asked a passing teamster what land was worth there. The teamster replied that he thought some might be purchased for \$1,000 an acre. 'Like a flash,' says the author, 'it came upon me that with the growth of population land grows in value, and the men who work it must pay more for the privilege. I turned back, amid quiet thought. The perception that then came to me has been with me ever since.' In 1880 G. removed to New York. His book gained an immediate and wide reputation, and within a few weeks after his arrival in New York he was in receipt of requests from all parts of the country to give public expositions of his theories. The same year he went to Ireland as correspondent of the *Irish World* of New York, and spent a year abroad, studying the land question in Ireland and lecturing for the English Land Restoration Soc. in England. His third book, *The Irish Land Question*, was published 1881. In the winter of 1884-5 he lectured in Scotland for the Scottish Land Restoration Soc., and afterward spoke in nearly every important city and town in Great Britain. His *Social Problems* appeared 1883, and *The Land Question* 1884. Returning to New York and resuming lecturing, his views were adopted by the United Labor party, which made him its candidate for mayor of the city 1886. He received 68,110 votes against 90,552 for Abram S. Hewitt, democrat, and 60,435 for Theodore Roosevelt, republican. He made a vigorous campaign and was joined in it by the Rev. Edward McGlynn, D.D., rector of St. Stephen's (Rom. Cath.) Church. After the election he founded the *Standard*, a weekly newspaper, and, with Dr McGlynn, the Anti-poverty Soc. In 1886, Dec., Dr. McGlynn was suspended, and 1887, Jan., excommunicated, by the Rom. Cath. authorities for acts and utterances originating in his support of G.'s candidacy and theories. In 1887, G. was nominated by the United Labor party, for Sec. of State of N. Y., and received 37,377 votes against 111,248 for Frederick Cook, the successful democratic candidate. In 1888, Feb., Dr. McGlynn declared G. no longer the leader of the United Labor party or of the Anti-poverty Soc.; Mar. 27 G. resigned all connection with the Anti-poverty Soc.; and May 29 he was expelled from the United Labor party, being charged with 'abandoning the great principle of single tax on land for the lesser one of free trade.' G. was nominated 1897 for mayor of New York by the populists—several independent democratic organizations which fused under the name of the Jeffersonian Democracy. He accepted the nomination, and entered the campaign against his opponents with extreme ardor. The stress of the fight was too great for his physical organism, and in the early morning of Oct. 29 he was stricken with apoplexy and died in a few hours. All par-

ties united in tributes of respect to the dead, and his body lay in state. Henry G., Jr., was nominated for mayor in place of his father. G.'s sixth book, *Protection or Free Trade*, was published 1886, and *The Condition of Labor: an Open Letter to Pope Leo XIII.*, 1891.—See TAX, TAX, SINGLE.

GEORGE, LAKE: picturesque body of water in Warren and Washington counties, N. Y., 310 ft. above tide-water, 36 m. long n. e. to s. w., 1 to 4 m. wide, greatest depth 400 ft.; with outlet to Lake Champlain. It was known to the Indians as Caniaderioit and afterward as Lake Horicon. It is noted for the beauty of its surrounding scenery, the clearness of its water, the number and charm of the islands that dot its surface, its historical associations and popularity as a summer resort and camping ground. On the e. shore Black Mountain rises to a height of 2,200 ft. above it, and 12 m. distant is the steep rock 200 ft. high, down which Maj. Rogers slid to safety when pursued by Indians in the French war. Close by is the spot where Lord Howe's army landed prior to its attack on Fort Ticonderoga. Steamers ply on the lake in summer for the convenience of tourists, its shores are dotted with numerous hotels, and many camping parties are seen on its banks and islands every season. The lake was discovered early in the 17th c., visited by Champlain 1613, named Lake St. Sacrement 1646, occupied by large armies in the French and Indian war, and was the scene of several battles and important military movements. Fort William Henry was erected by the English near the head of the lake 1755, and Fort George, $\frac{1}{2}$ m. e., 1759. See DIESKAU, LUDWIG AUGUST: FORT WILLIAM HENRY AND FORT GEORGE.

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GEORGE OF CAPPADOCIA: Arian abp. of Alexandria: b. abt. the beginning of the 4th c.; d. 361, Dec. 24; son of a fuller. Some authorities make him a native of Epiphania in Cilicia; but a larger number agree that he was a Cappadocian. Though regarded as a type of extreme meanness, he was possessed of abilities and powers of insinuation that enabled him to secure a contract for supplying provisions to the army; but in executing it he was guilty of such imposition that he was nearly killed by the soldiers and forced to flee. Subsequently he settled in Constantinople and became wealthy as a receiver of taxes. There is no record of his admission to holy orders, nor of his having held any subordinate ecclesiastical office; but after the banishment of Athanasius 356, G. secured the vacant see through the influence of the Arians. His tyranny led his friends to put him into prison for safety, and after the accession of Julian, he was dragged out by the populace and killed, his body being burnt and his ashes cast into the sea. He collected a valuable library which Julian appropriated. He has some times been confused with St. George (see **GEORGE, SAINT**).

GEORGE OF TREBIZOND: 1396–1486; b. Chandace, island of Crete: scholar and philosopher. In 1430 he was invited to Italy by Francesco Barbaro, a noble Venetian, and was soon appointed prof. of Greek literature and philosophy in Venice. Later, Pope Eugenius IV. induced him to accept a similar post in Rome, to which was added that of pontifical secretary. He held both appointments through Eugenius's life and was continued in them by Nicholas V. He eulogized Aristotle, attacked Plato, and translated several of the Greek authors into Latin in such a thoughtless and hasty manner as to provoke bitter criticism, draw out a spirited response from Cardinal Bessarion (q. v.) and compel him to seek protection at the court of Alphonso V. at Naples.

GEORGE (known as PISIDES or PISIDA): Byzantine historian and poet of the 7th c.; also deacon and officer of the church of St. Sophia, Constantinople. Little is known of his personal history but he left detailed chronicles of the first expedition (622) of the emperor Heraclius against the Persians, an account of Avari's unsuccessful attack on Constantinople (626), a survey of the military operations of Heraclius till the overthrow of Chosroes (627), a poem on the creation of the world, a controversial composition against Severus of Antioch, two poems on the resurrection of Christ and the Virgin's temple at Blachernæ, and an encomium in prose on Anastasius the martyr. Other works ascribed to his pen are not extant.

GEORGE, ST.: one of the Bermudas or **SOMERS' ISLANDS**, British possessions in mid-Atlantic. It has a picturesque capital, plentifully supplied with hotels and stores. Owing to its temperate climate St. George has become a popular holiday as well as winter resort, especially for Americans. Though the soil is generally poor, large quantities of garden produce are raised. It is strongly fortified

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and forms the principal military depôt in the group. On the s. coast is the town of St. G., which has a large harbor, with fortifications.

GEORGE, SAINT: soldier: b. in Cappadocia; supposed to have been put to death as a Christian martyr, 303, Apr. 23, on which day his festival is observed by the whole Roman Church. This saint is venerated in both the Eastern and Western churches, held in special honor as the patron of Chivalry, and adopted as the tutelary saint of England. His origin is extremely obscure; and the very oldest accounts of him extant contain a strange mixture of history and legend. The Greek acts of his martyrdom fix the date of his death as the persecution under Diocletian; but these acts are, by the confession even of Rom. Cath. hagiologists, undoubtedly spurious. On the other hand, it is asserted (see Gibbon's *Decline and Fall*, II. 323) that the canonization of G. is one of the many errors which Prot. historians freely impute to the Roman calendar, and that the George who is thus reputed a saint and martyr is no other than the turbulent and unscrupulous Arian partisan, George of Cappadocia (q.v.), whom his Arian followers revered as a saint, and imposed as such on the credulity of their Cath. countrymen. It must be confessed, however, that the best modern authorities, Rom. Cath. and Prot., agree in admitting the great improbability of this allegation. Heylin is of one mind in this matter with the Jesuit Papebroch, and Dean Milman adopts the arguments and agrees in the opinion of the Rom. Cath. Bp. Milner. The truth is, that whatever is to be said of the early accounts of the martyrdom of G., the fact of his being honored as a martyr by the Catholic Church, of churches being dedicated to him, and Hellespont being called, 'St. George's arm,' is traced by Papebroch, by Milner, and by other writers to so early a date, and brought so immediately into contact with the times of the angry conflicts in which George of Cappadocia figured as an Arian leader, that it would be as reasonable to believe that the Rom. Catholics of England at the present day would accept Lord George Gordon as a Rom. Cath. saint, as to suppose that the Catholics of the East—while the tomb of Athanasius was hardly closed upon his honored relics—would accept as a sainted martyr his cruel and unscrupulous persecutor. Indeed it cannot be doubted that the St. G. of the Eastern Church is a real personage, and of an earlier date than George of Cappadocia—probably of the date to which these acts, though otherwise false, assign him. The legend of his conflict with the Dragon arose probably out of symbolical or allegorical representation of his contest with the pagan persecutor. As in this ancient legend St. G. appears as a soldier, he was early regarded as one of the patrons of the military profession. Under this title, he was honored in France as early as the 6th c.; but it was not until after the Crusaders, who ascribed their success at the siege of Antioch to his intercession, returned to Europe from the Holy War, that the religious honor given him reached its full development. He was selected as the patron saint of the Republic of Genoa and of

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England. At the council of Oxford, 1222, his feast was ordered to be kept as a national festival. In 1330, he was made the patron of the Order of the Garter by Edward III.; and even since the Reformation, the ancient sentiment is still popularly maintained.

GEORGE, ST., BANNER OF: white with a red cross. According to Sir N. H. Nicolas, the cross of St. George was worn as a badge over the armor by every English soldier 'in the 14th and subsequent centuries, even if the custom did not prevail at a much earlier period,' to indicate that he was in the service of the crown. On the invasion of Scotland by Richard II., 1386, it was ordained 'That everi man of what estate, condicion, or nation they be of, so that he be of oure partie, bere a signe of the armes of Saint George, large, bothe before and behynde, upon parell that yf he be slayne or wounded to deth, he that hath so doon to hym shall not be putte to deth for defaulte of the crosse that he lacketh. And that non enemy do bere the same token or crosse of St. George, notwithstanding if he be prisoner, upon payne of deth.' A similar ordinance was adopted by Henry V. for his army in France.

GEORGES, *zhorz*, MARGUERITE JOSEPHINE: 1787, Feb. 23—1867, Jan. 12; b. Bayeux, France: actress. She was daughter of an actress and of a tailor, was educated for the stage in Paris, and made her first appearance there as *Clytemnestra*, 1802. Her acting and beauty made a great sensation, and after a vain attempt to supplant Mlle. Duchesnois she went to Russia, where Emperor Alexander I. became infatuated with her. She played at Dresden and Erfurt before the emperor and Napoleon, was induced by the latter to return to France, was readmitted to the Theatre Français 1813, and was paid her salary from 1803, was further trained by Talma, and again broke her engagement 1816. She played in England, Germany, and the French provinces, at the Odéon and Porte St. Martin theatres, Paris, 1821-47, retired 1855, and found it necessary to teach in the conservatory for a living.

GEORGE'S CHAN'NEL, St.: south portion of that arm of the Atlantic which separates Ireland from the United Kingdom. A line, extending from Holyhead in Wales to Dublin, would form the n. limit of this channel; and a similar line from St. David's Head to Wexford, its s. limit. At its n. extremity it is 64 m. wide, and at its s. about 62 m.; length, from n.e. to s.w., is about 100 miles.

GEORGETOWN: a separate city till 1871, when it was made a part of Washington; in the District of Columbia, on a range of hills, the highest of which are denominated the *Heights*, on the left bank of the Potomac, two m. n.w. of the capitol. From the Heights occupied by elegant villas, a magnificent view of the whole of G. and Washington, and of the surrounding country, is obtained. G. is quiet and antiquated, and has a reputation for literary advantages and refined society. Its principal institutions are the Georgetown College, under the manage-

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ment of the Jesuits, and the convent of Visitation Nuns—attached to which is an academy for girls with about 100 pupils. Here the Alexandria branch of the Chesapeake and Ohio canal is carried across the Potomac on an enormous viaduct 1,446 ft. long, 36 ft. above the ordinary level of the water. As it is the only port in the district of Columbia, and at the head of the navigation of the Potomac, 125 m. from its mouth, its foreign commerce and coasting trade are important. It has 50 mills to supply its trade in flour. It is one of the greatest markets in the United States for shad and herrings, of which vast quantities are caught in the Potomac, and brought here for barrelling. See WASHINGTON (city).

GEORGE'TOWN (Dutch, *Stabroek*): capital of British Guiana, at the mouth and on the right or eastern shore, of the river Demarara; lat. 6° 49' 20" n., and long. 58° 11' 30" w. It is handsomely built, and has spacious, clean streets, intersecting at right angles, with neat wooden houses which have open verandas in front and are embosomed in trees, of which the cabbage-palm, cocoa-nut, and orange-tree are the chief. Some of the streets are traversed by canals, communicating with each other and with the river. The principal public buildings are the town-hall, an elegant structure, with marble-paved galleries resting on cast-iron columns, the Episcopal cathedral, and the Colonial Hospital. There are also a mariners' hospital, numerous churches and schools, astronomical and botanical societies, barracks, theatres, and a market-place surrounded by well-stocked shops. G., owing to the low and swampy character of the district, is unhealthful. Yellow and intermittent fevers, diarrhea, and dysentery are local diseases. The chief exports of G. are sugar, coffee, and rum; and its annual trade employs about 600 vessels of 102,000 tons burden. A new almshouse for the poor has been erected, and all the settled parts of the colony have been connected with G. by telegraph. Pop. (1891) 53,176, most of whom are negroes and people of color.

GEORGETOWN, UNIVERSITY OF: educational institution in Washington, D.C., under the care of the Rom. Cath. Church. It was organized as a college 1788, and chartered by congress as a univ. 1815; had its astronomical observatory built 1845, its medical dept. organized 1851, and its law dept. 1870; had its new college building begun 1878, the Riggs library 1890, new law school 1891, and Dahlgren memorial chapel 1892. It had (1902) 120 instructors, 750 students, and 85,600 vols. in its library. The pres. 1894 was the Rev. J. H. Richards, S.J.

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GEORGIA, *jawr"jĭ-a*: state; one of the 13 original states of the American Union; lat. $30^{\circ} 30'$ — 35° n., long. 81° — 86° w. of Greenwich, or 4° — 9° w. of Washington; bounded n. by Tenn. and N. C., n.e. by S. C., e. by the Atlantic Ocean, s. by Fla., and w. by Ala.; extreme length n. to s. 315 m., extreme width e. to w. 250 m.; direct coast line 128 m., coast and islands line 480 m.; area 59,475 sq. m. (38,064,000 acres), of which 495 sq. m. is water surface; named in honor of George II. of England; capital, Atlanta.

Topography.—G. possesses nearly every variety of soil, climate, and scenery common to the entire United States, because of its location and physical features. The s. part is in a pine belt, touches the Atlantic Ocean, and is warmed by the Gulf Stream; the n. part is among the foothills of the Blue Ridge mountains. Between the savannas of the coast on the s.e. and the mountains on the n. are low, pine-covered plains, high level plains, hill slopes, high plateaux, and fertile, picturesque valleys, the surface rising in terraces and showing numerous table-lands. Separated from the coast-line by narrow and shallow sounds are a number of islands, formerly widely known for their production of 'sea-island' cotton, of which Cabbage, Ossabaw, St. Catherine's, Sapelo, St. Simon's, Jekyl, and Cumberland are chief. The Etowah hills in Bartow and Cherokee counties, the Amicolola hills in Gilmer and Lumpkin counties, and the portion of the Blue Ridge mountains ranging with them in Lumpkin, White, and Habersham counties on the s., and Union and Towns counties on the n., constitute the great watershed of the state. This region gives rise to the two principal rivers of G., and was the scene of important military movements in the war of 1861-65. The chief water courses are the Savannah river, the largest in the state, which is formed by the Tugaloo and Keowee, constitutes the boundary between G. and S. C., flows s.s.e. to the Atlantic Ocean, and is navigable for ships to Savannah, for steamboats to Augusta, and for small boats 150 m. beyond; and the Chattahoochee, which rises near the Savannah in the extreme n.e. of the state, flows s.w. and s., takes the name of Appalachicola in Fla., and empties into the Gulf of Mexico. Other important streams are the Altamaha, formed by the Oconee and the Ocmulgee; the Ogeechee, Santilla, and St. Mary's, all of which flow into the ocean; the Flint and the tributaries of the Suwanee, which flow into the Gulf; and the Coosa, Etowah, and Oostanaula, in the n.w. of the state, all of which are navigable. The important water powers of the state are confined mainly to the metamorphic region, where the fall is steep and the rock is solid gneiss that has no pervious strata and no underground caverns to form a subterranean outlet. These streams drain off all the rainfall that is not evaporated, and, as the rainfall is remarkably uniform throughout the year, they can be relied on for constancy of supply. There are four good harbors,—Savannah, Darien, Brunswick, and St. Mary's.

Geology.—The state is divided into four marked geological belts: the Archæan, which includes the mountains and

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foothills in the n.e. and extends in a s.w. direction across the state; the Paleozoic, which comprises 10 counties in the n.w.; the Mesozoic, which dominates the part about Columbus; and the Tertiary, which covers the lower half of the state. Much of the Archæan belt consists of the Piedmont plains, a rolling-section 700–1,300 ft. above sea-level; the remainder shows crystalline rock. In the Paleozoic are valleys 800–1,000 ft. above sea-level, with numerous ridges and some mountain spurs of 2,000 ft. extreme elevation. The Mesozoic is a triangular belt, showing plains intersected by deep valleys and having a general elevation of about 600 ft. A part of the Tertiary consists of plains 600 ft. above sea-level, but most of it slopes to that level. Fossil remains of extinct mammals, including the mylodon and megatherium, are found in the s.e. savanna region; and the mountainous region contains numerous caves of much interest, picturesque cataracts, and important relics of prehistoric times.

Mineral Resources.—G. has wealth beyond computation in her mineral resources. It is believed that every mineral of economic importance has been found in the state. The upper half abounds in iron ores, coal, marble, slate, corundum, gold, asbestos, and a variety of building stones; in the vicinity of Atlanta is a vast quantity of granite of a superior quality; and in the s. section are marls, kaolin, fire-clay, and phosphates in workable quantities. Gold has been mined continuously in the n. part for 100 years. The building stones include marble of various shades, granite, sandstone varying from gray to brown, and limestone. There are clays suitable for producing the finest pressed brick, vitrified brick, and roof and drain tiles. In the crystalline rock are mica in workable sheets, feldspar suitable for porcelain manufacture, and quartz. Garnets for grinding, soapstone, talc, graphite in scales, sulphide of iron, manganese ores, nickel ore, argentiferous galena, beryl, and bauxite, containing from 55 to 70 per cent. of alumina, are found in various localities. The following summary of production, from the United States govt. report on *Mineral Resources* for the calendar year 1893, should be qualified by the statement that that year was one of general business stagnation. The production of coal was 372,740 short tons, value \$365,972, a notable increase, principally in Walker co., which yielded nearly one-half the total amount. The granite output was valued at \$476,387, a decrease in the year in value of fully one-half. For the marble industry the year opened favorably and closed with slight demand; value of output \$261,666. The entire product of slate was from the Rockmart quarries, and amounted to 2,500 squares for roofing; value \$11,250. Limestones had an output valued at \$34,500. Of the precious metals, gold yielded 4,702 fine oz., value \$97,200, and silver 500 fine oz., coining value \$646, total value \$97,846. G. and N. C. together (not reported separately) produced 38,012 tons of red hematite ore, 138,221 of brown hematite, and 9,782 of magnetite, total 186,015 tons; value \$203,682. Mining for manganese ore was begun in the Cartersville

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district 1866, and the total output 1866-93 was 61,135 long tons, the highest production in a single year being 9,024 tons, 1887. In 1901 the three principal mineral products were marble, granite, and coal. The first was valued at \$936,549, second at \$761,646, third at \$411,685.

Climate.—In the upper part of the state the mean temperature averages 40° in Jan. and 76° in July; in the middle, 47° in Jan. and 80° in July; and in the lower, 50° in Jan. and 80° in July; and the rainfall averages 55 in. in the upper part, 48 in the middle, and 50 in the lower. In each section the seasons are regular. Spring, summer, and autumn are delightful seasons in the entire n. half of the state. The months selected by the U. S. Weather Bureau for determining temperatures, Jan. and July, are not representative months for this section. Dec. and Feb. are as a rule much milder than Jan., hence the real winter temperature is several degrees warmer than that officially reported. The general range for the state may be put reasonably at 50° in the winter to 80° in summer. The climate generally is healthful, and the state is free from epidemics. Vast tracts of pine forests render even the lower section salubrious, and have made many localities in the state famous as winter resorts and as sanitariums for persons suffering with lung or bronchial troubles.

Soil and Products.—The various geological formations have given the state a soil showing much variety. Red and brown loams and gray gravel lands predominate in the n.w.; red clay and gray sand, in the middle and n.e. parts; and sand, marl beds, marsh lands, and savannas, in the lower middle and s. sections. The soil is everywhere light and easy of cultivation. The greatest variety is seen in the n.w., where rich bottom lands border the streams, and where the conditions are most favorable for growing corn, hay, and such fruit as apples, plums, cherries, grapes, and strawberries. Grains and grasses, with cotton, pears, apples, peaches, grapes, and various berries, thrive in the n. and middle sections generally. In the s. part, pine, oak, and hickory, with the common and long staple cottons, rice, fruits, melons, and vegetables, are the chief local features. The standing timber of the state is said by competent authorities to be far more valuable than all the other property. Yellow pine supplies several of the largest industries, and furnishes the bulk of freight taken from the state by rail and water. Products of the pine, such as spirits of turpentine, and rosin, form the basis of the principal commerce of the state naval stores.

The following table shows the number, acreage, and value of the farms, including buildings and fences, as reported in the census of 1890 and 1900:

Farms.	1890.	1900.
Number.....	171,071	224,691
Acreage.....	25,200,435	26,392,057
Value.....	\$152,006,230	\$183,370,120

The cotton crop of 1902 was officially reported at 1,509,199 bales. The yield of rice in G. is steadily decreasing,

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owing to the substitution of more profitable crops. The highest yield reached since 1880 was 24,715,200 lb., 1881, and the lowest, 8,688,015 lb., 1894, when the fields were visited by severe harvest storms. The acreage, product, and value of other principal crops during the calendar year 1902, were as follows:

Crop.	Acreage.	Product.	Value.
Corn.....	3,899,331	35,093,979 bu.	\$25,618,605
Wheat.....	284,531	1,707,186 "	1,673,042
Oats.....	264,013	2,930,544 "	1,553,188
Rye.....	13,917	87,677 "	94,445
Potatoes.....	8,715	505,470 "	454,923
Hay.....	88,080	119,789 tons.	1,605,173
Total.....	4,558,587	.....	\$30,999,376

The number and value of the live-stock are shown in the following table, for 1903, Jan. 1:

Animals.	Number.	Value.
Horses.....	120,715	\$7,946,663
Mules.....	193,271	17,093,854
Cows.....	274,604	6,024,812
Other cattle.....	623,033	5,806,173
Sheep.....	297,484	536,186
Swine.....	1,425,285	7,454,241
Total.....	2,934,392	\$34,961,929

Manufactures.—G. has made remarkable advance in manufacturing industries. The following comparison from the U. S. census reports of 1890 and 1900 shows this development but partially:

Census.	Establishments.	Capital.	Persons employed.	Wages paid	Cost of materials.	Value of products.
1900	7,504	\$89,789,656	83,842	\$20,290,071	\$58,232,202	\$106,654,527
1890	4,285	56,921,580	52,298	14,623,996	35,174,480	68,917,020
In-crease	3,219	\$32,868,076	31,544	\$6,666,075	\$22,457,722	\$37,737,507

In both census years the chief manufactures according to amount of capital employed were cotton goods. The development of this industry was as follows: 1880, number of mills, 40; spindles, 198,656; looms, 4,493; 1890, number of mills, 53; spindles, 445,452; looms, 10,459. In 1900 the manufacture of cotton goods was the most important in the state. There were 68 establishments employing 18,348 persons, and yielding products valued at \$18,544,910. The increase in value of products since 1890, was \$6,509,281. There were 27 new textile mills either projected or in course of erection. In the new era of development the cotton mill has been erected in the cotton field. One prosperous mill is built at the side of a railway, where rows of cotton grow to within a few feet of the building. Augusta and Columbus, each on a bold river, with abundant water power, and within the cotton belt, are the centres of this important in-

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dustry. In 1880 there was not a cotton-seed oil mill in the state; in 1900 there were 43 such mills, paying \$6,-229,436 for the seed used, and yielding products valued at \$8,064,112. G. has a larger output of turpentine than any state in the Union. In 1890-1900 the value of the product increased from \$4,242,255 to \$8,110,468, or almost doubled. The manufacture of fertilizers from phosphate rocks shows a still larger development. In 1880 there were 3 factories whose output was valued at \$246,500; in 1900 there were 41 factories which had a \$3,367,353 output. In the same period the output of malt liquor increased from a value of \$99,584 to \$973,-212. Incomplete returns 1890 showed an output of lumber valued at \$9,855,067; in 1900 the output was worth \$13,704,923. The planing-mill products, including sash, doors, and blinds, increased from \$737,200 in 1890 to \$4,302,976 in 1900. In 1902 the collection of internal revenue on special articles of manufacture amounted to \$601,806.

Commerce.—G. has a large foreign trade, principally in naval stores, and a domestic trade in cotton, pine lumber, fertilizers and watermelons. Foreign trade reported at 3 ports of entry for 1902 was as follows:

Ports.	Imports.	Exports.
Brunswick.....	\$10,701	\$7,871,314
St. Mary's.....	.....	.....
Savannah.....	768,695	47,671,951
Total.....	\$779,396	\$55,543,265

Transportation.—G. has excellent means of internal and external communication. The coast region has steamship lines from Savannah, Brunswick, Darien, and St. Mary's, with numerous lines of small boats plying in the rivers and sounds. Steamboats furnish transportation on the Savannah, Altamaha, Ocmulgee, Flint, and Chattahoochee rivers. Lines of railway connect every part of the state directly with the great cities of the n. and w. states. At the close of the fiscal year 1893 there were 5,669.69 m. of railway, of which 4,987.60 m. were in operation. The capital stock aggregated \$68,658,187; the funded debt, \$87,233,927; and the total investment, \$172,688,253. The cost of the roads and equipment was \$157,383,146; the gross earnings from passengers were \$4,545,302; freight, \$10,089,474; and all sources, \$16,159,156; net earnings, \$2,-962,905. Interest payments on bonds aggregated \$2,577,-305, and dividend payments on stocks, \$1,320,404. In 1895 the total mileage in operation, not including sidetracks and private lines, was 5,103. There were three systems,—the Central, controlling a mileage of 1,133; the Savannah Florida and Western, mileage 597; and the Southern, mileage 723. There were also 43 minor and local lines, ranging in mileage from 4 to 183.

Religion.—The entire state constitutes the Prot. Episc. diocese of G. and the Rom. Cath. diocese of Savannah. The following table shows the condition of the principal church organizations as reported in the census of 1890:

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Denominations.	Organi- zations.	Churches and halls.	Mem- bers.	Value of church property.
Bapt. Regular, Colored	1,818	1,858	200,516	\$1,045,310
Bapt. Regular, South.	1,647	1,649	137,860	1,848,675
Meth. Episc., South...	1,268	1,285	134,600	1,661,410
African Meth. Episc..	334	661	73,248	601,287
Meth. Episc.....	320	320	25,400	255,940
Colored Meth. Episc.	266	263	22,840	167,145
African M. E., Zion..	70	71	12,705	52,360
Presb. in the U. S.....	162	164	12,096	737,725
Rom. Cath.....	64	64	11,228	485,123
Bapt. Primitive.....	351	350	11,172	150,855
Prot. Episc.....	46	50	5,515	492,300
Disciples of Christ...	64	63	4,676	197,925
Meth. Prot.....	80	80	4,390	33,475
Congregational.....	73	70	3,880	75,350

At the Seventh International Sunday-school convention (St. Louis, 1893) there were reported in G., connected with evangelical denominations only, 6,748 Sunday-schools, with 55,338 officers and teachers, and 298,498 scholars, a total membership of 353,836.

Education.—The public school system is based on the constitution of 1868, and practically dates from 1872, when the legislature passed a general school law, in which a state board of education was created, consisting of the gov., atty.gen., sec. of state, comp.gen., and the state school commissioner. The last official reports, obtainable at the time of writing, were for the school year 1893. The state enumeration showed a population of school age (6–18 years) of 604,971, of whom 161,284 were white males, 153,756 white females, 145,310 colored males, and 144,621 colored females. The enrolment was 233,295 white children, and 157,293 colored (390,588); and average attendance, 138,386 white, 91,667 colored (230,053). There were 4,892 schools for white pupils and 2,702 for colored (7,594); and 5,219 teachers were employed in white schools and 2,902 in colored (8,121). Adding what are known as 'local' systems, the totals would be: Enrolment, 436,682; average attendance, 262,140; teachers, 9,033. The total school fund of the year was \$1,274,412. The total amount apportioned for public school purposes together with the poll-tax, partly a matter of record and partly estimated, in 1872–93 aggregated \$12,603,314. In 1901 there were 491,848 pupils enrolled; 310,453 in average daily attendance; and 10,300 teachers. The 6,246 school buildings were valued at \$2,738,800. The institutions for higher instruction are the Univ. of Ga., at Athens; Emory Coll., Oxford; Mercer Univ., Macon; Pio Nono Coll., Macon; N. G. Military and Agric. Coll., Dahlonega; Middle G. Military and Agri. Coll., Milledgeville; Cuthbert Agricultural College, Cuthbert; Technical Institute, Atlanta; Douglasville College, Douglasville; Middle G. College, Jonesboro; Gainesville College, Gainesville; Martin Institute, Jefferson; Wynton Male and Female College, Columbus; S. G. Male and Female College, Dawson; Young L. Harris Institute, Young Harris; Gordon Institute, Barnesville; Wesleyan Female College, Macon; Lucy Cobb Institute, Athens; La Grange Female College, La Grange;

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Southern Female College, La Grange; Dalton Female College, Dalton; Monroe Female College, Monroe; Andrew Female College, Cuthbert; Agnes Scott Female Institute, Decatur; Young Female College, Thomasville; Chappell Female Institute, Columbus; G. Baptist Seminary, Gainesville; Monroe Female College, Forsyth; New Ebenezer College, Cochran; Girls' Industrial College, Milledgeville; and Shorter College, Rome. The advanced institutions for the colored race were: Clark, Atlanta, Spellman, and Gammon universities, all in Atlanta; Payne Institute, Augusta; and the Univ. for the Colored, Savannah. There were also a Normal Institute in Atlanta, and a State Normal School in Athens. A state institution for the blind is maintained in Macon, and one for the deaf and dumb in Cave Spring. For the State Univ., see GEORGIA, UNIVERSITY OF. The remarkable development of the public school system of G. is illustrated by the following table, and shows a progress equalled by but few states.

	1870-1	1875-80	1889-90	1900-1
Average No. days school per y'r.	59	65	89	112
Pupils enrolled.....	49,578	236,533	381,297	491,818
Average daily attendance.....	31,377	145,190	240,791	310,453
Per cent. of sch. pop. enrolled..	11.89	46.24	58.46	65.37
Total exp'diture common sch...	\$292,000	\$471,029	\$1,190,354	\$2,083,366

Libraries.—An official report on public libraries in the U. S., having 1,000 vols. and upward each 1900, showed for G., 55 libraries of all kinds, containing 296,855 bound vols. and 35,759 pamphlets. The following was the classification of the libraries: General, 10; school, 15; college, 16; college society, 5; theological, 1; medical, 1; public institution, 2; scientific, 1; societies, 2.

Illiteracy.—Statistics of illiteracy, according to the census reports of 1880 and 1890, show an encouraging progress in education. In 1880, in a total population 10 years of age and upward of 1,043,840, 520,416, or 49.9 per cent., were classed as illiterates. There were 563,977 whites in this class, of whom 128,934, or 22.9 per cent., were illiterates; and 479,863 colored, of whom 391,482, or 81.6 per cent., were illiterates. In 1890, the total population of this class was 1,302,208, of whom 518,706, or 39.8 per cent., were illiterates. The whites numbered 701,585, and had 114,691, or 16.3 per cent., illiterates; and the colored population was 600,623, of whom 404,015, or 67.3 per cent., were illiterate.

Post-Offices and Periodicals.—In 1901, Jan., there were 2,772 post-offices, classified as follows: Presidential, 56 (4 first-class, 10 second, 42 third), fourth-class, 2,716. Of the total, 698 were money-order offices, 21 money-order stations, and 17 limited money-order offices.—In 1894 there were reported 359 newspapers and periodicals, of which 26 were of daily publication, 280 weekly, 6 semi-monthly, 39 monthly, and one quarterly.

Finances.—The assessed valuations of real and personal property, as officially reported 1894, Oct. 1, were \$388,428,748, and of railway property, \$40,584,775—total, \$429,012,923. It is a significant fact that colored tax-payers re-

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turned taxable property to the value of \$14,387,730. The total increase in assessed valuations since 1879 was \$202,000,000, or nearly 100 per cent. The receipts during the financial year were \$2,789,595, the balance from the previous year, \$1,139,837, total amount available, \$3,929,432. The disbursements were \$3,100,798, leaving a balance of \$828,633. The total debt recognized as valid was \$8,154,500, of which \$8,149,500 was interest-bearing, and \$5,000 past-due and non-interest-bearing. In 1902 the total assessed property valuation was \$467,310,646.

Banking and Insurance.—In 1902, Sept., there were reported 41 national banks with aggregate capital of \$4,281,000; 177 state banks with aggregate capital of \$9,627,187, and 6 private banks.—Authority was given to 130 insurance companies, domestic and foreign, to transact business in the state during 1895, of which 55 were fire companies, 27 life companies, 27 assessment life and accident companies, and 21 other than fire and life.

Building and Loan Associations.—According to a United States govt. report (1894), G. had 43 such associations, with 31,294 shareholders who held an aggregate of 224,090 shares, representing dues and profits of \$5,938,077. Of the total shares, 42 associations reported 152,168 free, and 41 associations reported 62,161 borrowed on by 6,132 shareholders. The assets of all the associations were \$7,313,744, of which \$6,229,826 was on real estate bearing loans. During the life of 41 of the 43 associations which reported this item, only 70 mortgages were foreclosed. These represented loans aggregating \$91,218.

History.—G. was named in honor of King George II., who granted the territory to a corporation for settlement 1732, June 9. Previous to this time it was a dense wilderness thronged with wild beasts and venomous reptiles, and formed a portion of the original Carolina grant. Within a few months after the king signed the patent, a party of colonists was organized under James Oglethorpe (q.v.), 116 in number, who sailed from Gravesend, England, and landing on the site of Charleston 1733, Jan., made immediate preparations to take possession of the grant. Oglethorpe was accompanied by George Whitefield and John and Charles Wesley, pioneers of Methodism. Oglethorpe, a soldier, experienced in civil and political affairs, designed to found a colony that would constitute a barrier between the Spaniards and the Indians on the s. and N. C. and S. C. on the n., while Whitefield and the Wesleys deemed the occasion auspicious to establish a refuge for the destitute and oppressed of England and a home for orphaned and friendless children. In consonance with his intentions as well as with the protective necessities of his people, Oglethorpe explored the country in the interior and along the coast in search of an eligible location for defensive works. He found the Yamacraw tribe of Indians in possession of a suitable spot, purchased a large tract of land from them, and on a high bluff over-looking the river and near the sea coast laid the foundation of the present city of Savannah in the spring following his arrival. After a consid-

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erable portion of the immediate vicinity had been surveyed, Oglethorpe deeded tracts of land to the colonists on the condition that they should pay for them with personal military service. This restriction on the tenure of land was antagonistic to the plans of Whitefield and the Wesleys, and repulsive to the colonists; and many of the latter learning that lands in N. C. were held in fee-simple removed thither. Oglethorpe then changed his policy, offered 50 acres of land free to every settler, and soon had numerous Scotch and German families taking up his lands.

When the settlement was beginning to show progress in numbers and industry, war broke out between Spain and England 1739. Oglethorpe was appointed military commander of S. C. and G., mustered 1,000 men and a number of friendly Indians, and marched against the Spaniards, in Fla. He failed in an attempt to capture St. Augustine, returned to G., began fortifying exposed points, and awaited attack by the Spaniards. At length the Spaniards appeared 1742, with a fleet of 36 vessels and a land force of 5,000 men, either sufficient to destroy Oglethorpe's entire force and occupy G. at least. The fleet sailed into the Altamaha river, captured Fort St. Simon and were preparing to bombard its companion Fort Frederica on St. Simon's island, as a preliminary to a combined attack on Savannah, when Oglethorpe in sheer desperation made such a show of activity in various quarters that the Spaniards imagined he had an overpowering force at his command, became frightened, hastily withdrew to their ships and returned to Fla. After the restoration of peace between the belligerents, the settlers renewed their demands for slaves to till their grounds, and when slavery was prohibited a second time, general discontent set in, and many settlements were abandoned. Till this time the affairs of the colony had been vested in the corporation described as the 'trustees for settling the colony of Georgia.' When the trustees found the colony being rapidly thinned out because of their prohibition of slavery, they determined to surrender their charter to the crown and impose the responsibility for slavery, should it be deemed essential to the proper development of the colony, upon the highest authorities. G. thus became directly subordinate to the royal govt. 1752, and received privileges and regulations similar to those of the other colonies, including the right to hold slaves. From this time the colony made rapid progress. A general assembly was established 1755; the limits of the colony—the Savannah on the n., the Altamaha on the s., and an indefinite extension in the w.—were enlarged by the annexation by royal proclamation of all the territory between the Altamaha and St. Mary's rivers 1763; and a greatly enlarged area was brought under profitable cultivation. In 1775 the commerce of the colony amounted to \$1,086,270.

It was acknowledged at the time and the claim has since been substantiated beyond question, that the people of G. had no cause for personal or colonial dissatisfaction with England during the exciting days that preceded the revolu-

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tion. The relations between the colony and the home govt. had been wholly amicable, and none of the acts of oppression of which the New England colonies particularly complained had been enforced against G. But when the movement of protestation began to take effective shape in the n. and e., G. patriotically volunteered her sympathy and cooperation. A convention was called 1775, July, which assumed a share in the grievances of the other colonies and appointed delegates to the congress instructed to pledge the support of G. to its public measures. Immediately after this action Sir James Wright, the royal gov., resigned and returned to England. The population that year was estimated at 70,000. From the time that her delegates signed the Declaration of Independence till the close of the revolutionary war, G. suffered severely by British land and naval forces. Savannah was captured 1778, Augusta and Sudbury 1779. A combined American and French force under Gen. Lincoln and Count D'Estaing (q.v.) made an attempt to recapture Savannah and lost nearly 1,000 men in the assault 1778, Sep., and the city remained in possession of the British till the peace was concluded. Gen. Lincoln was compelled to surrender Charlestown 1780, and the patriots in S. C. and G. could do little more than carry on an irregular warfare till Gen. Greene marched down from the n. with a large army and drove the royal troops from the provinces. After the peace G. was the third state to ratify the federal constitution, 1788, Jan. 2. She framed her first constitution 1777, second 1785, third 1798, fourth 1868, and fifth 1877.

Between 1783 and 90 Creek and Cherokee Indians created much alarm in the state by their depredations along the frontier, but treaties were made with them 1790, and 91. 1802 a special treaty with the Creeks gave to the United States a large tract of land which now comprises the s.w. counties of the state, and the federal govt. exchanged the tract for the possessions of G. w. of the Chattahoochee, from which the states of Ala. and Miss. were subsequently formed. The isolated settlements were subject to Indian raids, incited by the Spaniards in La., till the govt. obtained possession of that territory; the state became involved in hostilities with the Indians on her w. border during the second war with England; and it was not till the cession of Fla. to the United States that G. was finally relieved of troubles of Spanish origin. In 1825, the govt. of G. took the military steps toward extinguishing the title to lands in the state held by the Creeks and Cherokees. This led to serious complications with the federal govt., the head chief of the Creeks was killed by his own people for having signed away their lands, and a war of extermination was threatened for several years. In 1830 Congress passed an act providing for removal of the Indians to the territory w. of the Miss. river, and in 1838 the transfer was accomplished after much friction between the state and federal authorities.

In 1860, Nov., the legislature provided for a convention to determine the question of the state's attitude in the im-

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pending national crisis. The convention met at Milledgeville 1861, Jan. 16, and on the 19th decided to secede from the Union by a vote of 208 to 89. G. ratified the confederate constitution Mar. 16, assumed jurisdiction over forts, arsenals, and other places that it had ceded to the United States, and seized and transferred to the Confederacy Forts Pulaski and Jackson at Savannah, and the U. S. arsenal at Augusta with all its munitions of war. 1861, Nov., Com. Du Pont, U.S.N., captured Port Royal, S. C., occupied Big Tybee island at the mouth of the Savannah, and erected works for the reduction of Fort Pulaski. 1862, Mar. he took possession of St. Mary's, Brunswick, Darien, and St. Simon's islands, and Apr. 11 received the surrender of Fort Pulaski after a vigorous bombardment from the fleet and island batteries. In the early part of 1863, aggressive operations were confined to the sea coast, Com. Worden destroyed the Confederate ironclad *Nashville* in Ogeechee river Feb. 28; made an unsuccessful attack on Fort McAllister on the same river s.w. of Savannah, March 3; and aided in burning Darien June 11; and Capt. Rodgers captured the Confederate ironclad *Atlanta* in Warsaw Sound June 17. The military operations before Chickamauga Tenn., 1863, Sep. (see CHICKAMAUGA, BATTLES OF) constituted the opening of a most remarkable series of maneuvers, and transferred the chief theatre of war after that of the Potomac to the borders of G.; and from that date till 1865, May, G. was almost constantly the scene of conflict. In 1864, May, Gen. Sherman started on his great campaign from Chattanooga, Tenn. (see CHATTANOOGA, BATTLES OF), which resulted in the occupation and partial destruction of Atlanta Sep. 1. On Nov. 15 he set out on his great march to the sea, Nov. 23 entered Milledgeville, Dec. 10 reached the vicinity of Savannah, Dec. 13 took Fort McAllister by storm, and Dec. 21 occupied Savannah. Gen. Wilson took Columbus, West Point, and Macon, Apr., and captured Jefferson Davis, the Confederate pres., who had fled from Richmond, at Irwinville. May 10.

After the surrender of Johnston's army G. was under military control till June 17, when James Johnson was appointed by Pres. Johnson provisional governor. A convention at Milledgeville repealed the ordinance of secession 1865, Oct. 30, declared the war debt void, abolished slavery, and ordered an election for state officers and members of Congress. The legislature ratified the amendment to the federal constitution abolishing slavery; state officers and U. S. senators and representatives were elected, and the provisional gov. was directed to surrender to the new gov. the gov't. of the State. Subsequently congress disapproved of these measures, and G., Ala., and Fla. were constituted a military division, and placed under command of Gen. Pope. A constitutional convention was held 1868, Mar., and the gov't. of the state was restored to the civil authorities July 30. A refusal to ratify the XVth amendment to the federal constitution led to the state being again placed under military rule, but upon its acquiescence it was

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once more turned over to its own officers, and its reconstruction was finally accomplished 1868, December.

The development of G. since the close of the war has been remarkably rapid and substantial. A liberal public policy, ably supplemented by individual effort, has changed the industrial characteristics of the state, and given it high rank as a manufacturing commonwealth, and made it a striking example of the results of well-directed energy. The first notable outgrowth of the new policy was the International Cotton Exposition held in Atlanta 1881, Oct. 5–Dec. 31, which was a great success, but was far surpassed in every way by the Cotton States and International Exposition 1895, Sep. 18–Dec. 31. The site was Piedmont Park, containing 189 acres, about 2 m. from Atlanta. A notable and suggestive feature was the U. S. gov't. building. There were 12 other principal structures. The buildings and the preparation of the grounds cost over \$2,000,000.

Government.—For administrative purposes G. is divided into 137 counties. The executive authority is vested by the constitution in a gov. elected for two years, salary \$3,000 per annum; the legislative in a general assembly comprising a senate of 44 members, elected for two years, and a house of representatives of 175 members also elected for two years, salary \$4 per diem and mileage; and the judicial in a supreme court of three judges, 19 circuit courts, and county courts in the most populous counties. The legislature meets biennially in the even numbered years. Judges of the supreme court are appointed for terms of 12 years; salaries chief justice and two associate justices \$2,500 each per annum. The three principal circuit judges receive \$3,500 each per annum. The state officers include sec. of state; treas.; comp.gen.; atty.gen.; school commissioner; commissioner of agriculture; adj.gen.; 3 railway commissioners; geologist; librarian; principal keeper of the penitentiary; and principal physician to the penitentiary. There are also over 500 justices of the peace.

The successive gov's., with their terms of office since the adoption of the U. S. constitution, are as follows:

George Walton.....	1789-90	George W. Crawford.....	1843-7
Edward Telfair.....	1790-3	George W. B. Towns.....	1847-51
George Matthews.....	1793-6	Howell Cobb.....	1851-3
Jared Irwin.....	1796-8	Herschel V. Johnson.....	1853-7
James Jackson.....	1798-1801	Joseph E. Brown.....	1857-65
David Emanuel (act'g).....	1801	James Johnson (provis'l).....	1865
Josiah Tatnall.....	1801-2	Charles J. Jenkins.....	1865-7
John Milledge.....	1802-6	Gen. T. H. Ruger (provis'l).....	1867-8
Jared Irwin.....	1806-9	Rufus B. Bullock.....	1868-72
David B. Mitchell.....	1809-13	James M. Smith.....	1872-7
Peter Early.....	1813-15	Alfred H. Colquitt.....	1877-82
David B. Mitchell.....	1815-17	Alexander H. Stephens.....	1882-3
William Rabun.....	1817-19	J. S. Boynton (act'g).....	1883
Matthew Talbot (act'g).....	1819	Henry D. McDaniel.....	1883-6
John Clarke.....	1819-23	John B. Gordon.....	1886-90
George M. Troup.....	1823-7	W. J. Northen.....	1890-94
John Forsyth.....	1827-9	William Y. Atkinson.....	1894-98
George R. Gilmer.....	1829-31	Allen D. Candler.....	1898-1902
Wilson Lumpkin.....	1831-5	J. M. Terrell.....	1902-
William Schley.....	1835-7		
George R. Gilmer.....	1837-9		
Charles J. McDonald.....	1839-43		

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State elections are held on the first Wed. in Oct.; congressional and presidential, Tues. after the first Mon. in Nov. For vote for president see PRESIDENT AND VICE-PRESIDENT, ELECTION OF.

Counties, Cities, and Towns.—G. was divided 1892 into 137 counties. In 1880 the most populous *counties* were: Fulton 49,137; Chatham 45,023; Richmond 34,665; Bibb 27,147; and *cities and towns*: Atlanta 37,409; Savannah 30,709; Augusta 21,891; Macon 12,749; Columbus 10,123; Athens 6,099; Rome 3,877; Milledgeville 3,800; Americus 3,625; Griffin, 3,620; and Albany, 3,216. In 1900 the leading *counties* were: Fulton, 117,363; Chatham 71,239; Richmond 53,735; Bibb, 50,473; and *cities and towns*: Atlanta 89,872; Savannah 54,244; Augusta 39,441; Macon 23,272; Columbus 17,614; Athens 10,245; Brunswick 9,081; Rome 7,291; Americus 7,674; Griffin, 6,857; Albany 4,606; and Marietta 4,446.

Population.—The population and relative rank of the state are given below.

Year.	Rank.	White.	Free colored.	Slave.	Total.
1790.....	13	52,886	398	29,264	82,548
1800.....	12	101,678	1,019	59,404	162,101
1810.....	11	145,414	1,801	105,318	258,433
1820.....	11	189,564	1,767	149,654	340,987
1830.....	10	296,806	2,484	217,533	516,823
1840.....	9	407,695	2,753	280,944	691,392
1850.....	9	521,572	2,931	381,682	906,185
1860.....	11	591,550	3,538	462,198	1,057,286
1870.....	12	638,926	545,183		1,184,109
1880.....	13	816,906	725,274		1,542,180
1900.....	12	.....	.....	.....	2,216,331

GEOR'GIA, *javr ji-a*: name formerly applied to the central portion of what is now Russian Transcaucasia (q.v.), bounded by the Caucasian Mountains on the n., and by the Armenian Mountains on the s. The Persian name is Gurgjestan, from which the name G. is probably derived; the Russian, Grusia; and the native, Iberia.

The early history of the Georgians is wrapped in fable. Alexander the Great conquered G., but after his death the country regained its independence under Pharnawas, with whom began the series of Mephé or kings of G., who, under a variety of dynasties, ruled the country almost without interruption more than 2,000 years. Toward the end of the 4th c. Christianity was introduced by St. Nina. During the reign of the Sassanian dynasty (265-787) the country was conquered by the Arabs and held, though in constant rebellion, for nearly 100 years. The most noted king of the Bagratides, Bagret III. (980-1008), extended the kingdom from Caspian to the Black Sea. In 1048 began a long series of contests with the Seljukes (q.v.), throughout which, however, G. maintained its independence. The reign of Tamar 1184-1212 was the era of the greatest extent and prosperity of the nation. Alexander I. (1413-1442) committed the fatal error of dividing the kingdom among his three sons, and from that time forward internal strife was added to the horrors of repeated Mongol devas-

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tations. At last in 1799 George XIII. resigned the crown to Alexander I. of Russia, and the history of G. merges into that of Russia.

The Georgians belong to the Kartveli stock, forming the s. group of Caucasian peoples. With the Imerians, Mingrelians, and Laz, they are accordingly of the Caucasian or Fair race (as opposed to the Mongolic or Yellow race). They are noted for their beauty, and under the Mohammedan rule, the white slaves of w. Asia and of Egypt were drawn mostly from among them and the Circassians. Their numbers are estimated at about 1,100,000.

The language of the Georgians is harsh, but regular and forcible. It has a peculiar structure, but is clearly of the Agglutinative type. With the languages of one or two allied tribes, it constitutes a group to which the name *Iberian* has been given. The Georgian literature begins with the introduction of Christianity, and consists chiefly of ecclesiastical writings, translations of the Bible, the fathers, Plato, Aristotle, and their commentators. A few heroic poems may be traced back to the time of Queen Tamar. The golden era of Georgian literature was the 17th and 18th centuries. It was unfavorable to the mental culture of the country, that, 1807, the archives and scientific works of G. were conveyed to St. Petersburg, and a thorough Russianizing is now in progress in all government schools. The chief authority on the language, literature, and history of G. is Brosset. Besides the translation of a Georgian chronicle, he published, among other works, the *Elements de la Langue Georgienne* (Paris 1837), the *Rapport sur un Voyage Archéologique dans la Georgie et dans l'Arménie, exécuté en 1847-8* (Petersburg 1850-1), *L'Histoire de la Georgie*, in Georgian and French, and *Additions et Eclaircissements à l'Histoire de la Georgie* (Petersburg 1850-57); *Wardrop's Kingdom of Georgia* (1888).

GEORGIA, GULF OF: arm of the North Pacific Ocean, between Vancouver's Island and the mainland of British Columbia. It averages 20 m. in width, is 100 m. long, receives Fraser River (q.v.), and communicates with the open ocean by Queen Charlotte's Sound in the n. and by the Strait of Fuca in the south. Its southerly entrance is about lat. 49° n. and long. 124° w.

GEORGIA, UNIVERSITY OF: at Athens; chartered 1785; organized 1801; placed under its present form of govt. 1889. It is unsectarian, and tuition is free in all its schools excepting those of law and medicine. The constituents are Franklin College (a school of liberal arts); the State College of Agriculture and the Mechanic Arts, with branches at Dahlonega, Thomasville, Milledgeville, Hamilton, and Cuthbert; Law School; Medical School; School of Technology; State Normal and Industrial College for young women; State Normal School; and four branch colleges for elementary and preparatory training. The univ. grounds proper in Athens cover an area of 37 acres, and contain the new college building, chapel, library, Moore College, gymnasium, Ivy building, Y. M. C. A. building, dormitory,

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halls of the Demosthenian and Phi Kappa literary societies, the chancellor's residence, houses occupied by several of the professors, parade ground, and athletic field. There are biological, chemical, physical, and physiological laboratories, and a natural history museum. Two miles from the chapel is the univ. farm of 65 acres, with a substantial building, Rock College. Instruction in military tactics is given by an officer detailed from the United States army. The library contains nearly 30,000 vols. In the univ. year 1901-2 there was an aggregate of 2,689 students. The various departments included the school at Athens, the medical school, the School of Technology, the Normal and Industrial College, and the branch colleges. Walter B. Hill, LL.D., was chancellor.

GEORGIA BARK: see PINCKNEYA.

GEORGIAN, a. *jawr'jĭ-ăn*: pertaining to *Georgia* in Asia, or to one of the United States so called: pertaining to the reigns of the four Georges, kings of England.

GEORGIAN BAY, *jawr'jĭ-an*: e. portion of Lake Huron, in province of Ontario, Canada, 120 m. long and 50 m. wide, shut in from the main body of the lake by the peninsula of Cabot's Head on the s., and the Manitoulin chain of islands on the n. Formerly the bay was known as Lake Manitoulin.

GEORGICS, n. *jawr'jĭks* [L. *Georgicā*, the Georgics—from Gr. *gē*, the earth; *ergon*, labor]: a poem of Virgil, the anc. Latin poet, treating of the rules for cultivating land; a poem on rural subjects. GEOR'GIC, a. *-jĭk*, relating to agriculture.

GEORGIUM-SIDUS, n. *jawr'jĭ-ŭm-sĭdŭs* [L. for *George*, used as an adjective, and L. *sĭdus*, a star]: the name of a planet, better known as Uranus or Herschel.

GEORGSWALDE, *gā'ōrgs-vāl-dé*: small town on the n. border of Bohemia, 64 m. n. of Prague. It has a mineral spring and some manufactures of linen. Pop. (1880) 6,248.

GEORHYCHUS, n. *jĕ-o-rĭ'kŭs* [Gr. *gē*, the earth; *orussō*, I dig]: typical genus of *Georhynchidæ* (mole-rats), a family of rodentia, found in Asia, Africa, and s. e. Europe, burrowing like moles.

GEORYSSUS, or GEORISSUS, *jĕ-o-rĭs'sŭs*: typical genus of the *Georyssidæ*, family of beetles, tribe *Clavicornes* (q. v.).

GEOSAURUS, n. *jĕ'ō-saw'rŭs* [Gr. *gē*, the earth; *sauros*, a lizard]: in *geol.*, a gigantic terrestrial reptile of the oolitic epoch.

GEOSCOPY, n. *jĕ-ōs'kō-pĭ* [Gr. *gē*, the earth; *skōpĕō*, I view]: a knowledge of the different kinds of earth.

GOSELENIC, a. *jĕ-o-sĕ-lĕn'ĭk* [Gr. *geō* for *gēios*, belonging to the earth; *selēnē*, the moon]: pertaining or relating to the earth and the moon, with reference to their mutual relations.

GEOSTATIC, a. *jĕ-o-stăt'ĭk* [Gr. *gē*, the earth; Eng. *static*]: term applied to a peculiar kind of arch, suited to sustain the pressure of earth.

GEOTEUTHIS—GERACE.

GEOTEUTHIS, *jē-o-tū'thīs*: genus of fossil calamaries, peculiar to the Oolitic period. The shell or horny pen is broad and truncated in front, and pointed behind, with the lateral wings shorter than the shaft. Some specimens from the Oxford clay are remarkably preserved, still showing the muscular mouth, the bases of the arms; and the ink-bag. The ink has been made into Sepia. Some of the ink-bags from the Lias are nearly 12 inches long, and are invested with a brilliant nacreous layer. More than a dozen species have been found.

GEO-THERMIC, a. *jē-o-thēr'mīk* [Gr. *ge*, the earth; Eng. *thermic*]: of or relating to the internal temperature of the earth.

GEO-THERMOMETER, n. *jē-ō-thēr-mōm'ē-tēr* [Gr. *gē*, the earth, and *thermometer*]: an instrument for measuring the earth's heat at different depths, as in wells and mines, and for ascertaining its rate of increase.

GEOTROPISM, n. *jē-ōt'rō-pīzm* [Gr. *gē*, the earth; *tropē*, a turning]: in *bot.*, the movements of leaves or flowers toward the earth; the influence of gravitation on growth.

GEOTRUPES, n. *jē-o-trō'pēs* [Gr. *gē*, the earth; *trupaō*, I bore]: in *entom.*, typical genus of *Geotrupidæ* (drone scarabs), a family of lamellicorn beetles.

GEPHYREA, n. plu. *jēf-īr'ē-ā* [Gr. *gephūra*, a mound or dike]: a class of the Anarthropoda, comprising the spoon-worms and their allies.

GEPIDÆ, *gēp'ī-dē*: ancient race of Germanic people, somewhat similar to the Goths, who lived near Vistula, on the Baltic, when first discovered in the 3d c. Afterwards they settled between the Ostrogoths on the e. and the Visigoths on the w., became subjects of Attila, regained independence under their own king on Attila's death, drove out the Huns and occupied their territory; were defeated by Theodoric, King of the Ostrogoths, 488; and were finally subjugated by Albion, King of the Lombards, 566.

GERA, *gā'rā*: town of Germany, chief place in the small principality of Reuss-Schleiz; pleasantly situated on the right bank of the White Elster, 35 m. s.s.w. of Leipsic. It is handsomely built, with broad and regular streets, and has six squares, a castle, a fine town hall, and several religious and educational institutions. There are extensive manufactures of woolen and cotton goods, also machine-making, and manufactures of soap, gloves, leather, hats, tobacco, waxcloth, ironware, stoneware, and porcelain. Ten manufactories of harmonicas employ 1,500 hands. Beer is extensively manufactured for export. The town is prospering. Pop. (1843) 11,300; (1880) 27,118; (1900) 45,634.

GERACE, *jā-rā'chā*: ancient commercial town in s. Italy, chief town of the dist. of G., province of Reggio. It occupies a beautiful and fertile situation on the upper slopes of the Apennines, about four m. from the Ionian Sea. On the destruction of the anc. town of Locri by the Saracens in the 12th c., the inhabitants, out of the ruins of

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their homes, constructed a new settlement about four m. from the site of Locri, on the sea-shore, and called it Santa Ciriace, which has since become *Gerace*. This town has suffered from repeated earthquakes, in one of which, 1783, both the cathedral and the citadel, a fortress of great strength, were reduced to ruins. In a neighboring plain are ruins supposed to occupy the site of Locri Epizephyrrii, important city of Magna Grecia, celebrated by Pindar in more than one of his odes. Coins bearing the epigraph of Locri have been found in the vicinity of the ruins, and together with the Greek character of the ruined edifices, seem to support this supposition. The modern G. is well-built, and owes its commercial prosperity to its silk factories and its trade in wine, a sweet white kind of which, known as 'Il Greco di Gerace,' has deservedly high repute. Pop. about 5,000.

GERAH, n. *gě'rǎ*: a Hebrew coin, equal to nearly three cents.

GERALD DE BARRI: see GIRALDUS CAMBRENSIS.

GERANDO, DE: see DEGERANDO, MARIE JOSEPH.

GERANIUM, n. *jě-rǎ'nĭ-ŭm* [L. *gerǎnĭŭm*; Gr. *gerǎnĭŏn*—from Gr. *gerǎnŏs*, a crane]: extensive genus of exogenous plants, type of the nat. ord. *Geraniaceæ*, the limits



a, Geranium; b, Pelargonium;
c, Herb Robert (*Geranium Robertianum*).

of which correspond with those of the Linnæan genus. Of this order is the large genus *Pelargonium* (q.v.), native of the region of the Cape of Good Hope—a genus distinguished by an irregular corolla and by a nectariferous tube running down the flower-stalk. Many species of *Pelargonium*, and many fine hybrids and varieties produced by cultivation, are seen in green-houses, and some are frequent in cottage-windows; the name geranium is still frequently given them. In some countries, as Britain, species of *Geraniaceæ* are common weeds in fields and gardens,

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with small flowers; others have large and beautiful flowers, and are among the finest ornaments of groves and meadows. Some species of *Geranium* are much cultivated in flower-gardens. The name *Geranium* [Gr. *geranos*, a crane], the popular English name *Crane's-bill*, and the German *Storchsnabel*, all refer to the beaked fruit. The *Geraniaceæ* are generally characterized by astringency; many have a disagreeable, others a pleasantly aromatic and resinous smell, some a delightful fragrance. The STINKING CRANE'S-BILL or HERB ROBERT (*Geranium Robertianum*) with a diffuse habit, deeply divided leaves, and small flowers, has been used medicinally as an astringent, and in nephritic complaints. *G. maculatum*, n. American species, with flowers of considerable beauty, is the most valuable medicinal plant of the order. Its root, called in the United States ALUM ROOT, is extremely astringent, and abounds in tannin: it is used for gargles and as a medicine in various diseases. GERANIACEÆ, n. plu. *jě-rā'nĭ-ā'sĭ-ē*, natural order of exogenous plants, consisting of herbaceous plants and shrubs, of which about 500 species are known, distributed over the whole world, and abundant particularly in s. Africa. See GERANIUM. The stems are jointed, usually tumid, and easily broken at the joints. The leaves are simple in some, divided in others, opposite, or alternate, with flower-stalks opposite to them; they have membranous stipules. The calyx consists of five persistent sepals; the corolla of five petals, which are clawed. The stamens are united by their filaments, hypogynous, twice or thrice as many as the petals. The ovary consists of five carpels around a long awl-shaped *torus* or *carpophore*, to which the styles cohere; ripening into a fruit which consists of five small one-seeded shells cohering around the base of a long beak, the indurated style of each carpel finally curling back from the base upward, and carrying the seed with it. The indurated styles are in many species extremely hygroscopic, and their twistings and untwistings seem intended to move the seed after it has fallen, until it reach a fit place for its germination.—A few *Geraniaceæ* produce edible tubers: those of *Geranium tuberosum* are eaten in s. Europe; those of *G. parviflorum* in Van Diemen's Land, where they are known as *Native Carrot*; and those of *Pelargonium triste* at the Cape of Good Hope. The leaves of *Pelargonium acetosum* and *P. peltatum* are edible, and gratefully acid. The cultivated *Geraniaceæ* are propagated by seed or by cuttings; the shrubby kinds are very easily propagated by cuttings. They require a light rich soil: a mixture of leaf-mould and sand is very suitable. They are kept low by pruning, to increase their beauty and their productiveness of flowers. GERA'NIAL, a. *-nĭ-āl*, pertaining to. GERANIN, n. *gěr'ā-nĭn*, a valuable astringent obtained from the root of one of the graniums called *crane's-bill*.

GÉRARD, *zhā-rār'*, ETIENNE-MAURICE, Comte, Marshal of France: 1773, Apr. 4—1855, Apr. 17; b. Damvilliers, in Lorraine. He enrolled as a volunteer in the second battalion of the Meuse, and served during the campaign of

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1792-3 under Dumouriez and Jourdan, and afterward accompanied Bernadotte on his embassy to Vienna, where he was the means of saving his master's life in the mêlée that ensued on his arrival. After rapid promotion, he was appointed col. 1800, Nov. 15; and 1805 aide-de-camp to his friend Bernadotte. He specially distinguished himself at Austerlitz (1805), for which he was appointed gen. of brigade; also Halle (1806), Jena (1806), Erfurt (1806), Lintz (1809), and Wagram (1809). On the morning after this last battle, he received the title Baron of the Empire. He was in the wars of the Spanish Peninsula and in the Russian campaign; and 1812 was made gen. of division. Subsequently, Napoleon named him Count of the Empire. After the first restoration, he was named Grand Cross of the Legion of Honor, and Chevalier of St. Louis, and received various honorable appointments. On the return of Napoleon from Elba, G. joined him, and commanded the fourth corps, numbering 16,000 men. At the battle of Ligny G. was opposite to the centre of the Prussian position, which covered Ligny, and was thus in the hottest of the fight. On the morning of June 18, G. was near Wavres when firing was heard in the direction of Soignies, upon which a council was called, and if G.'s advice had been taken the battle of Waterloo might perhaps have had different result. After the second restoration G. was compelled to leave France, and did not return till 1817. He was elected a member of the chamber of deputies 1822; was active in the revolution of 1830, and commanded the troops appointed to maintain order and tranquillity in Paris. In 1831 Louis Philippe appointed G. a marshal of France, and gave him command of the expedition to Belgium, in which he distinguished himself by taking Antwerp 1832, Dec. In 1835 he succeeded Marshal Mortier as grand chancellor of the Legion of Honor.

GÉRARD', FRANÇOIS PASCAL, Baron: 1770, Mar. 11—1837, Jan. 11; b. Rome: one of the first historical and portrait painters of the modern French school. At an early age he went to France, and was apprenticed to Pajou, the sculptor, in Paris. He afterward worked for some time in the studio of the painter Brenet, and in his 16th year became the pupil of David, but his artistic career was interrupted for several years by the Revolution. In 1795, he exhibited his first picture, *Belisarius*; some time afterward he painted *Psyche Receiving the First Kiss from Cupid*. He then turned his attention to portrait-painting. He gained Napoleon's favor, was loaded with honors, and received, with other commissions, that of painting the Battle of Austerlitz, perhaps the most successful of his paintings illustrating the campaigns of Napoleon. But his grandest work—for size and merit—is *Entrance of Henri Quatre into Paris*, 30 ft. wide by 15 high, glowing with life, bright with color, and accurate in costume; painted 1817. Soon afterward he was appointed first court-painter, and raised to the rank of baron by Louis XVIII. He died at Paris. G.'s most celebrated portraits are—Napoleon in his Coronation Robes, the Queen of Naples and her Children, Talleyrand, Talma, Louis Philippe, and Madame

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Récamier. Of his other pictures, the best known are *Ossian's Dream* (engraved by Godefroy), *Homer* (engraved by Massard), *Daphnis and Chloë*, *Philip V.*, *Corinna on the Promontory of Misena*, *St. Theresa Kneeling at the Altar*, *Thetis Bearing the Armor of Achilles*.

GÉRARD, JEAN IGNACE ISIDORE: see GRANDVILLE, JEAN IGNACE ISIDORE GÉRARD.

GERARD, *jê-rârd'*, JOHN: 1545–1612, Feb.; b. Nantwich, Cheshire, England: botanist and surgeon. He was educated at Willaston, spent several years in travel, settled in London to practice surgery, and was head-gardener to Lord Burghley, Queen Elizabeth's sec. of state, 1577–97. He published a catalogue of 1,039 plants cultivated in his own garden 1596, and a curious *Herball* with numerous quaint illustrations 1597. He was buried at St. Andrews, Holborn.

GERARD, *zhâ-râr'*, THE BLESSED (surnamed TUM, TUNC, TENGUE, or THOM): about 1040–1120: saint of the Rom. Cath. Church, and founder of the order of Knights Hospitallers of St. John of Jerusalem, or Knights of Malta. His birthplace is variously given as Martigues in Provence, and the Château d'Avesnes in Hainault, and his occupation as soldier and as merchant. He went to Jerusalem toward the end of the 11th c., became guardian of the hospice there about 1100, and organized the religious order of St. John, to which Pascal II. gave the papal recognition 1113 in a bull, which Calixtus II. renewed and confirmed 1120. G. built hospitals in the chief maritime towns of w. Europe for the accommodation of pilgrims, and these subsequently became commanderies of the order.

GERARDIA, n. *jêr-ârd'î-a* [named from John Gerard (q.v.)]: typical genus of *Gerardiæ*, a tribe of *Scrophulariaceæ*, sub-order *Rhinanthideæ*.

GERASA, *gêr'a sa* or *jêr'a-sa*: in the time of the Romans, city of Palestine, on the e. borders of Peræa; among the mountains of Gilead, about 20 m. e. of the Jordan, 25 m. n. of Rabbath-Ammon. It attained prosperity under the Antonines A.D. 138–180. On the rise of Christianity it became the seat of a bishopric, but subsequently sank into decay. G. is now notable only for its ruins, said to be the most beautiful and extensive in Palestine e. of the Jordan. It still preserves its original outlines; great portions of the surrounding wall are in good preservation; three of the gateways are almost perfect, and within the city more than 230 columns are standing on their pedestals.

GERBA, *jêr'ba*, or GERBI, or JERBA, *jêr'ba* (Meninx of Strabo and Pliny; Ger. *Dscherba*): island on the n. coast of Africa belonging to the state of Tunis; in the Gulf of Gabes; separated by a strait from a headland on the shore. It is about 20 m. long and 12 m. broad; contains abt. 425 sq. m.; and is fertile and populous. Shawls of brilliant colors, beautiful silk and woolen fabrics of finest texture, bournous and blankets, are manufactured. This island contains a triumphal arch in honor of Antoninus and Verus; a pyramid 25 to 30 ft. in height, built of the skulls of the Spanish

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soldiers who fell here in the 16th c. in a disastrous battle with the Turks, was removed 1837. Pop. 30,000.

GERBERT: see SILVESTER II.

GERBERT, *gër'bert*, MARTIN: 1720, Aug. 12—1793, May 3; b. Horb, Württemberg: Rom. Cath. abbot and writer on church music. He was educated at Freiburg, at Klingenuau, Switzerland, and at the monastery of St. Blaise in the Black Forest, joined the Benedictine order 1736, was ordained priest 1744, and, after serving nearly 20 years as prof. of theol. at St. Blaise's monastery, became abbot 1764. While holding his professorship he visited the oldest monasteries in Germany, Italy, and France, to study their collections of musical literature, and while abbot published *De cantu et musica sacra*, 2 vols. (1774); *Monumenta veteris liturgiæ Alemannicæ* (1777); *Scriptores ecclesiastici de musica sacra*, 3 vols. (1784); beside *Codex epistolaris Rudolphi I.* (1772), and *Historia Nigræ Silvæ* (1783-88).

GERBIL, *jër'bil*: rodent of the rat species; native of Asia, Africa and e. Europe, beautiful fawn in color, nocturnal and active in movement, living in deep burrows in which it stores large quantities of grain. It is very offensive in odor.

GERBOA, or GERBUA: see JERBOA.

GERDA: see PLANETOIDS.

GERFALCON and GYRFALCON, n. *jër'faw-lcn* [OF. *ger-fault*; mid. L. *gerofalco*—from *gyrus*, a circle; *falco*, a falcon: Ger. *geierfalk*]: a large and fierce species of falcon of a white color—so named from its circling flight.

GERGESA: see GADARA.

GERHARD, *gër'hârt*, JOHANN: 1582, Oct. 17—1637, Aug. 20; b. Quedlinburg, Saxony: theologian. He was educated in the universities of Wittenberg, Marburg, and Jena, took a full medical course, studied theology 1603, graduated at the Univ. of Jena 1604, became master of Heldburg Gymnasium 1606, and soon afterward gen. (ecclesiastical) supt. of the duchy of Coburg. In the last capacity he was actively engaged in the work of ecclesiastical organization till 1616, when he accepted the tender of the senior theol. chair in the Univ. of Jena, which he held till death. In his own day he was regarded as the greatest living theologian of Protestant Germany, his advice was widely sought on important questions, and he received flattering offers for his services from nearly every univ. in Germany, as well as from that of Upsala, Sweden. His writings in exegetical, polemical, dogmatic, and practical theol. are very numerous.

GERHARDT, *gër'hârt*, F. *zhâ-râr'*, KARL FRIEDRICH: 1816, Aug. 21—1856, Aug. 19; b. Strasburg: eminent chemist. At the age of 15 he was sent to the Polytechnic School of Carlsruhe, where his attendance at Prof. Walchner's lectures awaked in his mind a taste for chemistry. After two years residence in Carlsruhe he removed to Leipsic where he attended the lectures of Erdmann, which seem to have developed in him a passion for speculative chemistry.

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In 1838 he arrived in Paris, where he was welcomed by Dumas, and gave lectures and instructions in chemistry, and, with Chevreul's permission, worked in the laboratory of the Jardin des Plantes, where, with his friend Cahours, he commenced his important researches on the essential oils. In 1844 he was appointed prof. of general chemistry in the Faculty of Sciences at Montpellier, and in the same year he married the youngest daughter of Dr. James Sanders of Edinburgh. About this time he published his *Précis de Chimie Organique*, in which he sketches the idea of 'Homologous and Heterologous Series' (q.v.), which at a later period he so successfully developed. In 1845, with Laurent, he commenced the *Comptes rendus des Travaux de Chimie publiés en France et à l'Étranger*, which were continued till 1848. In 1848, he resigned his chair and returned to Paris, to follow his special investigations; and in that city he established in successive memoirs (1849-55) his views of series (above adverted to) and the theory of types, with which his name will be ever associated in the history of chemistry. It was there, also, that he gave to the scientific world his remarkable researches upon the anhydrous acids and the oxides. All his ideas and discoveries are embodied in his *Traité de Chimie Organique* (1853-56, 4 vols.), which forms, to use the words of his friend and biographer Cahours, 'an important monument of modern science.' He had hardly completed the correction of the last proof of this great work, when, after an illness of only two days, he was surprised by death. He had just received the diploma of corresponding member of the Acad. of Sciences at Paris, and had been appointed prof. of chemistry at Strasburg. See GERHARDT'S NOTATION.

GERHARDT, PAUL: 1607, Mar. 12—1676, June 7; b. Gräfenhainchen, near Wittenberg; theologian and hymnologist. Little is known of his early life excepting that he studied for the ministry, became tutor in an advocate's family in Berlin, and received his first appointment at Mittelwald, 1651. In 1657 he became deacon in the church of St. Nicholas in Berlin, warmly espoused Lutheranism, and for this, as well as for his refusal to accept the syncretistic edict of 1664—which forbade either party to revile the other in the pulpit or charge it with heresy—he was deprived of his office, 1666. On the petition of citizens he was restored to the diaconate 1667, Jan., but his conscience forced him to resign it within a month, and after living a year in Berlin unemployed he was appointed archdeacon of Lübben, in Saxe-Merseburg, where he preached till his death. Next to Luther he ranks as the best German hymn writer, and many of his compositions are now sung throughout the world in the form of John Wesley's translations.

GERHARDT'S NOTATION, in Chemical Science. On certain theoretical grounds, Karl Friedrich Gerhardt (q.v.) doubled the numbers that had been current expressing the atomic weights of certain of the chemical elements—oxygen, carbon, sulphur, selenium, and tellurium; the other numbers remaining unaltered. The following table shows the earlier system and Gerhardt's numbers:

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	Old Equivalent.	Gerhardt's Equivalent.
O,	8	16
C,	6	12
S,	16	32
Se,	39·75	79·5
Te,	64·5	129

The examination of a few formulæ will enable the student to translate from one system into the other:

Compounds.	Old Formulæ.	Gerhardt's Formulæ.
Water,	HO	<i>H₂O</i>
Potash,	KO	<i>K₂O</i>
Hydrate of Potash,	KO,HO	<i>KHO</i>
Hydrated Nitric Acid,	HO,NO ₅	<i>NO₃H</i>
Hydrated Sulphuric Acid,	HO,SO ₃	<i>SO₄H₂</i>
Hydrated Acetic Acid,	HO,C ₄ H ₃ O ₃	<i>C₂H₄O₂</i>
Alcohol,	HO,C ₄ H ₅ O	<i>C₂H₆O</i>

In Gerhardt's formulæ the symbols whose equivalents are changed are printed above in italics. Each system of notation seemed to have its advantages; and at first British chemists generally adhered to the old: the new system is now generally adopted. The general principle on which it is grounded is, 'that the atomic weights of an element and of its combinations should be selected so as to express the entire series of combinations by the simplest series of formulæ; so as best to accord with the chemical properties and metamorphoses of the bodies; so as best to illustrate their analogies with other bodies; and so as to be in relation with their physical properties, such as their specific volumes, specific heats, isomorphism, etc.'

GERHART, EMANUEL VOGEL, D.D.: clergyman: 1817, June 17— ———; b. Freeburg, Penn.: noted theologian of the Ger. Ref. Ch. He was graduated at Marshall Coll. 1838; was pres. of Heidelberg Coll., Tiffin, O., 1851-55, of Franklin and Marshall Coll. 1855-66, and in 1868 became prof. of systematic theol. in the seminary at Lancaster, Penn. For several years he was editor of the *Mercersburg Review*. He has contributed prolifically to the religious literature of the period. Among his publications are *Philosophy and Logic* (1858); *The Reformed Church* (1863); *The Child's Heidelberg Catechism* (1882); and *Institutes of the Christian Religion* (1891).

GERICAULT, *zhâ-re-kô'*, JEAN LOUIS ANDRÉ THÉODORE: 1790-1824, Jan. 18; b. Rouen, France: painter. He studied painting with Carle Vernet 1808-10, then with Guérin, and 1816-19 in Rome. Early in his career he showed a strong passion for Rubens, and while yet a student exhibited his *Officier de Chasseurs à Cheval*, which attracted wide attention by its picturesque fidelity, in the Paris Salon. Two years later, 1814, this work was again placed on exhibition, and beside it a realistic counterpart, *Cuirassier blessé*. Both pictures were bought for the Louvre. His enthusiasm in military subjects led him to enter the army for the Hundred Days' campaign, after which he

went to Rome. While there, he painted his great picture, *Course des Chevaux Libres*, and, on his return to Paris, exhibited his *Radeau de la Méduse*, which excited considerable hostile criticism. He spent two years in London with this painting, and there produced a large number of lithographs, returning to Paris 1822, and indulging in excesses that caused his death.

GERIZIM, *gēr'î-zîm*, AND EBAL, *ē'bal*: two hills noted in Scripture story; separated by a narrow valley about 200 yards wide, in which stands the town of Nâbulus, the ancient Shechem or Sychar, metropolis of the Samaritan sect. They are nearly equal in height, not exceeding 700 or 800 ft. above the valley, which, however, is itself 1,800 ft. above the sea. The view from the top of Mount G., the southern hill, is said to be among the finest in Palestine, embracing glimpses of the blue Mediterranean on the w., the snow-capped heights of Hermon on the n., and on the e. the wall of the Trans-Jordanic mountains, broken by the deep cleft of the brook Jabbok.

In the Samaritan tradition, Mt. Gerizim was the scene of Abraham's offering of Isaac. This is contrary to the ancient and consistent Hebrew tradition, and to the belief that has been general among Biblical scholars, with the exception of a few eminent names—that Mt. Moriah, on which Solomon afterward built the Temple, was the place also of Abraham's offering. With Mt. Ebal, it was the scene of a grand and impressive ceremony, in which the whole people of Israel took part after crossing the Jordan, in obedience to a command of Moses. Half of the tribes stood upon the declivities of one hill; the rest occupied the sides of the other, while, in the valley between, the Levites, surrounding the sacred ark, pronounced, 'with loud voice,' the blessings affixed to the performance of the law, and the curses affixed to the neglect of it. (Deut. xi. 26-30; Josh. vii. 30-35.) According to the Mishna, their manner of procedure was as follows: They first turned toward Gerizim, and pronounced the blessing, whereupon the vast host that thronged the ascent of that hill rolled back their multitudinous 'Amen;' then turning toward Ebal, they uttered the corresponding malediction, to which the tribes there stationed responded in deep and solemn tones. In this way, alternating blessing and curse, they went through the whole series. The more full prescription for the ceremony, in Deut. xxvii., gives only the curses—the customary explanation of which fact is that probably these were merely the reverse form of the blessings, and may have been selected by the writer of the book on account of the greater awe inspired among a rude people by a malediction, than a benediction. At a later period, the Samaritans, by permission of Alexander the Great, built a temple on Mt. Gerizim, as a rival to that of Jerusalem, and organized a rival priesthood. And though this temple was destroyed by Hyrcanus about 200 years afterward, the mountain on which it stood continued to be held sacred by the Samaritans. It was to Mt. Gerizim that the 'woman of Samaria' referred when she said to our

Savior: 'Our fathers worshipped in *this* mountain, and ye say that in Jerusalem is the place where men ought to worship' (Jno. iv. 20). Subsequently, a Christian church in honor of the Virgin was built on it, which Justinian surrounded with a strong wall to protect it against the assaults of the Samaritans, who were even then a powerful and important sect. The ruins of this wall are still visible.

GERKI, *ghër'kê*: town of Africa, in the Súdán, district of Sokoto; lat. 12° 26' n., and long. 9° 10' e. It is surrounded by a wall surmounted with pinnacles. Its inhabitants are notorious for thievish propensities, and for their aversion to agriculture, and indeed to any form of industry. Pop. estimated 15,000.

GERLACH, *gër'lách*, ERNST LUDWIG VON: 1795, Mar. 7—1877, Feb. 18; b. Berlin: publicist. He was active in the politico-religious movement in Germany from an early age; wielded great influence as a journalist for many years; was a member of the first Prussian chamber, 1849, and of the Urfurt parliament, 1850, was conspicuous as an opponent of the reactionary movement, 1851; held important civil offices 1865-73; and 1874 published a pamphlet in opposition to the govt. for which he was prosecuted, heavily fined, and dismissed from public service.

GERLACHE, *zhër-lásh'*, ETIENNE CONSTANTIN, Baron DE: 1785, Dec. 26--1871; b. in the province of Luxemburg, Belgium. In 1824, he was elected deputy from the province of Liege, to the second chamber of the 'States General,' supporting the Rom. Cath. party, of which he was considered a leader. At the time of the Revolution, G. presided over the committee appointed to revise the constitution, and was head of the deputation sent to offer the crown to Prince Leopold of Saxe-Coburg. In 1831, he became pres. of congress, and in that capacity received the oath exacted from the king by the constitution, and the following year was appointed first pres. of the 'Court of Cassation.' In 1843, the king conferred on him the title of baron. In 1867, he retired from his office and from politics. G. had a literary reputation. His most important works are: *Mémoires sur les Changements à apporter aux Tarifs du Royaume* (1821-24); *Histoire du Royaume des Pays-Bas* (1839).

GERM, n. *jër'm* [F. *germe*—from L. *germen*, the bud of a tree, a young twig; It. *germine*]: that from which anything springs; origin; first principle; a bud or shoot (see EMBRYO). GERM-CELLS, the cells which contain active germinal matter or protoplasm and a nucleus or kernel. GERM-MASS, the materials prepared for the future formation of the embryo. GERM THEORY: see below. GERMEN, n. *jër'mën*, in bot., old name for the ovary (see below). GERMINATE, v. *jër'mĭ-năt* [L. *germinātus*, sprouted forth, germinated]: to bud or sprout; to begin to grow; to vegetate; to cause to sprout. GERMINATING, imp.: ADJ. sprouting or vegetating. GERMINATED, pp. GERMINAL, a. *-mĭ-năl* [F.—L.]: pertaining to a germ. GERMINANT, a. *-nănt*, sprouting; germinating. GERMINATION, n.

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-nā'shŭn [F.—L]: the act of sprouting; the time of vegetating; the first appearance of vegetation or of growth of a new plant from seed that has been planted (see SEED: and as regards acotyledonous plants, SPORE). GERMINAL VESICLE, in *bot.* and *zool.*, a cell contained in the embryo-sac, from which the embryo is developed; the small vesicular body within the ovum or the yelk of the egg; the nucleus of the ovum.

GERMAN, a. *jēr'mǎn*, also GERMANE and GERMAIN, a. *jēr'mǎn* [L. *germānūs*, sprung from the same stock; F. *germain*, german: It. *germano*, true, natural, a brother]: of the first degree of relationship; of the same stock; nearly allied; natural (the term has no relation to German—Teutonic). COUSINS-GERMAN, the sons or daughters of brothers or sisters; cousins having the same grandfather. *Note.*—In *general use*, GERMAN is applied to cousins; and GERMANE to affairs, as, 'it is not at all germane to the subject.'

GERMAN, n. *jēr'mǎn*: a native of *Germany*; also the language. GER'MANISM, n. *-izm*, an idiom of the German language. GERMAN'IC, a. *-ik*, pertaining to Germany.

GERMAN, SAN, *sán chěr-mán'*: town in the s.w. of the Spanish islands of Porto Rico; lat. 18° 10' n., long. 67° west. It is about 10 m. from the sea, in the centre of a district productive in cotton, coffee, and cattle. Pop. estimated 9,125.

GERMAN BARM: see YEAST.

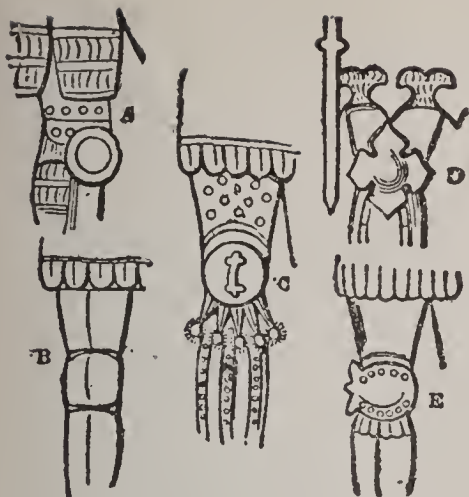
GERMAN CATHOLICS.

GERMAN CATHOLICS: religious sect which in recent years in Germany has come out from the Rom. Cath. Church. Though retaining the designation Catholic—i. e., universal—they form independent congregations, and commonly style themselves Catholic Apostolic Christians. So far as their general refusal of the Roman obedience is concerned, the G. C. stand on Prot. ground; but neither in theory nor in practice are they evangelical Protestants, nor do they wish to be accounted such.

Whatever might be the deeper causes of the schism, the immediate occasion of it was the exhibition of the Holy Coat at Treves. In 1844, Bp. Arnoldi appointed a special pilgrimage and service to this relic, to be preceded by confession and remission of sins. This proceeding called forth a protest from Johann Ronge (pronounced Rongé, the *g* hard), Rom. Cath. priest in Silesia, who, having quarrelled with the authorities of his church, had been suspended from his office, and was living in retirement. Ronge addressed a public letter to Bp. Arnoldi, 1844, Oct. 1, in which he characterized the exhibition of the coat as idolatry. Ronge's voice found response in the minds of many Rom. Catholics; and a congregation of his adherents was formed at Breslau about the beginning of 1845.

A short time previous to the publication of this letter, Johann Czerski, a priest at Schneidemühl, in Posen, who also had come into collision with the authorities of his church, had seceded, and was about to form a 'Catholic Apostolic Christian' congregation. Czerski and Ronge were naturally drawn into confederacy. Ronge at last addressed an appeal to the lower orders of the priesthood, calling upon them to use their influence in the pulpit and everywhere to break the power of the court of Rome and priestcraft in general, throughout Germany; to set up a national German Church independent of Rome, and governed by councils and synods; to abolish auricular confession, the Latin mass, and the celibacy of the priests; and to aim at liberty of conscience for all Christians, and perfect freedom for the religious education of children.

A congregation of Czerski's followers had been formed at Schneidemühl, with a doctrinal symbol differing little from that of Rome. The Holy Scriptures and the Nicene Creed were held to be the only standards of Christian faith, and were to be understood in the sense patent to every enlightened and pious Christian. Nothing was said against the worship of saints and relics, pilgrimages, confession, etc. This Confession of Schneidemühl served many other congregations as a groundwork, though some of them modified it in various ways. The new sect quickly increased. At the beginning of 1845, more than a hundred congregations were in existence. The congregation formed at Breslau under Ronge completely departed from the doctrine and ritual of the Rom. Cath. Church. The Scripture was declared the only rule of Christian faith, and no external authority was to be allowed to interfere with the free interpretation of it. The essentials of belief were restricted to a few doctrines: belief in God as the Creator



Crested Gentian (*Gentiana septemfida*).

Genouillères.—A, Plain knee-boss or knee-piece (1325); B, From the monument of the Black Prince, in Canterbury Cathedral (in this case the armor of complete plate has been attained, and here the genouillères have articulations above and below); C, From monumental brass of Thos. Cheyne, Esq. (1368), at Drayton Beauchamp, Bucks; D, From the tomb of Hartmann von Kronberg (1379), at Kronberg; E, From statue of a knight of the De Salney family, in the church of Newton-Sulney, Derbyshire (here the material of the cuissard passes beneath the boss, terminating in an escallop).



The George of the Order of the Garter.



Herb Robert (*Geranium robertianum*).

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and Governor of the world, and the Father of all men; in Christ as the Savior, in the Holy Spirit, the holy Christian Church, the forgiveness of sins, and eternal life. Baptism and the Lord's Supper were held to be the only sacraments. Confirmation was retained, but most of the Roman rites and practices were given up.

The need of something like concert being felt, the first council of German Catholics was held at Leipsic 1845, Mar. 22, attended by delegates from 27 congregations, others signifying their willingness to abide by the decisions that might be come to. Only two or three of the delegates were in clerical orders. With the idea that a Christian church could be founded only on a doctrinal system, the principles of the Breslau Confession were mostly adopted. The interpretation of Scripture, the only source of Christian belief, was left to the free exercise of reason, pervaded and actuated by the 'Christian idea.' Forms of worship were to be adapted to the requirements of time and place. In church government, the council declared for a presbyterial and synodal constitution. The congregations were to have the free election of their clergy and eldership. But Czerski refused to sign the doctrinal symbol of the Leipsic council, declaring that it ignored the divinity of Christ: his congregation held to their original name, 'Catholic Apostolic Christians.'

The German Cath. congregations increased, numbering in Germany 173 in 1846, June. Some leading Rom. Catholics, professors, and others, joined the movement; and learned Protestants, like Gervinus, looked upon it as a momentous event in the history of Germany. Individual Protestant clergymen went over to the body; and all those Protestants who, from dissatisfaction with the state church, had formed what are called 'free' or independent congregations, entered more or less into relations with it. The local boards and magistracy also showed favor to the cause, and often supported it by granting the use of Protestant churches, and even funds. But German Catholicism was destined soon to find enemies both within and without. Orthodox Catholics, even when doubtful as to Rome, were more distrustful as to the essential Christianity of the new system; and conservative Protestantism began to suspect it as an undermining of religion in general, and dangerous to the welfare of 'church and state.' And as the movement fell in with the liberal tendencies of the times in general, the governments took the alarm, and set themselves to check its spread. Saxony took the lead, and Prussia soon followed, in imposing vexatious, and even tyrannical restrictions upon the 'Dissidents,' as they were styled by the authorities. In Baden, they were even denied the rights of burghers, while Austria, then pre-eminent in religious bigotry, sent them out of her territories,

Internal disagreements even more than state persecutions, checked the prosperity of German Catholicism, as was indicated in the wide discrepancy between the views of Czerski and those of Ronge. Czerski and his adherents held closely by the doctrines and ritual of Rome, and issued

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successive symbols more and more definite in doctrine. Ronge's party made equal approach to the Rationalists, and, leaving the province of religion altogether, occupied themselves with free-thinking theories and democratical politics. This led to numerous disagreements between congregations and clergymen, and checked the spread of the movement. When the second council was held in Berlin 1847, the interest had greatly declined.

When the storm of 1848 burst, the German Catholics had free space for their exertions, which took mostly a political direction. Ronge was active in travelling and preaching, and though his free-thinking and political tendencies were repudiated by numbers of the body they predominated in many places, and found expression in a series of publications, among others, in Rau's *Catechism of the Christian Religion of Reason*, and Schell's *Book of Religion*. After the political reaction set in, strong measures were taken against the German Catholics. The early enthusiasm of the movement had passed, and after the dissolution of the Frankfurt parliament, Ronge retired to London. In 1850 a conference was held at Köthen between the German Catholics and the 'Free Congregations' (*Freie Gemeinden*), an association of free-thinking congregations which had been gradually forming since 1844 by secession from the Protestant Church. The immediate issue was a close confederation of the two bodies, followed 1859 by an incorporative union of German Catholics and Free Congregations under the name *Association of Free-Religious Congregations*. At this time the whole number of the congregations in the united body was 104; they received few subsequent additions, and are in a very unprosperous condition. See Kampe's *Geschichte des Deutsch-Katholicismus*.—See OLD CATHOLICS: DÖLLINGER.

GERMANDER, n. *jēr-män'dēr* [F. *germandrée*—from It. *catamandrea*], (*Teucrium*): genus of plants of nat. ord. *Labiatae*, having the calyx tubular, 5-toothed and sometimes 2-tipped; the corolla with the upper lip very short and bipartite, the lower lip spreading and trifid; the stamens much exerted. The species are numerous and very widely distributed. The COMMON G. or WALL G. (*T. chamædrys*), found on ruined walls, is probably from s. Europe. It is a small, almost shrubby, perennial; with wedge-shaped ovate inciso-serrate leaves, and whorls of about three large reddish purple flowers. It is bitter, somewhat aromatic, and was formerly much used in medicine, particularly as a principal ingredient in a famous gout medicine called *Portland Powder*.—Similar medicinal virtues were ascribed to *T. Botrys*, a small annual species common on dry hills in Germany; with aromatic fragrance and yellow flowers. WOOD G. or WOOD SAGE (*T. scorodonia*) is a common British plant, growing in dry bushy or rocky places, with oblong-ovate very much wrinkled leaves, and one-sided racemes of yellowish-white flowers. It is very bitter, slightly aromatic, and is used in the island of Jersey instead of hops.—WATER G. (*T. scordium*), growing in wet meadows, has a smell resembling that of garlic: it had formerly a great

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reputation in medicine.—CAT THYME (*T. Marum*), native of s. Europe, abounds in a pungent volatile oil, has a camphor-like smell, and—like catmint and valerian root—has great attractiveness for cats. It is often used as a sternuta-



Wood Germander, or Wood Sage (*Teucrium scordiana*):
a, corolla; b, calyx, with pistil.

tory; and its powder snuffed into the nose has proved beneficial in cases of polypus.—A species found in Cochin. China (*T. thea*) is used there in infusion as tea. *G. speedwell* is a species of Veronica.

GERMANE, a. jér'mān: nearly related: see GERMAN.

GERMAN EVANGELICAL SYNOD OF NORTH AMERICA: ecclesiastical body constituted 1840, Oct. 15, at Gravois Settlement, near St. Louis, Mo., by six German ministers—at first under the name Evangelical Church Association of the West, which in 1860 was changed to German Evangelical Synod of the West, and in 1877 to its present name. The following declaration of faith was adopted by the founders, and still serves as its confessional basis: ‘The G. E. S. of N. A. as a part of the Evangelical Church means by the term Evangelical Church *that* church community which acknowledges the Holy Scriptures of the Old and New Testament as the word of God and as the only and infallible standard of Christian doctrines and precepts, and accepts as its confession *that* interpretation of the Holy Scriptures which is laid down in the symbolic books of the Lutheran and Reformed churches, among which the Augsburg confession, Luther’s small catechism and the Heidelberg catechism are the principal ones, *as far as they agree*; but in points of difference the G. E. S. adhere solely to the passages of Holy Scripture alluding to them, observing that liberty of conscience existing in the Evangelical Church.’ According to this confession of faith the G. E. S. accepts as its doctrine the *consensus fidei* of the Lutheran and Reformed churches, confesses with the church of the Reformation God as the Almighty Creator of heaven and earth, the doctrine of the fall of man, of original sin, of redemption through the atoning blood of Christ, and the Christology as the same was formed by the ecumenical councils of the first centuries. Thus the G. E. S. establishes a union between the Lutheran and Reformed churches similar to that which is in existence with few exceptions in the churches of the different states of Germany. As is well known, the two branches of the church of the Reformation agree in all fundamental doctrines of Christian life and faith, and on all subjects and facts found clearly stated in the Holy Scriptures which are necessary for our salvation. The controversy centres especially around the doctrine of the Holy Supper. The G. E. S. believes that in the Lord’s Supper the faithful and penitent communicant receives under the bread and wine the body and blood of Christ; but it leaves unanswered the question how this is done, since on that question the Scriptures furnish us with no answer.

Every congregation binds itself voluntarily to the doctrines and precepts as laid down in the statutes of the G. E. S. when it joins this body; but every congregation retains independence in the management of its own affairs. A number of congregations within certain geographical boundaries constitute a ‘district,’ whose ministers and lay delegates meet annually in district conference. Of these districts there are (in 1896) 17. All the districts together are represented by the ‘general synod,’ which is composed of one out of every 9 ministers and 1

lay delegate for every 9 congregations, elected at district conferences. It convenes every 3 years. The general synod has exclusive control of the management of those institutions which are not the sole property of any one district, but receive support from all parts of the synod, e.g., seminaries, foreign and home missions, support of invalid pastors and teachers, provision for pastors' widows and orphans, the publishing house, etc.

The theological seminary, founded 1850 at Marthasville, Mo., removed in 1883 to St. Louis, Mo., has (1896) 3 professors and 60 students, the course of study being 3 years. At Elmhurst, Ill., is located the preparatory college for students purposing to enter the theological seminary. It was founded in 1871, has 130 students taught by 8 professors, the course of study being 5 years. At this institution the teachers of the parochial schools also receive their education.

In 1883 a mission society in New York city, whose members were pastors and congregations of various denominations, offered their mission in India to the G. E. S., which offer was accepted. At present there are 4 central stations with a large number of affiliated stations, 7 missionaries, 51 native preachers and assistants. More than \$10,000 are annually contributed and expended for this work. Home mission work, consisting of organization of congregations, aiding weak congregations, and supplying them with pastors at the expense of the synod, has from the beginning been vigorously pursued and has been eminently successful. In 1895 \$18,000 was expended in this work. A harbor mission at Baltimore, Md., for the benefit of emigrants, has for the last ten years done much good.—There are orphanages at Lincoln, Neb., Hoyleton, Ill.; St. Louis, Mo., Detroit, Mich., and Bensenville, Ill. (the two last named in connection with a home for old people), all controlled by the G. E. S.; also deaconess homes at St. Louis, Mo., Cincinnati and Dayton, O., Evansville, Ind., and Lincoln, Neb. The book concern and publishing house (Eden Publishing House) is at St. Louis, Mo., books used in churches and schools, such as hymnals, pastors' manuals, catechisms, Sunday-school supplies, Bible history, etc., are here published; also the periodicals published by the G. E. S. The official organ is the *Friedensbote* (circulation 23,000); there are also 7 other papers. A mutual fire insurance for churches and church property has since 1893 been successfully introduced.

Statistics (1902): Districts 17; ministers 940; congregations 1,179; members 209,156; baptisms (1895) 28,625; confirmed 9,961; communicants 185,203; deaths 9,696; marriage 6,220; Sunday schools 900; Sunday-school scholars 81,091; parochial schools 406; scholars 17,730; benevolent contributions (1895) \$80,000; value of church property \$5,500,000. President of General Synod, the Rev. J. Zimmermann, West Burlington, Iowa.

GERMANIA.

GERMANIA, *jér-mā'nî-a*: general name under which the Romans designated, not only a great part of modern Germany, but also a portion of Belgium and the n. and n.e. districts of Gaul; the last two being especially characterized as 'Germania Prima' and 'Secunda,' while Germany proper was called 'Germania Magna,' 'Germania Trans-Rhenana,' or 'Germania Barbara.' The boundaries of the region comprehended under these designations were: On the w., the Rhine and Celtic Gaul; on the e., the Vistula and the Carpathian Mountains; on the s., the Danube; and on the n., the sea, which was divided by the Cimbrian Chersonesus (Jutland) into the German and the Suevic (Baltic) seas. The first occurrence known in connection with the history of the people of G. was the appearance of warlike tribes of Cimbri and Teutones in the present Steiermark or Stiria, where they defeated the Roman consul Papirius, B.C. 113. Eleven years later, they again came into collision with the Roman arms, but the result was their signal defeat by Marius. The names Germani and Germania do not seem to have been appellations in use among the people themselves; and it is probable that the Romans borrowed them from the Gauls or Celts, in whose language the word 'gairm,' a loud cry (like the Homeric *boèn agathōs*, 'good at the war-shout'), may possibly have served to designate this people, whose habit it was to accompany their attack on an enemy by loud cries. The Tungri were the first German people that crossed the Rhine, but other tribes soon followed; and when Julius Cæsar opened his Gallic campaigns (B.C. 58), he found the Germanic nations of the Triboci, Nemetes, and Vangiones in possession of the districts between the left bank of the Rhine and the Vosges, while he even encountered a rival pretender to the supremacy of Gaul, in the person of Ariovistus, leader of the Suevic tribe of the Marcomanni. All these tribes were finally reduced to subjection, with the rest of Gaul, while the Tencteri and Usipetes, who had invaded Belgium, were driven, together with the Sicambri, across the Rhine to their former settlements by the victorious general, who for the first time (B.C. 35) led a Roman army into Trans-Rhenic Germany. The quiet which Cæsar's victories had secured in the Rhenish districts was again so seriously disturbed by the Usipetes and several neighboring tribes B. C. 16, that Augustus, who had hastened to Gaul on the outbreak of disturbances, saw that stringent measures must be adopted to keep the Germans in check, and sent Drusus, at the head of eight legions, into Germany. The first step of the Roman general was to dig a canal ('fossa Drusiana') from the Rhine to the Yssel, by which the Roman galleys could sail from the heart of the continent to the ocean; and so successful were his measures, that in the course of four campaigns he had carried the Roman arms as far as the Albis (Elbe), subdued the Frisii, Batavi, and Chauci in the n., and defeated the Catti of the Moenus (Maine) districts. Drusus (d. B.C. 9) began the series of forts, bridges, and roads which were completed and extended under succeeding commanders. The attempt made by Varus, under the

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direction of Augustus, to introduce the Roman provincial forms of administration into Germany, brought, however, a sudden check to the advance and consolidation of Roman power; for the tribes of central Germany, indignant at this attempted subversion of their national institutions, ranged themselves under the leadership of Arminius, a chief of the Cherusci, who organized a general revolt. The result was the destruction, at the *Salus Teutobergensis*, of the three legions commanded by Varus, and the subsequent loss of all the Roman possessions between the Weser and the Rhine. The news of this disastrous event threw the city of Rome into consternation. Germanicus, who was sent forth A.D. 14 to restore the Roman supremacy, would probably have again wholly subjugated the Germanic tribes had he not been recalled by Tiberius in the midst of his victories. From this time, the Romans ceased their attempts to conquer Germany, and contented themselves with repelling the incursions of the tribes on their frontiers, and endeavoring by their influence to foster the intestine disturbances which were perpetually generated through the ambition and jealousy of rival leaders, such as Arminius, Marbodius, and the Goth Catualda. After the murder of Arminius, by his own people, the power of the Cherusci declined, while the Longobardi and Catti began to assert a recognized preponderance among the neighboring tribes. Occasional encounters took place between the people of central Germany and the legions who guarded the well-protected Roman boundary-line, which extended from the Rhine to the Taunus, and thence to the Danube; and from time to time the Batavi and other warlike tribes of the n. and n.w., who, like them, had been brought into partial dependence on the Romans, rose in formidable insurrection. But after Trajan had restored order and strengthened the forts, peace remained undisturbed in the n. till the beginning of the 3d c., while, with the exception of the sanguinary war of the Marcomanni and Quadi, under Aurelius Antoninus, A.D. 166, there was a similar absence of hostilities in the south. But with the 3d c. the tide of war turned, and the Romans were compelled to defend their own empire from the inroads of the numerous Germanic tribes, foremost among whom were the powerful confederacies of the Alemanni and Franks. In their track followed, during the next two centuries, successive hordes of the Vandals, Suevi, Heruli, Goths, and Longobards, who soon formed for themselves states and principalities on the ruins of the old Roman provinces. From this period till the establishment of the western empire in the person of Charlemagne, the history of Germany is a blank; but the condition of the country when he entered on his German patrimony showed that since the retirement of the Romans the smaller tribes had become gradually absorbed in the larger, for on his accession the land was held by a few great nations only, as, the Saxons, Frisians, Franks, Suabians, and Bavarians, whose leaders exercised sovereign power within their own territories, and in return, for military services, parcelled out their lands to their followers.

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The knowledge which we possess of the habits and government of the ancient Germans is derived principally from the Commentaries of Cæsar and the 'Germania' of Tacitus; and imperfect as these sources of information are, they are far less contradictory than the subsequent records of the earliest Christian times. According to the Roman historians, the Germans were a people of high stature, fair complexion, and red or yellow hair, endowed with great bodily strength, and distinguished for an indomitable love of liberty. The men delighted in active exercise and the perils of war; and the women, whose chastity was without reproach, were held in high esteem. Each master of a family had absolute power over those of his household. Their habitations were generally separate, and surrounded by their several stalls and garners; for though there were villages whose inhabitants made common use of the fields and woods surrounding them, the Germans seem to have preferred isolated and detached dwellings to aggregate settlements. Towns and cities they long regarded with aversion, as inimical to personal freedom. In regard to their political organization, it appears that several villages formed a 'hundred,' several hundreds one 'gau,' and several gaus one tribe. In each tribe the people were divided into four classes—nobles, freemen, freedmen or vassals, and slaves. The king or chief was elected from among the nobles; but his power was very limited, and the government of the several tribes seems to have been democratic rather than monarchical.

The religion of the Germans, which is shrouded in great obscurity, points, like their language, to their eastern origin, and was based on Asiatic myths of the creation of the world, and the existence of gods having the forms and attributes of a perfect humanity. Their conceptions of these mythical beings were modified by the local coloring which they received from association with new scenes and through the lapse of time; hence the different tribes all had their special gods or demigods, often their own leaders or chiefs to whom the attributes of the god to whose worship they were most partial were ascribed. It is generally said that the Germans had neither temples nor statues. Both Cæsar and Tacitus expressly affirm this, but it cannot be literally true, for Tacitus himself mentions a temple of a goddess Tanfana among the Marsians; and at a later period, we find Christian missionaries exhorting the Germans to change their pagan temples into Christian churches, while we also read of the destruction of pagan idols. Nevertheless, their religious rites were mainly in the open air—in groves and forests, and on heaths and mountains. Although a priestly order also existed among the Germans, yet each master of a household performed religious services for himself and his family within his own homestead. A knowledge of the will of the gods and the events of the future was sought by divination from observations of the flight of birds, the rushing of waters, and other similar signs, in the interpretation of which women were thought especially skilled. Belief in a future life, and in an abode after death for those who had

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deserved well in this life, was cherished among the Germanic races, who had a strong faith in retributive justice, whose sway they believed would be extended over the gods by involving them in a universal annihilating conflict as the punishment of their evil deeds, after which a new world was to arise guarded by a pure and perfect race of gods. In addition to the higher deities, the Germans peopled every portion of space with a class of subordinate beings who pervaded the earth, air, and water, in the shape of elves, nixes, kobolds, dwarfs, and giants; while Nornes and Valkuries stood apart from either grade of spiritual existence as the representatives of destiny like the Moiræ and Parcæ of the Greeks and Romans.—See Kuhn, *Zur ältesten Gesch. d. indogerman. Völker* (Berlin, 1850); Wackernagel, *Familienleben d. Germanen* (Freibr, 1846); Gibbon's *Decline and Fall of the Roman Empire*; Grimm, *Deutsche Mythologie* (1844); Müller, *Altdeutsche Religion*; the *Deutsche Mythologie* of Simrock (1855) and of Holtzmann (1874).

GERMANICUS CÆSAR, *jër-män'î-küs sē'zar*: Roman general, belonging to the imperial family: B.C. 15, Sep.—A.D. 19, Oct. 9; son of Nero Claudius Drusus, and of Antonia, daughter of Mark Antony and niece of Augustus. In accordance with the desire of Augustus, who had even thought of making him his successor, he was adopted A.D. 4 by Tiberius, whom he accompanied in the war against the Pannonians and Dalmatians, for the purpose of securing the German frontiers after the defeat of Varus. After having been consul A.D. 12, he was appointed in the following year to the command of the eight legions on the Rhine. On the death of Augustus A.D. 14, the soldiers revolted, demanding higher pay and a shorter period of service. G. hastened from Gaul (where he happened to be at the time) to remind them of their duty. The soldiers, who almost idolized him for his frank and generous disposition, urged him to seize upon the supreme power. G., however, was incapable of treachery, and declared that he would rather die than forfeit his allegiance. He, however, granted their demands, though his colleague, A. Cæcina, secretly massacred the ringleaders at night. G. now led the legions over the Rhine below Wesel, attacked the Marsi during a nocturnal festival, and destroyed their celebrated temple of Tanfana. A.D. 15, he made a second inroad into Germany. Proceeding from Metz into the country of the Catti, he destroyed their chief town, Mattium (Maden, near Gudensberg), slaughtering all the inhabitants, young and old. On his return his assistance was implored by the ambassadors of Segestes (always a firm ally of the Romans), who was besieged by his son-in-law, Arminius, conqueror of Varus. Aid was at once given, and Thusnelda, heroic wife of Arminius, fell into the hands of the Roman general. Arminius, burning with anger and shame, now roused the Cherusci and all the neighboring tribes to war. G., in consequence, began a third campaign. He divided his army into three divisions. The main body of the infantry were led by Cæcina through the country of the Bructeri, the cavalry under another general marched through Friesland,

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while G. himself sailed with a fleet through the Zuydersee into the German Ocean, and proceeded up the river Ems, where he joined the others. The united divisions now laid waste the country in the neighborhood of the Teutoburg forest, penetrated into its gloomy depths, and gathering up the bones of Varus and his legions, which had lain bleaching there for six years, buried them with solemn funeral honours. A victory gained by Arminius induced G. to make a hasty retreat, during which he lost part of his fleet in a tempest. Cæcina, who retreated by land, sustained severe losses at the hands of the pursuing Germans. Before the fleet of 1,000 vessels, which G. had built in Batavia, was equipped, he was recalled over the Rhine A.D. 16, by news of the beleaguering of the recently acquired fortress of Aliso, on the Lippe. The Germans were repulsed, but the funeral mound in the forest of Teutoburg, which they had thrown down, was not restored. G. now sailed with his fleet again into the Ems, pressed forward to the Weser, which he crossed, and completely overthrew Arminius in two battles. Nevertheless, he determined to return, and on his way again lost the greater part of his fleet in a great storm. In order to prevent this event from giving courage to the Germans, he once more, in the same year, marched into the country of the Marsi, and dispatched his lieutenant, Silius, against the Catti. The victories thus achieved were to have been followed up in the succeeding years, but Tiberius, jealous of his glory, recalled him, and feigning good will, bestowed on him the honor of a triumph, in which Thusnelda appeared among the captives. To rid himself of G., whose popularity seemed to render him dangerous, Tiberius sent him, A.D. 17, with extensive authority, to settle affairs in the East, at the same time appointing Piso viceroy of Syria, whose haughty and despotic character everywhere counteracted the influence of Germanicus. G. died at Epidaphnæ, near Antioch, probably of poison. He was deeply lamented both by the inhabitants of the provinces and by the citizens of Rome, whither his ashes were conveyed, and deposited by his wife Agrippina in the mausoleum of Augustus. Agrippina herself and two of her sons were put to death by order of Tiberius; her third son, Caligula, was spared. Of the three daughters who survived their father, Agrippina became as remarkable for her vices as her mother had been for her virtues. Besides his splendid generalship, G. was conspicuous for his magnanimity, benevolence, finely cultured understanding, and personal purity of life. He wrote several rhetorical works which have been lost; but of his poetical works we possess an epigram, a version of the *Phænomena* of Aratus, and fragments of a work of the same character, entitled *Diosemeia*, or *Prognostica*, compiled from Greek sources. G.'s literary remains were published first at Bologna 1474. The latest edition is that of Orelli, at the end of his *Phædrus* (Zurich 1831).

GERMAN METHODIST CHURCH: incorrect designation of the EVANGELICAL ASSOCIATION (q.v.).

GERMANO, SAN. *sán jěr-má' nō*. or CASINO, as it is now

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generally called: beautiful and prosperous town of Italy, at the base of Monte Casino, province of Caserta, about 50 m. n.n.w. of Naples. It contains handsome public edifices, and is surrounded by the remains of monuments and buildings of high antiquarian interest; it is built on the site and from the ruins of the ancient Volscian town, Casinum, or Casca. The principal ruins of the ancient Volscian period are a monument, supposed to have been a tomb, an amphitheatre, and a temple. The monumental building is now used as a church; it is square, in the form of a Greek cross, constructed with enormous squared blocks of stone, on the Cyclopean principle. From its form, it is called the Church of the Crucifix, or *Crocefisso*. The amphitheatre must have been a magnificent building, and it is still in a state of preservation sufficient to give an idea of its original vast proportions. The temple, adjoining the amphitheatre, was built probably in conjunction with it, at the cost of the Volscian matron, Umidia Quadratilla, mentioned by Pliny. The Benedictine monastery of Monte Casino, two m. from San G., is one of the most renowned religious communities of Europe. Its foundation by St. Benedict dates from 529. It contains one of the most beautiful churches of Italy, and an extensive library, and in its archives a collection of the most precious documents of the middle ages. The district surrounding San G. is highly cultivated, and beautiful. Pop. about 10,000.—See CASINO or MONTE CASINO.

GERMAN OCEAN: see NORTH SEA.

GERMAN PASTE: a food for birds such as larks, thrushes, nightingales, and other singing-birds, especially those which in their wild state feed chiefly upon insects. Take two lbs. pea-meal, $\frac{1}{2}$ lb sweet almonds blanched, $\frac{1}{4}$ lb. fresh butter or lard, 5 oz. moist sugar, $\frac{1}{2}$ dr. hay saffron, and 3 eggs boiled hard: beat into a smooth paste, using sufficient water to give the consistence required for granulating by passing it through a colander; then expose the granulated paste to the air in a warm place until it is quite hard and dry. If properly prepared and dried, it will keep good in a dry place for a year or more.

GERMAN PHILOSOPHY.

GERMAN PHILOSOPHY: one of the forms or processes of speculative thinking. When we speak of the philosophy of Germany, we do not necessarily imply that it differs from the philosophy of any other country in the problems that it seeks to solve, any more than when we compare the German chemistry with that of France or England. To characterize G. P., means nothing more than to point out the peculiar path that German thinkers have followed, and the degree of success that has attended their investigations in the domain of philosophy, on questions which concern all men, if they concern any. Understood in this sense, G. P. claims a high place—according to many, the highest. At least, for almost a century now, a more general interest has been taken in the cultivation of philosophy in Germany than elsewhere, and abstruse and deep speculation has been represented chiefly by German thinkers. The country has thus made up for the ground which it lost by adhering to the traditional forms of scholastic philosophy after they had been forsaken in France and England. This spread of philosophic culture was coincident with the perfecting and adaptation of the German language to prose composition. For though Leibnitz confined himself in his philosophical writings to the Latin and French languages, Chr. Thomasius, about the same time, had begun to employ the mother tongue both in academic lecturing and in writing, a practice extended by the numerous writings of Chr. Wolf. The expansion of German literature in the last half of the 18th c. completely emancipated speculation from the trammels of a foreign idiom, and with a rich poetical literature there sprang up a philosophy which may claim comparison with that of Greece.

As regards the scientific characteristics of G. P., it may be remarked that the systems put forth by Bacon in England, Descartes in France, and Spinoza in Holland, had little influence in Germany at the time of their appearance. It was Locke who first awakened any considerable attention. The empiricism of this philosopher, who grounds all knowledge on experience, and makes psychology the regulator of metaphysic, called forth the opposition of Leibnitz, the first German that made an epoch in the history of modern philosophy, and who, from the varied impulse that he communicated, must be deemed the awakener of the philosophic spirit in Germany. At the same time the fundamental doctrines of Leibnitz's system—that of monads, of a pre-established harmony, and of innate ideas—were rather genial hypotheses than regularly established propositions. To remedy this, Wolf endeavored to construct a system of philosophy complete in all its parts as required by the forms of logic, in doing which, however, he set aside precisely those doctrines that formed the characteristics of Leibnitz's philosophy. The great influence exercised by Wolf is shown by the wide circulation of his writings, and the multitude of his disciples and adherents. Wolf himself, however, outlived his fame, and the original philosophic mind in Germany went to sleep for a period, during which a sort of Eclecticism, without any funda-

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mental principle—the so-called philosophy of ‘common-sense,’ prevalent in England and France in the 18th c.—became general. This period, however, was not without great intellectual excitement of other kinds. Poetry, reform in education, politics, and religious enlightenment, keenly occupied men’s minds; old customs and associations, both in family and political life, were shaken; and preparation was silently going on for a great and radical revolution.

Kant, with whom the next period of German philosophy begins, thus found an age ready to receive impressions; and, though the *Kritik der Reinen Vernunft* (Critique of the Pure Reason) was at first in danger of being overlooked, when a hearing was once obtained, that and his other critical works, which, after long preparation, appeared in rapid succession, communicated a profound impulse to the thinking world. This arose not more from the novelty and the comprehensiveness of his researches, than from the circumstance that their aim agreed with the tendencies of the age. The exclusion of everything dictated by caprice or sentiment, the maintenance of the independence of speculative inquiry, the reference of all theoretical speculation to the field of experience accessible to it, and the elevation of the moral element to the highest and ultimate object of all human endeavor, form the leading traits of his philosophy, which he recommended to consideration, from its importance to man and society, more than to philosophers. He also entertained the hope that, through the critical inquiry into the nature of the human mind, it might be possible to reconcile empiricism and rationalism, sensualism and spiritualism, and other philosophical opposites, and discover a series of comprehensive principles to which all philosophical disputes might be referred in the last resort. This hope was disappointed for various reasons, but notably because Kant sought to ground the old metaphysic of the schools on a psychology which itself rested on the basis of that metaphysic. Besides, there was wanting in the heyday of Kantism any satisfactory point of unity for the several parts of philosophy. K. L. Reinhold was the first to point out this defect; and skepticism, as in C. Schulze’s *Ænesidemus*, and dogmatism in the writings of Eberhard and others, carried on a war with the ‘critical’ philosophy, though not with great success. It was Fichte who found, or thought he had found, in the fact of consciousness, that absolute point of unity which Kant’s ‘Critique’ had always pointed to. Fichte, following out the path on which Kant had entered, changed the half-idealism of Kant into a complete idealism, by declaring the Ego to be, not only the bearer and source of knowledge, but the only reality, the world being merely the ideas and active manifestations of the Ego. In the ego, being and knowing were identical, it was at once existence and knowledge, and nature appeared only as the reflex of its absolute activity.

With this idealism began a kind of revolutionary excitement in the philosophizing minds of Germans, which contrasted strongly with the calm and sober spirit of Kant. System followed system; philosophical books appeared in

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shoals; and for a quarter of a century or more the interest was shared by the public in general. But the meteors that appeared in the philosophical sky of Germany vanished, for the most part, as suddenly as they had blazed forth. Schelling was the first that attained a general influence. F. H. Jacobi had previously recalled attention to Spinoza; and Schelling, influenced by the speculations of Spinoza, converted the idealism of Fichte into what is called 'the philosophy of identity.' This system set out originally with the assertion that, as Fichte educes nature out of the ego, so by an inverse process the ego may be educed out of nature; but that both these forms of philosophizing have their ground in the *absolute* as the *identity* of all opposites—of the real and the ideal, of subject and object, of mind and matter. In carrying out this assertion, Schelling fixed upon intellectual intuition as the kind of cognition alone corresponding to the absolute, or rather as identical with and representing the absolute. The organ of this intuition was called reason, and, as such, was opposed to the reflection of the understanding, which was held to be quite incapable of taking cognition of the absolute. The relation of the phenomenal world to the absolute was held to consist in this, that the absolute represents itself in the multiplicity of appearances, steps out of the state of 'indifference' into that of 'difference,' manifests itself in 'difference,' etc. Taking special cases, particularly in natural philosophy, Schelling endeavored to demonstrate the existence of this identity in the midst of non-identity, and of non identity in the midst of identity. In this attempt, however, neither Schelling nor his disciples effected much. For in undervaluing and neglecting experience and reflection, the door was opened to a fanciful speculation, which in most cases had little more in common with science than the name; so that in the departments of poetry, religion, and social life, the Schelling philosophy often degenerated into a blind groping leading to the strangest aberrations of romanticism, and mysticism, tending to a refuge in Catholicism.

The philosophy of Hegel (q.v.) took the same general direction as that of Fichte and Schelling. Hegel attempted to develop, in regular organization, the contents of the intellectual intuition (in plain words, the cognitions and ideas of the mind) by the dialectic or logical method. Though he broke loose from the prevalent fashion of indulging in an unbridled play of fanciful combinations, he did not content himself with the rules of logic recognized for thousands of years, but sought an expression for speculative thought in a dialectic of his own. The essence of this transcendental logic consisted in the analysis of all the established general conceptions; and the process or method consists in making each conception of itself generate its opposite, and, combining with this opposite, thus become enriched and enabled to advance to still higher stages. This method Hegel, with remarkable perseverance, endeavored to carry through the whole field of philosophy; and divided his system into the three provinces of logic, philosophy of nature, and philosophy of mind.

GERMAN SILVER.

While the systems above considered form a continuous line of progress, that of J. W. Herbart (q.v.) arose in opposition to the idealism of Fichte, and took a direction in complete antagonism to the dominant philosophy. The well-nigh innumerable productions of other thinkers in this department, though often of individual merit, are of only secondary importance for the development of philosophy as a whole. None of them opened any new leading path; they are occupied chiefly in defending or remodelling older systems, and applying them to particular departments of science, or in controversy with the dominant philosophy of the day. To this category belong the Kantian systems of Krug and others; the physical speculations of Steffens, Oken, Schubert, etc.; the various attempts to lead back philosophy to empirical psychology; the peculiar speculative attempts of Schleiermacher, J. J. Wagner, Fichte the younger, A. Trendelenburg, etc.; the different tendencies within the Hegelian school; and, lastly, the position which Schelling latterly took. The philosophy of Schopenhauer (q.v.) has had a peculiar fortune. Long known to but a very limited circle, it has during the past 20 years largely occupied attention, and, by calling forth antagonism and defense, has done much to reawaken interest in philosophical speculation.

While philosophy during the last half-century was thus actively prosecuted as a science, a corresponding interest was taken in its history; in fact, Germans were the first who sought to deal with the history of philosophy as a whole, and to throw light upon the principal departments of it by valuable special treatises: see PHILOSOPHY. The rapid succession of systems one after another, and the extravagances into which some of them ran, have, it is true, produced a lull in the interest taken in speculation; and to the former enthusiasm there soon succeeded a skeptical aversion to all speculative inquiry. Still, the influence that philosophy has had in elevating and strengthening the scientific mind of Germany has been powerful and beneficial; and there are few departments of research in which the fruits of the philosophic spirit may not be seen in a deeper and more thorough mode of treatment.

GERMAN REFORMED' CHURCH: see REFORMED CHURCH IN THE UNITED STATES.

GERMANS, *jér'manz*, ST.: former seat of the episcopal government of the ancient diocese at Cornwall, England, now a small village in the county of Cornwall. It stands on the slope of a hill, on a branch of the river Lynher, 10 m. above Plymouth Sound, 21 m. e.s.e. of Bodmin. It is notable only for its fine parish church, which has an excellent Norman west front, and the towers of which are hung with ivy and fern. Pop. (1871) parish, 2,678.

GERMAN SCALE IN MUSIC: scale in which the natural notes are A, H, C, D, E, F, G, instead of A, B, C, D, E, F, G. The B being reserved for B flat, the H supplies its place.

GERMAN SILVER [named from its manufacture first

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in Germany, at Hildburghausen]: alloy of copper, zinc, and nickel. It is variable in composition according to the requirements of the manufacture, but may be stated, for general purposes, to consist of copper 50·0, zinc 30·0, nickel 20·0. This composition is very malleable, susceptible of high polish, and nearly as white as silver. This is used to imitate silver in articles which, being rolled and stamped, consequently require considerable malleability. By taking 55 parts of copper, 24·4 of zinc, and 20·6 of nickel, a beautiful alloy is obtained, scarcely inferior in beauty to silver itself. For wire-drawing and very thin rolling, a tougher alloy is formed of copper, 60 parts; zinc, 25 parts; nickel, 20 parts; and for castings the following proportions are used—copper, 60 parts; zinc and copper, each 20 parts. Many other formulæ are in use arising from difference of opinion among manufacturers as to the best proportions for their respective operations. Usually, however, the aim is to obtain a silvery whiteness and the largest proportion of malleability.—This alloy must not be confounded with other white alloys, such as Albata, Britannia metal, and nickel silver, which are used as substitutes for the true German-silver. Albata is composed of copper, zinc, nickel, and a little lead; Britannia metal, of copper, zinc, tin, antimony, and sometimes bismuth; and nickel-silver of copper 60·0, nickel 22·2, zinc 17·8. This last differs from G. S. only in its proportions; it has the color of highly polished silver, and is very hard. The color of G. S. being so near that of the precious metal, it is particularly well adapted for plating, either by the old process of rolling with silver, or in the newer and now usual process of electroplating: the advantages are that a thinner deposit of silver can be used, and the articles made are not liable, as with the old process of plating on copper, to show the reddish hue as soon as the silver begins to wear off.

GERMAN SOUTHWEST AFRICA: a German protectorate in West Africa extending along the coast from Cape Frio to Walfisch bay, and inland to lon. 20 e. It has an area of 322,450 sq. m.; pop. about 200,000. The seat of government is at Great Windhoek, which lies 170 m. e. of Walfisch bay. The country apparently has large deposits of copper and is rich in agricultural resources. In 1897 Germany began to build a railroad from the coast to the interior, and on 1893, Feb. 13, appropriated \$200,000 for its continuation. In 1902 the Europeans numbered 4,647, of whom 2,595 were Germans.

GERMAN THEOL'OGY: collective name for various systems of theology in Germany since the Reformation.—I. The Reformation proclaimed justification by faith in Christ, instead of salvation by obedience to the Church. This led to the avowal that the rule of faith is found in the Scriptures, of which the central doctrine, giving them unity and life, is salvation for all men through faith in Christ. The views of the German reformers concerning the doctrines taught in the Scriptures are set forth by Luther in his catechisms and the Schmalkald articles, and by Melancthon in the Augsburg Confession.—II. As

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the conflict with the adversaries of the Reformation advanced, Prot. teachers wrought to develop the external defenses of Christianity and to perfect its doctrinal statements. But thus engrossed they unhappily abated somewhat the energy of their spiritual life. Consequently, as formal orthodoxy advanced vital Christianity declined.—III. This tendency was arrested at the opening of the 17th c., by the declining spiritual life being wonderfully revived through the instrumentality, at first, of *True Christianity*, a book written (1605) by John Arndt, with the aim of awakening men to fervent piety and pure living. It produced a powerful effect and attained a circulation scarcely equalled by any other uninspired religious book. Spener, A. H. Francke, and Paul Gerhard, aided the movement, and, by establishing meetings, which they called 'Colleges of Piety,' gave it the name (see PIETISM) by which it is still known. Bengel, Zinzendorf, and others were active also in the movement, whose power was felt for a century and a half.—IV. But this movement, beneficent as it was, by devoting itself altogether to Christian feeling and activity, lost first the disposition, and then the ability to teach and defend Christian doctrine. Thus the Pietists left the way open for those who finally (see RATIONALISM) made human philosophizing the basis and standard of religious things. Many teachers and writers were engaged in spreading rationalistic views: Wolf (abt 1750), though earnestly professing faith in the word of God, is called, because of the tendency of his philosophical opinions, 'the father of German rationalism;' Semler (died 1791) received the Scriptures as of divine authority only on ethical subjects; Lessing (died 1781) affirmed that the Scriptures are textbooks which perhaps may be set aside when the world is prepared for the new everlasting gospel; Paulus (died 1851, at the age of 90) has been called 'an unmitigated rationalist—a man who sat down to examine the Bible, convinced that everything in it represented as supernatural is either simply natural or fabulous; and that true criticism consists in proving that such is the fact.' His views were superseded, even before his death, by the mythical theory (see STRAUSS), which many for a time extolled as a great advance in the rational treatment of Scripture and Christianity.—V. While philosophical speculation was striving thus to establish itself as the foundation of theological truth, it also was developing into the broad assertion that 'God' is but the name for the one universal existence; that God, nature, man, angels, devils, matter, spirit, good, evil, holiness, and sin, all are parts of one immeasurable whole of being (see PANTHEISM). This was directly in the line of the Hindu philosophy of 2,000 years before Christ. The Greeks also had held similar views, in various schools and at different times, both before and after the Christian era. And they, in turn, had been followed by many among the schoolmen of the middle ages (see MYSTICISM). The prevalence of pantheism in Germany is due chiefly to Spinoza (q.v.), a Jew (b. 1634). His philosophy, Leibnitz said, was 'Cartesianism run wild.' The philosophy of Fichte (q.v.) (d. 1814) is described by competent critics as pantheistic; yet he earnestly

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protested his faith in a personal God. Schelling (q.v.) (d. 1854) was a disciple of Fichte, but professed to advance beyond him. His writings, also, are affirmed to be intensely pantheistic; yet in his maturer years he asserted his faith in a personal God, and even in the doctrines of the Augsburg Confession. Hegel (q.v.) (d. 1831) was a follower of Schelling, but went beyond him. He taught that we can know God purely and completely because we are a part of God. Rosenkrantz (b. 1805), following Hegel, and representing the extreme of pantheism, asserts that sin is one form of the activity of God; that the wicked and Satan are self-manifestations of God; and that, if any recoil from such language it is because they do not recognize the fact that, without evil, there can be no good.—VI. The Reformation gave a powerful impetus to biblical study, and to a critical examination of many questions relating to the text, style, date, contents and authorship of the various books. During the last 100 years, questions in this department have been multiplied, extended in range, and discussed with intensified boldness and zeal. Eichhorn, in his work (1780) embracing the various elements of the study in an organic method, gave it the name (see HIGHER CRITICISM) which has since come into general use. He has been followed by Michaelis, De Wette, Bleek, Ewald, Ranke, Hengstenberg, Hävernick, Kiel, Knobel, Reuss, Kuenen, and Wellhausen. By these and other writers, the Pentateuch has been subjected to elaborate scrutiny and protracted debate, in which some of them have ably defended its integrity and authority as the genuine work of Moses; while others, after what is called a profound analysis of style, diction, and history, assert it to be of composite character and the work, at least in its present state, of men who lived many centuries after the death of Moses. On this negative side, the last three writers mentioned above maintain the most advanced positions, and against their theories the defense of Moses has been of late mainly directed.—VII. While rationalism, pantheism, and destructive criticism were uniting their efforts to overwhelm Christianity, its truth was maintained in the lives of genuine disciples and in writings which combined intellectual power with faith. Klopstock's *Messiah*, the publication of which was commenced in 1748, was circulated throughout Germany, among all classes of people, and drew thousands to faith in Christ. Hamann, converted from a dissolute life, acquired by his writings great influence over men in the highest ranks. Herder (q.v.), by his *Spirit of Hebrew Poetry*, and by his writings on the New Testament, exhibited both the beauty and the inspiration of the Scriptures. Schleiermacher (q.v.) cherished from his youth an ardent love for Christ, which controlled and exalted the sometimes startling tendencies of his philosophic system. His *Discourses* (1799) 'marked at once the opening of a new century and of a new era in religion.' Among the multitude converted by them was a young Jew who, at his baptism, took the name Neander ('new man'), and was made a prof. at Berlin. Great crowds came to his lectures from all parts of Germany and from distant lands. Multitudes of the preachers of Germany were enlightened by him. Tholuck

GERMAN TINDER—GERMANUS.

(q.v.), converted from unbelief by the agency of Schleiermacher and Neander, became, in his turn, the winner of thousands of young men to Christ. Hengstenberg (q.v.) also, about the same time, was conspicuous among those who defended the Scriptures against critical assault.—VIII. At the present day, the discussions in German theology continue along the lines above indicated; but with noticeable tendency to eclecticism, and with some modification from the former bitterness of assault on Christianity.

GER'MAN TIN'DER: see AMADOU.

GERMANTOWN, *jér'man-town*; former borough of Philadelphia co., Penn., but since 1854 the 22d ward of the city of Philadelphia. It is 6 m. n.w. of the old state-house building, was laid out under a grant from William Penn, 1684, and settled by a number of German families under Francis Daniel Pastorius. It is now thoroughly metropolitan in character, has broad and regular intersecting streets, is lighted with gas and electricity, has an ample street-car (horse and cable) service, contains 24 churches, an acad., high, grammar, and graded public-schools, a community of Vincentian fathers, Rom. Cath. college and seminary, national and savings banks, and numerous charitable institutions. Pop. (1880) 31,798; (1900) 64,655.

G. was the scene of a defeat of the American army under Washington by the British under Howe, 1777, Oct. 4. Washington had confined the British fleet in the Delaware river by a series of obstructions, thus preventing a marine attack on Philadelphia. Gen. Howe attempted to aid his brother, the admiral, and sent a portion of his army, then encamped in G., to dislodge the Americans on the Delaware below Philadelphia. As soon as Washington perceived the movement, he concluded to attack the weakened force left at G., and, on the night of Oct. 3, marched his army in four divisions upon the position. He entered G. at sunrise, surprised the British, and, just as their infantry were falling back in confusion, his own army was enveloped in a sudden and thick fog. The movements of his divisions were retarded and confused, and the British, rallying from their surprise, attacked the Americans and routed them, with a British loss of 600 and an American, about 1,000.

GERMANUS, *jér-mā'nūs*, SAINT: about 380–449, Jan. 31; b. Auxerre, central Gaul: lawyer, writer, and Rom. Cath. bp. He was descended from a senatorial family, was educated in literature, jurisprudence, and oratory, distinguished himself by his eloquence of speech and administrative ability as milit. gov. of his native dist. under Emperor Honorius, and though married was chosen bp. of Auxerre 418. He left his wife, gave all his possessions to the poor, built a monastery on the river Yonne, visited England twice, and caused the establishment of schools for the education of the clergy and the suppression of the doctrines of Pelagius, aided the Britons in defeating a force of Picts and Saxons, terrifying them by raising a great shout of 'Hallelujah,' and prompted St. Patrick to attempt the conversion of Ireland. Shortly before his death he acted as mediator between Valentinian III. and the rebellious Bretons.

GERMANY.

GERMANY, *jér'ma-nĩ*, from Lat. *Germania* (q. v.): English name of the country which the natives call Deutschland, and the French L'Allemagne: see ALEMANNI. The word is sometimes used to denote the whole area of the European continent within which the Germanic race and language are dominant. In this broad sense, it includes, besides Germany Proper, parts of Austria, Switzerland, and perhaps even of the Netherlands; but in the present article the name is to be understood as denoting the existing Germanic Empire, of which Prussia is the head. G. occupies the central portions of Europe, from 6° to 22° 40' e. long., and from 49° 7' to 55° 50' n. lat. It is bounded on the n. by the German Ocean, the Danish Peninsula, and the Baltic; on the e. by Russia and Austria; on the s. by Austria, Italy, and Switzerland; on the w. by France, Belgium, and the Netherlands: area, estimated 208,613 sq. m. or about one-sixteenth of that of all Europe. Pop. (1900) 56,345,014. The coast-line measures about 950 miles. G. is an aggregation of different states (26 in number), which, as they are specially treated of under their respective titles, are noticed here only so far as they severally form parts of the present Germanic Empire.

The following list gives the names of these states, with the number of members representing each in the Bundesrath or Federal Council, and the Reichstag or Imperial Diet (1890). For populations and areas of the states, see near the end of this article; see also each specially.

States of the Empire.	Number of Members in Bundesrath.	Number of Deputies in Reichstag.
Kingdom of Prussia	17	236
“ “ Bavaria	6	48
“ “ Würtemberg	4	17
“ “ Saxony	4	23
Grand-duchy of Baden	3	14
“ “ Mecklenburg-Schwerin ..	2	6
“ “ Hesse	3	9
“ “ Oldenburg	1	3
“ “ Saxe-Weimar	1	3
“ “ Mecklenburg Strelitz	1	1
Duchy of Brunswick	2	3
“ “ Saxe-Meiningen	1	2
“ “ Anhalt	1	2
“ “ Saxe-Coburg-Gotha	1	2
“ “ Saxe-Altenburg	1	1
Principality of Waldeck	1	1
“ “ Lippe-Detmold	1	1
“ “ Schwarzburg-Rudolstadt ..	1	1
“ “ Schwarzburg-Sondershau- sen	1	1
“ “ Reuss Aeltere Linie	1	1
“ “ Schaumburg-Lippe	1	1
“ “ Reuss Jüngere Linie	1	1
Free town of Hamburg	1	3
“ “ Lübeck	1	1
“ “ Bremen	1	1
Reichsland of Alsace-Lorraine		15
Total	58	397

Besides the above political divisions, there are certain distinctive appellations applied to different parts of G., derived either from the names and settlements of the ancient

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Germanic tribes, or from the circles and other great subdivisions of the old empire. Thus the name of 'Swabia' is still applied in common parlance to the districts embracing the greater part of Würtemberg, Southern Baden, South-western Bavaria, and Hohenzollern; 'Franconia,' to the Maine districts of Bamberg, Schweinfurt, and Würzburg; 'the Palatinate,' to Rhenish Bavaria and the north of Baden; the Rhineland,' to portions of Baden, Rhenish Prussia, Bavaria, Hesse-Darmstadt, and Nassau; 'Voigtland,' to the high ground between Hof and Plauen; 'Thuringia,' to the districts between the Upper Saale and the Werra, as Saxe-Weimar, etc.; 'Lusatia,' to the e. part of Saxony; 'East Friesland,' to the country between the Lower Weser and Ems; and 'Westphalia,' to the district bounded by Lower Saxony, the Netherlands, Thuringia, Hesse, and the German Ocean.

Four-fifths of the population of this country are of the race called in English Germans, in French Allemands, but by the people themselves Deutsche. The term Deutsch, in Gothic *thiudisk*, in O. H. Ger. *diutisc* (Latinized into *theotiscus*), is derived from the Gothic substantive *thiuda*, people, and therefore meant originally the popular language, or, in the mouth of the learned, the vulgar tongue. In the 12th and 13th c. it became elevated into the accepted designation both of this wide-spread tongue and of the race that speak it.

Of the estimated population 1891 (52,244,503), there were about 3,403,390 belonging to non-Germanic races, including 2,922,475 Poles, Masurians, and Cassubians, 280,000 Walloons and French, 117,637 Lithuanians, 138,134 Danes, 65,254 Wends, 74,069 Czechs and Moravians, besides Bohemians. Among the first of these were included half a million of Jews. The Germans admit of being divided into High and Low Germans; the phraseology of the former is the cultivated language of all the German states; that of the latter, known as *Platt-Deutsch*, is spoken in the north and north-west. The Poles are found exclusively in the e. and n.e. of Prussia; the Czechs, in Silesia, about Oppeln and Breslau; the Wends, in Silesia, Brandenburg, and Prussian Lusatia; the Lithuanians and Courlanders, in e. Prussia; the Danes, in Slesvig; the Walloons, about Aix-la-Chapelle, in Rhenish Prussia; and the French, partly in the same region, and partly in the newly re-acquired provinces of Alsace and Lorraine. Although the Jews are scattered over every part of Germany, they are most numerous in the Prussian territories.

Physical Character.—G. presents two very distinct physical formations. 1. A range of high table-land, occupying the centre and s. parts of the country, interspersed with numerous ranges and groups of mountains, the most important of which are the Harz and Teutoburgerwald, in the n. the Taunus and Thuringerwald, in the middle; and the Schwarzwald and Raube Alps, in the s. and containing an area, including Alsace and Lorraine, of 110,000 sq. m. 2. A vast sandy plain, from the centre of the empire n. to the German Ocean, including Slesvig-Holstein: area about

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98,000 sq. miles. This great plain, stretching from the Russian frontier on the e. to the Netherlands on the w. is varied by two terrace-like elevations: one stretches from the Vistula into Mecklenburg, not far from the coast of the Baltic, and has a mean elevation of 500 to 600 ft. rising in one point near Danzig to 1,020 ft. the other line of elevations begins in Silesia and terminates in the moorlands of Lüneburg, in Hanover, its course being marked by several summits from 500 to 800 ft. in height. A large portion of the plain is occupied by sandy tracts interspersed with deposits of peat: but other parts are moderately fertile, and admit of successful cultivation.

In drainage, the surface of G. belongs to three different basins. The Danube (q.v.) from its source in the Schwarzwald to the borders of Austria belongs to G., and through this channel the waters of the greater part of Bavaria are poured into the Black Sea; thus opening communication with the east. By far the greater part of the surface, however (about 185,000 sq. m.), has a northern slope, and belongs partly to the basin of the North Sea, and partly to the basin of the Baltic. The chief German streams flowing into the North Sea are the Rhine (q.v.), the Weser (q.v.), and the Elbe (q.v.); into the Baltic, the Oder (q.v.) and the Vistula (q.v.).

The most important of the numerous canals which connect the great river systems of G. are Ludwig's canal in Bavaria, which unites the Danube and Main, and thus opens a communication between the Black Sea and German Ocean; the Finow and Friedrich-Wilhelm's canals in Brandenburg; the Plaue canal, which connects the Elbe and the Havel; and the Kiel and Eyder canal, uniting the Baltic and German Ocean. Numerous lakes occur both in the table-land of southern G. and in the low lands of the northern districts, but mostly they are small. G. abounds in swamps and marsh-lands, especially in the low n. districts. Its mineral springs occur principally in Nassau, Würtemberg, Baden, Bavaria, and Rhenish Prussia. Many of these springs have retained their high reputation from the earliest historic time.

Geology.—The great plain of n. Germany consists of strata of the same age as the Tertiary strata of the Paris basin, covered with very recent sand and mud. Newer tertiary beds occupy the river basin of the Rhine n. from Mayence; they consist of fine light-colored loam, and contain the bones of the mammoth, rhinoceros, and other contemporaneous mammals. Erratics are scattered over n. Germany. The whole district in the centre of Germany, from the Danube northward to Hanover, consists of Secondary strata. The rocks of the Trias period are best known in Germany, the typical rocks of bunter sandstein, muschel-kalk, and keuper being developed here, so as to justify the suitability of the name Trias, which is wholly inapplicable in Britain, where the series is represented by sandstone beds only. The Trias is highly fossiliferous, abounding especially in marine shells, and containing several genera of remarkable labyrinthodont saurians. Juras-

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sic rocks occur in central Germany; at Hanover they consist of clays and marl, with beds of sandstone and limestone, containing coal and ironstone of such value that they have been extensively wrought. The Cretaceous strata are frequently highly altered from the intruded igneous rocks, which have raised the beds in some districts to a nearly vertical position, and have altered them into crystalline marbles and silicious sandstones.

Of the Paleozoic rocks, the carboniferous strata are nearly absent in Germany. The coal obtained in the country is from rocks of a later age. True coal-beds are found in Rhenish Prussia. The sedimentary rocks of the Harz Mountains are chiefly Devonian; to the s.e., near Herzgerode, they are Upper Silurian. They all are greatly dislocated by granite and other intrusive rocks. The Harz Mountains are surrounded by a zone of Permian rocks. The stratified rocks of the Thüringerwald also are Devonian, resting on Lower Silurian strata, the lower portion of which is highly altered into quartzose schists; the remainder consists of graywacke, slate, and sandstone, with limestone and alum slates. There are numerous fucoid and annelid impressions in the older beds, and graptolites, orthoceratites, and trilobites in the newer.

The basaltic rocks, trachytes, and other volcanic products are largely developed in the Eifel, Siebengebirge, Westerwald, Vogels, Rhöngengebirge, and other mountain systems of central Germany.

Climate.—The climate of G. presents less diversity than a first glance at the map might lead one to infer, for the greater heats of the more southern latitudes are considerably modified by the hilly character of the country in those parallels, while the cold of the northern plains is mitigated by their vicinity to the ocean. The average decrease in the mean temperature is, in going from s. to n., about 1° F. for every 52 m.; and from w. to e. about 1° F. for every 72 m. The line of perpetual snow varies from 7,200 to 8,000 ft. above the sea. The mean annual fall of rain is 20 inches. The following table shows the mean annual records of the temperature at different points of the continent:

	Mean An. Temp.	Summer.	Winter.
Hamburg.....	47° Fah.	64° Fah.	30° Fah.
Dresden.....	48°	67	29
Frankfort-on-the-Maine...	48·5	66	31
Berlin... ..	46·5	66	27
Hanover.....	48°	63	33
Königsberg.. ..	43°	62	24

Products.—G. is rich in mineral products, among which the most important are silver, found in the Harz Mountains; iron in numerous mountain-ranges; salt in many parts of the country; coal in Rhenish Prussia and Silesia. Cobalt, arsenic, sulphur, saltpetre, alum, gypsum, bismuth, pumice-stone, tripoli-slate, kaolin, emery, ochre, and vitriol, are among the exports of Germany. The vegetable products comprise a very large proportion of the European flora. All the ordinary cereals are extensively cultivated in the n. and largely exported, chiefly from Würtemberg and Ba-

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varia; hemp and flax, madder, woad, and saffron, grow well in the central districts, where the vine, the cultivation of which extends in suitable localities as far north as 51°, is brought to great perfection—the best wine-producing districts being the valleys of the Danube, Rhine, Maine, Neckar, and Moselle, which are, moreover, generally noted for the excellence of their fruits and vegetables. Tobacco is grown in sufficient quantities for extensive exportation, on the Upper Rhine, the Werra, and Oder. The hops of Bavaria have high reputation, and the chicory grown in that country, and in the district between the Elbe and Weser, finds its way all over Europe as a substitute for coffee. The most extensive forests are found in central G., and in some parts of Prussia, while the n.w. parts of the great plain are deficient in wood, the place of which is in some degree supplied by the abundance of turf yielded by the marshy lands. G. has long been noted for the good breed of horses raised in the n. parts of the continent; while Saxony, Silesia, and Brandenburg have an equal reputation for their sheep-flocks, and the fine quality of the wool which they yield. The rich alluvial flats of Mecklenburg and Hanover are celebrated for their cattle; the forests of n. and central G. abound in swine, and in small game of various kinds; while the Bavarian Alps afford shelter to the larger animals, as the chamois, the red deer and wild-goat, the fox, marten and wolf; and in all the plains in the north, storks, wild-geese, and ducks are abundant. Among the fishes of G., the most generally distributed are carp, salmon, trout, and eels; the rivers contain also cray-fish, pearl-bearing mussels, and leeches. The oyster, herring, and cod-fisheries constitute important branches of industry on the German shores of the Baltic and North Sea. G. stands next to Great Britain in regard to the care and success with which its agricultural, mining, and other natural capabilities have been cultivated. All the German states encourage agriculture, and have endeavored, by the establishment of agricultural colleges and exhibitions, to diffuse among the people a knowledge of recent scientific appliances. The countries most conspicuous in this movement are Prussia, Bavaria, and Saxony. The preservation and cultivation of woods receive almost as much attention in G. as agriculture, and like the latter, are elevated to the rank of a science. The larger woods and forests in most of the states belong to the government, and are under the care of special boards of management, which exercise the right of supervision and control over all forest lands, whether public or private.

Manufactures.—The oldest and most important of the German industrial arts are the manufactures of linen and woolen goods. The chief localities for the cultivation and preparation of flax, and the weaving of linen fabrics, are the mountain-valleys of Silesia, Lusatia, Westphalia, the Harz, and Saxony (for thread laces); while cotton fabrics are principally made in Rhenish Prussia and Saxony. The same districts, with Pomerania and Bavaria, manufacture the choicest woolen fabrics, including damasks and car-

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pets. Toys, wooden clocks, and wood-carving, almost a specialty of German industry, are carried to the greatest perfection in the hilly districts of Saxony, Bavaria, and the Black Forest. The best iron and steel manufactures belong to Silesia, Hanover, and Saxony. Silesia probably possesses the finest glass-manufactories; while Saxony and Prussia are pre-eminent for excellence in china and earthenwares. Augsburg and Nürnberg rival Munich and Berlin in pre-eminence in silver, gold, and jewelry work, and in the manufacture of philosophical and musical instruments; while Leipsic and Munich claim the first rank for type-foundries, printing, and lithography.

Trade and Commerce.—The commercial affairs of Germany, formerly regulated by the *Zollverein* (q.v.), are now managed by committees of the federal council of the empire. The tendency of the imperial policy in this department has of late been more and more in favor of protective tariffs. The total imports of G. (1877) had a value of \$966,750,000; (1878) \$930,750,000; (1901) \$1,142,067,600; the exports (1877) \$673,800,000; (1878) \$229,100,000; (1901) \$902,529,200. The mercantile fleet of G. was exceeded (1895) only by those of Great Britain, the United States, and France. It comprised 2,493 sailing vessels of 593,770 tons, and 1,390 steamers of 1,347,875 tons, in all 3,883 vessels. 1,941,645 tons, with 50,556 sailors. For commerce between its own internal ports, G. (1898) had 22,564 vessels plying on its rivers and canals.

Railways, etc.—In 1900 there were 30,974 m. of railroad in operation, of which the govt. owned 28,387 m.; 69,215 m. of telegraph in operation, with 655,040 m. of wire; 221,306 persons employed in the postal and telegraph service. In 1901 the imperial post-office and the separately administered offices of Bavaria and Würtemberg carried together 1,976,899,700 letters, 1,094,604,870 postal cards, and 1,417,256,518 newspapers.

Emigration.—Since 1881, when the highest total (220,798) was reached, the annual number of emigrants has greatly decreased. During 1830–87, it is estimated about 4,200,000 emigrants left the country, five-sevenths of whom went to the United States. In 1884 there were 143,586 (139,339 to the United States); (1886) 83,218; (1887) 103,055; (1888) 98,515; (1901) from German and the principal Dutch ports 22,073. By far the largest proportion of emigrants are from Prussia, Bavaria, Würtemberg, Saxony, contributing more than 16,580 to the total. The census (1900) showed 778,698 foreign residents in the empire.

Education.—Education is more generally diffused in G. than in any other country of Europe, and is cultivated with an earnest and systematic devotion not equalled in extent among other nations. There are 21 universities: Berlin, Breslau, Halle, Bonn, Greifswald, Munich, Würzburg, Erlangen, Leipsic, Tübingen, Göttingen, Heidelberg, Freiburg, Marburg, Giessen, Jena, Rostock, Kiel, Königsberg, Münster, and Strasburg. These have four faculties, Theology, Law, Medicine, and Philosophy; and had in

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1902, 2,976 professors and teachers, and 36,890 students. Of the 21 universities of the empire 14 are Prot., i.e., in the dept. of theology they teach only Prot. theology; three, besides that of Münster, are Rom. Cath., viz., Freiburg, Munich, and Würzburg; three, viz., Bonn, Breslau, and Tübingen, are mixed. There are a number of polytechnic schools; numerous special schools of technology and trade, of agriculture, forestry, mining, architecture, music and art, navigation and other branches of study; seminaries for teachers and theologians; nearly 800 gymnasia and Latin schools; 300 'real-schulen' and upper burgher schools; and more than 56,560 elementary schools. Compulsory education reduces the number of wholly illiterate persons to singularly small proportions. Among the army recruits 1900, only 0.07 per cent. could neither read nor write.

Public libraries—of which there are more than 150—museums, botanical gardens, art-collections, picture-galleries, schools of music and design, and academies of arts and sciences, are in most of the capitals, and in many of the country towns, more than 200 of which possess one or more permanently established theatres. In no country is the book and publishing trade more universally patronized than in Germany. The press annually sends forth 8,000 to 10,000 works, while about 3,000 papers and journals are circulated throughout the empire; of the current newspapers, a comparatively small number only exert marked influence, but many of the German scientific and literary periodicals have world-wide reputation. The censorship of the press was abolished by a decree of the diet of 1848, and freedom of the press under certain restrictions, promulgated 1854, has been introduced.

Army and Navy.—1. *Army.*—By the constitution of 1871, Apr. 16, the Prussian obligation to serve in the army is extended to the whole empire; article 59 prescribes that every German who is *wehrfähig*, i.e., 'capable of bearing arms,' must be in the standing army from his 21st year to his 28th year. Of these seven years, three must be spent in active service (*bei den Fahnen*), the remainder in the army of reserve. On quitting the army of reserve, he has to form part of the *Landwehr* (q. v.) for other five years. Article 63 enacts that *die gesammte Landmacht des Reichs wird ein einheitliches Heer bilden, welches im Krieg und Frieden unter dem Befehle des Kaisers steht* ('the whole land-forces of the empire shall form a united army, in war and peace, under the command of the emperor'). The sovereigns of the principal states have the right to select the lower grades of officers, but even their selections require to obtain the approval of the emperor, whose authority is paramount; article 64 expressly declaring that *alle deutschen Truppen sind verpflichtet den Befehlen des Kaisers unbedingt Folge zu leisten* ('all German troops are bound to obey unconditionally the orders of the emperor'). By the army law of 1902, the peace effective was placed at 24,292 officers, and 581,519 rank and file, with 105,143 horse. Details for 1896 showed 513 battalions of infantry of the line, 21 of Jägers, Landwehr

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cadres for 277 battalions, 465 squadrons of cavalry, 494 batteries of field artillery, 31 battalions of fortress artillery, and 24 of pioneers. The army was divided into 21 corps, and had 335,328 troops in active service, 42,967 being stationed in Alsace-Lorraine. The Prussian army had 21,404 officers, 431,644 men, 76,382 horses, and comprised 11 corps, exclusive of the Guard, which formed a distinct corps. The war effective of the regular imperial army was 35,400 officers, 1,500,000 rank and file, 2,500 guns, and 312,000 horses. The Landsturm would bring the war strength to 2,650,000 trained men. See **ARMIES, MODERN—Germany.**

2. *Navy.*—The formation of a German navy, due to the initiative of Prussia, dates from 1848, and of late years rapid progress has been made. In 1902, Jan., the imperial fleet consisted of battleships, 1st class, 14, 2d class, 5; coast-defense ships, 9; armored cruisers, 7; cruisers, 1st class, 5, 2d class, 21, 3d class, 21; gunboats, sea-going, 20, gunboats, river, 9; transports and despatch vessels, 11; tugs, repair, water, coal, hospital, depot, and special service, 72; school and training ships, 14; subsidized and auxiliary ships, 28; hulks and obsolesces, 41; torpedo boat destroyers, 29; torpedo boats, 1st class, 84, 2d class, 73, 3d class, 61. The personnel for the same year was comprised of 1,284 officers, 164 surgeons, 119 paymasters, 1,280 warrant officers and 28,552 petty officers and seamen. The empire has 3 ports of war: Kiel (q.v.) and Danzig (q.v.) on the Baltic, and Wilhelmshaven (q.v.) in the Bay of Jahde on the North Sea, the latter of granite, with 5 basins, and dry-docks for ironclads.

Religion.—In general Protestantism predominates in the n. and Roman Catholicism in the s., though very few states exhibit exclusively either form of faith. The following is the proportion of the different denominations, according to the census of 1900: Prot. (Lutheran and Calvinist) 35,231,104; Rom. Cath. 20,327,913; Jews, 586,948; and other religions about 200,000.

Political Organization.—All the states of the empire recognize four distinct orders—viz., the nobility, clergy, burghers, and peasantry, and all distinguish three grades of nobility. The highest grade includes the members of reigning houses, and the descendants of families who belonged at the time of the old empire to the sovereign nobility of the state, and were *reichsunmittelbar*, or directly connected with the empire, as holding their domains directly under the emperor, but whose houses have subsequently been *mediatized*, or deprived of sovereign power in accordance with special treaties between the state and the princes. There are at present 50 princely and 51 *gräfliche* (countly) mediatized families, who, in accordance with the act of the diet of 1806, have equality of rank with reigning houses, with many of the special privileges which were accorded to the high nobles of the empire. The second grade of nobility is composed of counts and barons not belonging to reigning or mediatized houses; the third and lowest grade includes the knights and hereditary patrimonial proprietors of Germany.

Before considering the political organization of the new

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Germanic empire, a view may be taken of two subjects—1st, the principal features of the constitution of the old Germanic empire, overthrown by the First Napoleon 1806; 2d, that Bund or federal govt. which lasted from 1814 till Austria was excluded from the Confederation, 1866; and the hegemony of Germany was transferred to Prussia.

The Old Germanic Empire.—The states of that empire comprised three chambers or colleges: 1. The Electoral College, consisting of the archiepiscopal electors of Mainz, Treves, and Cologne; and the secular electors, of whom there were originally only four, but whose number was subsequently increased to five, and who at the dissolution of the empire were represented by the sovereigns of Bohemia, Bavaria, Saxony, Brandenburg, and Brunswick Lüneburg or Hanover (see ELECTORS). 2. The College of the Princes of the Empire, who had each a vote in the diet, and were divided into spiritual and temporal princes. 3. The Free Imperial Cities, which formed a college at the diet, divided into two benches, the Rhenish with 14 cities, and the Swabian with 37; each of which had a vote. These colleges, each of which voted separately, formed the diet of the empire. When their respective decisions agreed, the matter under discussion was submitted to the emperor, who could refuse his ratification of the decisions of the diet, though he had no power to modify them. Ordinary meetings were usually summoned twice a year by the emperor, who specified the place at which the sittings were to be held, which, during the latter periods of the empire, were at Regensburg (Ratisbon). The diet had the right to enact, abrogate, or modify laws, conclude peace and declare war, and impose taxes for the general expenses of the state. The Aulic Chamber, and the Cameral or chief tribunal of the empire, decided in cases of dispute between members of the diet. The emperors were chosen by the electors in person or by their deputies; and after their election and coronation, both usually at Frankfurt-on-the-Maine, the emperor swore to the 'capitulation' or constitution of the empire. After the dissolution of the empire 1806, its place was nominally taken by the Confederation of the Rhine, which owed its existence to Napoleon, and which lasted till 1815.

Late Germanic Confederation.—The late Germanic Confederation was established by act of the Congress of Vienna 1815, on the overthrow of Napoleon. It was an indissoluble union, from which no single state could at its own pleasure retire. Its central point and its executive and legislative powers were represented by the federative diet, which held its meetings at Frankfort-on-the-Main, and was composed of delegates from all the confederated states, chosen, not by the people, but by the various governments. The diet deliberated either in a limited council (the Federative govt.) or as a general assembly (*Plenum*). In the limited council there were 17 votes, of which 11 of the principal states each had a single vote, while the remaining states divided the six collective votes between them. The *Plenum*, which met only when any organic change was to be effected in the diet itself, embraced 70 votes, of which Austria and the five

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German kingdoms each had four, while the other states had 3, 2, or 1 vote each in proportion to their importance. It rested with the limited council, which executed the enactments of the Plenum, and dispatched the ordinary business of the Confederation, to decide (by a majority of voices) whether a question should be submitted to the Plenum, where it was not debated, but simply decided by a majority of ayes or noes. Austria presided in both assemblies, and had a casting voice in cases of equality. The diet, as a collective body, had the right of concluding peace and alliances, and declaring war; but this power could be exercised only for the maintenance of the independence and external security of G., and the individual integrity of the several federative states, which on their part were bound to submit to the diet the consideration of all questions in dispute between themselves and other powers. Where such differences could not be settled by the committee empowered by the Plenum to consider them, they were finally referred to a special tribunal known as the 'Austrägal' Court, which was composed of several members of the Confederation invested for the time with full powers.

North German Confederation.—The immediate occasion of the war of 1866 was the difference that arose between Prussia and Austria as to the occupation and disposal of the territory taken from Denmark (see SLESVIG) after the Convention of Gastein (1865). But the real grounds lay in the rivalry between the two states for the leadership of G., the germ of which is as old as the time of the Great Elector (see FREDERICK-WILLIAM), and which has shown itself at many epochs of the history (see above, *History*). There can be little doubt that the feeling of the German people as distinguished from the princes and bureaucracy, has, in recent times at least, been in favor of the purely German Prussia as their leader, rather than Austria, the great mass of whose population are Slaves and Magyars. And when the parliament of Frankfurt, 1850, offered the imperial crown to the king of Prussia, the unity of G. might have been secured without bloodshed, had the monarch been resolute, or had he had a Bismarck for his adviser. But that opportunity being let slip, and the incubus of the 'Bund' being restored, it became apparent that the knot must be cut by the sword.

By the treaty of Gastein, Austria and Prussia agreed to a joint occupation of the Elbe duchies; but to prevent collision, it was judged prudent that Austria should occupy Holstein, and Prussia Slesvig. Already a difference of policy had begun to show itself: Prussia was believed to have the intention of annexing the duchies; while Austria began to favor the claims of Prince Frederick of Augustenburg, and wished to refer the disposal of the matter to the Bund. In the meantime, both nations were making ready for the struggle. In fact, the preparations of Prussia had been going on for two or three years; and the new organization of her army, which had occasioned the protracted contest between the govt. and the house of deputies, had been made with a view to some such eventuality as was now

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to occur. The preparations of Austria were made more openly, as she could plead the necessity of meeting the warlike attitude of Italy; which power, looking upon the quarrel between Austria and Prussia as a precious opportunity, was actively arming, with a view to strike a blow for the liberation of Venetia, and had secretly entered into an alliance with Prussia.

At this crisis, England, France, and Russia invited the disputants to a conference. Prussia and Italy readily consented; but nothing came of it, through the obstinate pride of Austria, who would not allow her position in Italy to be even taken into consideration. Never, perhaps, was a greater blunder made. Had she at this moment ceded Venetia for a reasonable compensation, she would have replenished her empty treasury with many millions, have made Italy friendly or at least neutral, and set free her best army of 80,000 veterans for the inevitable contest with her northern rival. A few weeks later, she made the concession with a bad grace, without compensation, and to no purpose.

On the failure of the conference, Benedek, commander-in-chief of the Austrian army of the north, issued an order of the day, dated May 12, in which he announced that he had been appointed to 'lead the brave and faithful Austrian army against the unjust and wanton foes of the empire.' It remained only to find a formal ground for the declaration of war, and that ground was found in the Slesvig-Holstein question. In the sitting of the German diet, 1866, June 1, Austria, disregarding the Convention of Gastein, placed the whole matter at the disposal of the Bund, and then proceeded to convoke the states of Holstein 'to assist in the settlement of the future destination of the duchy.' Prussia protested against this as an insult and a violation of treaty; demanded the re-establishment of the joint occupation; and, while inviting Austria to send troops into Slesvig, marched troops of her own into Holstein. Instead of responding to this invitation, Austria withdrew her forces altogether from Holstein, under protest; and then, calling attention to this 'act of violence' on the part of Prussia, proposed that the diet should decree 'federal execution' against the enemy of the empire. This eventful resolution was carried by a great majority, 1866, June 14; Hanover, Saxony, Hesse-Cassel, Hesse-Darmstadt, and the 16th Curie voting for it. The resolution having passed, the Prussian plenipotentiary, in the name of his govt., declared the German Confederation dissolved for ever, and immediately withdrew.

When the news of the federal execution was received in Berlin, identical notes were sent to the courts of Saxony, Hanover, and Hesse-Cassel, demanding the reduction of their armies and assent to the convocation of a common German parliament; on which condition, Prussia would guarantee their territories and sovereign rights as her allies. Twenty-four hours were allowed for the decision; and when the term had expired without assent, the Prussian troops, previously concentrated on the frontiers, crossed at once

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into the three kingdoms, and took military possession without resistance. The Saxon army retired into Bohemia to join the Austrians; that of Hanover, after vainly trying to make its way south to join the army of the Bund and bringing on the useless affair of Langensalza, was forced to lay down its arms, and return home.

Besides the moral advantage gained by this display of promptitude in paralyzing her declared enemies and securing the adhesion of waverers, Prussia had by these occupations secured her rear, and, in Saxony, had won a favorable basis for operating against Austria. The Prussians now lost no time; war was declared against Austria; and, following the example set by Frederick the Great, the troops immediately began to march into Bohemia. To their own surprise, as well as that of all Europe, they were allowed to pass the easily-defended defiles without opposition, or even seeing an enemy. So great was the reputation of Benedek, that every one now began to look for some deep-laid plan by which the enemy was to be enticed into the heart of the country, only to be completely and at once overwhelmed. But, as it turned out, there was no plan at all. With their usual sluggishness, the Austrians were taken by surprise in a state of unreadiness—ill organized, ill equipped, ill provisioned; and though in actual engagement the soldiers fought bravely, they were animated with a very different spirit from their opponents. The Prussian people had at the outset been rather averse than otherwise to the war; and in some places, it required strong measures to make the Landwehr take the field. But once under arms, and as the object of the struggle became more apparent, they entered into it with enthusiasm, and manifested a rare combination of soldierly qualities, the results of a universally diffused education and military training, and while such was the quality of the men, seldom has an army taken the field so well organized, with the plan of the campaign so well laid, the arms so efficient, and the equipments in every way so complete.

The Prussian host invaded Bohemia at three several points: the central army, under Prince Frederick-Charles (q.v.) entered from e. Saxony, crossing the frontier range of the Erzgebirge by Krottaw, Friedland, and Neustadt, toward Reichenberg; the western or 'Elbe' army under General Herwarth von Bittenfeld, started from Dresden, and entered Bohemia by Neustadt and Schluckenau toward Gabel; while the eastern or 'Silesian' army, under the crown-prince, Frederick William, afterward German emperor, Frederick I. (q.v.), invaded from Silesia by the Landshut and Nachod passes, marching toward Trautenau and Skalitz. The first of these armies numbered 72,000 infantry, 11,000 cavalry, 294 guns; the second, 34,000 infantry, 3,900 cavalry, 132 guns; the third, 92,000 infantry, 12,500 cavalry, 348 guns—in all, 225,400 men, 774 guns. To oppose these, the Austrians had 55,000 infantry, 5,400 cavalry, and 172 guns (inclusive of the Saxon army, which had been withdrawn into Bohemia on the approach of the Prussians), under Count Clam-Gallas, stationed along the

frontier n. of Turnau and Leitmeritz; and 186,000 infantry, 16,000 cavalry, and 544 guns, under Marshal Benedek, commander-in-chief, in Eastern Bohemia, behind the Riesengebirge—in all, 262,400 men and 716 guns. As the Austrians expected the attack from Silesia, by far the greater portion of their army was stationed behind the Riesengebirge; so that when Von Bittenfeld and Prince Friedrich-Karl crossed the Erzgebirge (June 24), they found themselves opposed by only the outlying brigades of Clam-Gallas, which they forced to retire toward Turnau and Münchengrätz, after defeating them in some insignificant combats at Reichenberg, Langenbrück, Liebenau, and Turnau, and in a severe struggle at Podol, which cost the Austrians in all 2,400 killed, wounded, and prisoners; the loss of the Prussians being only 124 men. The first and second Prussian armies, now united, advanced leisurely, driving the enemy toward Münchengrätz, where Clam-Gallas had strongly posted himself, and where, June 28, he was attacked by the combined Prussian armies, and after a brief but severe contest, forced to retreat in haste. By several routes, the combined armies under Friedrich-Karl continued their march, routing the detached corps of Austrians and Saxons which attempted to bar their progress; and after a severe contest (June 29), which cost the Prussians 2,000 men, and the Austrians about 4,000, took possession of Gitschin, and encamped on the following morning between that town and Horzitz, having established communications with the crown-prince; while Clam-Gallas retired to join the main body under Benedek, after having, with a force only half as numerous as his opponents', and still more inferior in guns, compelled his antagonists to spend six days in making an advance of 40 English miles.

Meanwhile the third Prussian army had advanced in two divisions, the right wing through the passes of the Riesengebirge by Landshut, toward Trautenau; the left by Glatz, toward Nachod and Skalitz; while the centre divisions crossed by Braunau, all crossing the frontier June 26. The defiles were traversed without opposition, the Austrians being posted only at the mouths of the passes; but as the left wing under Steinmetz debouched toward Nachod, it was assailed (June 27) by Ramming's Austrian corps, and driven back into the pass. Steinmetz, however, persevered; and by the aid of his guns, and repeated charges of cavalry, succeeded, after a conflict of six hours, in extricating his corps from the defile, at a cost of 1,191 killed and wounded, to 6,000 on the part of the Austrians. Both armies being reinforced, the contest was renewed at Skalitz on the 28th; but, though long and bloody, it was on all sides favorable to Steinmetz, who beat the Austrians back upon Josephstadt, with a loss in killed and wounded of 5,815, and 5,850 prisoners, with five guns. The Prussian right wing, under Bonin, also had a double conflict with the Austrians, who were posted to receive them; for, after extricating themselves from the Landshut defile, and seizing Trautenau, they were met (June 27) by General Gablentz,

and, after a long-continued fight, were driven back to their previous camping-ground, losing, however, only 1,423 men, to about 3,500 of the Austrians. Gablentz being much exhausted with his hardly-won victory, obtained reinforcements from Benedek; and the Prince of Württemberg, with a corps of Guards, being sent by the crown-prince (who marched with the centre, ready to afford support to either wing when necessary) to attack Gablentz by Eypel, fell upon him (June 28) while he was preparing to complete the defeat of Bonin, and, after a severe combat, or rather series of partial unconnected combats, the Austrians were this time defeated, with a loss of 4,000 men, and an equal number of prisoners; the Prussian loss being only 834 killed and wounded. The three Prussian armies having thus effected a firm lodgment in Bohemia, moved steadily forward in lines, converging to a point n. of the Austrian army, which was now concentrated between Josephstadt and Königgrätz; and the king of Prussia, who had arrived (July 1) at the headquarters of the 1st and 2d armies, hearing of Benedek's intention to assault them before the crown-prince's army could come to their aid, resolved to anticipate him, and ordered an attack on the Austrian position, July 3, 8 A.M., at the same time sending off an urgent dispatch to hasten the arrival of the crown-prince, whose host, at 8 A.M. on the 3d, was 15 m. off. The Prussians, at the commencement of the fight, believed they had to do with only the half of the Austrian army, but they were soon undeceived, for, after carrying the villages in front of the Austrian position, and advancing up the slope, they were met by such a crushing fire of artillery as completely stopped their progress. Benedek then directed his reserves against the Prussian left, in order to cut it off from the crown-prince, but all his endeavors to drive it permanently from its position failed. The conflict, mainly an artillery-fight, thus continued without intermission, and the Prussian left was almost on the point of giving way before the overwhelming numbers of its assailants, when the wavering of the Austrian right unmistakably showed that a portion at least of the third army had arrived, and attacked them in flank. This new assailant becoming more formidable every minute, speedily rolled up the Austrian right wing; and the advance of the 1st and 2d armies, by partially inclosing the Austrians between two fires, threw them into great confusion. Their array was soon broken, and dissolved in precipitate flight; multitudes perished in the morasses, in the waters of the Elbe, and under the wheels of the fleeing baggage-wagons; but the undaunted attitude of the splendid Austrian cavalry, and the deficiency of the Prussians in that arm, greatly mitigated the horrors of the rout. The Prussians lost more than 9,000 killed and wounded; the Austrian loss was 16,235 killed and wounded, and 22,684 prisoners. After this decisive defeat, known as the battle of Königgrätz, or Sadowa, all hope of staying the advance of the Prussians by the army of Benedek was at an end; a truce was asked for, but refused; and the victorious Prussians pushed forward toward Vienna, whither

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Benedek had drawn his beaten forces. At the same time, the southern Austrian army, which had been employed against the Italians, was collected at the capital, and every precaution was taken, by the erection of entrenchments, fortifications, etc., to insure the safety of Vienna, when, by the agency of the emperor of the French, a truce was agreed to, which afterward led to a treaty of peace.

A few days before this campaign had commenced, the Italians, burning with eagerness to free Venetia from the yoke of the alien, and combining, with all the enthusiasm and heroic spirit of a young nation, no small portion of its overweening presumption, had assembled an army of 200,000 men, one half of which, under Gen. Della Marmora, was intended to cross the Mincio between Peschiera and Mantua; while the other half was stationed round Bologna, to operate on the lower Po. To oppose this force, the Archduke Albert, commander-in-chief in Venetia, had about 90,000 men near Verona; besides the garrisons of the Quadrilateral and Venice, not available for field-service. On June 23 (on which day it was notified to the archduke that hostilities would be commenced), La Marmora's army crossed the Mincio, unopposed by the Austrians; and the Italian commander, not expecting attack, masked the fortresses of Peschiera and Mantua, and marched the rest of his army forward in a somewhat careless fashion. The archduke, however, had been all along watching his opponent; and after having succeeded in entangling him between the river and the hills, he attacked him (June 24) with his whole force. The Italian left was speedily broken and driven back, and would have been wholly destroyed had not Gen. Pianell, whose division was on the right bank of the Mincio, crossed the river, and held the assailants at bay during the rest of the day. The Austrian attack on the Italian right was, however, at first unsuccessful. In the centre, where were the village of Custoza and Monte Belvedere, the keys of the position, an obstinate struggle was maintained on both sides throughout the day, but toward 4 P.M. victory inclined to the Austrians, and soon afterward they gained possession of the position which decided the day. The Italians fell back, in fair order, toward the Mincio, unpursued by their exhausted opponents, and, on the following day, were all assembled again on the right bank of the river. The Italians lost, in killed, wounded, and prisoners, 8,175 men, and several pieces of artillery; while the loss of the Austrians was about 8,000 men. This plan of the campaign having failed, the Italian generals set about devising another, and spent more than a week in deliberation and discussion. At the end of this time, news came of the great defeat which the Austrians had sustained in the north, and of the cession of Venetia, by the Emperor of Austria, to the Emperor Napoleon. Though it was not for a moment in doubt that this cession was only a round-about way of surrendering the province to Italy, the Italian govt., true to the Prussian alliance, refused to conclude a separate treaty; and (the archduke's army having been, as above mentioned, withdrawn for the defense of Vienna)

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Cialdini's army crossed the Po (July 7) and occupied Padua, Vicenza, and Treviso; while Garibaldi, at the head of his volunteers, and Gen. Medici, with a division of Cialdini's army, advanced up the Lake of Garda into the Trentino, the small body of Austrians in the district being wholly unable to offer a successful resistance to such an overwhelming attack. Not content, however, with attacking Austria by land, a fleet was equipped and dispatched under Admiral Persano, to assail the Dalmatian coast and retrieve for Italy by her navy the disgrace which had fallen upon her army; and accordingly Persano directed an attack on the island and forts of Lissa, and failed. News of this attack being communicated to Admiral Tegethoff, commander of the Austrian fleet in the Adriatic, he sailed at once for the relief of Lissa; and though his ships were inferior in number, size, and weight of ordnance, and only 7 of them ironclads, to 12 more powerful vessels of the same sort in the Italian fleet, he bravely led his ships to the attack, destroyed or sank two of the largest of the enemy's vessels, broke through his fleet, and took up a position in front of Lissa, ready to renew the fight if necessary. The Italian fleet, however, drew off, and on the following morning was out of sight, making for Ancona.

Thus baffled both on land and sea, Italy, though vigorously professing her determination to go hand in hand with Prussia, was very loath to agree to the armistice signed by the two belligerent German powers at Nikolsburg, July 26; and attempted to salve her chagrin by insisting upon the surrender by Austria to her of the Trentino. Prussia, however, having agreed with Italy only for the cession of Venetia, was not inclined to support this demand; and Italy, seeing that she must either make peace or fight for the Trentino single-handed against Austria, gave way reluctantly, and agreed to the armistice, Aug. 12.

A third contest was, about the same time, in progress between Prussia and those minor states of Germany which had raised armies to support Austria, viz., Bavaria, Würtemberg, Baden, and Hesse-Darmstadt. After the capture of the Hanoverian army, the Bavarians, who, under Prince Charles of Bavaria, had been advancing slowly to join them, took post, June 30, at Suhl, in the valley of the Werra. A second army had been assembled under Prince Alexander of Hesse-Darmstadt, and had been drawn together in front of Frankfurt. To prevent the junction of these two armies, the Prussian general, Vogel von Falkenstein, who had 48,000 infantry, 3,300 cavalry, and 96 guns, threw a part of his forces forward toward Fulda, and with the remainder attacked the Bavarians, who were inferior in number, and routed them at Dermbach, Kaltenordheim, and Hünfeld, driving them toward Kissingen; he then turned his superior force against Prince Alexander, whom he forced to retreat toward Darmstadt. The two armies were now completely separated, and Von Falkenstein found little difficulty in keeping them apart during the rest of the brief campaign, and in routing the Bavarians at Kissingen and Hammelburg, and the Darmstadters at Aschaffenburg, and driving

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the broken remnants of the two armies s. of the Main. He then crossed the Main and occupied Würzburg, in Bavaria. After some little delay, peace was concluded between these four minor states and Prussia; but, unlike Austria, of which they were merely the allies, some of them were forced to submit to a certain loss of territory.

The states n. of the Main which had taken up arms against Prussia were completely incorporated with Prussia—viz., Hanover, Hesse-Cassel, Nassau, Frankfurt, and a small portion of Hesse-Darmstadt, as well as Slesvig-Holstein and Lauenburg; and the other states n. of the Main were united with Prussia in a confederacy of a more intimate nature than before existed, called the *North German Confederation*.

Bavaria, Baden, Würtemberg, the part of Hesse-Darmstadt s. of the Main and Liechtenstein, were not included in this union, but were invited to reform their armies and enter into a closer mutual relationship, with a view to a military and political connection with the Confederation.

Saxony, which had prominently figured in the contest as an ally of Austria, was doomed by Count Bismarck to incorporation; but Austria, supported by France, so steadily opposed this arrangement that it was abandoned, and the little kingdom was admitted into the Confederation.

Austria, by the treaty of Prague (1866, Aug. 23), was completely excluded from participation in the new organization of the German states, and formally agreed to the surrender of Venetia to Italy, to the incorporation of Slesvig-Holstein with Prussia, and to the new arrangements made by Prussia in Germany. A portion of the fifth article of this treaty secured that, if the 'inhabitants of the northern districts of Slesvig declare, by a free vote, their desire to be united to Denmark, they shall be restored accordingly.' Though losing no territory to Prussia, Austria had to pay 40 millions of thalers for the expense of the war, after which payment the Prussian troops were to be withdrawn from Austrian territories.

Saxony resigned to Prussia the right of garrisoning Königstein, and of partially garrisoning Dresden, and paid ten million thalers war-indemnity; Bavaria (by treaty of Berlin, Aug. 22) surrendered several districts of Lower Franconia to Prussia, and paid 30 millions gulden war-indemnity; Baden (by treaty of Berlin, Aug. 17) and Würtemberg (by treaty Aug. 13) surrendered no territory, but paid, the former six, and the latter eight, millions gulden; while Hesse-Darmstadt (by treaty of Berlin, Sep. 3) surrendered various districts of the province of Ober-Hesse, receiving in return several districts formerly belonging to Electoral Hesse, Nassau, and Frankfurt, and paid three millions of gulden war expenses; also, the province of Ober-Hesse, into which were to be incorporated the districts ceded by Prussia, was to form a part of the N. German Confederation, the other parts of the grand duchy s. of the Main being unconnected with it. Even the little principality of Reuss had to pay 100,000 thalers into the fund for Prussian invalids.

The N. German Confederation, as thus constituted, pos-

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essed a common parliament, elected by universal suffrage, in which each state was represented according to population. The first or constituent parliament met early in 1867, and was employed in deliberating over the details of the proposed constitution for the Bund, which was drawn up and submitted to it by Count Bismarck. After some weeks' discussion, the draft, with a few modifications, was agreed to; the new elections took place, and the first regular N. German parliament met 1867, Sep. According to this constitution, there was to be a common army and fleet, under the sole command of Prussia; a common diplomatic representation abroad, of necessity little else than Prussian; and to Prussia also was intrusted the management of the posts and telegraphs in the Confederation.

The s. German states which till this point had not joined the Bund, were Bavaria, Baden, Würtemberg, Hesse-Darmstadt, and Liechtenstein, with a joint area of 43,990 sq. m., and total pop. (1866) 8,524,460. But though these states were not formally members of the Bund, they were so practically, for they were bound to Prussia by treaties of alliance offensive and defensive, so that in the event of a war the king of Prussia would have at his disposal an armed force of more than 1,100,000 men.

In the spring of 1867, a war between Prussia and France seemed imminent, from difficulties arising out of the occupation of Luxembourg by the former; but by the good offices of the British govt., a congress was assembled at London, at which representatives of the great powers (Italy included) were present, and an arrangement satisfactory to both nations was amicably agreed upon, the province under dispute remaining in the possession of the king of Holland. Though the outbreak of hostilities was thus averted for the present, neither nation entirely gave up the thought of war, and on both sides extensive military preparations were carried on.

During the next few years, the N. German Confederation was employed in consolidating and strengthening itself, and in trying to induce the southern states to join the league. The Zollverein (q. v) was remodelled and extended, until, in 1868, every part of Germany was a member of it, with the exception of the cities of Hamburg and Bremen, and a small part of Baden. This paved the way for the formal entrance of the s. German states into the confederation; but they still hung back, though it daily became more evident that a united Germany would soon be an accomplished fact.

In 1870, the long-threatened war between Prussia and France broke out. On July 4 of that year, the provisional govt. of Spain elected Prince Leopold of Hohenzollern, a relative of King William of Prussia, to fill their vacant throne. This step gave the greatest umbrage to the French govt., and the Paris journals almost unanimously asserted that the accession of this prince to the Spanish throne would be tantamount to the re-establishment of the empire of Charles V., in favor of Prussia. M. Benedetti, French minister at Berlin, was instructed to ask explanations from King William; and, though by the advice of that monarch, Prince Leopold resigned his candidature, the French govt.

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was not satisfied, but demanded an assurance that Prussia would at no further period sanction his claims. This assurance the king refused to give; and July 23, Louis Napoleon, Emperor of the French, proclaimed war against Prussia. Contrary to the expectation of France, the s. German states at once decided to support Prussia and the northern states, and placed their armies, eventually commanded by the Crown-Prince of Prussia, at the disposal of King William.

Early in Aug. the forces of both countries were congregated on the frontier. Napoleon, however, lost a fortnight in delays after the declaration of war, and it was discovered that the French army was far from a state of satisfactory preparation, while the Germans were splendidly organized, and much superior in number. The result was, that the French, instead of marching to Berlin as they anticipated, never crossed the Rhine, and had to fight at a disadvantage in Alsace and Lorraine.

On Aug. 2, the French obtained some unimportant success at Saarbruck, but on the 4th a brilliant victory was achieved by the army of the Crown-Prince of Prussia at Weissenburg. This was followed by the victory of Wörth on the 6th, in which the French, under MacMahon, lost 4,000 prisoners, and were pursued toward Metz. On the same day, the French under General Froissard were again defeated at Spicheren, and lost 2,500 prisoners. On the 14th the Prussians occupied Nancy, and on the 16th the French army under the command of Bazaine was driven back on Mars-la-Tour. The battle of Gravelotte, in which King William commanded in person, was fought on the 18th; and, though the Germans suffered immense loss, they were again victorious, and forced Bazaine to shut himself up in Metz. The losses of the French in these last three days' fighting amounted in dead alone to more than 12,000 men. About 4,000 prisoners were made at Gravelotte. Emperor Napoleon and Marshal MacMahon in vain attempted to proceed to the relief of Bazaine. They were surrounded at Sedau, and completely defeated with heavy loss. The emperor surrendered Sep. 2, with his whole army, about 90,000 men, and was sent as a prisoner into Germany. By Sep. 19 the Prussians had reached Paris, and commenced a vigorous siege. Strasburg capitulated on the 27th after a severe bombardment; and Oct. 28, Bazaine surrendered Metz with an army of 6,000 officers and 173,000 men, 400 pieces of artillery, 100 mitrailleuses, and 53 eagles. Verdun capitulated Nov. 8; Thionville followed on the 24th; after which were several capitulations of lesser importance.

The French made extraordinary efforts to raise armies and relieve Paris, but, with the exception of a momentary gleam of success on the Loire, they met with nothing but severe defeats. Of these were the battle of Dec. 3 in the Forest of Orleans, and that of Le Mans, Jan. 12, in which contests Prince Frederick Charles took altogether 30,000 prisoners. After numerous unsuccessful sorties, and enduring great sufferings from famine, Paris surrendered Jan. 29, and the war was virtually at an end. The French army of the east, 80,000 strong, under Bourbaki, was compelled to retire to

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Switzerland on the 31st. France was condemned to pay a war indemnity of 5 milliards of francs, or \$1,000,000,000; and the province of Alsace, with the German part of Lorraine, was ceded to Germany. For further account of this war, see FRANCO-GERMAN WAR.

New German Empire.—The 79th article of the constitution of the N. German Confederation provided for the admission of the s. German states into the new Bund; and the war between France and Germany, which broke out 1870, July, and in which all the German princes and peoples took part, gave an irresistible impetus to the desire for national unity. 1870, Nov. 15, the grand-duchies of Baden and Hesse joined the Bund; Bavaria followed on the 23d, and Württemberg on the 25th. Shortly afterward the king of Bavaria wrote a letter to the king of Prussia, urging him to re-establish the German empire. This brought the question under the notice of the Bund; and 1870, Dec. 10, it was agreed, by 188 votes to 6, that the empire should be restored, and that the king of Prussia should be acknowledged hereditary German emperor. The latter, then with his victorious army near Paris, solemnly accepted the new dignity, and was invested with the imperial title and power, at Versailles, 1871, Jan. 18.

The new empire is composed, like the old Bund, of a confederation of German states; but these all, both the northern and the southern, welded into one for national purposes as was never before the case; and the imperial power, by the terms of the constitution, is so fully asserted, that it cannot possibly be assailed or questioned from within. There are two legislative bodies in the empire—the *Bundesrath*, or Federal Council, the members of which are annually appointed by the governments of the various states; and the *Reichstag*, the members of which are elected for a period of three years by universal suffrage and ballot. All imperial laws must receive the votes of an absolute majority of both bodies, and, to be valid, must, in addition, have the assent of the emperor, and be countersigned when promulgated by the *Reichskanzler*, or chancellor of the empire, who is *ex officio* president of the Bundesrath.

According to the 11th article of the constitution, the German emperor, with the consent of the Bundesrath, can declare war, make peace, enter into treaties with foreign nations, and appoint and receive ambassadors. If, however, the territory of the empire is attacked, he does not require the consent of the Bundesrath to declare war, but can act independently.

The power exercised by the empire extends to everything necessary to the security and welfare of the German people. The preamble to the constitution expressly declares that all the states of Germany *schliessen einen ewigen Bund zum Schutze des Bundesgebiets, und zur Pflege der Wohlfahrt des Deutschen Volkes* ('form an eternal union for the protection of the territory of the Bund, and for the care of the welfare of the German people'). Thus, it possesses the exclusive right of legislation on all military and naval affairs; on imperial finance and commerce; on posts, telegraphs,

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and railways so far as the interests of national defense are concerned. Whenever the laws of the empire come into collision with those of particular states of the Bund, the latter must be held as abrogated, and in all disputes that arise among the latter, the imperial jurisdiction is supreme and final.

Acting under the direction of the chancellor of the empire, the Bundesrath, in addition to its legislative functions, represents also a supreme administrative and consultative board, and as such, has seven standing committees—namely, for army and naval matters; tariff, excise, and taxes; trade and commerce; railways, posts, and telegraphs; civil and criminal law; financial accounts; and foreign affairs. Each committee consists of representatives of at least four states of the empire; but the foreign affairs' committee includes only the representatives of the kingdoms of Prussia, Bavaria, Saxony, and Würtemberg.

Following is a list of the states composing the present German empire, with their areas and populations, 1900:

States.	Area in sq. m.	Pop. in 1900.
KINGDOMS—		
Prussia.....	134,603	34,472,509
Bavaria.....	29,282	6,176,057
Saxony.....	5,787	4,202,216
Württemberg.....	7,528	2,169,480
GRAND DUCHIES—		
Baden.....	5,821	1,867,944
Hesse.....	2,965	1,119,893
Mecklenburg-Schwerin.....	5,135	607,770
Saxe-Weimar.....	1,388	362,873
Mecklenburg-Strelitz.....	1,131	102,602
Oldenburg.....	2,479	399,180
DUCHIES—		
Brunswick.....	1,424	464,333
Saxe-Meiningen.....	953	250,731
Saxe-Altenburg.....	511	194,914
Saxe-Coburg-Gotha.....	755	229,550
Anhalt.....	906	316,085
PRINCIPALITIES—		
Schwarzburg-Rudolstadt.....	363	93,059
Schwarzburg-Sondershausen.....	333	80,898
Waldeck.....	433	57,918
Reuss Aeltere Linie.....	122	68,396
Reuss Jüngere Linie.....	319	139,210
Schaumburg-Lippe.....	131	43,132
Lippe-Detmold.....	469	138,952
FREE TOWNS—		
Lübeck.....	115	96,775
Bremen.....	99	224,882
Hamburg.....	158	768,349
Alsace-Lorraine.....	5,600	1,719,470
Heligoland.....	¾	2,086
	208,830	56,369,264

See *Handbuch d. Geog. und Statist.* v. Dr. Wappäus (Leip. 1859); *Geogr.-Statist. Hist.-Atlas der Staaten d. Deutsch Bund* v. Weiland (1828); H. Berghaus, *Ethnograph.-Statist.-Darstellung des deutschen Reichs* (Gotha. 1848); Schauenburg, *Flusscharte v. Deutschl. und Mittel-Europa* (Berlin 1855); Stieler's and Spruner's *Atlases*; Baedeker's *Hand-*

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books; Von Klöden's Erdkunde (Berlin, 3d ed. 1873 *et seq.*); *Statistik des Deutschen Reiches* (1873-79); Neumann's *Das Deutsche Reich in Geographischer, Statistischer und Topographischer Beziehung* (1872-74); *Statesman's Year-book* and *Almanach de Gotha* for the current year.

German History —After the gradual expulsion or retirement of the Romans from Germany, the country necessarily became subdivided into numerous petty states, each governed by its own chief. The erection of the Franko-Merovingian empire in France had given preponderance to the Frankish power on both sides of the Rhine, and when Charlemagne succeeded 771, to the German as well as the Gallic possessions of his father, Pepin d'Heristal, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of w. Germany, while his conquests over the heathen Saxons in the n., and the Avari in the s.e., extended his German dominions from the North Sea to the Alps, and from the Rhine to Hungary. With Charlemagne, who received the imperial crown and title of *Roman* emperor from the pope 800, began the line which occupied the German throne for a thousand years. With him, too, the vast fabric of the *Holy Roman Empire*, which he had reared on the ruins of Roman power, lost its stability. for at his death 814, no member of his family was competent to wield the imperial sceptre, although in 843 some portions of his German possessions fell, in accordance with a family compact, to his grandson Ludwig, surnamed 'the German,' who was recognized as king of Germany. On the extinction, 911, of the degenerate Carlovingian dynasty in the person of Ludwig 'the Child,' the provincial rulers, who, together with the archbishops, bishops, and abbots, constituted the chief members of the diet or national assembly, arrogated to themselves (in imitation of the practice of the nobles of the ancient German tribes) the right of electing their sovereign, who, however, could not assume the imperial title till he had been crowned by the pope. At this period, there were in Germany five nations—the Franks, Saxons, Bavarians, Swabians, and Lorrainers. The Franks as the descendants of those who had conquered the land and founded the empire, had pre-eminence over the others; hence, on the extinction of the Carlovingian race, the choice of the prince-electors seems to have fallen almost of course on the chief of the Franks, the Duke or Count of Franconia, who reigned as king of Germany 911-918, under the title Conrad I. At his own instigation, his rival and adversary, Henry, Duke of Saxony, was chosen as his successor, and proved himself an able and war-like prince. The conquests which he gained over the Danes, Slaves, and Magyars were confirmed and extended by his son and successor, Otho I. (reigned 936-973), who carried the boundaries of the empire beyond the Elbe and Saale, and who, by his acquisition of Lombardy, laid the foundation of the relations which existed for many ages between the rulers of Germany and the Italian nation. Otho's coronation-festival was eventful, as it formed the precedent for the exercise

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of those offices which, till the dissolution of the empire, were regarded as connected with the dignity of the secular electors, for on that occasion, while the emperor dined with his three spiritual electors, he was waited upon by the secular princes—the Elector of Bavaria (afterward Saxony) serving as grand-marshal; of Swabia (afterward Bohemia), as grand-cupbearer; and of Lorraine (afterward Brandenburg), as arch-chamberlain.

Otho II. (reigned 973-983), Otho III. (reigned 983-1002), and Henry II. (reigned 1002-24), belonged to the House of Saxony, which was succeeded by that of Franconia, in the person of Conrad II. (reigned 1024-39), an able ruler, who added Burgundy to the empire. His son and successor, Henry III. (reigned 1039-56), extended German supremacy over Hungary, part of which he conquered and annexed to Lower Austria, while he repressed the insolence and despotism of the temporal and spiritual princes of Germany, and gained the respect of his contemporaries by his zeal for justice and his valor in the field. The minority of his son and successor, Henry IV. (reigned 1056-1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the imperial authority, which had been considerably extended in the two preceding reigns. Henry's constant quarrels with the astute Gregory VII. entangled him in difficulties and mortifications which ended only with his life, and which plunged Germany into anarchy and disorder, and entailed upon the empire destructive wars convulsing the whole of continental Europe for more than two centuries. With his son and successor, Henry V. (reigned 1106-25), the male line of the Franconian dynasty became extinct; and after the crown had been worn (1125-38) by Lothaire of Saxony, who made a bold attempt to recover some of the prerogatives of which at his election the empire had been deprived through papal intrigues, the choice of the electors, after a season of dissension and intrigue, fell upon Conrad III., Duke of Franconia, the first of the Hohenstauffen dynasty (reigned 1138-52). His reign, in which the civil wars of the Guelphs and Ghibellines began, was distracted by the dissensions of the great feudatories of the empire, while the strength of Germany was wasted in the disastrous Crusades, in which Conrad took an active part. On his death, the electoral college for the first time met at Frankfurt, which retained the honor of being the place at which the sovereign was elected and crowned till the dissolution of the empire in the 19th c. Frederick I. (reigned 1152-90), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle Conrad, chosen as his successor, and the splendor of his reign fully warranted the selection. By the force of his character, Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and counties of Germany, while then for the first time appeared the *hereditary* right possessed by certain princes to

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exercise the privilege of election. Unfortunately for Germany, this great monarch suffered the interests of his Italian dominions to draw him away from those of his own country, while his participation in the Crusades, in which both he and the flower of his chivalry perished, was memorable only for the misfortunes which it entailed on the empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolf I. (1273), first of the Hapsburg line, which through a female branch, still reigns in Austria, was one of constant struggle, internal dissension, and foreign wars. Individually, the princes of the Hohenstauffen dynasty were popular monarchs, their many noble and chivalrous qualities having endeared them to the people, while one of the race, Frederick II. (reigned 1212-50), was, after Charlemagne, perhaps the most remarkable sovereign of the middle ages; but their ambitious designs on Italy, and their constant but futile attempts to destroy the papal power, were a source of misery to Germany; and with Frederick II. ended the glory of the empire, till it was partially revived by the Austrian House of Hapsburg. His son, Conrad IV. (reigned 1250-54), after a brief and troubled reign, was succeeded by various princes, who, in turn, or in some cases contemporaneously, bore the imperial title without exercising its legitimate functions or authority. This season of anarchy was terminated at the accession of Rudolf I. (reigned 1273-91), who, by the destruction of the strongholds of the nobles, and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandizement of his Austrian possessions, which embraced Styria, Carinthia, Carniola, and Tyrol.

For the next 200 years, the history of the German empire presents very few features of interest, and may be briefly passed over. Adolf of Nassau, who was elected to succeed Rudolf, was compelled 1298 to yield the crown to the son of the latter, Albrecht I. (reigned 1298-1308), whose reign is chiefly memorable as the period in which three Swiss cantons, Unterwalden, Schwytz, and Uri, established their independence. After the murder of Albrecht, the throne was occupied in rapid succession by Henry VII. (reigned 1308-13), who added Bohemia to the empire; and conjointly by Frederick of Austria and Ludwig of Bavaria (reigned 1313-49). Charles IV. (reigned 1349-78) of Luxembourg was the successful candidate among many rivals, and though he attended specially to the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the empire, for which he provided by a written compact, known as the *Golden Bull*, which regulated the rights, privileges, and duties of the electors, the mode of the election and coronation of the emperors, the coinage, customs, and commercial treaties of the empire, and the rights and obligations of the free cities. His son, Wenceslaus (reigned 1378-1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Ruprecht of the Palatinate (reigned 1400-10). The nominal

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reign of Sigismund (reigned 1410-37), brother of Wenceslaus, would demand no notice were it not for his connection with the Councils of Constance and Basel, at the former of which Huss was condemned, and which was followed by the disastrous Hussite wars. The readiness with which Sigismund lent himself to the interests of Henry V. of England, and of all other princes who ministered to his love of personal display, brought discredit on the imperial dignity, while his dishonorable desertion of Huss will ever attach ignominy to his name. Albrecht II. of Austria (reigned 1438-40), after a brief reign of two years, in which he gave evidence of great capacity for governing, was succeeded by his cousin, Frederick III. (reigned 1440-93), an accomplished but avaricious and indolent prince, whose chief object seemed to be the aggrandizement of the House of Austria, with which the title of emperor had now become permanently connected (see AUSTRIA), while he neglected the interests of Germany collectively, and suffered the infidels to make unchecked advances upon its territory. Maximilian I. (reigned 1493-1519), son and successor of Frederick, resembled him in few respects, for he was active, ambitious, and scheming, but deficient in steadiness of purpose. His marriage with Mary, rich heiress of her father, Charles the Bold of Burgundy, involved him in the general politics of Europe, while his opposition to the reformed faith preached by Luther exasperated the religious differences which disturbed the close of his reign. Maximilian had, however, the merit of introducing many improvements in the internal organization of the state, by enforcing the better administration of the law, establishing a police and an organized army, and introducing a postal system. With him originated, moreover, the special courts of jurisdiction known as the 'Imperial Chamber' and the 'Aulic Council;' and in his reign, the empire was divided into 10 circles, each under its hereditary president and its hereditary prince-convoker. Maximilian lived to see the beginning of the Reformation, and the success that attended Luther's preaching; but the firm establishment in Germany of the reformed faith, and the religious dissensions by which its success was attended, belong principally to the reign of his grandson, Charles I., King of Spain (son of the Archduke Philip and of Joanna, heiress of Spain), who succeeded to the empire under the title of Charles V. (reigned 1519-56). The management of his vast possessions in Spain, Italy, and the Netherlands, and the wars with France, in which he was so long implicated, diverted him from his German territories, which he committed to the care of his brother Ferdinand. The princes of Germany were thus left to settle their religious differences among themselves, and to quell, unaided by the head of the state, the formidable insurrection of the peasants (1525), which threatened to undermine the very foundations of society. This rising of the lower orders was due to the preaching of the fanatic M \ddot{u} nzer, and other leaders of the sect of Anabaptists, which had arisen from a perverted interpretation of some of the tenets advanced by

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Luther. Charles's determined opposition to the reformers rendered all settlement of these religious differences impracticable; and though by the aid of his ally, Maurice of Saxony, he broke the confederation of the Prot. princes, known as the Union of Smalkald, he was forced by his former ally to make concessions to the Lutherans, of which he disapproved; and in his disgust at the complicated relations in which he was placed to both parties, he abdicated in favor of his brother Ferdinand (reigned 1556-64), who put an end to much of the religious dissension that had hitherto distracted the empire, by granting entire toleration to the Protestants. Although Ferdinand was personally mild and pacific, his reign was troubled by domestic and foreign aggressions—the different sects disturbing the peace of the empire at home, while the French and the Turks assailed it from abroad. During the next 50 years, the empire was a prey to internal disquiet. Maximilian II. (reigned 1564-76) was indeed a wise and just prince, but the little he was able to effect in reconciling the adherents of the different churches, and in raising the character of the imperial rule, was fatally counteracted by the bigotry and vacillation of his son and successor, Rudolph II. (reigned 1576-1612), in whose reign Germany was torn by the dissensions of the opposite religious factions, while each in turn called in the aid of foreigners to contribute toward the universal anarchy which culminated in the Thirty Years' War, begun under Rudolph's brother and successor Matthias (reigned 1612-19); continued under Ferdinand II. (reigned 1619-37), an able but cruel and bigoted man; and ended under Ferdinand III. (reigned 1637-57), by the treaty of Westphalia, 1648. The effect of the Thirty Years' War was to depopulate the rural districts of Germany, destroy its commerce, burden the people with taxes, cripple the already debilitated power of the emperors, and cut up the empire into a multitude of petty states, the rulers of which exercised almost absolute power within their own territories. Leopold I. (reigned 1658-1705), a haughty, pedantic man, did not avail himself of the opportunities afforded by peace for restoring order to the state, but suffered himself to be drawn into the coalition against France, while his hereditary states were overrun by the Turks. Although success often attended his arms, peace brought him no signal advantages. The reigns of Joseph I. (reigned 1705-11) and Charles VI. (reigned 1711-40), with whom expired the male line of the Hapsburg dynasty, were signalized by the great victories won by the imperialist general, Prince Eugene, in conjunction with Marlborough, over the French; but they brought no solid advantage to the empire. The disturbed condition of Spain and Saxony opened new channels for the interference of Germany, which was further distracted, after the death of Charles, by the dissensions occasioned by the contested succession of his daughter, Maria-Theresa, and, through her, of her husband, Francis I. of Lorraine (reigned 1745-65), after their rival, the Bavarian elector, Charles VII., had, through the intervention of Prussian aid, been elected 1742 to the imperial throne, which, however, he was forced to cede, after

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a brief occupation of three years. Constant disturbances, intensified during the Seven Years' War, when Frederick the Great of Prussia maintained his character of a skilful general at the expense of the Austrians, made the reign of these sovereigns one of trouble and disaster. Joseph II., their son (reigned 1765-90), during the lifetime of Maria-Theresa, who retained her authority over all the Austrian states, had little that was imperial beyond the title Emperor, to which he had succeeded on his father's death. But when he ultimately acquired his mother's vast patrimony, he at once entered on a course of reforms, which were, however, premature, and unsuited to the cases to which they were applied; while his attempts to re-establish the supremacy of the imperial power in s. Germany were frustrated by Prussian influence. Leopold II., after a short reign of two years, was succeeded 1792 by his son, Francis II., who, after a series of defeats by the armies of the French republic, and the adhesion, 1805, of many of the German princes to the alliance of France, which led to the formation of Rhenish Confederation under the protectorate of Napoleon, resigned the crown of the Holy Roman Empire, and assumed the title Emperor of Austria. From this period till the Congress of Vienna of 1814-15, Germany was almost entirely at the mercy of Napoleon, who deposed the established sovereigns, and dismembered their states in the interest of his favorites and dependents, while he crippled the trade of the country, and exhausted its resources by the extortion of subsidies or contributions. As a reconstruction of the old empire was no longer possible, those states which still maintained their sovereignty combined, 1815, to form a German Confederation. Of the 300 states into which the empire had once been divided, there now remained only 40, a number since reduced by the extinction of several petty dynasties. The diet was now reorganized, and appointed to hold its meetings at Frankfort-on-the-Main, after having been formally recognized by all the allied states as the legislature and executive organ of the Confederation; but it failed to satisfy the expectations of the nation, and soon became a mere political tool in the hands of the princes, who simply made its decrees subservient to their own efforts for the suppression of every progressive movement. The French revolution of 1830 reacted sufficiently on a few of the German states to compel their rulers to grant written constitutions to their subjects; but the effect was transient; and it was not till 1848 that the German nation gave expression, by open insurrectionary movements, to the discontent and the sense of oppression which had long possessed the minds of the people. The princes endeavored, by hasty concessions, to arrest the progress of republican principles, and, fully recognizing the inefficiency of the diet, they gave their sanction to the convocation, by a provisional self-constituted assembly, of a national congress of representatives of the people. Archduke John of Austria was elected Vicar of the newly organized national govt.; but he soon disappointed the hopes of the assembly by his

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evident attempts to frustrate all energetic action on the side of the parliament, while the speedy success of the anti-republican party in Austria and Prussia damped the hopes of the progressionists. The refusal of the king of Prussia to accept the imperial crown which the parliament offered him, was followed by the election of a provisional regency of the empire: but as nearly half the members had declined taking part in these proceedings, or in a previous measure, by which Austria had been excluded, by a single vote, from the German Confederation, the assembly soon lapsed into a state of anarchy and impotence, which terminated in its dissolution. The sanguinary manner in which insurrectionary movements had, in the meanwhile, been suppressed by Prussian troops both in Prussia and Saxony, put an effectual end to republican demonstrations; and 1850, Austria and Prussia, after exhibiting mutual jealousy and ill-will, which more than once seemed likely to end in war, combined to restore the diet, whose first acts were the intervention in Slesvig-Holstein in favor of Denmark, and the abolition of the free constitutions of several of the lesser states. After that period, the diet became the arena on which Austria and Prussia strove to secure the supremacy and championship of Germany; and every measure of public interest was made subservient to the views of one or other of these rival powers. These states did, however, conclude a treaty of alliance 1854, guaranteeing to each other the mutual defense of their possessions against all enemies—a compact in which the diet soon joined. In 1858, a currency convention was concluded between all the states of the German Confederation, which had previously entered into similar alliances for the adjustment of international postal and commercial relations; and in the same year the diet adopted a resolution by which the Danish govt. was called on to submit to the legislative assemblies a new project for the political organization of the duchies of Holstein, Lauenburg, and Slesvig. In 1859, after many stormy discussions, the assembly passed a resolution to mobilize the whole federal army, and to appoint the Prussian prince regent commander-in-chief, subject to the control of the diet, or virtually of Austria, with which rested the casting-vote in the federal assembly. This appointment did not satisfy the views of Prussia, which, however, abstained, for a time, from making any direct attempt to secure the political leadership in Germany. The anti-Napoleonic feeling, which at a later period swelled to such a tide, manifested itself decidedly during the difficulties between France and Austria 1859; and the discussions and apprehensions to which this sentiment gave rise, together with the consideration of the Slesvig-Holstein difficulties, constituted the principal questions under discussion in the federal parliament, until the rupture between Prussia and Austria, and the dissolution of the Bund 1866. See FRANCE: FRANCO-GERMAN WAR.—*Scriptores Rerum German. apud Menkenium*; Mannert, *Gesch. d. Tuetschen*; Sismondi, *Histoire des Français*; Putter, *History of the German Constitution*; Raumer. *Hist. of the Hohenstauffen*;

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Coxe, *House of Austria*; Eichhorn's, *Deutsch. Staats-Rechtsgesch.*; Carlyle, *Hist. of Fred. II.*; Schulze, *Einleitung in das Deutsche Staatsrecht*, etc (Leip. 1867); Meyer, *Grundzüge des Norddeutschen Bundesrecht* (Leip. 1868); Hirth, *Annalen des Nordd. Bundes*, etc. (Berl. 1868); and *Annalen des Deut. Reichs* (1871); Auerbach, *Das neue Deut. Reich und seine Verfassung* (Berl. 1871); and Hausen, *Die Verfassung des Deut. Reichs* (Nordl. 1871).

A noticeable movement in Germany since the war with France, is its ecclesiastical contest with the Church of Rome, which owed its immediate outbreak to the pope's refusal to receive the German ambassador 1872. This was followed by the expulsion of the Jesuits from Germany; an act to which the pope replied by an allocution asserting the supremacy of the laws of the church over those of the state. The Falk laws, whose general principle is that all religious societies are subject to the laws and supervision of the state, were then passed, and several German prelates, protesting against their principles and provisions, refused to submit their ecclesiastical arrangements to the inspection of the government, and threatened to excommunicate such of the clergy as should comply. The matter admitting of no compromise, the govt. resolved to carry out the laws, and several of the refractory bishops were expelled from Germany. In 1875 Germany passed a law making marriage a civil rite, and the pope issued an encyclical letter declaring the Falk laws invalid. See further, OLD CATHOLICS: DÖLLINGER. The serious disorganization that ensued in the affairs of the church led in 1878-9, under the more conciliatory auspices of the new pope, Leo XIII., to attempt at a compromise or *modus vivendi* between the empire and the papal see—at first without effect, but later with a resumption of friendly relations between the imperial govt. and the Roman see. Meanwhile the struggle of the state with Socialism had taken the foremost place in public interest. The repeated attempts on the life of the emperor, 1878, were attributed more or less directly to the Socialistic organization, of late notoriously increasing in strength; and the attempted assassination was the signal for legislative measures giving the administration very extensive powers for checking or suppressing the influence of Socialism. Recent legislation and the new tariffs are strongly protectionist. More cordial relations with Austria led 1879 to an Austro-German Alliance. The years 1880,1 were marked by the revival of a spirit of hostility against the Jews in various parts of the empire, causing much excitement, though but few breaches of the peace resulted. Several persons of high standing uttered themselves in justification of the feeling of suspicion cherished by the populace against the Semitic race, which was alleged to be acquiring a dangerous influence in the public life and learned professions of Germany. Emigration to America assumed almost alarming proportions; 250,000 Germans forsaking their fatherland in a single year. Bismarck's scheme of compulsory insurance for workmen—repeatedly brought forward—was regarded as of the nature of 'state socialism.'

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and was keenly opposed by the progressists, without securing the support of the liberals. The tobacco monopoly, zealously promoted by the chancellor, was not sanctioned by the legislature or by the general election 1881. Emperor William I. died 1888, Mar. 8; was succeeded by Emperor Frederick William III., who died 1888, June 15, and was succeeded by Emperor William II. Prince Bismarck (q.v.) resigned the office of chancellor 1890, Mar. 17, and was succeeded by Gen. Caprivi. In 1888-9 conflicts on the chief of the Samoan Islands led to diplomatic correspondence with the United States; and 1890 G. surrendered rights in Africa to Great Britain, in return for the cession to it of Heligoland (q.v.).

Early in 1890 the emperor endeavored to force the passage of his education bill, whose chief feature was compulsory religious instruction in the primary schools. This bill discriminated in favor of certain denominations, and met with opposition so strong that it had to be withdrawn. On March 29 the Reichstag passed a bill permitting the govt. to declare Alsace-Lorraine in a state of siege in case of war, and the chancellor effected commercial treaties with the members of the Triple Alliance with Switzerland and Belgium. In 1892 a new army bill was presented to the Reichstag by which 4,500,000 men will be available in 1916. The most important event of 1893 was the attempt to pass an army bill which called for a peace force of more than 500,000 men and a war force of 4,400,000. This increase involved an additional expense of \$14,696,000. The bill called for 84,000 additional recruits annually, and caused a storm of opposition. Compromises were offered but none accepted, and the measure was defeated by 58 votes. The Reichstag was dissolved and the question of armament referred to the people. The election returns (1893) showed that in the new Reichstag the govt. had 205 votes as against 172 hostile to the army bill. On the final reading of this measure it passed by a majority of 16.

Anti-semitic agitation of some violence, led by Rector Ahlwardt, who represented New Stettin in the Reichstag, received much attention throughout the year. Ahlwardt in his political addresses declared that German official life was corrupted by the influence of Jewish bribes. Although sentenced to imprisonment for libels on prominent officials Ahlwardt persisted in his agitation. Recently he visited the United States, where he received little encouragement as a "Jew-baiter." In 1893, Feb., the agrarian movement developed unexpected strength, and a congress of 4,000 delegates met in Berlin to protest against the granting of advantages to foreign imports, and to condemn commercial treaties with foreign countries, as injurious to home industries. The agrarian party became powerful in the Reichstag.

The consideration of duelling and military reform occupied the Reichstag during 1896, and in Oct. a measure dealing with these subjects was laid before the federal council. Early in 1897 the emperor issued a decree urging that thereafter duels be effectively prevented,

In 1896 G. placed restrictions on Am. insurance companies doing business in the empire, and retaliatory legislation was promptly enacted in N. Y. state against German companies trading in the state, and the renewal of licenses was refused. By proclamation 1896, Dec. 3, Pres. Cleveland reimposed the tax of 6 cents per ton on all vessels of all nations that entered the United States from German ports. This step was taken as a retaliatory measure because the German govt. levied tonnage or lighthouse dues upon Am. vessels.

In 1897, May, the imperial chancellor introduced a bill restricting the rights of public meeting and political association. This caused much excitement, and the opposition brought about material modification of the measure.

German Language and Literature.—The numerous dialects spoken by the different confederacies and tribes of ancient Germany were all derivatives from one branch of the Aryan or Indo-Germanic family of languages, which separated from the parent stock at a very early period, though subsequently to the separation of the Celtic. We can trace the co-existence of the two branches of Teutonic speech known as Low-German and High-German as far back as the 7th c., but there is no evidence that they existed as common uniform languages, from which their variously modified dialects were respectively derived. According to the eminent philologist Max Müller, there never was *one* common Teutonic language which diverged into two streams; while the utmost we can venture to assert in regard to the various High and Low German dialects is, that they respectively passed at different times through the same stages of grammatical development. The High-German branch—spoken in the dialects of Swabia, Bavaria, and Austria, and parts of Franconia and Saxony—has been the literary language of Germany since the days of Charlemagne. It may be classified under three periods—the Old High-German, dating from the 7th c., extending to the period of the Crusades, or the 12th c.; the Middle High-German, beginning in the 12th c., continuing till the Reformation; and the new High-German, dating from Luther's time to our own days. The Low-German, which in Germany itself has been little used in literature, comprehends many dialects, as the Frisian (q.v.), the Flemish, Dutch, Platt-Deutsch, etc. The oldest literary monument of Low-German belongs to the 9th c., and is a Christian epic known as *The Heliand* (the Healer or Savior); and though there are traces of popular Low-German literature till the 17th c., the translation of the Bible into High-German by Luther decided the fate of Low-German. In addition to the various dialects commonly included under High and Low German, an important evidence of the cultivation of a form of German differing equally from the high and low groups has been preserved. This important linguistic monument is a fragment of a Gothic translation of the Bible, made in the 4th c. by Bp. Ulfilas, and used by all the Gothic tribes when they advanced into Italy and Spain. The Gothic language died out in the 9th c.; and after the extinction of the power of the Goths, the translation of

Ulfilas was forgotten and lost sight of till the accidental discovery, in the 16th c., of a ms. preserved in the abbey of Werden, and containing fragments of this important work. This ms. is a copy made in the 5th c. of Ulfilas's translation, and fragmentary as it is, it affords evidence of the high degree of development to which this dialect had been carried, and exhibits a form of speech which belongs to neither the High nor Low German group, but possibly may have been merely one among numerous allied forms of Teutonic speech which have perished.

The diffusion of Christianity among the Germanic tribes had the effect both of suppressing the use of the Runic characters that had been common to them, and of changing the nature of their literature, for instead of the heroic songs and 'beast-epics' of a sanguinary paganism (*Thier-epos*), scriptural paraphrases, legends, and hymns were selected; while the ancient form of alliteration by degrees gave place to the rhythmical arrangement of the Latin versification common in the early periods of the middle ages. Latin, moreover, became the language of the court, the church, and the law under the Saxon emperors, while German was left entirely to the people, until the new ideas, which were diffused both in regard to literature and language during the Crusades under the rule of the accomplished emperors of the Hohenstauffen line, had the effect of reviving the use and cultivation of the vernacular dialects, among which the Swabian, as the language of the court, soon acquired marked preponderance. In that age of chivalry and romance, the art of song was cherished by princes and nobles, many of whom belonged to the order of the *Minnesänger* (or Singers of Love), and composed in the Swabian or High-German dialect of the imperial court. The subjects chiefly selected during the 13th and 14th c., both by courtly and by popular singers, were based on the legendary lore of Charlemagne and his paladins, and King Arthur and his knights, and of the Sangrael; and it is to this period that we must refer the *Nibelungen Lied* and *Gudrun*, the greatest treasures of German national literature. Among the most successful poets and minnesingers belonging to the Swabian period, were Heinrich von Veldeke, Hartmann von der Aue, Wolfram von Eschenbach, Walther von der Vogelweide, Neidhart of Bavaria, Heinrich von Ofterdingen, etc. The taste for the *Thier-epos* received a new impetus among the people in the middle of the 12th c. by the re-translation, from the Walloon into German, of the ancient poem of *Reinhard Fuchs*, which, according to the distinguished philologist Jakob Grimm, originated with the Frankish tribes, who carried it with them when they crossed the Rhine and founded an empire in Gaul, and from whom it was diffused among the neighboring tribes of n. France and Flanders.

The period which succeeded the decline of chivalry was marked by a thorough neglect, among the higher classes, of national literature, which thus fell into the hands of the people, to the utter disorganization of all principles of grammar. To this age belongs, however, the great mass of the *Volkslieder*, or national ballads, in which Germany is spe-

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cially rich; the fables and satires of Brand and of Sachs, and the romances of the satirist Johann Fischart. The mysteries and passion-plays, which were at their height in the 15th c., and still linger in the village of Oberammergau, in Upper Bavaria, may be said to have given origin to the German drama, which numbered among its earliest cultivators, Sachs, Rebhuhn, and Ayrer. The close of the 15th c. was prolific in rhyming historical chronicles, in satires on the clergy, and in theological writings for and against the tottering power of the Roman Church. The writings of Luther, his translation of the Bible, and the works of Ulrich von Hutten, Zuinglius, and of many of the other reformers, were the most important events in German literature from the close of the 15th to the middle of the 16th c.; and it must be remembered that Luther addressed himself to the minds of his countrymen not merely through his polemical writings, but also by those noble hymns, which, since his day, have constituted one of the greatest literary treasures of the kind. Some of the best of these *Kirchen-lieder*, or church songs, were composed by Luther himself; while next to him those of Speratus, Decius, Nicolai, and Herberger, have perhaps found most favor both among Germans and among foreigners. These fervent effusions of the devout and eloquent reformers were followed by a period of literary degeneration and stagnation, in great measure to be ascribed to the demoralizing effects of the Thirty Years' War, when Germany was a prey to all the evils inseparable from civil war fostered by foreign interference. The indirect result of this period of anarchy was to quench the national spirit, and vitiate the popular taste; for while the petty courts aped the habits, language, and literature of Versailles, the lower orders forgot their own literature, with its rich treasures of legends, tales, and ballads, and acquired a taste for the coarse camp-songs imported by foreign mercenaries, and the immoral romances borrowed from impure French and Italian sources. German poetry in the 17th c. was framed after the model of the later classics, and their modern imitators. The study of the genuine national literature was neglected, and although a host of learned societies were formed, whose professed object was to purify and elevate the public taste, the results were lamentably unsatisfactory; and it was not till J. C. Gottsched (1700-66) succeeded in his *Critical Art of Poetry* in drawing attention to the turgid pedantry and artificial stiffness of the classicist school, that a better taste was awakened. His own pretentious bigotry gave origin, however, to a counter-party, from which emanated, headed by Bodmer (q.v.), the German æsthetic school, under the guidance of A. Baumgarten and G. Meier. A favorable reaction then took place, and with the names of Klopstock, Lessing, and Wieland, began the brilliant epoch of modern German literature. Their influence was alike great and varied; for while Klopstock's poem of the *Messiah*, and his odes, in which he had taken Milton as his model, re-echoed the tender piety of the old reformers, and were so thoroughly German in their spirit that they at once met with an enthusiastic response in the

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Hearts of the people, Lessing's tragedy of *Minna v. Barnhelm*, and his drama of *Nathan der Weise*, may be said to have created anew the dramatic art in Germany. Wieland, on the other hand, the complete antithesis of Klopstock—though, like his two great contemporaries, he was the founder of a new style, and gave a graceful flexibility to German diction, which it had never before been made to assume—had imparted to his numerous tales and romances an undisguised sensuous materialism, which, like his style, had been borrowed from the French philosophers of his day, and thus introduced into the language and literature of Germany the germs of many defects, as well as graces, to which they had previously been strangers. The influence exerted on German literature by these three writers, who may be regarded as its regenerators, was soon appreciable in every branch of knowledge; and among the galaxy of great names which have imparted renown to the literary and scientific annals of Germany during the last 100 years, we can instance only a few of the principal writers who have especially enriched their several departments of learning.

Philosophy, which in Germany originated with Leibnitz, who, however, wrote in Latin and French, assumed an individuality and completeness through the intellectual acumen and subtle analysis of Kant, Fichte, Schelling, and Hegel, which have no parallel in any other country. Other names worthy of mention are Herbart, Schopenhauer, Feuerbach, Baader, Lotze. In theology, Reinhard, Paulus, Schleiermacher, Neander, Julius Müller, Lücke, Baur, Strauss, Möhler, Döllinger, and a host of others, have infused new life into biblical inquiry; while invaluable aid has been afforded in the same direction by the profound philological and critical researches of Wolf, Hermann, Müller, the erudite brothers J. and W. Grimm, Bopp, Benecke, Adelung, Lassen, Rosen, Schlegel, W. Humboldt, Lepsius, Bunsen, etc. In archeology, history, and jurisprudence, all nations owe gratitude to Winckelmann, Heeren, Von Raumer, Schlosser, Von Hammer, Gervinus, Dahlmann, Ranke, Niebuhr, and Mommsen. In poetry and belles-lettres, the name of Goethe (1749–1832) is a host in itself. He had been preceded in the school to which he attached himself, known as that of the *Sturm-und-Drang* period, by Herder, its originator, whose philosophical critiques of foreign and German literature, contributed materially to the complete literary revolution which ushered in the modern period of German poetry. In *Leiden des Jungen Werther* (The Sorrows of Werther), Goethe carried the sentimental tendencies of the school to their culminating point; but his own later and very numerous works became in time more and more free from the blemishes into which he had led others. The *Sturm-und-Drang* period closed with Schiller (1759–1805), whose early works, *The Robbers*, *Fiesco*, and *Don Carlos*, threw the whole German people into a frenzy of excitement. His later dramatic works, though less exciting than these, gave evidence of more matured taste, while some of

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his ballads and lyrics may be said to be unrivalled. In the present century, poetry has found noble representatives in the so-called *Vaterlandsdichter* (Poets of the Fatherland), among whom are Theodor Körner, and Arndt, whose spirited patriotic songs are intimately associated with the war of 1813 against Napoleon, in which the former fell fighting gloriously. F. Rückert and L. Uhland belong to the same school; but the former is known especially for his admirable adaptations and translations from the Oriental languages, and the latter for his exquisite romances and ballads. A still greater name is that of Heine, who may rank almost with Goethe and Schiller in poetic power. The names of Müller, Hoffmann von Fallersleben, Platen, Freiligrath, Geibel, amid a crowd of others, are highly esteemed in their native country. The influence of Goethe and Schiller extended in a marked degree to the drama and to novel writing. In the former department Iffland acquired great reputation as a writer of sensation dramas, A. von Kotzebue as an inexhaustible composer of light effective comedies, A. Müllner v. Honwald, F. Grillparzer, and E. Raupach, for historical and social tragedies, while C. Immermann (better known as the author of the novel *Münchhausen*), Mosen, Laube, and G. Freytag, all have produced good dramatic pieces. Among the host of novelists who have endeavored to follow in the steps of the great leaders of the *Sturm-und-Drang* period, the majority do not require notice. J. P. Richter, the satirist and humorist, stands forth, however, apart from, and far above his compeers; and few novelists ever exerted so lasting an influence on the literature and mode of feeling of their compatriots as that which Richter exerted over the minds of the middle classes of Germany, during the close of the last and the early part of the present century. Among other writers of note, were De la Motte Fouqué, A. Hoffmann, and A. Chamisso, whose tendencies were to dwell on the mysterious agencies of nature, which they attempted to individualize, and bring into association with material forms, as in the *Undine* of the first, the fantastic tales of the second, and the *Peter Schlemihl* of the last-named. C. Pichler, Spindler, H. Steffens, C. Gutzkow, Sternberg, W. Häring (imitator of Sir W. Scott), Hauff, Zschokke, admirable writer of *novettes*, Hackländer, Ida v. Hahn-Hahn, Auerbach, Freytag, Gerstäcker, Gottschall, Spielhagen, and Paul Heyse all have in turn had wide popularity, and some of them not as novelists only.

But numerous as have been writers of poetic and dramatic literature during the present century in Germany, the tendency of the German mind has of late years been rather to science than to fiction; and the immense impetus given to the taste for scientific inquiry by A. v. Humboldt's travels and observations, and by his *Cosmos* and *Views of Nature*, has been followed by the prosecution of the most profound researches in every department of physical and natural science, and by the appearance of a multitude of records of travel, among the more important of which, for

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example, are those of Martius in Brazil, Pöppig in S America, Tschudi in Peru, Schubert in Greece, Lepsius and Brugsch in Egypt, Schomburgk in British Guiana, Gützlaff in China, Siebold in Japan, the three brothers Schlagintweit in the Alps and in Central Asia, Barth and Vogel in Africa, and Leichhardt in Australia. Of the many eminent Germans who by their labors have at once enriched the science of the world, and enhanced the literary and scientific glory of their own country, the following are a few, in addition to writers above mentioned: in astronomy and mathematics, Bessel, Encke, Struve, Gauss, and Mädler; in natural sciences, and in medicine, J. Müller, Ehrenberg, Carus, Oken, Schleiden, Von Buch, Liebig, Kopp, Dove, Moleschott, Bischoff, Rose, Poggendorf, Erdmann, Gmelin, Gräfe, Vogel, Rokitansky, Wagner, Schönbein, Helmholtz, Dieffenbach, Steinthal, Virchow, Dubois-Reymond, Haeckel; in history and biography, Niebuhr, Leo, Duncker, Preuss, Böttiger, Varnhagen v. Ense, Pertz, Lappenberg, Pauli; in geography, ethnology, statistics, and travels, Berghaus, Petermann, Stein, Hübner, Klöden, Kohl, Bunsen, Ideler, Lassen, Unger, Zimmermann; in the history of language, literature, and the fine arts, and on politics, Vilmar, Bousterwek, Kuno Fischer, Waagen, Heinsius, Heyse, Becker, Creuzer, Ernesti, Jacobs, Savigny, Eichhorn, Bülow, Ersch, Carrière. See Grimm *Geschichte d. Deutschen Sprache*, and *Deutsche Grammatik*; Bopp, *Comparative Grammar*; M. Müller, *On the Science of Language*; the works of Koberstein, Wackernagel, Vilmar, Kurz, Cholevius, König, Hillebrand, Hettner, Gottschall, Brandes; and in English, Hallam's *Europe in the Middle Ages*, and the *Outlines* by Gostwick.

GERMEN, now always called OVARY: lowest and thickened part of the pistil (q.v.) of a flower; containing in its cavity the rudiments of the seeds, called *Ovules* (q.v.) attached to the *Placenta* (q.v.) often by *umbilical cords* (q.v.). There is often only one ovule in the G.; sometimes it consists of a number of *Carpels* (q.v.), with one ovule in each; occasionally the cavity of the G. is divided into cells, each of these containing one, and often many ovules. When there are many ovules, usually some are abortive. The G. is sometimes *superior*—i.e., *free* in the centre of the flower, as in the poppy, stock, and carnation; occasionally *inferior*, the calyx being adherent to it throughout, and the upper part or limb of the calyx thus seeming to arise from its summit, as in the gooseberry, rose, campanula, and snow-drop; sometimes it is half inferior, as in *Saxifraga granulata*. The G. develops itself into the *Fruit* (q.v.), after the flowering is over. Some plants bend their flower-stalks to the ground after flowering, press the G. into the ground, and ripen their fruit in the earth, as a species of Clover (*Trifolium subterraneum*), and the ground-nut (*Arachis hypogæa*): see ARACHIS.

GERMERSHEIM, *gër'mèrs-hîm*: town of the Bavarian Palatinate, on the left bank of the Rhine, eight m. s.w. of

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Spcier. The site is marshy. The town founded 1276, fell into the hands of the French 1644, by whom it was restored to the elector palatine at the peace of Westphalia; but it was again taken by the French under Turenne 1674, when the walls were demolished, and again 1688. The peace of Ryswick restored G. to the Palatinate. There is some trade in corn, hemp, flax, etc., and a fishery. Pop. (1890) 6,038.

GERMICIDE, n. *gér'mĩ-sĩd*: any agent used to destroy disease-germs or other micro-organisms. The blood of living animals is said to be germicidal.

GERMICULTURE, n. *gér'mĩ-kũl-tũr*, also *chũr*: artificial cultivation of bacteria or disease-germs for scientific research.

GERMIN, n. *jér-mĩn*, or **GERMEN**: in *OE.*, for **GERM**, which see.

GERMINAL, n. *jér'mĩ-nal* [F. from L. *germen*, a germ]: name given 1793, Oct., by the French convention to the seventh month of the republican year. It commenced on March 21, and was the first spring month.

GERMINAL, **GERMINATE**, **GERMINATION**: see under **GERM**.

GERM THEORY.

GERM THEORY: one of the recent developments of scientific medicine, and now greatly influencing its practice. That minute forms of life, popularly called germs, can produce disease was thought of in the days of the early Greek philosophers. Aristotle had an inkling of the truth, but the subject has been a matter of speculation until the last 25 years; it is now unquestioned truth.

The steps that have led up to the accurate conception of this idea have been gradual and interesting. The first step consisted in the discovery that minute forms of life, bacteria and yeasts, produced fermentation of various kinds, also that bacteria were the chief agents of putrefaction. This advance was made mainly through the researches of Pasteur and Tyndall on the old and now almost forgotten battle-field of spontaneous generation. It was in the endeavor to show that there was or was not spontaneous generation that the earlier and crude methods were devised by which these minute forms were obtained and studied.

The second most important step was the devising of methods by which these infinitesimal organisms could be separated and obtained in pure culture, so that experimenters might know definitely what particular kind of organism was being used in their observations. Such methods were found by Robert Koch (q.v.), who thus made one of the most important contributions to knowledge that the world has ever had. These methods consisted in the using of solid media such as gelatine and agar-agar, a Japanese kind of gelatine, instead of the liquids previously used for the growth and cultivation of these bacteria. These media as specially devised enabled investigators to obtain in pure culture any particular kind of organism.

It had been held for some time that certain forms of vegetal life known as bacteria could produce disease, and when Koch brought forward his methods 20 to 30 years ago, it became possible to prove the truth of these ideas. He laid down a series of laws which have been called Koch's laws. They are substantially as follows:

(1) In every case of disease which is supposed to be caused by some form of micro-organism, a germ or microbe, this micro-organism must always be found in this disease.

(2) When found it must be capable of being isolated and grown in pure culture.

(3) On being inoculated into another animal or plant capable of having the disease, this organism must produce the disease.

(4) It must again be recovered from the animal or plant so diseased, and again obtained in pure culture.

This completes the chain of evidence, and this proof is forthcoming for a large number of diseases. Thus in the following diseases of man all the requirements of Koch's laws have been carried out. Tuberculosis in its many forms is produced by the *bacillus tuberculosis*, diphtheria by the *bacillus diphtheriæ*, typhoid fever by the *bacillus typhosus*, cholera by *spirillum cholerae*. Erysipelas, boils,

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abscesses, and many fevers are caused by *streptococci* and *staphylococci* of various kinds; pneumonia by *diplococcus lanceolatus*; malignant pustule by *bacillus anthracis*, and lockjaw by *bacillus tetanæ*. In addition to these there are a number of diseases in the lower animals, such as mouse-septicæmia, chicken-cholera and hog-cholera, and many others, that are caused by definitely known bacteria. Bacteria also cause disease in a large number of plants; thus cucumbers have a bacterial disease, as do also the Bermuda lily and potatoes and tomatoes. For all these the proof is conclusive.

In man there are a number of diseases in which the bacteria causing them are known, though thus far no one has been able to cultivate them outside of the human body and thus fulfil Koch's second law. The bacillus of leprosy and of syphilis both are in this category.

In such diseases as measles, scarlet-fever, chicken-pox, and smallpox the probabilities are that they are caused by micro-organisms, but as yet little is known about them.

Bacteria are not the only forms of micro-organisms that can cause disease. A number of parasitic skin-diseases are caused by low forms of plant life, the fungi, called moulds; and hundreds of thousands of dollars are lost every year on fruits and vegetables because of these fungus pests. The number of plant-diseases caused by fungus parasites is legion.

Still further there are low forms of animal life (Infusoria) that can cause disease in man and in other animals. Malaria is due to a minute form of animal life, the *Hematozoon malariae*, and forms of diarrhoea and dysentery are due to the same class of infusorians. A number of peculiar skin-diseases are known to have similar causation, and it is believed by some observers that cancer is caused by some such kind of organism. This will not be so unexpected when it is remembered that bacteria are closely related to infusoria and are, in fact, said to be infusoria by some investigators.

How do these minute parasites produce disease? In the case of the fungus diseases of plants the explanation is evident. The parasites are robbers and take from the stem or leaves the food needed by the plant. But it is distinctly different with the bacteria and the diseases of mankind. Here the facts are more intricate, and they still remain involved, though some principles are definitely known. Bacteria have the property of making new compounds from their food-supply: this is evidenced by familiar facts of fermentation. As bacteria grow in the human body, or outside of it in some albuminous food, they form a series of these compounds of which a large class have certain peculiar chemical characteristics; these have been called Ptomaines (q.v.). Very many of these ptomaines are innocuous, in fact the greater number of them; but certain ones called Toxins are poisonous, and some to an exceedingly marked degree.

The symptoms of disease are due in great part to these toxins. Thus the typhoid bacillus produces as it grows the

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typho-toxin, and this causes the symptoms of the disease. A number of these toxins have a chemical composition resembling the albuminoid bodies; these have been called tox-albumins: the poisons of bacillus tuberculosis, of diphtheria, and of tetanus are of this character. Thus these diseases and many others are caused by the bacteria and their products, the toxins or the tox-albumins.

The exact means by which the animal micro-organisms cause disease is not yet definitely known. One of the great difficulties in the study of these micro-organisms is that thus far no good methods have been devised by which they can be cultivated outside of the body and experimented on as Koch did for the bacteria. When such methods become practicable much more will be learned about these organisms and their methods of producing disease.—See BACTERIA: BACILLUS: TOXIN.

GEROCOMY, n. *jě-rŏ'ko-mĭ* [Gr. *gerōn*, an old man; *komeō*, I take care of]: branch of medicine which treats of the proper regimen for old people,

GÉROME, *zhā-rŏm'*, JEAN LEON: eminent French painter: b. Vesoul, 1824; son of a goldsmith. Having received his early education at Vesoul he went to Paris in his 17th year, and entered the studio of Paul Delaroche, at the same time attending the School of the Fine Arts. In 1847, one of his pictures was exhibited at the Louvre; 1853 and 56, he travelled in the East; 1855, he received the cross of the Legion of Honor; 1863, he was appointed prof. of painting in the School of the Fine Arts. G. was decorated with the Prussian order of the Red Eagle 1869, and made commander of the Legion of Honor. In 1855, his first great picture, *Le Siècle d'August et la Naissance de Jésus-Christ* was exhibited; it was much canvassed by the critics, on the whole was received with favor, and ultimately was purchased by the state. In 1859, he exhibited his noble picture of Roman gladiators in the amphitheatre, with the motto: *Cæsar, ave, Cæsar Imperator, morituri te salutant*, which raised to the highest pitch his reputation as a colorist and painter of the human figure. With *Phryne before her Judges*, exhibited 1861, he won fresh honors as colorist and draughtsman. In the same year, he exhibited, with other pictures, *Socrates searching for Alcibiades at the House of Aspasia*, *The Two Augurs*, and a portrait of Rachel. Among his best known subsequent works are *Louis XIV. and Molière*, *The Prisoner*, and the *Death of Cæsar*. G. has painted admirably several Eastern subjects. His mural picture, *The Plague at Marseille*, *Death of St. Jerome*, *Lioness meeting a Jaguar*, *Rex Tibicen* (1874), and *L'Eminence Grise* (1874), have received high encomiums. Though not to be ranked among painters of the first class, historically, he certainly took a foremost place among his contemporaries as a colorist, and as a spirited and elegant figure painter.

GERONA—GERONTES.

GERONA, *chā-rō'nā*: province of Spain, in Catalonia; bounded by France, the Mediterranean, and the provinces of Barcelona and Lérida; 2,272 sq. m.; cap. Gerona. The surface is irregular, with branches of the Pyrenees, between which are many fertile valleys, and is chiefly drained by the Ter and the Fluvia rivers. Fishing and shipbuilding employ the people on the coast and agriculture and cattle raising in the interior. Pop. (1900) 299,287.

GERONA, *chā-rō'nā* (anc. *Gerunda*): capital of the Spanish province of G.; at the confluence of the Ter with its affluent the Oñar, 60 m. n.e. of Barcelona. It consists of an old and new town, the latter irregularly built on the declivity of a rocky hill, but highly picturesque, and containing a beautiful and lofty Gothic cathedral (commenced 1316), approached by a superb flight of steps. There are 5 other churches and 12 convents. The inhabitants manufacture paper, soap, and leather; and they do spinning and weaving. The city is protected by high thick walls, and 4 forts. —G. was of Roman origin, and was formerly the residence of the kings of Aragon. It has suffered much from sieges, of which the most noteworthy was that of 1809, when the French with 35,000 men encompassed and assailed the town. The besieged, unprovided with everything, even with ammunition, maintained a defense for seven months and five days against seven open breaches, and were forced to capitulate only when their heroic governor was struck down by famine and disease. Pop. 15,020.

GERONTES, n. *gě-rōn'tēz* or *jě-rōn'tēz* [old men—from Gr. *gerōn*, an old man]: in *Gr. antiq.*, magistrates in Sparta, not eligible till 60 years of age, who, with the ephors and kings, had supreme power in the state.

GERONTOCRACY—GERS.

GERONTOCRACY, n. *jër'õn-tõk'rǎ-sĩ* [Gr. *gerõn*, or *geronta*, an old man; *kratõõ*, I rule over]: the government or influence of old men or elders.

GEROPIGIA, *jër-õ-pij'ĩ-a*, or **JERUPIGIA**, *jër-ũ-pij'ĩ-a*: unfermented grape-juice, with brandy and sugar sufficient to keep it from fermentation, and colored with (probably) extracts of rhatany-root and logwood. Within 25 years, a considerably quantity has been exported from Portugal, and used for giving a spurious strength and color to red wines, especially to those intended for exportation—the factitious compound being mixed or vatted with the wines in bond. At least 20,000 gallons are now brought annually into Britain.

GERRY, *gër'ĩ*, **ELBRIDGE**, LL.D.: 1744, July 17—1814, Nov. 23; b. Marblehead, Mass.: statesman. He graduated at Harvard College 1762, engaged in mercantile business in his native town, and through industry soon acquired a considerable fortune. In 1772 he was elected member of the Mass. legislature, served there on the committees of safety and of supplies, was elected delegate to the Continental congress 1776, Jan., signed the Declaration of Independence, gave special attention to naval operations during the revolution, was chairman of the committee on the treasury till 1780, when the treasury board was organized with him as presiding officer, aided in preparing the Federal constitution 1787 but declined to sign it, and served in congress 1776–85 and 1789–93. In 1795 he retired to private life in Cambridge; 1797 accompanied Pinckney and Marshall on a special mission to France; 1798, 1801, 1812 was defeated as anti-Federalist candidate for gov.; 1810, 11 elected gov. of Mass.; and 1812 elected 5th vice-pres. of the United States, which office he held till his death.

GERRYMANDER, *gër'ĩ-mǎn-dër*: arrangement of the political divisions or districts of a state so that in an election one party may obtain an advantage over its opponent, even though the latter may have a majority of the votes in said state. The term is derived from the redistricting of Mass. under Gov. Gerry 1811. For several years the democratic and federal parties had been about equal in strength in that state. That year the democrats had a majority in the legislature, and passed a bill to change the boundaries of the districts, that those sections which had given a large number of federal votes might be brought into one district. The bill was signed by Gov. Gerry, the state redistricted according to its provisions, and in the next election the democrats carried every office in the state though the returns showed that nearly two-thirds of the voters were federalists. Gov. Gerry, on his accession to office had replaced all civil officers in the state with adherents of his own political party, which caused a great opposition outcry; and after he had signed the redistricting bill his name was utilized in the popular name for the peculiar operation, though it has been claimed that he had no hand in framing the bill.

GERS: *zhär*: department in s. w. France, formed of por.

tions of the old provinces of Gascony and Guienne. The dept. of Landes intervenes between it and the Bay of Biscay, and that of Hautes-Pyrénées between it and the frontiers of Spain. It has 2,420 sq. m.; capital, Auch. The surface toward the s. is mountainous, covered with ramifications of the Pyrenees, which extend northward in parallel lines. These lines decrease in height as they advance, and are separated by fan-shaped valleys, which are only a few yards wide in the s., but expand to a width of several m. in the n. of the department. The principal rivers are the Gers—which gives its name to the dept.—the Losse, the Baise, the Arratz, the Gimone, and the Save. The climate is healthful and temperate. The soil is a stiff loam, resting on thick layers of clay, and only moderately productive. More than half of the surface is used for agriculture, one-seventh is in vineyards, and the rest in meadows, heaths, and forests. Wine is produced in considerable quantity, but of inferior quality; much of it is converted into Armagnac brandy, which, after Cognac, is esteemed the best. The manufactures and exports are inconsiderable. Pop. (1881) 281,532; (1891) 261,084; (1901) 238,448.

GERSON, *zhēr-sōng'*, JEAN DE (proper name, JEAN CHARLIER, but named from the place of his birth): 1363–1429; b. Gerson, in the diocese of Rheims: eminent scholar and divine. He was educated in the Univ. of Paris, under the celebrated Peter d'Ailly. Here he rose to the highest honors of the university, and ultimately to its chancellorship, having acquired by extraordinary learning the title 'The Most Christian Doctor.' During the unhappy contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western Schism, the Univ. of Paris took a leading part in negotiations for union; and G.—as one of the most active supporters of its proposal to end the schism by the resignation of both the contending parties—visited the other universities to obtain their assent. But though he had the satisfaction to see this plan prevail in the council of Pisa, it failed to secure the desired union. In a treatise inscribed to his friend D'Ailly, he renewed the proposal that the rival pontiffs (now not two, but three since the election of John XXIII. at Pisa) should be required to resign; and in the new council at Constance 1414, he was again the most zealous advocate of the same expedient. To him, also, the great outlines of the plan of church reformation, then and afterward proposed, are due. But his personal fortunes were marred by the animosity of the Duke of Burgundy and his adherents, to whom G. had become obnoxious, and from whom he had suffered much persecution, for the boldness with which he had denounced the murder of the Duke of Orleans. To escape their vengeance, he was forced to become an exile; and he retired from Constance, in the disguise of a pilgrim, to Rattenberg in Bavaria, where he composed his celebrated work *De Consolatione Theologiæ*, in imitation of that of Boëthius, *De Consolatione Philosophiæ*. It was only after several years that he was enabled to return to France, making his residence in a monastery at Lyon. of which his brother was the

superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. His works, among the most remarkable of the age, filled five vols. in folio. Among the books formerly ascribed to him was the celebrated spiritual treatise *On the Imitation of Christ*; but it is no longer doubtful that he was not its author, and probable that it is the work of Thomas-a-Kempis: see KEMPIS. The authority of G. is much relied on by the advocates of Gallican principles; but the Ultramon-tanes allege that the principles laid down by him as to the limitation of the authority of the pope by a general council are applicable only to the exceptional case in which he wrote—viz., that of a disputed succession, in which the claim of each of the rival popes, and therefore of the existing papacy itself, was doubtful. G. openly denied papal infallibility, revolted from scholasticism, was a nominalist in philosophy, and followed in theology the method of a devout subjective mysticism.

GERSTÄCKER, *gër'stëk-ër*, FRIEDRICH: 1816, May 16, —1872; b. Hamburg: German novelist and traveller. In 1837, he went to America; spent some months in New York, then wandered through the United States, sometimes as a stoker or sailor in various steam-packets, sometimes as silversmith, woodcutter, maker of pill-boxes, etc., working till he had earned money enough to enable him to proceed. For a time he led a wild adventurous life as a hunter in the forests. In 1842, he set up a hotel at Point Coupée, La.; but in 1843, a strong desire to see his friends induced him to return to Germany. Here he published his admirable *Streif- und Jagdzüge durch die Vereinigten Staaten Nordamerikas* (2 vols., Dresden 1844). This was followed by his *Die Regulatoren in Arkansas* (3 vols., Leip. 1846), *Die Flusspiraten des Mississippi* (3 vols., Leip. 1848), *Mississippi-bilder, Licht- und Schattenseiten transatlantischen Lebens* (2 vols., Dresden, 1847), and *Amerik. Wald- und Strombilder* (2 vols., Leip. 1849). In his popular writings, as the *Reisen um die Welt* (6 vols., Leip. 1847), and *Der Deutschen Auswanderer Fahrten und Schicksale* (Leip. 1847), G. contrives to rivet the attention even of the uneducated. In 1862, he accompanied Duke Ernest of Gotha on his travels in Egypt and Abyssinia; and on his return lived some time in Gotha. In 1867–8, he undertook the longest journey of his life, visiting N. America, Mexico, Ecuador, Venezuela, and the W. Indies; and published, 1868, *Neue Reisen*, in which he gives a vivid account of them. As to novels, he published among others, *Eine Mutter*, 1867; *Die Missionäre*, 1868; *Die Blauen und die Gelben*, 1870; *In Mexico*; *In Amerika*; *Herrn Mahlhuber's Reiseabenteuer* (3d ed. 1871).

GERSTER-GARDINI, *gër'stër-gär-dë'në*, ETELKA (ADELAIDE): prima donna; b. Kaschau, Upper Hungary, 1856. At an early age she gave evidence of unusual musical abilities, and by the advice of the director of the Vienna Conservatory, who had heard her sing, she studied with Mme. Marchesé 1873–76. She made her appearance first in Venice as Geida in *Rigoletti*, 1876, Jan.; then sang in

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Berlin, Buda-Pesth, St. Petersburg, Moscow, and London, came to the United States with the Mapleson English Opera Company 1877; and sang through several seasons in the large cities. She married Signor Gardini, her first director, and has a beautiful residence near Bologna, Italy.

GERUND, n. *jěr'ünd* [L. *gerun'diüm*, a gerund; *gerun'düs*, that which is to be done or carried on—from *gero*, I bear, I carry]: in *Latin gram.*, a kind of verbal noun; a part of the Latin verb which, according to grammarians, declares that anything is to be done. Thus the gerund of *scribo*, I write, is *scribendum*; as, *charta utilis ad scribendum*, paper useful for writing. As a sort of verbal noun, it has the same power of government as its verb, but is scarcely ever found in the nominative, at least as a governing word. In *French*, the infinite has almost entirely supplanted the gerund, the sole surviving remnant, we believe, being found after the preposition *en*, as *en attendant*. In *English*, the present participle does duty also for the gerund; as, he is *reading* novels (participle); he amuses himself with *reading* novels (gerund). **GERUNDIAL**, a. *jěr-rün'di-äl*, pertaining to or resembling a gerund. **GERUNDIVE**, n. *jěr-rün'div*, in *Latin verbs*, the future participle passive; perhaps more strictly, 'a passive verbal adjective': **ADJ.** pertaining to or resembling a gerund; gerundial. **GERUN'DIVELY**, ad. *-ly*.

GERU'SIA: see **GERONTES**.

GERVAISE, *zhěr-vāz'*, OF **CANTERBURY**: born abt. 1150; d. prob. soon after 1200: monk and historian. Of his early life and education nothing is known, excepting that he was attached to the priory of Christ Church, Canterbury, and saw the burning of the cathedral 1174. His writings comprise an account of the burning and rebuilding of the cathedral (abt. 1184): a chronicle of clerical disputes during the episcopate of Baldwin (1185-90); *Chronica de tempore regum Angliæ, Stephani, Henrici II., et Ricardi I.*, extended to 1199; *Vita Dorobornensium Archiepiscoporum*, closing 1191; an unpublished ms., in the library of Corpus Christi College, Cambridge, entitled *Mappa Mundi*; and an English chronicle covering the period from the age of fable to the death of Richard.

GERVAS, *jěr'vas* (*Stachytarpheta Jamaicensis*): small shrub of nat. ord. *Verbénacæ*, native of the W. Indies and warm parts of America. It has scattered hairy branches, oblong-ovate coarsely and sharply serrated leaves about two inches long, and long dense spikes of lilac flowers. It is regarded as a stimulant, febrifuge, anthelmintic, and vulnerary; a decoction of the leaves is applied to severe contusions; and the dried leaves are used as tea. In Austria, they are sold under the name of *Brazilian Tea*. In some countries they are used only for adulteration of tea; but for this purpose they are perhaps more used than any other leaf.

GERVASE, *jěr'vas* (OR **GERVAISE**, *zhěr-vāz'*), OF **TILBURY**: English historian of the 13th c.: b. at Tilbury, in Essex; d. abt. 1218. He is said to have been nephew of King

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Henry II. About 1208, he was received with great distinction at the court of Otho IV., Emperor of Germany, and appointed by that monarch marshal of the kingdom of Arles. He wrote a commentary upon Geoffrey of Monmouth's History of Britain, entitled *Illustrationes Galfridi Monemuthensis*, lib. iv.; a History of the Holy Land (*Historia Terræ Sanctæ*); a treatise, *De Origine Burgundionum*; and a History of the Kings of England and France, comprised in a work entitled *Otia Imperialia*, libri tres; known also under the titles, *Mappa sive Descriptio Mundi* and *De Mirabilibus Orbis*. MSS. of the *Otia Imperialia* are preserved in the Cottonian Collection, and in the library of Corpus Christi, Cambridge. Nicolson ascribes to G. the Black Book of the Exchequer (*Liber Niger Scaccarii*), but Madox, who published a very correct edition of that work, makes Richard Nelson, Bp. of London, the author.

GERVILLIA, n. *jër-vil'li-a* [from M. *Gerville*, French naturalist]: in *paleon.*, genus of conchiferous mollusks, family *Aviculidæ* (wing-shells). Thirty-seven species are known, from the Carboniferous period to the Chalk.

GERVINUS, *gër-vë'nûs*, GEORG GOTTFRIED: 1805, May 20—1871, Mar.; b. Darmstadt: historian of German literature, and politician. He received a mercantile education, and was employed by a merchant in his native town. By diligent self-instruction, he supplied what was wanting in his school-education, and 1826 was ready to enter the Univ. of Heidelberg. After completing his studies, he became teacher in an educational institution at Frankfurt-on-the-Maine. In 1835 he was appointed prof. extraordinary at Heidelberg. Previously he had published *Geschichte der Angelsachsen im Ueberblick* (Frank. 1830), followed by his *Historische Schriften* (Frank. 1833). In 1836, he was appointed ordinary prof. of history and literature at Göttingen. He had now begun to publish *Geschichte der Poetischen Nationalliteratur der Deutschen* (3 vols., Leip. 1835–38). This was followed by the *Neuere Gesch. der Poetischen Nationalliteratur der Deutschen* (2 vols., Leip. 1840–42). These two works were afterward published together under the title *Gesch. der deutschen Dichtung* (5th ed. 1871). In 1837, he was one of the Göttingen professors who signed the famous protest against the abolition of the Hanoverian constitution, in consequence of which he lost his chair, and was ordered to leave the country within three days. He went first to Darmstadt, then to Heidelberg, and in the spring of 1838, to Italy. He spent the winter in Rome, engaged in historical studies. In 1844, he was appointed honorary prof. in the Univ. of Heidelberg. From this period his career was that of a political writer. Constitutional liberty was the object for which he ardently labored. His pamphlets and writings in different periodicals exercised very great influence over the national mind. In 1847, July, he, with some others, established the *Deutsche Zeitung* in Heidelberg, to advocate the political views of the constitutionalists. In 1848, he was deputed to attend the diet in behalf of the Hanse towns, and was elected a member of

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the national assembly by a district of Prussian Saxony. After the failure of the national democratic party in Germany, G. returned to literary pursuits, the fruits of which are his suggestive work on Shakespeare (4 vols., Leip. 1849-50) and *Geschichte des 19ten Jahrhundert* (Leip. 1853-66). *Händel und Shakespeare* appeared 1868, and *Händels Oratorientexte* 1873.

GERYONIA, n. *gër-ÿ-ön'ÿ-ä* [from *Geryon*, a three-headed monster in class. myth.]: in *zool.*, typical genus of *Geryonidæ*, family of *Discophora*, or *Medusas* (jelly-fishes or sea-nettles).

GESENIUS, *gè-sè'nÿ-ÿs*, Ger. *gā-zā'nē-ÿs*, **FRIEDRICH HEINRICH WILHELM**: 1785, Feb. 3—1842, Oct. 23; b. Nordhausen, Prussian Saxony: great modern German Orientalist and biblical scholar. He studied first at the gymnasium of his native town, afterward at the universities of Helmstedt and Göttingen. After teaching in the pædagogium at Helmstedt, he became 1806 a theological *Repetent* in Göttingen; and 1809, on the proposal of Johann von Müller, was appointed prof. of anc. literature in the gymnasium of Heiligenstadt. In 1810, however, he received a call to Halle as extraordinary prof. of theology, and was made an ordinary prof. 1811. 1810-12, he published, in two vols., *Hebrew and Chaldee Dictionary of the Old Testament*, which underwent improvements in several subsequent editions, after he had made a journey to Paris and Oxford in the summer of 1820, for researches in the Semitic languages. In the two years following the publication of this Dictionary, appeared his *Hebräisches Elementarbuch* (2 Bde., Halle, 1813-14), consisting of a Hebrew grammar and reading-book. This work, as it has been improved in the recent editions of G.'s distinguished pupil and literary executor, Professor Rödiger of Halle, and the lexicon above mentioned, are still the grammar and dictionary of the Old Testament most in use in Germany, Great Britain, and America. The best English translations of the dictionary founded on the Latin edition are those of Robinson (American), and of Tregelles (British); the best of the grammar are those of Davies (London), and of Conant (New York). In 1815, another work was published by G. on the history of the Hebrew language (*Kritische Gesch. d. Hebr. Sprache u. Schrift* Leip.), and a treatise, *De Pentateuchi Samaritani Origine, indole et auctoritate* (Halle). Besides a translation of Isaiah with a commentary in three vols. (Leip. 1820-1), we are indebted to G. for a larger Hebrew Grammar (*Grammatisch-kritisches Lehrgebäude d. Hebr. Sprache*, 2 Bde., Leip. 1817), as well as for a larger lexicographical work (*Thesaurus philologico-criticus Linguae Hebraicæ et Chaldaicæ Veteris Testamenti*), of which the first part was published 1829, but which was completed only in 1858 by Prof. Rödiger. G. contributed papers on Oriental Antiquity to Ersch and Gruber's *Allgemeine Encyclopädie*; and his notes to the German translation of Burckhardt's *Travels in Syria and Palestine*, throw light on many points of biblical geography. A memorial of him appeared in the year after his death (G.,

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eine Erinnerung an seine Freunde, Berlin 1843).—Many of the results of the rationalizing method of interpreting the Old Testament which characterizes all the works of G., have not stood against the progress of biblical science, and he has certainly been surpassed by Ewald in insight into the genius of the Hebrew language, and its bearing on the interpretation of Hebrew life and thought, as well as in all that qualifies the critic for a true historical, æsthetical, and religious appreciation of the literature preserved in the Old Testament. Yet his intense devotion to his favorite studies, and the advance which he made beyond all his predecessors in the establishment of more certain principles of Hebrew philology, entitle him to be regarded as having constituted a new epoch in the scientific study of the Old Testament.

GESH, n. *gēsh*, or GEES, n. *gēz* [probable corruption of *Cuth*]: the sacred and anc. language of Ethiopia and Abyssinia; the modern language of Abyssinia is called *Amharic*.

GESNER, *gēs'nēr*, KONRAD VON: 1516–1565, Dec. 13; b. Zürich: Swiss naturalist. His father, a leather-seller, was too poor to pay for more than the first years of his education at the town-school; but John Jacob Ammianus, prof. of Latin and oratory in the college, saw in the boy so much promise that he took him into his house and instructed him gratuitously for three years in Latin, Greek, dialectics, and oratory. He subsequently studied three or four years at Paris, whence he was summoned back to Zürich, to become a teacher in the school in which he had begun his studies as a child. He applied all his spare time to the study of medicine and botany, in the hope of ultimately rising to the office of a professor. The hope was gratified on the opening of the Univ. of Lausanne, when he was appointed prof. of Greek. After holding the office three years, he went to Montpellier, where he attended medical lectures, and to Basel, where, after additional study, and the usual disputations, he was admitted to the degree doctor of medicine. At the age of twenty-five he returned to his native town, and soon received the appointment of prof. of philosophy, which he held until his death. He likewise practiced medicine, and published from time to time the fruit of his studies. As, in the course of his life, he published no less than 72 works, besides leaving at his death 18 in progress, only a few of the most important can here be noted. His first great work, *Bibliotheca Universalis*, appeared when he was only 29 years old. It contained the titles of all the books then known in Hebrew, Greek, and Latin, with criticisms and summaries of each; and as an index to authors who wrote before 1545, it remains to this day very valuable. Ten years later (1555), *Mithridates, de Differentiis Linguarum* appeared, containing histories of 130 ancient and modern languages. But by far the greatest of his literary works was *Historia Animalium*, planned in six books, of which only four were completed: in this work, a monument of industry, he aimed at bringing together all that was known in his time concerning every animal. These four volumes entitle their author to the designation, 'the German Pliny.' Botany was probably

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the section of natural history with which he had the greatest practical acquaintance. He had collected more than 500 plants undescribed by the ancients, and was arranging the results of his labors in this department at his death in Zürich, of the plague. He appears to have been the first who made the great step toward a scientific classification of distinguishing genera by a study of the fructification.

GESNERA, n. *jěs'něr-a* [from Conrad *Gesner*, botanist]: typical genus of *Gesneraceæ*, gesnerworts.

GESNERACEÆ, *jěs něr-ā'sě-ě*: natural order of exogenous plants, allied to *Scrophulariaceæ*, consisting of herbaceous plants and soft-wooded shrubs, generally tropical or sub-tropical. They frequently spring from scaly tubers. The leaves are wrinkled and destitute of stipules. The calyx is 5-parted; the corolla, tubular, 5-lobed, more or less irregular. The stamens are generally four, two long and two short, with the rudiment of a fifth. The germen is half inferior, surrounded at its base by glands or a fleshy ring; it is one-celled, and has parietal placentæ. The fruit is either a capsule or a berry, many-seeded.—There are about 120 species, exclusive of those sometimes formed into a distinct order under the name *Cyrtandraceæ* or *Didymocarpeæ*, of which there are about 140. The true *Gesneraceæ* all are natives of the warmer parts of America, where some grow on trees. The *Cyrtandraceæ* are more widely distributed.—Some plants of this order have mucilaginous and sweetish edible fruits; but it is chiefly remarkable for beauty of flowers, containing some of the most admired ornaments of hothouses, as species of *Gloxinia*, *Achimenes*, etc.

GESS'LER, ALBRECHT OR HERMANN (called also **GESSLER VON BRUNECK**): according to Swiss tradition, an Austrian gov. of the Forest cantons in 1300: see **TELL, WILLIAM**.

GESSNER, *gěs'něr*, **SALOMON**: 1730, Apr. 1—1787, Mar. 2; b. Zürich: German poet and artist. Apprenticed to a bookseller in Berlin 1749, he ran away and endeavored to earn a livelihood by landscape painting. From Berlin he went to Hamburg, where he became intimate with Hagedorn. On his return to Zürich, he published *Daphnis*, followed by *Inkle und Yarico*, a small volume of idyls, and *Tod Abels* (the Death of Abel), a species of idyllic heroic prose poem, which, though the feeblest of all his productions, is the best known. Later he became an excellent engraver.

GEST, n. *jěst* [OF. *geste*, thing done, exploit: L. *gestus*, borne, carried on]: a deed; an act; a feat.

GEST, n. *jěst* [F. *giste*, a lodging—from mid. L. *gista* or *gesta*, a sleeping-place]: in *OE.*, a lodging or sleeping-place; the appointed resting-place for the king on a royal progress; the roll in which these stages were written.

GESTA ROMANORUM, *jěs'ta rō-mā-nō'rŭm*: oldest legendary work of the middle ages. The stories are in Latin, and mostly from the histories of the Roman emperors, or at least are referred to their period. Later,

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moralizing expositions were added, whence the work obtained the name *Historiæ Moralistæ*. The G. R. belongs to that class of works with which the monks were wont to beguile their leisure hours, and which were appointed to be read in the refectory. The stories are short, and destitute of rhetorical ornament; neither have they any dialogues or tragic incidents. Their attractiveness lies in their naïveté and childlike simplicity, though their artless piety often passes into a deep mysticism. Down to the 16th c., the G. R. was one of the most widely read books among the learned, as is proved by the number of manuscripts and of printed impressions shortly after the invention of printing (the first was issued at Cologne 1472). It was early translated into French, English, German, and Dutch. The oldest Dutch translation was published at Gouda by Gerard Leeu 1481; the oldest German translation at Augsburg, by Hans Schobser, 1489. Among the older English translations was that by R. Robinson (Lond. 1577). In 1824 the Rev. C. Swan published *Gesta Romanorum, translated from the Latin, with Preliminary Observations, and Copious Notes*. The later German fabulists and novelists, such as Hans Sachs, Burkard Waldis, and others, made abundant use of this great storehouse. But soon after the Reformation it was thrown into the background, and even in the monasteries, where for a long time it maintained its footing, it was at length forgotten. Recently, however, amid the general revival of interest in the literature of the past, it has received special attention. Its author has been supposed by some to have been Petrus Berchorius or Bercheur of Poitou, who died prior of the Benedictine Abbey of St. Eloi in Paris 1362, but it is now believed that he only added the moralizings; and Grässe, in an appendix to his German translation (2 vols., Dresd. and Leip. 1842), has shown that a certain Elinandus is the author or compiler of the work. This Elinandus was undoubtedly a monk, and was either an Englishman, or German. According to Oesterley, to whom we owe the first critical edition of the work (1872), the G. R. took shape in England about the beginning of the 14th century.

GESTATION, n. *jěs-tā'shŭn* [F. *gestation*—from L. *gestātīōnem*, a bearing or carrying—from *gesto*, I bear or carry]: the act of carrying young in the womb from conception to delivery; the state of pregnancy. GESTATORY, a. *-tā-ter-ĭ*, that may be carried or worn; pertaining to pregnancy.—The *period of Gestation*, in physiology, is the period that intervenes in the mammalia between impregnation and the bringing forth of the young. The period and the number of young produced at a birth vary extremely in different mammals, but usually stand in an inverse ratio to one another. Thus, in the larger herbivora, as, for example, the elephant, the horse, the ox, and the camel, the female seldom produces more than one at a time, but the period of gestation is long; while in the smaller ones the progeny is numerous, but the period of gestation only a few weeks. In the elephant, the period of gestation extends over 20 or 21 months; in the giraffe, it is 14 months; in the dromedary,

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It is 12 months; in the mare, more than 11 months; in the tapir, between 10 and 11; in the cow, 9; and in many of the larger deer somewhat more than 8 months. In the sheep and goat, the period is 5 months. In the sow, which produces a numerous litter, the period is 4 months. In the rodentia, the progeny is numerous and imperfectly developed, and the period of gestation is comparatively short; in the beaver, one of the largest of the order, it is 4 months; in the rabbit and hare, 30 to 40 days; in the dormouse, 31 days; in the squirrel and rat, four weeks; and in the guinea-pig, three weeks or less. The young of the carnivora, like the young of the rodentia, are born with their eyes closed, and in a very immature state; and in even the larger carnivora the period of gestation is far shorter than in the larger ruminantia or pachydermata: it is six months in the bear; 108 days in the lion (the period in this animal is stated by Van der Hoeven at three months); 79 days in the puma; 62 or 63 days in the dog, the wolf, and the fox; and 55 or 56 days in the cat. In the marsupial animals, which, from a structural peculiarity, produce their young in a far more immature state than any other mammals, the period of gestation is very short, being 39 days in the kangaroo, the largest of the marsupial animals, and only 26 days in the opossum. Nothing certain is known regarding the period of gestation of the cetacea. The quadrumana produce one, sometimes two, at a birth; and the period of gestation, as far as has been observed, seems to be seven months. In the human race, 40 weeks is the usual period of gestation, but liable to certain deviations: see FÆTUS.

GESTICULATE, v. *jës-tik'û-lât* [L. *gesticulâtus*, having made pantomimic gestures—from *gesticulus*, a mimic gesture: F. *gesticuler*, to gesticulate]: to make gestures or motions, as in speaking or attempting to speak; to play antic tricks. **GESTIC'ULATING**, imp. **GESTIC'ULATED**, pp. **GESTIC'ULATOR**, n. *-lâ-tër*, one who. **GESTIC'ULA'TION**, n. *-lâ'shûn* [F.—L.]: the act of making gestures to express passion or enforce sentiment; motions or postures of the body in speaking. **GESTIC'ULA'TORY**, a. *-lâ'tër-î*, connected with or having the character of gesticulation.

GESTURE, n. *jës'tûr* or *-chûr* [mid. L. *gestûrâ*, mode of acting—from L. *gestus*, posture, motion: F. *geste*; It. *gesto*, gesture]: motions of the body or limbs used to express forcibly ideas or passions, or to enforce an argument or opinion; any significant motion of the body or limbs. **GES'TURAL**, a. *-tû-râl*, belonging to gesture. **GES'TURELESS**, a. *-lës*, free from gestures.

GET, v. *gèt* [AS. *getan*, to get: Icel. *geta*, to conceive, to acquire: Goth. *bi-gitan*, to find, to obtain]: to procure; to obtain; to attain; to realize; to bring into a certain condition; to become; to beget. **GET'TING**, imp.: N. the act of obtaining or acquiring; acquisition; profit. **GOT**, pt. *gõt*, did get. **GOTTEN**, or **GOT**, pp. *gõt'n*, *gõt*. **GETTER**, n. one who. **TO GET AHEAD**, to advance: to prosper. **TO GET ALONG**, to proceed; to advance; to prosper. **TO GET AT**, to reach; to make way to. **TO GET AWAY**, to leave; to

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escape. **GET AWAY!** begone! **TO GET BY HEART,** to learn anything, as a lesson, so as to be able to repeat it from memory. **TO GET CLEAR,** to escape; to be released or freed, as from confinement or danger. **TO GET DRUNK,** to become intoxicated. **TO GET LOOSE,** to disengage one's self. **TO GET OFF,** to escape. **TO GET ON,** to proceed; to advance; to prosper. **TO GET OUT,** to extricate one's self; to escape. **TO GET OVER,** to surmount. **TO GET QUIT OR RID OF,** to be freed from a disagreeable person or thing with difficulty or after effort. **TO GET THE DAY,** to win. **TO GET THROUGH,** to traverse; to finish. **TO GET TO,** to reach; to arrive at. **TO GET TOGETHER,** to assemble; to convene; to amass with effort. **TO GET UP,** to rise from sleep or repose; to make ready or prepare, as a play; to perfect one's self, or make one's self competent in, as in a subject for examination.—**SYN.** of 'get': to acquire; gain; win; earn; procreate; generate; learn; induce; persuade; betake; carry.

GET, *v. gět:* a contraction for **BEGET.** **GETTER,** *n. gět'ēr,* one who begets.

GETÆ, *jět'tē:* people of Thracian extraction, who, when first mentioned in history, inhabited the country called Bulgaria. They were a warlike people, and long successfully resisted the attempts of Alexander the Great and Pyrrhus to subdue them. They afterward removed to the n. bank of the Danube, having the Dnieper as their boundary on the e., while westward they encroached on the Roman empire, with which from this time they were continually at war. They were called Daci by the Romans, and their country Dacia, and are often mentioned in the literature of the Augustan era as savage and unconquerable foes. During the reign of Domitian, they overcame the Romans, and exacted an annual tribute. But in 106, their gallant king, Decebalus, was defeated by Trajan, and the people completely subdued. A Roman colony was settled in the country, and becoming incorporated with the G., gave rise to a mixed race, the modern Wallachs.

GETHSEMANE, *gět'h-sēm'a-nē* [Heb. *gath,* a wine-press, and *shemen,* oil]: scene of Christ's agony on the night before his Passion. It was a small farm or estate at the foot of Mount Olivet, a little more than half a mile from the city of Jerusalem. Attached to it was a garden or orchard, a favorite resort of Christ and his disciples. The spot pointed out to modern travellers as the site of the garden of G. corresponds sufficiently with the requirements of the Scripture narrative, and the statements of Jerome and Eusebius. It is a place about 50 paces square, inclosed by a low wall of loose stones, and contains eight very old olive-trees, regarded with pious superstition as having existed in the time of our Lord.

GETTY, *gět'ty,* **GEORGE WASHINGTON:** soldier: b. Georgetown, D. C., 1819, Oct. 2. He graduated at the U. S. Milit. Acad. 1840; was promoted 1st lieut. 4th U. S. artill. 1845, Oct. 31; served through Mexican war and was brevetted capt. for gallantry 1847, Aug. 20; was engaged in the Seminole war 1849-50, 56-7, and the Kansas disturbances

GETTYSBURG.

1857-8; and became aide-de-camp and lieut.col. 1861, Sep. 28. In the civil war he commanded the artill. at Dobb's Ferry, 1861; Yorktown, Gaines's Mills, and Malvern Hill, 1862; was engaged at South Mountain, Antietam, and in the Rappahannock campaign 1862-3; promoted brig. gen. vols. 1862, Sep. 25; and brevetted col. U. S. A. for gallantry in the Wilderness, brig. gen. U. S. A. for Petersburg, maj. gen. vols. for Winchester and Fisher's Hill, and maj.-gen. U. S. A. 1865, Mar. 13, for services during the war. He was appointed col. 37th U. S. inf. 1866, July 28, commanded the troops along the Baltimore and O. railroad during the labor riots 1877; retired 1883; d. 1901, Oct. 3.

GETTYSBURG, *get iz-berg*: post-borough, cap. of Adams co., Penn.; on the Hanover Junction, Hanover and G., and the G. and Harrisburg railroads; 8 m. n. of Mason and Dixon's line, 25 m. e. by s. of Chambersburg, 28 m. w. by s. of York, 45 m. s. w. of Harrisburg, 115 m. w. of Philadelphia; named from James Gettys, who settled it 1780. It is the seat of Pennsylvania College (Lutheran, founded 1832), and of the Theol. Seminary of the General Synod of the Lutheran Church in the United States (organized 1826), each having a large and valuable library, and contains several public schools, 10 churches, including 2 for colored people, 2 national banks (cap. \$245,150), an opera-house, gas and water works, 2 weekly newspapers, manufactories of carriages and leather, beer brewery, and 2 granite yards. It is built on a cluster of hills, connected with the G. springs hotel and a valuable katalysine spring $1\frac{1}{2}$ m. to the w. by a passenger railroad. G. is noted for the great battles of the civil war fought in the town and the surrounding country 1863, July 1, 2, 3, and contains the Soldiers' National Cemetery, dedicated 1863, Nov., in which 3,580 Union soldiers are buried. A national memorial monument costing \$50,000, and a bronze statue costing \$13,000, of Gen. Reynolds, who was killed there, have been erected in the cemetery. G. was incorporated as a borough 1806. Pop. (1900) 3,495. See GETTYSBURG, BATTLE OF.

GETTYSBURG, BATTLE OF: 1863, July 1, 2, 3, between the Confederate army of Northern Virginia under Gen. Lee and the Union army of the Potomac under Gen. Meade. The Confederate army numbered nearly 100,000, men, included 15,000 cavalry, and was formed into three corps under Gens. Longstreet, Ewell, and A. P. Hill, the cavalry constituting a separate command under Gen. Stuart. The Union army comprised 70,000 infantry, 10,000 cavalry, and 300 guns. The movements leading to the series of battles began immediately after the battle of Chancellorsville 1863, May 2-4. Several raids into Md. and Penn. were made by the Confederates, and so little resistance was encountered that Gen. Lee determined to invade Penn. in great force, spread terror through the north thereby, and fight the decisive battle of the war on loyal soil. In accordance with this plan he left the shore of the Rappahannock early in May, and by a feint secured a week's march before Gen. Hooker, then commanding the army of the Potomac,

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became aware of his intentions. June 9th the Confederate columns encountered the Union cavalry under Gen. Pleasanton at Beverly Ford; on the 13th Gen. Ewell reached Winchester, defeated Gen. Milroy, and crossed the Potomac; on the 21st and 22d he traversed Md., pushed forward into Penn., and sent Rode's brigade toward Harrisburg and Early's to Columbia; and on the 27th Longstreet and Hill reached Chambersburg. In the meantime the Union army under Gen. Hooker crossed the Potomac and headed toward Frederick City, Md. Hooker, seeing that Lee had left his communications exposed, decided to attack them without waiting for a general engagement, and calling for 10,000 troops at Harper's Ferry and of no use there, was refused their aid. On this he resigned command, and June 28 Gen. Meade succeeded him. Neither of the commanders designed to meet the inevitable encounter at G. Lee, fearing that the Union army would gain his rear and shut him in a hostile country, planned to concentrate his whole army as close as possible to the Union army, and selected G. as the rendezvous or point of union till he could study the country. Meade, on the other hand, with the responsibility of checking the Confederate advance thrust so suddenly upon him, determined to establish a defensive position on Pipe or Big Pipe Creek, 15 m. s. e. of G., and await attack. He ordered the occupation of the slope along Pipe Creek, pushed the 6th corps (right wing) toward Manchester, the 2d corps toward Taneytown, the 12th and 15th corps (centre) in a general n. direction, and the 1st, 3d, and 11th corps (left wing) toward Emmettsburg and G. July 1 the Confederate Gen. Hill moved toward G. to dislodge the Union force which he had ascertained was there, and the Union Gen. Reynolds, in command, sent Gen. Buford with cavalry from G. to check Hill's advance. The two forces met on Seminary Ridge w. of G. Reynolds hastened with infantry to support Buford, and for a time held the advantage, but Hill soon threw forward other troops, Reynolds was killed, and the Confederates drove the Union force through G. to the hills. In this action the Union loss in killed and wounded was about 5,000 and the same in prisoners; the Confederate probably greater in killed and wounded and less in prisoners. The remainder of the Union force took up a position on Culp's Hill. Meade, at Big Pipe Creek, heard the firing at G., and sent Hancock to take command. The latter considered G. a better place for a general engagement, than the one first chosen, and in this opinion Meade after examination concurred. By daylight July 2, the greater part of both armies were in position, in an elliptical area of about 60 m. with G. in the centre. The Union army occupied the whole line of Cemetery Ridge, with the bulk of Lee's army on Seminary Ridge opposite, and Ewell at the foot of Culp's Hill. Meade took command at noon, and the second battle was opened at 4 P.M., by the Confederates attacking the 3d corps. It soon became general. The 3d corps was routed, but the line was saved by timely reinforcements, and after a stubborn contest for possession of Little Round Top, a position

GEUM.

of great importance, the Union force gained and kept it. The day closed without apparent advantage to either army, but with a Union loss of about 10,000, killed, wounded, and prisoners. The third day's fight opened at 1 P.M., the Confederates with 120 guns on Seminary Ridge firing upon the Union batteries of 80 guns on Cemetery Ridge. During a lull in the Union firing, Lee ordered a grand charge by Gen. Pickett's division, to which were added brigades that brought the attacking force up to 18,000 men. In an instant all the Union batteries from Round Top to Cemetery Ridge opened upon the enemy, and as they advanced up the slopes in the face of the terrific cannonading. Meade hurled his troops from all sides and utterly routed the attacking force, not one in four escaping death. Meade then drove Hood's division from the Ridge that it had won the preceding day, and the decisive day closed with a Confederate loss in killed, wounded, and prisoners of about 16,000, and a total Union loss of about 3,000. Both armies rested the next day, and at night Lee retreated to the Potomac. The total Confederate losses in the 3 days were about 18,000 killed and wounded, 13,600 missing, together 31,600; Union, 16,500 killed and wounded, 6,600 missing, together 23,100.

GEUM, *jě'ŭm*: genus of plants of nat. ord. *Rosaceæ*, subord. *Potentilleæ*, nearly allied to *Potentilla*, but distinguished by the hardened hooked styles which crown the carpels,



Water Avens (*Geum rivale*).

a, carpel and awn; *b*, petal; *c*, stamen; *d*, pistil.

so that the fruit becomes a bur. The carpels are dry. *G. urbanum*, called COMMON AVENS, or HERB BENNETT, is a herbaceous plant, 1-2 ft. high; *G. rivale*, called WATER AVENS, is about one ft. high; both species have the radi-

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cal leaves interruptedly pinnate and lyrate, and the cauline leaves ternate, but *G. urbanum* has erect yellow flowers, and *G. rivale* has nodding flowers of a brownish hue. The former grows in hedges and thickets, the latter in wet meadows and woods, and sometimes even in very alpine situations. Both are aromatic, tonic, and astringent, and are employed to restrain mucous discharges, and in cases of dysentery and intermittent fever. The root of *G. rivale* is used also in diseases of the bladder. The root of *G. urbanum*, when fresh, has a clover-like flavor, which it communicates to ale; and for this purpose it is gathered in spring before the stem grows up. *G. Canadense*, the CHOCOLATE ROOT or BLOOD ROOT of N. America, has some reputation as a mild tonic: it is much used in the United States in diseases of the bladder. It resembles in its leaves the two species above mentioned, and has erect flowers like *G. urbanum*. A number of other species are known, natives of temperate and colder regions of the northern and southern hemispheres.

GEWGAW, n. *gū'gaw* [OE. *gaud*, ornament: Swiss, *gugage*, an exclamation of contempt at senseless chatter: F. *joujou*, a plaything: comp. Gael. *geugach*, a little branch—*lit.*, trifling child's-play as opposed to work done with settled purpose]: a showy trifle; a toy; a bauble: ADJ. showy, but of no value. *Note.*—The word may only be a corrupt reduplication of AS. *gifan*, to give, as the prov. Eng. *giffgaff*, a mutual and friendly interchange of benefits or favors.

GEY, a. *gī* [Icel. *gagn*, very]: in *Scot.*, very, as, 'gey sharp,' pretty or rather sharp.

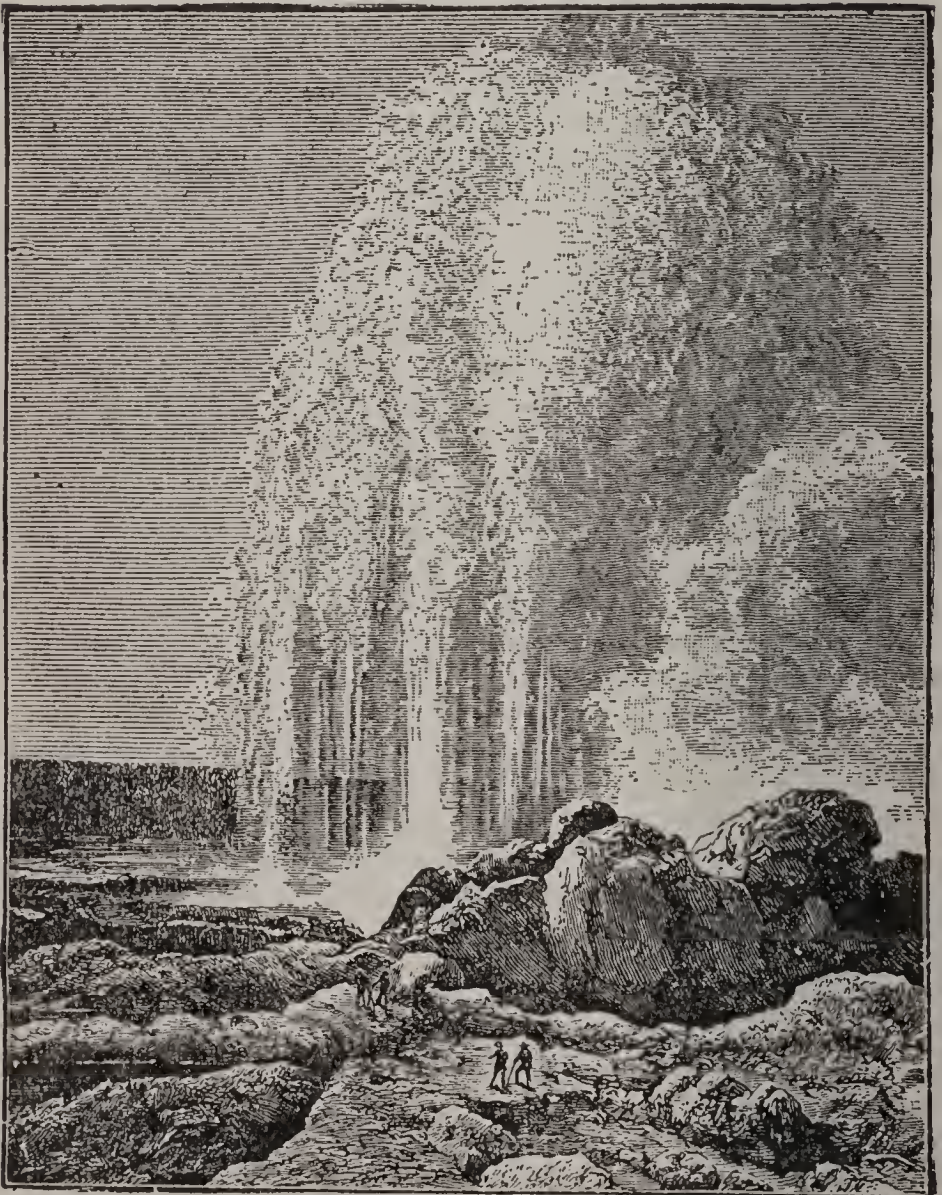
GEYSER.

GEYSER, or GEYSIR, n. *gī'zér* [Icel. *geysa*, to gush, to be impelled—allied to Eng. *gush*; *geysilegr*, vehement]: eruptive thermal spring, or spouting fountain of hot water. GEY'SERITE, n. *-zér-īt*, loose, porous, hydrated form of silica, deposited in concretionary cauliflower-like masses around such hot springs as the geysers.—*Geysers* are found in various parts of the world in evident connection with the volcanic forces at work below. The geysers in the Yellowstone Park in Wyoming terr. bordering on Montana, are probably the most wonderful (see YELLOWSTONE PARK): but a group long famous is in Iceland, about 70 m. from Reikiavik, 16 m. n. of Skalholt, and within sight of the volcano of Hecla. On the slope of a low trap-hill, overlooking the wide grassy valley of the Whitae, or White river, a space of ground measuring about half a mile square, is thickly interspersed with boiling or hot springs of various sizes, from jets not greater than an overboiling tea-kettle, up to great caldrons, besides vestiges of others no longer in operation. All are surrounded by silicious incrustations, formed in the course of time by the minute charge of silica infused into the water. The chief apertures are two, respectively called the *Great Geyser* and the *Strokr* (i. e. Churn), little more than a hundred yards apart. The latter is an irregular aperture of six to eight ft. diameter, down which one may in general safely look, when he sees the water noisily working in a narrower passage about 20 ft. below. If, by throwing in a sufficient quantity of turf, he can temporarily choke this gullet, the water will in a few minutes overcome the obstruction, and, perform an eruption with magnificent effect, bursting up 60 ft. into the air, brown with the turf that has been infused into it, and diffusing steam in vast volumes around.

The appearance of the Great Geyser is considerably different. On the summit of a mount about 15 ft. above the surrounding ground, is a circular pool or cup of hot water, 72 ft. across at its greatest diameter, and about four ft. deep, entirely formed of silicious crust of dull gray color. At the edge, this water has been found to be 188° F.; in the centre, it is considerably hotter. From the centre descends a pit eight ft. wide and 83 ft. deep, up which a stream of highly heated water is continually but slowly ascending, the surplus finding its way out by a small channel in the edge of the cup, and trickling down the exterior of the crusty eminence. Every few hours, the water, with a rumbling noise, rises tumultuously through the pit, and jets for a few feet above the surface of the pool; soon it subsides, and all is quiet again. About once a day, however, this tumult ends in a terrific paroxysm, which lasts perhaps a quarter of an hour, during which the water is thrown in repeated jets 60 to 80 ft. high, mingled with such volumes of steam as obscure the country for half a mile round. If a visitor be tolerably near on the windward-side, he may catch glimpses of this grand spectacle—the eruption of a water-volcano, it may be termed. When quiet is restored, the chalice, and perhaps 20 ft. of the pit, are found empty, and the visitor obtains, so far, a sight of



Germination.—Seeds germinating: in centre, a plant which has newly appeared above ground.



'Old Faithful' Geyser.

GEYSER.

the internal arrangements and structure of the geyser. In a little time, the water reascends to its usual level, and there remains for the next day or two, with only those minor disturbances above described.

The thermal springs and wells of Iceland may be said to be of three classes.—1. Those of continual and uniform ebullition; 2. Those which, while not constantly ebullient, are liable to occasional eruptions; 3. Certain wells not yet particularized, which contain tranquil tepid water, but are supposed (at least in some instances) to have formerly been eruptive. It is only in regard to the second class that there is any room for speculation. To what are we to attribute the occasional eruptions?

The theory started by Sir George Mackenzie, who visited Iceland 1810, is, that steam is gathered in some cavernous recess connected with the subterranean channels through which the water rises; and that, when it has accumulated there till such time as the pressure overcomes the resistance, it bursts forth through the rocky tube, carrying the water before it, and tossing it high into the air. This mechanical theory, as it may be called, has lost ground since the announcement of a chemical one by Prof. Bunsen, who spent 11 days beside the Great Geyser 1846. The learned German looks for an explanation of the phenomena to the molecular changes which take place in water after being long subjected to heat. 'In these circumstances, water loses much of the air contained in it; the cohesion of its molecules is greatly increased, and a higher temperature is required to boil it. When water in this state is brought to the boil, the production of vapor is so instantaneous and so considerable as to cause an explosion. It has been found that the water of the Great Geyser at the bottom of the tube has a temperature higher than that of boiling water, and this goes on increasing till an eruption takes place, immediately before which it has been found as high as 261° F. This peculiarity—for so it is, seeing that, in ordinary circumstances, the hotter water at the bottom would rise to the top till all was equally warm—shows that the heating of the water in the Geyser takes place under extraordinary circumstances. As far as I understand Prof. Bunsen, he implies that the great pressure of the column above, and perhaps some mechanical impediments to free circulation in the form of the Geyser, give these required circumstances. Such being assumedly the case, there is an increase in the cohesion of the molecules of the water constantly going on at the bottom, at the same time that the heat is constantly increasing; at length, the latter force overcomes the former—ebullition takes place—an immense volume of vapor is instantaneously engendered, and an eruption is the consequence.' (From Dr. Robert Chambers's *Tracings of Iceland*. See also Lord Dufferin's *Letters from High Latitudes* (1860); for the American Geysers, the U. S. Geological Survey Reports 1872 and 3; for those of New Zealand, Hochstetter's *New-Seeland*, or Wallace's *Australasia*). We have to consider Bunsen's theory in an unusually curious light in connection with a small

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double geyser, as it may be called, in the group at Reik-holt, and in which each pool makes an eruption every few minutes, the other being at those times pacific.

The water of the Great Geyser contains soda in various forms; but the chief ingredient is a charge of about 31 grammes of silica to 6 gallons. This forms the incrustations around the pools, reaching to the bulk of a little hill around the Great Geyser.

GFRÖRER, *gfrö'rér*, AUGUST FRIEDRICH: 1803, Mar. 5—1861; b. Calw, in the Black Forest: German historian. Although he studied for the clerical profession, he had lost all taste for its practical work when he completed his theological education 1825. After studying French and Italian, he became, 1828, a *Repetent*, or tutor, in the theological institution at Tübingen; 1829 was removed to a similar situation in Stuttgart; and 1830 was appointed national librarian. His first work was on Philo and the Judæo-Alexandrian Theosophy in their relation to the doctrine of the New Testament (*Philo und die Jüdisch-Alexandrinische Theosophie*, 2 Bde., Stutt. 1831); first part of a larger work on the History of Primitive Christianity (*Gesch. d. Urchristenthums*), completed 1838 in three other parts. Between the beginning and completion of this work, G.'s views of Christian doctrine had undergone a change. A change of views appeared also in his History of Gustavus Adolphus and his Times (*Gustav Adolf, König von Schweden, und Seine Zeit*, Stutt. 1833-37), for the first edition of that work takes at the commencement the side of the Guelphs, and toward the close, that of the Ghibellines—an impropriety corrected in the 2d ed. (1844-5). After a work on the *Propheta Veteres Pseudepigraphi* (Stutt. 1840), G. published his *Allgemeine Kirchengeschichte* (Stutt. 1841-46), which, extending to seven vols. brings church history down to 1305. While working at this history, he came to the conviction that the Rom. Cath. is the true church, and that the Reformation originated to a large extent in misunderstanding and the ambition of princes. He was called 1846 to the Rom. Cath. Univ. of Freiburg, and there was drawn into manifold conflicts, as also at the Frankfurt parliament 1848; where he was one of the most decided adherents of the party called the *Grossdeutschen*. In 1848 appeared his History of the Carolingians of e. and w. Franconia (*Gesch. d. ost- u. westfränkischen Karolinger*, 2 Bde., Stutt.); 1855, the first two vols. of a work on the Early History of Mankind (*Urgesch. d. menschlichen Geschlechts*, Schaff.); 1861, the concluding vol. of *Pabst Gregorius VII. und Seiner Zeit*, 7 Bde., Schaffh.). His *Geschichte des 18 Jahr* appeared 1863; and *Zur Geschichte deutscher Volksrechte*, 1866. In all these works he gave emphatic expression to his views on ecclesiastical affairs.

GHADA'MES: see GADAMES.

GHAMBARU, *gám-bâ-ró'*: formerly a notable town of Africa, state of Bornu; lat. 13° 5' n., and long. 12° 5' e. During the flourishing period of the Bornuese empire, it was the favorite retreat of the kings of the country. It was

taken and destroyed by the Fulahs 1809, and has remained in utter ruin and desolation; so that now almost all traces of the town have become covered with vegetation, and swallowed up by the surrounding forest. The most interesting relic of G. is a well-preserved portion of an ancient edifice, evidently a mosque. This mosque was of bricks, which, though not so regularly shaped as European bricks, are in other respects said to be quite as good. G. stands in a district comprising the finest land of Bornu, and which, before the beginning of the present century, was loud with the noise and bustle of hundreds of towns and villages; now, however, it is the haunt of the elephant and the lion, and has sunk back into the condition of the primeval jungle.

GHARA, *gâr'â*: river formed by the junction of the Sutlej and the Beas; most easterly of the rivers of the Punjab. It unites with the Chenab, which has previously collected the remaining three of the five, to form the Punjnad, which thus carries the whole into the Indus. The distance between the two points of confluence is about 300 m. The G. is nowhere fordable at any season; and its breadth varies from 200 to 500 yards.

GHARRY: see GAREE.

GHASEL, or GHAZEL: form of lyrical poetry favorite among the Turks and Persians. It is composed of not less than 5, and not more than 17 strophes of two lines each, all the second lines of which rhyme together. The last couplet always contains the real or assumed name of the author. In regard to matter, the G. is either purely erotic and bacchanalian, or allegorical and mystical. Western scholars regard it as the Oriental sonnet. Hafiz is unsurpassed in this kind of verse, and it has also been happily imitated by the German poets, Platen, Rückert, Bodenstedt, etc.

GHAFTLY, a. *găst'li* [AS. *gæstlic*, terrible: AS. *gast*; Ger. *geist*, a spirit]: unearthly; spectre-like; death-like; pale; dismal; shocking; dreadful. GHAFT'LINESS, n. horror of countenance; a deathlike look: see GHOST.—SYN. of 'ghastly': grim; grisly; horrible; hideous.

GHAT, or GHAUT, n. *gawt* [Hind. *ghât*]: a difficult pass through a mountain; a range or chain of mountains; also, a landing by a water-side, or ferry stairs: see GHÂTS.

GHÂTS, *gawts* (usually written, GHAUTS): buildings along the banks of rivers, for affording easy access to bathers. They are peculiar to n. Hindustan, and line the river banks in most of the great cities, especially on the Ganges. A ghât consists in general of a long, high building fronting the river, to which access is had by several flights of steps which form the essential part of the structure, as the wall or building is only for the protection of loungers from the sun's rays. The uniformity of the long lines of steps is broken by small projections, often crowned by kiosks, which relieve the eye. 'Upon these ghâts,' says one traveller, 'are passed the busiest and happiest hours of a Hindu's day. Escaping from the

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narrow unwholesome streets, it is a luxury for him to sit upon the open steps, and taste the fresh air of the river; so that on the ghâts are concentrated the pastimes of the idler, the duties of the devout, and much of the necessary intercourse of business.' Though the Ganges, the sacred river, is *par excellence* the river of ghâts, one of the most beautiful in Hindustan is that erected at Maheswar, on the Nerbudda, by Alaya Baiee, widow of Holkar; and though Benares prides itself on the greatest number of ghâts, it is almost rivalled by Ujein and other cities. —See Fergusson's *Hand book of Architecture*.

GHAUTS, *gawts* [in English, *Gates* or *Passes*]: two converging ranges of mountains, parallel with the e. and w. coasts of the peninsula of Hindustan, hence known as the *Eastern* and *Western G.*—1. The Eastern G. extend, with an average height of 1,500 ft., from the vicinity of Balasore, lat. 21° 30' n., a little n. of the Mahanadi, to within 20 m. of Cape Comorin. Before joining the kindred ridge at this last-mentioned point, they send forth, about 36 m. n. of Madras, a common spur, as it were, of both ranges, which reaches the other range n. of the gap of Palghatcheri. South of the departure of this connecting chain, the E. G. become less continuous and distinct. Moreover, they are nowhere a water-shed on any considerable scale, being penetrated and crossed by nearly all the drainage of the interior.—2. The Western G. stretch from the s. side of the Tapti, about the same latitude as Balasore, to their junction with the kindred ridge, 20 m. from Cape Comorin, rather to Cape Comorin itself. Though they are generally far more continuous and distinct than the G. Eastern, yet they are sharply divided by the gap of Palghatcheri, 16 m. broad—the n. section measuring 800 m. in length, the s. 200. Their general elevation appears to vary from about 4,000 ft. to fully 7,000. The peak of Dodabetta in that portion of the Western G. known as the Neilgherries, is said to be 8,760 ft. above sea level. The opposite faces of these mountains differ remarkably from each other. Landward, there is a gradual slope to the table-land of the Deccan; seaward, almost perpendicular precipices generally sink nearly to the level of the sea, at a distance from it ranging from 40 to 70 m., but at one place approaching within 6 miles. From this peculiarity, aggravated, as it is, by the incredibly heavy rains which the s.w. monsoon dashes against the lofty barrier before it, the maritime strip, particularly toward the south, presents that singular feature of the country which is known as the 'Baekwaters:' see COCHIN. The Western G. are a water-shed, for not a single stream of any magnitude finds its way through them.

GHAZIPORE, *gâ-zê-pôr'*: city of Hindustan, cap. of the dist. of G. in the N. W. Provinces; on the left bank of the Ganges; lat. 25° 32' n., long. 83° 39' e. The mean temperature of May, the hottest month, is 97° F.; and of January, the coldest month, 56°. The air is salubrious, owing to the porous character of the soil and the fact that there is a long reach of the river toward the s.e., whence the hot

winds generally blow. Large quantities of roses are grown in the vicinity for making rose-water and attar of roses. Pop. about 40,000.

The *district* of GHAZIPORE has an area of 2,226 sq. m.: pop. 1,200,000.

GHAZNI: see GHIZNI.

GHAZZALI, *châ-zâ'lê*, ABU HAMID MOHAMMAD IBN AHMAD, surnamed ZAINEDDIN (glory of the law): eminent Mohammedan philosopher, and zealous adherent of Sufism: 1058 (450 H.)—1111 (505 H.); b. at Tus, in Khorassan, birthplace also of Firdusi, and burial place of Harun-al-Rashid. The surname G. was given to him, according to some, because his father dealt in *ghazal* or spun cotton. Left an orphan at an early age, by the advice of his guardian, a Sufi, he went to Djorshan, for study and science, which he intended to make a means of support; and became the favorite pupil of Abu Nasr Ismail, eminent teacher. Afterward at Nishapur, he attended the lectures of the learned Imam of the two sanctuaries (Mecca and Medina) on law, polemics, philosophy, and theology, and remained till the death of his instructor. The grand vizier of Bagdad then appointed him (1091) to a professorship at his *Nizamjé* (university), which he left four years later, in order to perform the holy pilgrimage to Mecca. On his return, he visited Jerusalem and Damascus, and remained ten years at the mosque of the latter place, leading a studious and ascetic life. He afterward visited Cairo, Alexandria, and other places in Africa, everywhere teaching and lecturing on religion and science, and returned for a short time to Nishapur; but finally went back to Tus, his native place, where he died, having founded a monastery for Sufis, and a college for the studious.

Of the 99 works written by him (mostly in Arabic, a few in Persian), the most famous is his *Ihjá Olúm ad-Dîn* (Restoration of Religious Sciences), a work so remarkable and exhaustive, that it has been said: 'If all the books of the Islam were lost, and we had only this one left, we should not miss the others' (*Haji Khalifah*). The academies of the West, however, Cordova, Morocco, Fez, etc., condemned it as contrary to the teachings of the Sunna (q.v.), and had it publicly burned. Next in importance is his great philosophical work *Taháfat Al-Filásafah* (Overturning of the Philosophers), which has survived only in Hebrew translations, and gave rise to a warmly contested controversy between him and Averroës (Ibn Roshd). Notable also was his commentary on the 99 names of God, and an ethical treatise, *O Child!* published and translated into German by Hammer-Purgstall. About one-third only of his works is known to have survived, and of this but a very small part has been published.

GHEBERS, or GHEBRES, or GEUBERS, n. plu. *gâ'bêrz* [Pers. *ghebr*; Ar. *kafir*; Turk. *giaour*, an infidel]: the anc. Persian fire-worshippers, so called by the Mohammedans; a Parsee: also written GHAVERS: see GUEBERS.

GHEE—GHEEL.

GHEE, n. *gē* [Hind. *ghi*]: clarified butter used in many parts of India; prepared generally from the milk of buffaloes. The fresh milk is boiled for an hour or more; it is then allowed to cool, and a little curdled milk, called *dhye*, is added to promote coagulation. The curdled mass is churned for half an hour; some hot water is then added; and the churning continued for another half hour, when the butter forms. When the butter begins to become rancid, which is usually the case after a few days, it is boiled till all the water contained in it is expelled, and a little *dhye* and salt, or betel-leaf, is added; after which it is put into closed pots to be kept for use. It is used to an enormous extent by the natives of many parts of India, but is seldom relished by Europeans.

GHEEL, *gāl*: well-known colony for the insane; a town of Belgium, province of Antwerp, 26 m. e.s.e. of the town of Antwerp. It is literally an oasis in a desert; a comparatively fertile spot, inhabited and cultivated by 10,000 or 11,000 peasants, in the midst of an extensive sandy waste, called the Campine, where neither climate, soil, nor surroundings invite a settlement. There are no gentlemen's seats in the district, and the farm-houses, though neat, and generally surrounded by trees and a garden, are evidently in the hands of the poor. Their frequency shows this. They are sometimes built of brick; much more generally, they are of wattled or wicker-work, thickly laid over with mud or plaster, and whitewashed: usually they are of comfortable size. The people inhabiting these seem to be about the rank of English cottagers, but are inferior in aspect, tone of character, and cleanliness of habits. The dwellings are arranged into three classes, or cordons: those of the village proper; those scattered around in its immediate vicinity; and those collected into hamlets in the more distant and least reclaimed portions of the commune, which may be about 20 m. in circumference.

Historically, G. is noted as the spot where a woman of rank, a Christian convert, said to have been of British origin, was murdered by her pagan father, who in his brutal revenge gave the church a martyr. Pilgrims, the sick, the sorrowful, and the insane, visited the tomb of the Christian virgin; the last, it is said, were restored to sanity and serenity. *Dymphna* became the tutelary saint of those stricken in spirit; a shrine rose in her honor, which now, for ten centuries, has been consecrated to the relief of mental disease, is said to have been distinguished by constant success, and, at all events, has collected around it hundreds of lunatics, chiefly of the poorer classes, under every form and stage of nervous malady. Formerly, besides the benefit from proximity to the ashes of the saint, and from the prayers of the church, the afflicted underwent a sort of novitiate in a building adjoining the church, where they were chained to the wall, and subsequently passed under the mausoleum of their patron, etc.; but now, though faith lingers, there do not appear to be any other than the ordinary ministrations of the church to which the patients belong, resorted to as treatment.

GHENT.

About 1,300 insane persons are lodged with the citizens of this community, or with 1,000 heads of families, and are controlled and employed by them, and this without recourse to walls or other asylum appliances, and with little coercion of any kind. The quiet and industrious reside generally one in each family in the town, the more excited in the suburban cottages, and the most unmanageable with the laborers on the confines of the commune. The effect produced by this large body of lunatics wandering, working, displaying many of their peculiarities in the midst of a thriving sane population, whose support depends chiefly on a traffic in insanity, is both striking and picturesque. In the enjoyment of comparative liberty, and of what is called the free-air treatment, these patients are, on the whole, contented, tranquil, and healthy. Violence is rare; only two suicides have occurred in four years; and morality is less outraged than in more protected classes. Each individual is maintained for about $6\frac{1}{2}d.$ to $7\frac{1}{2}d.$ *per diem*. Until recently, this colony was merely a psychological curiosity; recently, the anomaly and absurdity of treating all cases alike, and independently of medical aid, have led to the institution of a medical staff, the erection of a hospital, and the introduction of many salutary alterations in the relations between the insane and their custodians, in classification and supervision. The compatibility of the seclusion of the insane with greater freedom, with domestic life, and association with the sane, have suggested the introduction of cottage asylums, as a modification in the accommodation of this class in other countries. See *Gheel*, by Jules Duval (1860); *Die Irrencolonien*, by Brandes (1865); *Gheel*, by Rüdy (Bern, 1874).

GHENT, *gënt* (Flem. *Gend*, Ger. *Gent*, Fr. *Gand*): important city of Belgium, cap. of the province of E. Flanders, at the confluence of the Lys and the Scheldt, 31 m. w.n.w. of Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is encompassed with gardens, meadows, and pleasant promenades. It is surrounded by walls, pierced by seven gates, and inclosing an area eight m. in circuit, and is in general well built; but in the older part is quaint and fantastic houses render it in the highest degree picturesque. Among the chief buildings are the Church of St. Bavon, containing the famous *Adoration of the Lamb* by the brothers Van Eyck; the new citadel, finished 1830; the Palace of Justice, built 1844, and having a peristyle of the Corinthian order; the university, connected with a school for civil engineering, and for trades and professions; the Beguinage, a convent containing about 700 nuns; the Royal Gymnasium; and the Acad. of Painting. Cotton and woolen manufactures are on a great scale. There are many cotton-mills, and about 25,000 workmen are employed in spinning, printing, dyeing, and weaving of cotton, woolen, and linen fabrics. Leather, paper, and carpets also are manufactured, and there are foundries, machine-works, and sugar-refineries. Specially noteworthy is the floriculture of G., an important and flourishing branch of industry. By the Great Canal, which

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flows into the Scheldt, G. has communication with the sea, and it can receive into its docks vessels drawing 18 ft. of water. The new dock or basin on the n.e. side of the city is capable of holding 400 vessels. Pop. (1901) 162,291.

G. is mentioned in history as early as the 7th c. About 868, Baldwin Bras-de-Fer, first Count of Flanders, built a fortress here against the Normans. Under the Counts of Flanders, G. continued to prosper until, in the 14th c., it was able to send 50,000 men into the field. The wealth of the citizens of G., and the usual measure of liberty which they enjoyed, encouraged them to resist with arms any attempt to infringe upon their peculiar rights and privileges. This readiness to arm in their own defense is exemplified in the famous insurrection of Jacob van Artevelde (q.v.), and other instances. For many years, G. maintained a vigorous, but unavailing resistance against the Dukes of Burgundy—who wished to be recognized as Counts of Flanders—and the kings of Spain. In the various wars of which the Netherlands has been the battle-ground, G. suffered severely, and was frequently taken. In 1792, the Netherlands fell under the power of France, and G. was made cap. of the dept. of the Scheldt, continuing under French dominion until the fall of Napoleon, 1814, when it was incorporated with Flanders in the kingdom of the Netherlands.

GHENT, TREATY OF, *gěnt*: negotiated for the settlement of the second war between the United States and Great Britain, at Ghent, Belgium, concluded 1814, Dec. 24, ratified 1815, Feb. 17. Though no decision was reached by it on three points of great interest to the United States—impressment of American seamen, American fisheries rights under the treaty of 1783, and character and extent of naval force to be maintained by each party on the great lakes—it was beneficial in officially ending the war, providing for the settlement of numerous boundary disputes between the two countries, and binding both countries to use their best efforts to break up the African slave trade. All territory, places, and possessions captured by one party from the other were to be restored, except certain islands in and near Passamaquoddy Bay, the possession of which was to be determined by a special commission, or, in case of failure to agree, by the arbitration of a friendly power. Provisions were made for commissions to establish the boundary line from St. Croix river to the junction of the 45th parallel and the St. Lawrence river, to determine the centre of the water-communications from that point to Lake Superior, and to adjust the limits from the water-communications between Lakes Huron and Superior to the most n.w. point of the Lake of the Woods. In these cases also arbitration was provided in the event of the commissions disagreeing.

GHERARDESCA, *gā-rār-dēs'ká*: family of Tuscan origin, conspicuous in the history of the Italian republics during the middle ages. Their vast territorial possessions lay between Pisa and Piombino. In the 13th c., the

GHERARDI—GHETTO.

Counts G. had preponderating authority in the republic of Pisa, and were prominent supporters of the popular interests, in opposition to the encroachments of the nobles. In the great feud between the Guelphs and Ghibellines, they became warm partisans of the latter, and were the irreconcilable enemies of the Visconti, who headed the Guelphs. The most famous of this family, both for the historical events of his career, and for the appalling tragedy of his fate, is Count UGOLINO, whose name and fate have been invested with undying interest by Dante. Count Ugolino, more than any of his race, was possessed by a lawless ambition, and a subtle, unscrupulous spirit. Having resolved to usurp supreme power over Pisa, he formed an alliance with Giovanni Visconti, head of the Guelphic party, who promised to supply him secretly with soldiers from Sardinia. The plot was, however, discovered, and both Giovanni and Ugolino were banished from the city. The former died soon after; but Ugolino, uniting himself with the Florentines and the Lucchese, forced the Pisans, 1276, to restore him his territories, of which he had been deprived. No sooner was he reinstated in his possessions than he began to devise anew ambitious schemes. The war of the Pisans with the Genoese afforded him an opportunity. In the battle fought at the island of Malora, 1284, Aug. 6, Ugolino, by treacherously abandoning the Pisans, occasioned the complete annihilation of their fleet, with a loss of 11,000 prisoners. When the news of this disaster spread, the Florentines, the Lucchese, the Sieneese, the Pistoians, and all the other enemies of the Pisan republic, gathered together to destroy it, as the stronghold of the Ghibellines in Italy. Being thus brought to the brink of ruin, the Pisans had no resource but to throw themselves into the arms of him whose treachery had reduced them to such misery. From the time of his election, he gave free scope to his vindictive, despotic nature, persecuting and banishing all who were privately obnoxious to him, on pretexts of state delinquency, till at length a conspiracy was formed against him, headed by his former supporter, the Abp. of Pisa. Dragged from his palace, 1288, July 1, he was thrown into the tower of Gualandi, where he died of starvation.

GHERARDI, BANCROFT: an American naval officer; b. 1832, Nov. 10; entered the navy, 1846. At the beginning of the civil war he was a lieutenant on the *Lancaster*, of the Pacific squadron; was promoted lieut.-commander, 1862, afterward commanded first the *Chocours* and then the *Port Royal*. With the latter he participated in the battle of Mobile Bay, and signally distinguished himself. He was promoted rear-admiral, 1887; directed the Columbian naval review in New York harbor, 1893; retired, 1894.

GHETTO, *gĕt'tō*: that portion of various cities in Italy set apart for the exclusive residence of Jews. In the early part of the 14th c. Italy was the only country in Europe in which the Jews had repose. The king of Naples extended protection over them for their achievements in science,

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and Dante received Immanuel the poet into his own house. But this toleration was short-lived; civil and religious persecutions sprang up there as elsewhere, and the Jews were subjected to humiliating ceremonies and personal brutality. The triumphal arch of Titus in Rome commemorated the conquest of Judæa, and till the pontificate of Pius IX., whenever a pope-elect was being escorted to the Lateran palace for consecration the procession halted at this arch while a Jew presented a copy of the Pentateuch with an humble vow of fealty to the successor of St. Peter. The G. in Rome is in the rione (quarter) of San Angelo. Under the papal govt. a few Jews were permitted to establish shops in other parts of the city, but they mostly were confined to that locality. Since 1870, when Rome became the cap. of Italy, larger freedom has been granted the Jews.

GHIAOUR, n. *jour*: a spelling of GIAOUR, which see.

GHIBELLINE, n. *gīb'ël-lèn* [supposed to have been so named from *Weißlingen*, one of their castles]: one of a faction in Italy in the 12th c. which favored the German emperors, in opposition to the *Guelphs*, who sided with the pope. See GUELFs AND GHIBELLINES.

GHIBERTI, *gē-bēr'tē*, LORENZO: abt. 1378-1455; b. Florence: famous Italian sculptor. He was educated in art by his stepfather, a skilful goldsmith, and rapidly acquired dexterity in drawing, painting, and modelling. At the age of 19, he was selected for the execution of a noble fresco in the palace of Prince Pandolfo Malatesta at Rimini. With seven other artists, he was next chosen by the Florentine guild of merchants to compete for the execution of a splendid gate in bronze, to suit that executed by Andrea Pisano in the baptistery of Florence, about 1340. The subject of the design was *The Sacrifice of Isaac*, to be executed in bas-relief as a model for one of the panels. The judges found difficulty in deciding between Brunelleschi, Donatelli, and G., but the two former generously proclaimed the superiority of G.'s design, both with respect to the art and beauty of its conception, and the delicacy and skill of its execution. When G. had completed his great work, his fellow-citizens intrusted him with the execution of another gate, to emulate the beauty and colossal dimensions of the two already adorning the baptistery. From Michael Angelo, G. received a noble tribute of admiration, when the great artist asserted that *the two gates were worthy of Paradise*. G.'s second gate contains ten reliefs on a larger scale, the subjects in this case also being wholly biblical. The mingled grace and grandeur of these compositions are in the highest degree admirable. Not the least of G.'s merits was his breaking away from the conventionalism that before his day hampered the free development of sculptural art. Among his works are a bronze relief in the Duomo at Florence, representing San Zenobi bringing a dead child to life, and bronze statues of St. John the Baptist, St. Matthew, and St. Stephen. G. died at Florence.

GHİKA.

GHİKA, *gē-kā*: princely family of Albanian origin, which has given many hospodars to Moldavia and Wallachia. The founder of the House was GEORGE GHİKA, an Albanian by birth, who, through the favor of his compatriot, the grand vizier, Mohammed Kiupruli, was raised to the dignity of Hospodar of Wallachia 1657. He was succeeded by his son Gregory G., who ruled with various vicissitudes, till 1673, and received from the emperor Leopold I. the title of Prince of the Holy Roman Empire. Three subsequent members of the family are notable.

ALEXANDER GHİKA X., Hospodar of Wallachia: 1795–1862: through the influence of the Russian Count Kisseleff, was elevated to the hospodarat of Wallachia. 1834. Nevertheless, he soon showed liberal and enlightened tendencies. He founded schools for primary instruction in every village, lightened the burdens of the peasantry, commenced the enfranchisement of the gypsies, and assisted in the organization of a national party, known as *Young Roumania*. Russia naturally took alarm, and gradually under her influence, a twofold opposition was excited against him, viz., an opposition of the extreme liberals, and also of the old boyards (the landed proprietors), who formed the tory party, and were his personal enemies; the result of which, after many intrigues and plots, was that, in 1842, he was ordered to resign his dignity by the Turkish sultan. He removed to Vienna, where he lived quietly till 1853, when he returned to Wallachia, to find himself once more popular; and in 1856 he was elected 'Caïmacam' of the principality, which office he held till 1859.

GREGORY GHİKA X., Hospodar of Moldavia: 1807, Aug. 25—1857, July; b. at Botochani, in Moldavia: was appointed *Hetman*, or commander-in-chief of the militia 1826, sec. of state 1842, and minister of finance 1843, under the hospodarat of Michael Stourdza. But as the system of the government became more and more Russian in its character, he resigned his functions, and passed into the ranks of the liberal opposition, of which he soon became one of the chiefs. In 1849, the sultan appointed him hospodar, to counteract the influence of Russia in the adjoining principality. His tenure of office may be divided into three distinct periods. In the first, his efforts at reform were crippled by the presence of Russian troops in the Principalities, in violation of the convention of Baltaliman. The second, commencing with the departure of the Russians, 1851, was marked by many excellent measures; he organized a good police system, augmented the effective force of the militia, founded schools for superior and secondary instruction at Niamtzo, Houch, Galatz, etc., promulgated an administrative code—the first great step toward the reform of abuses; increased municipal resources, and at his own expense built aqueducts, and printed important historical mss. The re-occupation of the Principalities by Russia 1853 suspended his labors, and resigning the hospodarat provisionally, he withdrew to Vienna, but resumed his functions in the end of the following year. The third period of G.'s rule was initiated

by the formation of a liberal ministry, with whose support he effected, among other things, a radical reform of the penitentiary system, the abolition of serfdom (1855), and of the censorship of public journals (1856), and the establishment of foreign merchant companies for the navigation of the Pruth and the Sereth (1856); while he also encouraged the growth of a union feeling among the Roumanian party in both principalities. His tenure of office expired 1856, and as his private fortune had been rather diminished than increased by his dignity, he quitted Moldavia, and went to reside in France.

HELENA GHİKA, Princess *Koltzoff-Massalsky*, better known by her pseudonym of *Dora D'Istria*: 1829, Jan. 22-1888, Dec.; b. Bucharest; niece of Prince Alexander Ghika X., Hospodar of Wallachia. Profoundly instructed in the classics under the care of George Pappadopoulos, she travelled frequently through Germany, France, and Italy, gaining also an extensive knowledge of modern languages and literature; and at the age of 15 commenced a translation of the *Iliad* into German, and not long afterward wrote several pieces for the theatre. On her marriage with Prince Koltzoff-Massalsky, she accompanied her husband to the court of St. Petersburg. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published, Paris and Geneva 1855; followed by *Gli Eroi della Rumenia*, and *I Rumeni ed il Papato*. Her studies in Switzerland resulted in a volume entitled *La Suisse Italienne*. She received an official invitation, 1865, to attend the sixth centenary festival in honor of the birthday of Dante. This event she described vividly in a *Pèlerinage au Tombeau du Dante*. In 1867, she went to Venice to explore the ample archives of that city; but first she published *Venise en 1867*; afterward *Les Albanais musulmans*, and *Les Albanais en Roumanie, ou les Princes de Ghika*. In 1868, she gave some account of her own active life in *Di alcune opere della Principessa Dora d'Istria*, which reappeared, 1871, under the title, *Dora d'Istria e la poesie Albanese*. Her work, *Des Femmes, par une Femme* (1864), was translated into Russian, Italian, and English.

GHILAN, *ghē-lân*: a border province of Persia; s.w. portion of the narrow strip of country between the Elburz range and the Caspian Sea; between lat. 36° 30' and 38° 30' n., and long. 48° 33' and 50° 30' w. It is more than 150 m. in length, and about 70 m. greatest width. From the lowness of the land it is subject to frequent inundations, and during great part of the year is little better than a swamp. The climate is unhealthful. There are dense forests, and mulberry trees are grown for production of silk. The soil is fertile, bearing barley, hemp, hops, fruits, and great quantities of rice. Pop. estimated 100,000.

GHIRLANDAJO *gēr-lân-dâ'yō* (or CORRADI, *kor-râ'dē*), DOMENICO: 1451-95; b. Florence: eminent painter of the early Florentine school. From his youth, he was educated to the craft of the goldsmith by his father, who received the name Ghirlandajo as inventor of some sil-

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ver ornaments of elegance, in the form of a wreath or *ghirlanda*, which became the favorite head-dress of the Florentine beauties of his day. At the age of 24, G. abandoned working in gold, and studied painting, in which he became not only a famous and lauded artist, but also one of the most progressive and original masters of his age. His greatest works are frescoes, but he left also fine easel paintings, both in oil and distemper, and his compositions in mosaic—or 'eternal painting,' as he termed it—are unrivalled for brilliant coloring and for the delicate softness with which the colors are blended and graduated. The Capella di Sasseti, in Florence, contains a noble series of G.'s frescoes, illustrative of historical and legendary incidents in the life of St. Francis. They are strongly characterized by the wonderful mastery of intense and varied human expression, which, more than accurate delineation of form, was the great merit of G.'s paintings. The Church of Santa Maria Novella also is rich in this artist's work, being adorned by a set of frescoes representing scenes from the life of John the Baptist, many of the figures being correct likenesses of some celebrities of the day. G. was the first artist who adopted correct principles of perspective, just gradations of shade and form, and dramatic art in grouping. His son, RIDOLPHO G. (1483–1560), was a painter, whose earlier works were well received, but who lacked earnestness and patience.

GHIUSTENDIL, *gî-ôs-tên-dêl'*: town of European Turkey, in the cyalet of Rumili, on the slope of a hill about two m. from the right bank of the Struma or Kara Su, 192 m. in direct line w.n.w. of Adrianople. It is surrounded by an old wall flanked with towers, is the see of a Greek bishop, and contains a bazaar and sulphurous baths. Pop. 10,000.

GHIZEH, or GIZEH, *ghê'zêh*, (Coptic, *Tpersioi*): village in Egypt, close to the n. border of Middle Egypt, on the opposite side of the river, about three m. w.s.w. from Cairo. In the immediate vicinity, the line of great pyramids commences: see PYRAMID. Here is still seen the process of egg-hatching in ovens, a practice continued from the time of the Pharaohs. G., formerly adorned with beautiful palaces and mosques, the pleasant retreat of the Cairo merchants, is now a mere village, and mounds of rubbish are almost the only indication that buildings of some pretension once existed here.

GHIZNEVIDES.

GHIZNEVIDES, *g'iz'nē-vīds*: celebrated dynasty, whose empire, in the height of its power, extended from the Tigris to the Ganges, and from the Sihon or Sir-Daria to the Indian Ocean. The founder of the dynasty was Alepteghin, originally a slave belonging to Abdulmelek, the Samanī Ameer of Bokhara. He was appointed gov. of Khorassan; but on the death of his benefactor he rebelled, and proceeded at the head of an army to Ghizni, of which he took possession 961, and for 15 years successfully withstood the whole power of the Samanī (q.v.). On his death, Sebekteghin or Sabactagī was unanimously chosen his successor. He was distinguished for prudence and valor, and equally for humanity and justice. By him the kingdom was extended from the Indûs to Khorassan, and from the Gulf of Oman to the Amû-Daria or Jihon; and in the latter province his son, Mahmûd, was appointed gov. under the nominal suzerainty of the Samanī. Sebekteghin died 997, and was succeeded by his younger son Ismâil; but Mahmûd the elder, hearing of his father's death, hastened to Ghizni, and assumed the reins of government 998, with the title of Sultan. In the year following, he took complete possession of Khorassan, and 1001 began a series of destructive inroads into Hindûstân. Falling in with Jeypâl prince of N.W. India, at Peshawur, Sultan Mahmûd, on the 8th of Mohurrim (Nov. 26), defeated him with immense slaughter. In 1004, while on his second expedition to India, he was recalled by the news that Eylek Khân of Khashgar, who in 999 had conquered the Samanī and taken possession of their territory, was ravaging Khorassan and Balkh; on hearing which Sultan Mahmûd, leaving his conquests, returned in an incredibly short time to Ghizni, and thence proceeding without delay to Balkh, engaged in battle with the enemy, and completely defeated them. He then took possession of the country between the Sihon and the Jihon (ancient Transoxiana). In 1007 and 1009, Sultan Mahmûd made his third and fourth expeditions into Hindûstân, and each time carried off immense booty in money, jewels, and slaves. On his return to Ghizni, he made a liberal distribution from his treasures among the poor and the ministers of religion. About this time he reduced Ghûr, Gherjistân, and Khaurezm, bestowing the latter province upon Altun-Taush, one of his favorite generals. In 1024, he was engaged in his last expedition against the Hindûs, the famous expedition to Somnaut (q.v.), at the s. extremity of Guzerat: here he obtained an enormous booty. In 1027, he received from the Caliph Ul Kader a ratification of all his conquests, together with numerous titles of honor, and in the two following years having conquered Irak, Tebriztân, and Mazanderan, he returned to his capital, where he died, 1030, Apr. 29. At this time the empire of Ghizni was at the summit of its glory, having in 69 years extended over 38 degrees of longitude and 20 of latitude. Mahmûd possessed some exalted qualities of character, but they were much obscured by his sanguinary zeal for the advancement of Islam. He was succeeded by his younger son Mahomed, who in Oct.

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of the same year was compelled to resign the sovereignty to his elder brother, Mussaûd I. This prince was signally defeated in 1037 by the Seljûks (q.v.), who had taken possession of Khorassan under Toghrul Beg and Tchegher Beg, grandsons of Seljûk. Though an able and warlike prince, misfortunes crowded thickly round his declining years, and in 1041 he was put to death. During his reign the Seljûks took possession of Bâlkh, Khorassan, Khaurezm, Herât, and Irak. The sovereigns who in succession reigned in Ghizni were Mûdud (reigned 1041-49), Mussaûd II. (1049), Ali (1049-52), Abdurrashîd (1052-3), and Furrukhzaud (1053-58), of whose reigns there is nothing worthy of relation, beyond the intestine quarrels at Ghizni, and the encroachments of the Seljûks on the west and north. The reign of Furrukhzaud, however, shed lustre over the expiring glory of Ghizni, for the Seljûk prince, Daoud, thinking to take advantage of the dissensions at Ghizni, marched toward it; but he was met by Nûshtekein, one of the best generals of the age, and signally defeated. Taking advantage of this victory, Nûshtekein marched into Khorassan to recover that province, and encountering Kellisaurek, a celebrated Tûrkman chief, totally defeated him. On news of this second defeat, Alp-Arslan (q.v.) was sent by his uncle Toghrul Beg to stop the progress of the G.; and in the battle which ensued, fortune changed sides, and Nûshtekein was totally defeated: a treaty of peace was then concluded. Furrukhzaud was succeeded by Ibrahim (reigned 1058-98), Mussaûd III. (1098-1114), Arslan Shah (1114-18), and Behram Shah (1118-52). During the reign of this last prince the Ghûri, a tribe inhabiting the mountainous country of Ghûr; began to make inroads upon the territory of Ghizni, and growing bolder by success, attacked and took the capital itself, driving Behram Shah across the Indus. But on the retreat of part of the Ghûri to their own country, Behram Shah returned and retook his capital, making prisoner the Prince of Ghûr, Seyfud-deen Sourî, whom he put to death with the most refined cruelty. On learning this, the brother of the unfortunate prince, Allah-ud-deen, hastened from Ghûr, and having defeated Behram Shah, gave up Ghizni to be pillaged by his followers. Behram Shah, thus driven a second time across the Indus, desisted from all further attempts to regain his ancestral dominions, and died 1152. His son Khosrû Shah succeeded him, and took up his residence in Lahore; but the many attempts which he made to repossess himself of Ghizni and the surrounding territory were unsuccessful. Khosrû Melek, 17th and last monarch of the dynasty of Ghizni, occupied himself (1160-66) in the first part of his reign (1160-86), in extending and consolidating his Indian possessions, but subsequently his whole energies were required to repel the attacks of Shâhab-ud-deen Mahommed, Prince of Ghûr, who, having conquered all the territory w. of the Indus, now sought to drive the race of Sebekteghin from their last possession. In 1184, Lahore was all that remained to Khosrû Melek, and the taking of that city by the Ghûrian prince 1186 put an end to the power of the Ghiznevides.

GHIZNI—GHOST.

GHIZNI, *ghéz'nē*: river of Afghanistan, loses itself, after a southerly course of about 80 m., in the salt lake of Abistada, 7,076 ft. above the sea. The G.'s source is 12 m. n. of the city of G. (q.v.), and its mouth is about lat. 32° 35' n. and long 68° e. Its embankments, dating from the 11th c., are still fit for the purposes of irrigation.

GHIZ'NI: city of Afghanistan; anc. cap of the empire of the GHIZNEVIDES (q.v.). It stands at an elevation of 7,726 ft., on a scarped rock, 280 ft. above the adjacent plain. Its natural strength has been increased by walls 35 ft. in height, and a wet ditch. In 1839, July, G. was stormed by the British under Lord Keane; and 1842 it was first surrendered to the Afghans, and then retaken by Gen. Nott. Eventually it was restored, with the rest of the country, to Dost Mohammed. It is in long. 68° 18' e., and lat. 33° 34' n.—the remarkable altitude of the spot brings, in winter, a temperature of about 20° Fah. below zero. G. is an entrepôt of the trade between Afghanistan and the Punjab. Pop., fluctuating perhaps with the season of the year, variously estimated below 10,000.

GHOGRA, or **GHAGRA**, *gâ'grâ*: one of the largest affluents of the Ganges, joining that river from the left, lat. 25° 46' n., and long. 84° 40' e., after a generally s.e. course of 600 m. It rises in lat. 30° 28' n., and long. 80° 40' e., on the s. declivity of a mountain-range, which separates the dist. of Kumaon from s.w. Thibet. The actual source, being between 17,000 and 18,000 ft. above the sea, is hidden under perpetual snows, while in winter it can scarcely be said to flow at all. Through the first 50 m. the torrent, tumbling down deep gorges, is in many places entirely concealed by glaciers. After receiving many tributaries on both sides, it enters the great plain of Hindustan in lat. 29° 6' n., and long. 80° 13' e., where, after a flow of 148 m., it is 798 ft. above the sea. Here it has been estimated to be about two-thirds of the size of the Ganges at the corresponding point of Hurdwar. To this point it has generally formed the boundary between Kumaon and Nepal. Before the G. has descended 70 m. further, it has become navigable for craft of considerable burden. Further down, it is practicable for boats of all sizes at every season, though here and there beset by dangerous and intricate shoals. Like other great rivers traversing alluvial tracts (see GANGES), it sends off lateral water-courses, which in the rainy-season communicate with the parent-flood and with each other. The principal auxiliaries, in their order, are the Kalipani on the left; Dhoulî, on the right; Gorigunga, on the right; Chumalea, on the left; Western Surju, on the right; Lohogatalu, on the right; Ladbîa, last of its hill tributaries, on the right; Kurnalli, on the left; united Chonka and Woel, on the right; Eastern Surju, on the left; finally, the Rapti, on the left.

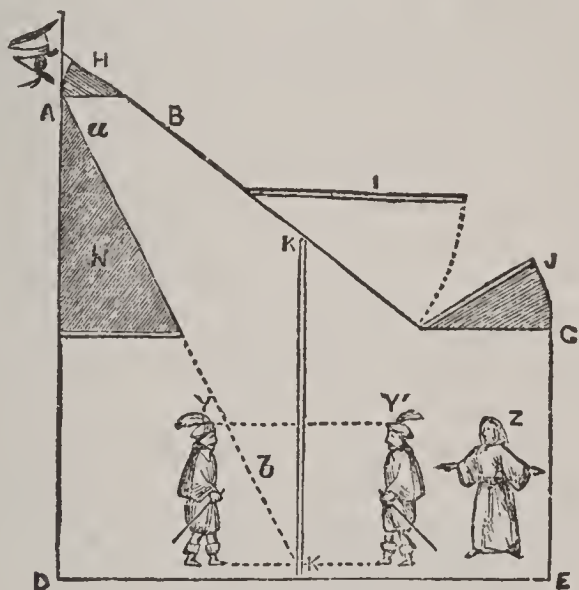
GHOR: see **EL GHOR**.

GHOST, n. *gōst* [AS. *gast*; Ger. *geist*, a spirit: comp. Gael. *geas*, a charm, sorcery]: an apparition or spectre; the soul or spirit of a deceased person (see APPARITIONS: **HYF-**

GHOST.

NOTISM): V. in *OE.*, to haunt with ghosts or apparitions. GHOST'ING, imp. GHOSTED, pp. *gōst'éd.* GHOST'LY, a. *-lĭ*, pertaining to the soul or spirit; spiritual; not carnal; not secular; relating to apparitions. GHOST'LINESS, n. GHOST-LIKE, a. *ghastly*; having sunken eyes. GHOST'LESS, a. without spirit or life. HOLY GHOST, the Third personal Distinction (commonly termed 'Person') in the Divine Trinity; the Comforter; the Advocate; the Paraclete (see HOLY SPIRIT, THE: TRINITY, DOCTRINE OF THE: PROCESSION OF THE HOLY SPIRIT: FILIOQUE). TO GIVE UP THE GHOST, to die; to yield up the breath or spirit. *Note*—In *English* the words GHASTLY and GHOSTLY are closely united in sense, though somewhat confused in their derivations. The *h* has been inserted into each without reason assigned.—SYN. of 'ghost': phantom; vision; phantasm; spirit; soul.

GHOST, OPTICAL: phantom appearance, produced by an ingenious mechanism which renders visible to a body of spectators certain phenomena of reflection and transmission, by varying the intensity of light passing upon or through large plates of glass, and by adjusting the position of the actors with reference to the glass and to the spectators. Dirck's small model first illustrated the principle of combining an object with its shadow or reflection so that their discrimination would be difficult. The cut shows a vertical section. ABCDE is a box inclosed on all sides, higher at one end than at the other; H, I, J are three flap-



Vertical Section.

ped or hinged openings at the top of the box, H for the eye of the spectator, I to put in the models or figures, and J to admit light; KK is a transparent vertical plate of glass, dividing the box into two compartments; N is an opaque screen, to shield a portion of the compartment L from the eye of the spectator. With small figures or models, very curious optical effects can be presented in this box. Place two figures, Y and Z, in the two compartments, one in each: an eye at A will see the real figure Z, and the reflection Y' of the figure Y, but not Y itself; and both will *appear* to

GHOST-MOTH.

be in the same compartment. By opening in various degrees the flap J and the side-doors, or by closing any one of the three, and opening the two others, the admission of light may be so regulated as greatly to modify the effects. In order that Y' may appear real, no solid body should be placed immediately before or behind it, or its transparency would at once be detected. If the apparatus were large enough for living performers, Z would not see Y', though he would see Y; but by a little rehearsal, Z and Y' might appear to act together.

The exhibition of Messrs. Dircks and Pepper, in London 1863, and later in New York, introduced the subject to popular notice. For their show, there is a stage like that of a theatre; and an under stage at a level about six ft. lower, between it and the spectators. The stage can be seen by all persons in the hall or theatre but the under-stage (though nearer) is so managed, by means of dimness of light, and dark baize lining, that its existence is scarcely suspected by most of the spectators. There is a large plate of unsilvered glass nearly upright, between the under-stage and the stage, so artfully framed and adjusted as to be invisible. A hidden actor is on the under-stage, entirely below the level of the real stage, and out of sight of the spectators. A strong light is thrown upon his face and figure, and is reflected from the front of the glass toward the spectators, who can thus see the reflected image, but not the actor. If the light is very strong on the hidden actor, and very faint on the glass, the phantom appears with wonderful force and vividness. By mechanical arrangement, the phantom may be made to disappear instantly; or by varying the intensity of the light, the phantom may dissolve gradually. If the under-stage is small, a small bust or model may take the place of the hidden actor: with a very large under-stage a group of hidden actors may be combined with the visible actors in a startling phantom-play. — Munro's patent (1863) interposes screens and various media so as to show a phantom with head suddenly severed from the body: by added mirrors the visible actor may seem to be entering a solid cube—effects due to the superposition of a reflected image upon an object seen by transmitted light.—Maurice's patent (1865), instead of reflecting a hidden actor as a phantom, makes the visible actor become a phantom, through superposing the phantom of a hidden object upon his living form.

GHOST-MOTH (*Hepialus hamuli*): species of moth of which the caterpillar—in some countries, called the OTTER—often commits great ravages in hop plantations, devouring the roots of the hop. It feeds on the roots also of the nettle, burdock, and some other plants. This moth belongs to a family (*Hepialidæ*) often popularly called *Swifts* from their rapid flight, having long narrow wings, and destitute of a tongue. The antennæ are short. The male G.-M. is entirely of satiny white color above; the female yellowish with darker markings; both sexes are brown on the under side. In England they are seen flying about in the twilight, generally over lawns and pastures, frequently in

GHOUL—GHÛRI.

churchyards, from which fact—and from the white color of the males and their sudden disappearance in the imperfect light on their folding their wings, or rising above the



Ghost-Moth (*Hepialus humuli*):

1, eggs, natural size; 2, the same, magnified; 3, larva or caterpillar; 4, chrysalis; 5, imago or perfect insect, male; 6, the same, female.

level of the spectator's eye so that the brown part is turned toward him—they derive their name. The caterpillar, sometimes two inches long, is yellowish white, with scattered hairs. It spins a large cylindrical cocoon among the roots on which it has been feeding, and there becomes a chrysalis.

GHOUL, n. *gól* [Pers. *ghul*, a mountain demon]: a supposed demon that feeds on the dead; also spelled **GHOLE**.

GHUMURDJINA, *güm-ór-jē'ná*, or **KOMULDSI'NA**: town of European Turkey, in the eyalet of Rumili, on the right bank of the Karadji, about 80 m. s.w. of Adrianople. It has extensive bazaars and a small citadel. Pop. supposed about 8,000.

GHÛR, *gór*, or **GHOE**, *gór*: mountainous district of western Afghanistan, s.e. from Herât. It was conquered by the famous Sûnní hero, Mahmûd of Ghizni (q.v.), and about three centuries afterward was overrun by Genghis Khan, who almost completely exterminated the ancient race of inhabitants. It was the original possession of the princes who established the second Mohammedan dynasty, in Hindûstân. It is inhabited now by the independent nomad Tartar tribes of the Hazâreh and Eimâk, principally the latter.

GHÛRI, *gô-rî*, or **SULTANS OF GHÛR**: race of princes who had the seat of their empire in the country of Ghûr (q.v.), and ruled over Persia, n. Hindûstân, and Transoxiana. The first of this family mentioned in history is Sûri, who opposed an obstinate but unavailing resistance

GIACOMO DA PONTE—GIANIBELLI.

to Sultan Mahmûd of Ghizni. One of his descendants, named Husseyne, was subsequently appointed gov. of Ghûr, in which office he was succeeded by his sons. But Behram Shah having put to death one of the brothers, the others threw off their allegiance to the race of Sebekteghin, and hostilities ensued (see GHIZNEVIDES), in which the eldest brother, Seyf-ud-deen, was killed, and his brother, Allah-ud-deen, surnamed Jehaun-souz (the Conflagrator), succeeded to the sovereignty. After subduing the sultan of Ghizni, Allah-ud-deen invaded Khorassan, but was defeated and taken prisoner by Sultan Sunjur the Seljûk. He was succeeded by his son Mahommed 1160, who was assassinated at the end of the first year of his reign. Gheitheddin Mahommed ascended the throne 1161, and after a long and bloody contest with the Khaurezmians, obtained possession of Khorassan. During his reign the affairs of Ghinzi were committed in charge to his brother, Shahab-ud-deen Mahommed, who, having subdued the Ghiznevide provinces w. of the Indus, crossed that river and conquered successively the provinces of Mûltan (1176), Lahore (1186), and Ajmere (1190), defeating the rajah of Ajmere's army numbering 300,000 horse and 3,000 elephants, and in the course of the next six years conquering Hindûstân as far s. as Nagpûr, and w. to the Irrawady. From this epoch the preponderance of Islam in Hindûstân is dated. Shahab-ud-deen succeeded to the throne 1203, on the death of his brother (see GHIZNEVIDES). The house of Ghûr had now reached its acme of power, their territory extending from the Caspian Sea to the Bay of Bengal, and from the Jihon to the Indian Ocean. Shahab-ud-deen, having invaded Khaurezm 1204, was attacked by the sultan of that country, and completely routed. In the following year, he undertook an expedition into Kojud, on the s. border of Cashmere, to reduce that rebellious province, in which he had complete success, but on his return was assassinated by one of the Fedayan, or followers of Hussun Sabah, 1206. His nephew, Mahmûd, succeeded; but after a short reign of four years he was assassinated. After his death, some members of the family made feeble efforts to revive the grandeur of their ancestors, but as the sultans of Khaurezm had by this time subjugated the whole Persian empire, their attempts were fruitless.

GIACOMO DA PONTE: see BASSANO.

GIANIBELLI, *jâ-nê-bêl'le*, or GIAMBELLI, *jâm-bêl'le*, FEDERIGO: born abt. 1530, in Mantua: military engineer. After serving in Italy, he went to Spain and offered his services to Philip II.; but failed to obtain audience of that monarch, and deeming himself slighted, he abruptly quitted Madrid, swearing, as the story goes, that the Spaniards would yet hear of him; and after a residence for some time at Antwerp, where he acquired high reputation as a mechanist, passed over to England and entered the service of the Queen Elizabeth, who granted him a pension. During the War of Independence in the Netherlands, Alexander, Duke of Parma, generalissimo of the Spanish forces, be-

GIANNONE.

sieged Antwerp, 1585, whereupon Elizabeth commissioned G. to proceed to the assistance of the inhabitants. Finding that the Spaniards had built a vast bridge across the Scheldt, interrupting all communication with the sea, by which alone the city could get provisions or help, G. invented an infernal machine, which he launched against the bridge one stormy night. The effect was frightful. The whole Spanish army was roused by the noise, and the Scheldt was found to be quivering to its lowest depths. The obstructing bridge was blown into the air, and no less than 800 men—among whom were some of the best Spanish officers—were killed. Many Spanish ships also were either burned or sunk. The want of unity, however, among the citizens, ultimately rendered G.'s aid unavailing, and he returned to England, where, at the time of the threatened Spanish invasion, he skilfully fortified the coast-line. When the Armada appeared in the Channel, G. proposed and carried out the plan of sending fire-ships into the midst of the enemy, and in this way greatly contributed to their defeat. After this he disappears from history, and all we know of him is that he died in London.

GIANNONE, *jân-nô'nâ*, PIETRO: 1676–1748; b. Ischi-tella, village of Capitanata, in Naples: historian and lawyer. He early distinguished himself as an able and learned practitioner at the bar of Naples, and soon acquired money enough to enable him to give his time to his favorite historical researches. In his beautiful villa, adjoining Naples, he labored 20 years at his greatest historical work, which, 1723, he published in four vols., under the title *Storia Civile del Regno di Napoli*. This valuable and comprehensive work deals critically with laws, customs, social institutions, and religious influences. Some severe strictures on the spirit of worldly aggrandizement, and progressive corruption of the doctrines and practices of primitive Christianity apparent in the modern Roman Church, so enraged the ecclesiastical party, that G. was universally denounced and anathematized from pulpit and altar. The grossest calumnies were levelled at the great writer, who was finally forced by the popular tempest to take refuge at Vienna. The history was solemnly condemned as heretical and libellous by the pope, and was strictly prohibited. G. was granted a small pension by the emperor Charles VI., under whose dominion Naples then was; but in 1734, G. was deprived of his pension, and returned to Venice, whence he was expelled. He then sought shelter in Geneva. There he composed his famous and bitterest diatribe, *Il Triregno*, against the papal pretensions, and even proclaimed his adoption of the Calvinistic doctrines. Soon, an emissary from the court of Turin, having artfully ingratiated himself into the confidence of G., induced him to enter the Sardinian states, where he was immediately arrested and conducted to the fortress of Turin a close prisoner. G. beguiled his tedious confinement with his chosen studies, and retracted his change of religious opinions, a step which in no way alleviated his persecution. He died a prisoner in the fortress, after 12 years of imprisonment. *La Storia*

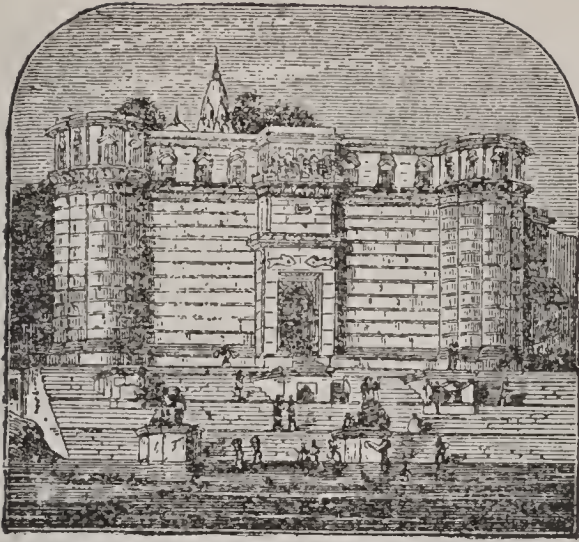
GIANT—GIANTS' CAUSEWAY.

Civile has passed through several editions (one at Milan 1823, 13 vols.). A collected edition of his works was published at Turin, 1859. See contributions to his life by Corniani, Parizini, and Fabroni.

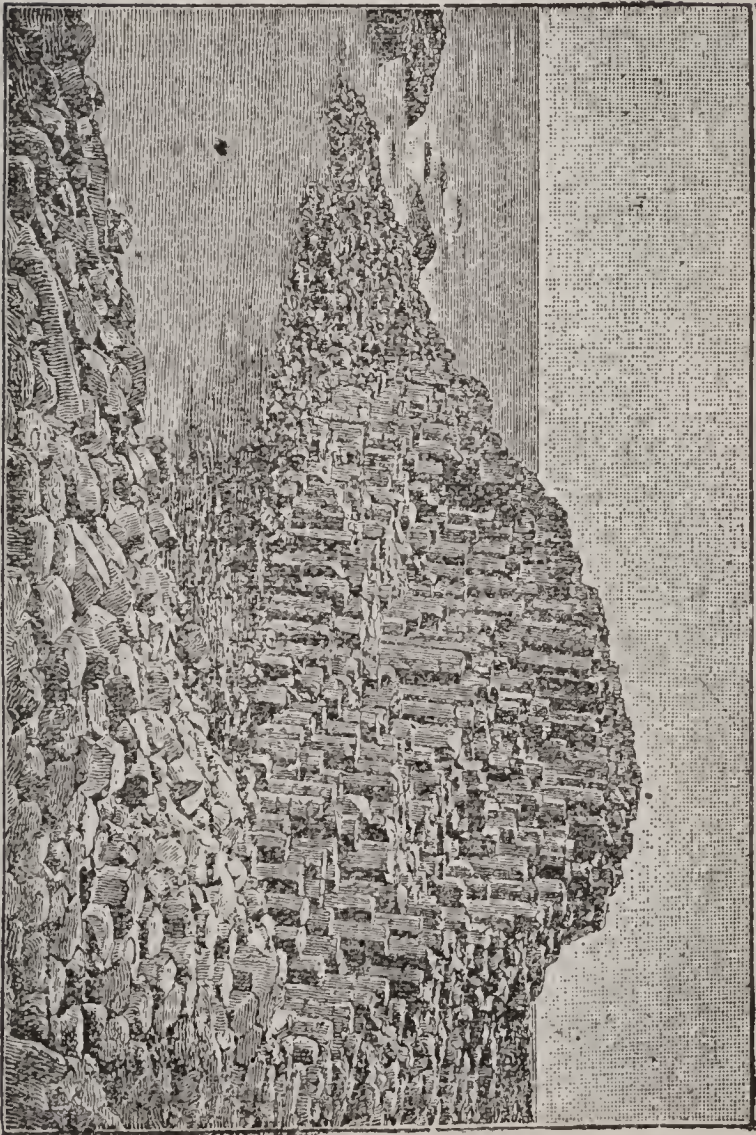
GIANT, n. *jī'ānt* [F. *géant*, a giant—from It. *gigante*—from L. *gigan tem*: Gr. *gigas*, a giant—from *gēgēnēs*, earth-born—from *gē*, the earth, and *genos*, birth, race]: a man of very large stature (see GIANTS AND DWARFS); a person of great bodily or intellectual power: ADJ great in size or strength. GI'ANTESS, n. a female giant. GI'ANTLIKE, a. of unusual size. GI'ANTSHIP, n. quality or character of a giant.

GI'ANTS' CAUSE'WAY (named from a legend that it was the commencement of a road to be constructed by giants across the channel to Scotland): a sort of pier or mole, of columnar basalt, projecting from the n. coast of Antrim, Ireland, into the North Channel, about 15 m. from Coleraine. It is part of an extensive and overlying mass of basalt, 300 to 500 ft. in thickness, which covers almost the whole county of Antrim and the e. of Londonderry, extending over nearly 1,200 sq. m. The basalt occurs in several beds, interstratified with layers of ash. It covers secondary strata, converting the chalk into granular limestone, and the lias shale into Lydian stone, where it comes in contact with them. Several of the basaltic beds are more or less columnar, but three are remarkably so. The first appears at the bold promontory of Fair Head; its columns are coarse and large, exceeding 200 ft. in height. The other two are seen together rising above the sea-level at Bengore Head. The lower one forms the Causeway at the place where it is uncovered, as it again gradually dips under the sea. It is exposed for 300 yards, and shows an unequal pavement, formed of the tops of polygonal columns, fitting so compactly that the blade of a knife can scarcely be inserted between them. The columns are chiefly hexagonal, though examples may be found with 5, 7, 8, or 9 sides; and there is a single instance of a triangular prism. The diameter of the pillar is very variable, but the average size is 15 to 20 inches. Each pillar is divided by joints of unequal length, the concave hollow at the end of one division fitting exactly into the convex projection of the other. The rock is compact and homogeneous, and is somewhat sonorous when struck with a hammer.

The Causeway is divided into the Little, Middle and Large Causeways. The Large Causeway, formed by the lowest of the three columnar beds of basalt, is about 30 ft. wide, and runs more than 200 yards from its exposure on the cliff till it is covered by the sea. The Little and Middle Causeways are formed from the second columnar stratum, and are less remarkable than the other.



Ghosla Ghât, Benares.



The Honeycomb, Giants' Causeway.

GIANTS AND DWARFS.

GIANTS AND DWARFS: individuals at the opposite extremes of human stature, which ordinarily ranges from little less than four ft. to little more than six feet.

Until the beginning of the present century, it was universally believed that giants, of a size far exceeding those exhibited in our times, formerly existed, either as nations or as individual specimens. This belief was based (1) on the asserted discovery of colossal human bones; (2) on supposed scriptural evidence; and (3) on the evidence of various ancient and mediæval authors.

A reference to the first vol. of Cuvier's *Ossements Fossiles* will show that the bones of elephants, rhinoceroses, mastodons, etc., have been exhibited and accepted as evidence of pre-historic giants. Even so good a naturalist as Buffon fell into this popular delusion, and figured the bones of an elephant as the remains of human giants. Isidore Geoffroy Saint-Hilaire, in his *Histoire des Anomalies de l'Organisation*, notices several of the most famous of these cases. A gigantic skeleton found at Trapani, Sicily, 14th c., was at once pronounced that of the classical giant Polyphemus, and his height was calculated at 300 ft. It was pointed out that the bones differed in form as well as in size from those of man, but this objection was easily met by the question: Why if his height was 50 times as great as that of an ordinary man, should not his form be also different? Many less celebrated giants were subsequently exhumed in Sicily, and the existence of the 'Osseous Caverns,' described by De Quatrefages in *Rambles of a Naturalist*, accounts for such discoveries, at an epoch when few could recognize the differences in form between the bones of an elephant and those of a man. Passing over a giant whose bones were exposed by the action of the Rhone 1456, and whose height was estimated at 30 ft., and another whose skeleton was discovered near Lucerne 1577, and who, according to the calculation of the learned physician Plater, did not exceed 19 ft., we come to the case of King Teutobochus, whose remains were discovered near the Rhone 1613, by a surgeon named Mazurier, whose *Histoire Véroitable du Géant Teutobochus* (1618), gave rise to a warm controversy. The anatomist Riolan endeavored to expose the imposture, but the Parisians rushed in crowds to see the bones of a mastodon, which were reported to have been found in a tomb 30 ft. long, bearing the inscription 'Teutobochus Rex.' Britons were not less credulous than their continental neighbors. In 1712, Dr. Mather, in *Philosophical Transactions*, announced the discovery of enormous bones and teeth which had been found in the region now the state of N. Y., and which he regarded as affording evidence of the existence of giants of enormous size in ancient times. The bones were in reality those of a mastodon.

The Scripture evidence, when carefully examined, is not definite. The Hebrew words rendered *giants*, might as well be translated, *rough, cruel, violent, or remarkable men*; except the two words *nephilim* and *gibborim*, which occur several times in Genesis: of these *gibborim* means powerful and not necessarily of large stature: and *nephilim*, which doubt-

GIANTS AND DWARFS.

less in some cases means *giants*, are, as a race, spoken of as swept away by the flood. Nothing is said from which to infer that their size exceeded that of giants now known. The height of Og, king of Bashan, is not given: we are only told the length of his bed; and excluding his helmet, which was probably taken into account in the recorded measurement, Goliath at most, did not exceed eight feet and a half in stature, and consequently was not taller than some giants of modern days.

The classical evidence is abundant, but obviously untrustworthy. Thus Plutarch relates that Serbonius had the grave of Antæus, in the city of Tungis, opened, and 'finding there his body, full 60 cubits long, was infinitely astonished, ordered the tomb to be closed, gave his confirmation to the story, and added new honors to the memory of the giant.' Pliny reports that an earthquake in Crete disclosed the bones of a giant 46 cubits in length, believed by some to be Orion, and by others Otus. Descending to more certain evidence, there is no doubt that a height of between 8 and 9 ft., and probably of more than 9 ft., has been attained. There is a skeleton in the Museum of Trinity College, Dublin, 8 ft. 6 inches in height; that of O'Brien (or Byrne), in the Museum of the College of Surgeons of England, is 8 ft. 2 inches; and that of a giant in the Museum at Bonn, is 8 ft.; and the actual body with the soft parts attached was probably two or three inches longer than the skeleton. (O'Brien, for example, measured 8 ft. 4 inches after his death, as we find recorded in the *Annual Register* XXVI. 209.)

We commonly apply the term *Dwarf* to any organized being, but especially to individuals of the human species, whose height is much less than the average height of their race. Strictly speaking, however, the word should be restricted to those cases in which there is a general and uniform arrest of growth, except, perhaps, in the nervous system, which is often fully developed in dwarfs.

The ancients believed not only in dwarfs of extreme minuteness, but in nations of them. Aristotle, greatest naturalist perhaps that ever existed, declared that the report of trustworthy witnesses testifies to the existence of a minute race of men, with minute horses, living in the caves washed by the waters of the Nile; and Pliny gives various details regarding their habits and their geographical position. Among the extreme cases recorded on ancient authority, is that of Philetas, poet contemporary with Hippocrates, and who was obliged to ballast himself, to avoid being blown away by the wind; that of the Egyptian dwarf mentioned by Nicephorus Calistus, who, at the age of 25 years, did not exceed a partridge in size; and lastly, that of the poet Aristratus, of whom Athenæus records that his stature was so small that *no one could see him*.

As to remarkable dwarfs of modern times.—readers of *Peperil of the Peak* remember Sir Geoffrey Hudson. Till the age of 30, his height was only 18 inches; from that age, he rapidly grew to the height of 3 ft. 9 inches. He had an enormous head, and large hands, but in other respects

GIANTS AND DWARFS.

was well proportioned: he died at the age of 63. Count Joseph Borowlaski was the son of well-formed healthy parents of the ordinary size, who had six children, of whom the first, third, and fifth were dwarfs. Joseph, who wrote a history of his own life, records that his eldest brother was 3 ft. 6 inches high; then came a son who was 5 ft. 10 inches; then Joseph himself, whose height at 20 was 2 ft. 4 inches and at 30, 3 ft. 3 inches. He was succeeded by three others, the middle one a girl, who died at 22 of the small-pox, being then 2 ft. 2 inches, but of admirable proportions. Joseph Borowlaski was very well proportioned, was married to a woman of ordinary size, who brought him several well-formed children, and died at Banks Cottage, near Durham, 1837, at the age of 98—a great age for an ordinary man, and without parallel in the history of dwarfs. Nicholas Ferry, commonly known under the name of Bébé, was a celebrated dwarf. His parents and his brothers and sisters were all well-formed persons. He was a seven month's child, and at birth measured less than eight inches, and weighed less than a pound. When five years old, a physician, who examined him, reported that he then weighed 9 lbs. 7 ounces, and stood 22 inches high, but was formed like a young man of 20. He died in his 23d year, being then under three ft. high. (Humphry, *On the Human Skeleton*, p. 101.) In the Museum of the Faculté de Médecine of Paris, there is a wax-model which represents him at the age of 18; and in the Muséum d'Histoire Naturelle is his skeleton, which in the complete ossification of the bones, and in the disappearance of the cranial sutures, resembles that of an aged person. According to C. G. Carus (*Symbolik der menschlichen Gestalt, Zweite Auflage*, 1858, p. 83), 'General Tom Thumb,' the well-known dwarf, exhibited by P. T. Barnum, was 25 inches in height, and weighed 25 pounds: His real name was Charles Heywood Stratton, b. Bridgeport, Conn. 1838; d. 1883; he was married to Lavinia Warren, 1863, also a minute specimen of humanity: a companion dwarf, 'Commodore' Nutt, was exhibited with these two. Prince Colobri, a Slesvig dwarf, exhibited in Dresden 1851, was of similar height and weight to 'Tom Thumb,' his age being 21 years. Carus examined likewise in 1857, a Dutch dwarf, who took the name of Tom Thumb, was aged 18 at the time of examination, and measured about 2 ft. 4 inches. (These are probably Prussian measures, which slightly exceed those of this country.)

On comparing the *data* in our possession regarding giants and dwarfs—and for most of these *data* we must refer the reader to Geoffroy Saint-Hilaire's *Histoire des Anomalies*—it appears (1) That giants are of rarer occurrence than dwarfs: (2) That giants are usually of a lymphatic temperament, and of a very delicate complexion, often deformed, and almost always badly proportioned; that their muscles are flabby, and their voice weak; while dwarfs are often perfectly well-proportioned, and are strong for their size: (3) That giants are never long-lived—O'Byrne died at 22 years, Magrath at 20—while dwarfs seem to attain the full ordinary period of human existence—Borowlaski died at

GIANTS AND DWARFS.

98, Hudson at 63: and though we do not know the age at which Therese Souvray—a dwarf described by Virey—died, we know that at the age of 73, ‘elle était encore vive, gaie, bien portant, et dansait à la mode de son pays:’ (4) That while giants usually show lack of activity and energy, and are feeble both in body and in mind, dwarfs are in general lively, active, and irascible (Borowlaski in his memoirs gives a good illustration of the last characteristic, as exhibited by the dwarf Bébé. ‘When he perceived that the king took pleasure in my society, he conceived the most violent jealousy and hatred of me . . . and endeavored to push me on to the fire;’ and Sir Geoffrey Hudson’s irascibility is well depicted in *Peveril of the Peak*). That the intellectual powers of dwarfs is sometimes considerable, is sufficiently evidenced in the cases of Borowlaski, General Tom Thumb, and the Dutch Tom Thumb, who, according to Carus, spoke four languages.

We know little of the causes which occasion the excessive development or the arrested growth on which the production of giants and dwarfs depends. Bp. Berkeley (died 1753) is said to have attempted with considerable success to manufacture a giant. (Our authority for this statement is Geoffroy Saint-Hilaire, who quotes Watkinson’s *Philosophical Survey of Ireland*, Lond. 1777). He took a poor orphan, named Magrath, and reared him on certain hygienic principles (Virey conjectures that he fed him with mucilaginous foods and drinks, but nothing seems known on this point), which were so far successful that, at the age of 16, he was 7 ft. in height, and at the time of his death, which occurred, with all the symptoms of old age, at the age of 20, he was 7 ft. 8 inches high.

Geoffroy Saint-Hilaire devotes a special section of his book to the ‘causes of dwarfism,’ but he arrives only at the general conclusion, that in these cases there is an obstacle to the proper nutrition and development of the fetus; that this obstacle may be due either to something wrong in the maternal organism, or more commonly to some disease affecting the fetus itself; and that this disease is usually rachitis or rickets.

Mythological Giants and Dwarfs.—Giants play a part in the mythology of almost all nations of Aryan descent. The Greeks, who represented them as beings of monstrous size, with hideous countenances, and having the tails of dragons, placed their abode in volcanic districts, whither they were fabled to have been banished after their unsuccessful attempt upon heaven, when the gods, with the assistance of Hercules, imprisoned them under Ætna and other volcanoes. Their reputed origin, like the places of their abode, points to the idea of the mysterious electrical and volcanic convulsions of nature, which they obviously typify; and, in accordance with this view, they are said to have been of mingled heavenly and earthly descent, and to have sprung from the blood that fell from the slain Ouranos upon the earth, Ge, which was their mother. In the cosmogony of the northern nations, giants occupy a far more important place than the Greeks assigned to them, for here

GIANTS AND DWARFS.

the first created being was the giant Ymir, called also 'Aurgelmir,' 'or the ancient Chaos,' the progenitor of the Frost-giants (Hrimthursar), among whom dwelt the All-Father before the creation of heaven and earth. The mode of origin of Ymir was as follows: In the beginning of time a world existed in the north, called Nifheim, in which was a well, Hvergelmir, whence issued a poisonous stream which hardened into ice, the accumulation of which formed the northern part of Ginnungagap, or abyss of abysses, whose southern extremity was radiant with the heat and light which emanated from another world, known as 'Muspelheim.' The meeting of heat and ice produced drops, which, through the agency of the same creative power (the All-Father) which had sent them forth, received life and a human form. This was Ymir, who was nourished from four streams of milk, which flowed from the cow, Audhumla, or the nourishing power, which had been created by Surt, the guardian watch of Muspelheim. While Ymir slept, a man and woman grew from under his left arm, and a son was produced from his feet. In course of time other beings were generated from the salt and frost-covered stones which the cow Audhumla licked, and from these were born three brothers, Odin, Vili, and Ve, who were gods, and who, having slain Ymir, and dragged him out into the middle of Ginnungagap, formed from his blood the sea and all waters, and from his huge body heaven and earth and all solid things in nature.

With Ymir perished all the frost-giants except Bergelmir, who, with his wife, escaped on a chest or drum, and became the father of the new giant dynasty of the Jötuns. The gods formed, however, of the eyebrows of Ymir, a wall of defense against these giants, who thenceforward dwelt in Jötunheim, beyond the boundaries of the ocean, which encircled Midgard, the future abode of the sons of men. The Æsir or gods lived in their own city, Asgard, occupying themselves with works of industry till they were corrupted by the giantesses who came to them from Jötunheim, when the Golden Age ceased, and discord arose among the gods. At the instigation of the maidens from Jötunheim, the gods created dwarfs and men; the former from the maggots generated within the body of Ymir, and the latter from trees; and from this time the giants gradually lost their power, under the united opposition of gods and men.—In the popular belief, common in all countries, that through the agency of giants mountains and islands have arisen, and rocks and mountains have been hurled from their original sites, we trace the ideal personification of the forces of nature, which after long periods of repose, burst into sudden and uncontrollable violence; thus giants were represented as good-humored and complacent when at rest, but implacable, savage, and treacherous when excited; while they were at all times impressed with a consciousness that, notwithstanding their huge bulk, and the excess of heads and arms with which many of them were supplied, they were but stupid monsters, unable to cope with the ready wit and keen intelli-

GIAOUR—GIARRE.

gence of divine or even human beings, to whom they believed it was the decree of fate that they must ultimately succumb. In this respect, the giants typify the heathen element in its conflict with Christianity, and northern Sagas are rife with the histories of gigantic, wild, and cruel races, known as *Thursar* (Goth. *thaurusjan*, to thirst); or *Jötnar* (Anglo-Saxon *etan*, to eat), who ate and drank voraciously, and subdued all things to their sway, until there came from the far East a people, who knew and worshipped the god of the universe under the name of the 'All-Father,' and who, by their greater skill, overcame the savage giants of the north, and compelled them to withdraw more and more into the recesses of the forests and mountains, whence they emerged only from time to time in the form of mountain trolls and giants. See SCANDINAVIAN MYTHOLOGY.

The *dwarfs* who figure in the *Edlas* as cunning and crafty elves, skilled in magic and in the working of metals, are conjectured to have been a race of Oriental Lapps, who immigrated into Sweden and Norway later than the Finns, who were the descendants of the giants, and therefore the oldest of the races that now occupy the Scandinavian peninsula. When considered under the broadest signification of the term, dwarfs (Goth. *dvaïrgs*, which Grimm conjectures may be identical with the Greek *theourgós*, one who does supernatural works) typify the transition from inorganic to organic nature, and thus personify the subordinate powers of nature; and under this idea they are represented as assisting men by combining the primary ores into new mineral bodies, and fostering the development of fruits and seeds. Considered from this point of view, they occupy an intermediate position between giants and men; and while they fear both, they incline to serve the latter at the expense of the former, and thus appear under the form of beneficent elves (q.v.), fairies, and brownies (q.v.). During the latter part of the middle ages, when the traditionary folk-lore of w. Europe was being supplanted by the literature of the monks, mainly legends of saints, the devil and the fallen angels took the place, in the minds of the illiterate, that had hitherto been occupied by giants and dwarfs; and the various supernatural feats of strength which had in earlier ages been ascribed to these imaginary beings, were attributed to Satan and his attendant spirits, or in some cases to the saints of the church.—See Grimm's *Deutsche Mythologie*, Thorpe's *Northern Mythology*, Grundtvig's *Nordens Mythologie*, and Petersen's *Nordisk Mythologie*.

GIAOUR, n. *jowr* or *gê-owr'* [Turk. *giâour*; Pers. *gawr*, an infidel]: term of reproach or contempt applied by the Turks to all unbelievers in Mohammedanism, but especially to Christians (see GUEBERS). Its signification has been modified, so that it now in many cases is a mere distinctive epithet without intention of reproach.—G. was the title of a poem of Lord Byron, published 1813.

GIARRE, *jâr'râ*: town of Sicily, province of Catania, on the slope of Mount Etna. The surrounding district is

GIAVENO—GIBBET.

famous for its vineyards and the quality of their produce. The port is Riposto, about a mile distant. Pop. of G. (1881) 7,819.

GIAVENO, *jâ-vâ'nô*: town of Piedmont, on the left bank of the torrent Sangone, 17 m. w.s.w. of Turin. It is surrounded by walls and possesses a castle, erected 1369 by the abbot of the monastery St. Michel della Chiusa. In 1003, Urban II., Count of Savoy, endowed this abbey with the lands of G., which, however, owing to the unproductiveness of the soil, were not of great value. The town was formerly a thriving commercial place, with considerable trade in linen, leather, etc. It still has some manufactories of linen, cotton and silk stuffs, besides tanneries and iron forges. Pop. (1881) 5,692.

GIB, or **GIB-CAT**, n. *gīb* [a contraction of *Gilbert* = F. *Thibert*, in same sense, viz., name for a male cat, as *tom-cat* now is]: a he-cat; an old male or tom-cat.

GIB, n. *jīb* [the same root as **JIB**, which see]: something which projects and swings loose; a raised or projecting thing; the lower jaw of a horse as projecting and movable. *Note.*—*giblets*, loose projecting parts; *gibbet*, that which can swing up into the air; *jib*, the foremost sail, the projecting part of a crane, and *gib*, have a common origin.

GIB and **KEY**, *jīb* [*gib*, cat or male cat (see **GIB** 1)]: in *steam machinery*, the fixed wedge, and the driving wedge, for tightening the strap which holds the brasses at the end of a connecting-rod; a piece or slip in a machine, or any kind of structure, to hold parts together, or keep them in place: **V.** to secure or fasten with gibs. **GIB'ING**, imp. **GIBBED**, pp. *jībd*.

GIBBER, v. *gīb'bēr* [imitation of the sound of rapid talking without reference to meaning: Icel. *gífra*, to jabber: comp. Gael. *gob* or *gab*, the mouth]: to speak inarticulately; to gabble. **GIB'BERING**, imp. **GIB'BERED**, pp. *-bērd*. **GIB'BERISH**, n. *-bēr-īsh*, unmeaning words; unintelligible language: **ADJ.** canting; unintelligible.

GIBBER, n. *gīb'bēr* [L. *gibber*, crook-backed, hunch-backed]: in *bot.*, a pouch at the base of a floral envelope: see **GIBBOSE**.

GIBBET, n. *jīb'bēt* [F. *gibet*, a jibbet: OF. *gibbet*, a large stick: Dut. *wippen*; Sw. *jippa*, to jerk up into the air]: a gallows on which criminals are hanged, or on which they were formerly exposed in chains; the projecting beam of a crane; any cross-beam like a gallows: **V.** to hang or expose on a gallows; to expose to public scorn and execration as if a criminal on a gibbet. **GIB'BETING**, imp. **GIB'BETED**, pp. See **HANGING**.

GIBBON.

GIBBON, *gīb'bōn* (*Hylobates*): genus of apes, or tailless monkeys, native of the E. Indies. They are nearly allied to the orangs and chimpanzees, but are of more slender form, and their arms so long as almost to reach the ground when they are placed in an erect posture; there are also naked callosities on the buttocks. The canine teeth are long. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with extreme agility. They cannot, however, move with ease or rapidity on the ground. The conformation of the hinder extremities adds to their difficulty in this, while it increases their adaptation to a life among the branches of trees, the soles of the feet being much turned inward. None of the gibbons are large. The **COMMON G.**, or **LAR G.** (*H. lar*)—



White-handed Gibbon (*Hylobates albimana*).

black with a border of gray hair around the face—is found in some parts of India, and in more eastern regions. The **WHITE-HANDED G.** (*H. albimana*)—black, the face bordered with gray, and the four hands white—is a native of Sumatra. The **ACTIVE G.** (*H. agilis*), found in Sumatra, is particularly remarkable for the power of flinging itself from one tree to another, clearing at once, it is said, a distance of 40 ft. The **Wow-wow** (*H. leuciscus*) is a G. found in Malacca and the Sunda Isles. The **HOOLOCK** (*H. Hoolock*) is a native of the Garrow Hills. The **SIAMANG** (*H. syndactyla*), a Sumatran species, differs from the rest of the genus in having the first and second fingers of the hinder extremities united to the second joint. All the gibbons are of gentle disposition, and easily domesticated.

GIBBON.

GIBBON, *gib'on*, EDWARD: historian of *The Decline and Fall of the Roman Empire*: 1737, Apr. 27 (O. S.)—1794, Jan. 16; b. Putney, England; first child of Edward Gibbon and Judith Porten, both of good family; the only one of seven children that survived infancy. Memoirs of his *Life and Writings* were written by himself, and these, with his letters and other miscellaneous works, were published after his death by his friend Lord Sheffield, with whom he had long carried on a most confidential correspondence. Few autobiographies are so interesting as that of G., and none more veracious. It is a self-portraiture, both in regard to what is said and in regard to the manner in which it is said—his pride, self-complacency, integrity, and contempt for the contemptible, and much beside, being all clearly revealed as proposed by him with ‘truth, naked unblushing truth.’ He reflects: ‘My name may hereafter be placed among the thousand articles of a Biographia Britannica; and I must be conscious that no one is so well qualified as myself to describe the series of my thoughts and actions.’ So, in his 52d year, after he had finished his ‘arduous and successful work,’ he proceeded to do it. Like most thinkers, his actions were few, and apart from his thoughts and the growth of his mind quite unimportant. He spent a sickly childhood in occasional lessons and desultory reading and discussion with his mother’s sister, a lady of strong understanding and warm heart, whom he calls ‘the mother of his mind,’ and to whose kindness he ascribes not only the bringing out of his intellectual faculties, but the preservation of his life in these critical early years. One of his temporary masters was the Rev. Philip Francis, translator of Horace. His father, who seems to have been the somewhat impulsive possessor of the wreck of a fortune, had him entered at Magdalen College, Oxford, at the age of 15, when he was very imperfectly prepared for this crisis; his extensive reading and interrupted education having produced ‘a stock of erudition that might have puzzled a doctor, and a degree of ignorance of which a schoolboy would have been ashamed.’ Here he spent 14 idle months, the chief result of which was, that in his incursions into controversial theology he became a convert to the Church of Rome, and found himself shut out from Oxford. He was by his father placed under the care of Mallet the poet, and a deist, but by his philosophy the young enthusiast was ‘rather scandalized than reclaimed.’ To effect his cure from popery, he was sent to Lausanne, in Switzerland, to board in the house of M. Pavillard, a Calvinist minister, a poor but sensible and intelligent man, who judiciously suggested books and arguments to his young charge, and had the satisfaction of seeing him reconverted to Protestantism, in witness of which conversion he received the sacrament in the church of Lausanne on Christmas-day 1754, his belief in popery having lasted not quite 18 months. He lived nearly five years in this house, respecting the minister, and enduring with more or less equanimity the ‘uncleanly avarice’ of his wife; and it was here that he began, and carried out steadily and joyously to an

extent that will astonish very hard students, those private studies which, aided by his enormous memory, made him a master of erudition without a superior, and with hardly an equal. Here also he fell in love with Mademoiselle Susan Curchod, daughter of a clergyman, a young lady beautiful and learned, who afterward became the wife of M. Necker, distinguished French minister and financier. G.'s father disapproved of this alliance, and he yielded to his fate. After his return to England and his father's house, he persevered in his studies as he best could.

He finished a little work in French, begun at Lausanne, and published it under the title of *Essais sur l'Étude de la Littérature*, 1761. In the same year he became captain in the Hampshire militia, in which he continued for two and a half years. Of this part of his career he observes: 'The discipline and evolutions of a modern battalion gave me a clearer notion of the phalanx and the legion; and the captain of the Hampshire grenadiers (the reader may smile) has not been useless to the historian of the Roman Empire.' The militia being disbanded, he revisited the continent, and travelled into Italy; and among the benefits of foreign travel, he notes its influence in suggesting the work of his life in these words: 'It was at Rome, on the 15th of October 1764, as I sat musing amidst the ruins of the capitol, while the bare-footed friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind.' His plan, originally circumscribed to the decay of the city, grew by years of reading and reflection and delay to embrace the empire. During these years his father died, leaving his affairs deranged, and he entered parliament for the borough of Liskeard at the beginning of the struggle with America, 'and supported with many a sincere and silent vote the rights, though not, perhaps, the interest, of the mother country. He sat eight years, but never had courage to speak; 'the great speakers filled him with despair, the bad ones with terror.' In 1776, the first vol. of *The Decline and Fall* was published, and its success was prodigious. The reputation of the author was established before the religious world had had time to consider and attack the last chapters of the work—the 15th and 16th—in which, while admitting, or, at least, not denying, the 'convincing evidence of the doctrine itself, and the ruling providence of its great author,' he proceeds to account for the rapid growth of the early Christian church by 'secondary' or human causes. Hume, who was then slowly dying, in a highly complimentary letter, told him in regard to these chapters: 'I think you have observed a very prudent temperament; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamor will arise.' The prophetic criticism was correct; the grounds of the 'clamor' being, at the best, only strong suspicions that, in becoming a convert from Popery to Protestantism, Gibbon had, like Bayle, gone on 'to protest against all sects and systems whatsoever.' That he did not like to see the barefooted friars in the temple of Jupiter is clear enough

all through the six large and compact volumes of his history. He finished this great work 1787, June 27, at Lausanne, to which he had retired for quiet and economy after leaving parliament, and holding office under government for a short time. In his *Memoirs*, he tells the hour of his release from his protracted labors—between eleven o'clock and midnight—and records his first emotions of joy on the recovery of his freedom and the sober melancholy that succeeded it, all in a style and in a connection which, with much beside, must be studied in his own pages by those who would know Gibbon in his real greatness, self-complacency, egotism, and contemplative sadness. The lady of Lord Sheffield, his close friend, having died, G. left Lausanne for England to console him; and about six months after his arrival, he died without apprehension or suffering, in St James Street, London, of an enormous rupture and hydrocele, which, as it gave him no pain, he had allowed to grow neglected without speaking of it to either friend or physician for thirty-two years.

In person, G. became very corpulent, and the small bones of the big-headed delicate boy were in after years hardly adequate to sustain their load. Vanity was, perhaps, his only frailty. He affected the manners of the fine gentleman of last century to the end, and they adjusted themselves grotesquely to the unwieldy body and the massive mind.

It is not easy to characterize a man of so gigantic and cultivated an intellect in few or many phrases. He was a faithful friend, pleasant and hardly rivalled in conversation, not disliked by any one who came near him. His *Decline and Fall* is probably the greatest achievement of human thought and erudition in the department of history; at least Niebuhr gives it this high praise. It is virtually a history of the civilized world for 13 centuries, during which paganism was breaking down and Christianity was superseding it; and thus bridges over the chasm between the old world and the new. Its style is marked by the highest power of condensation, and is full of smiting phrases and ponderous antithesis. Byron designates him

‘The lord of irony, that master-spell.’

He himself was not unaware of this part of his genius, and he says he cultivated it by reading the *Provincial Letters* of Pascal every year; which must have become eventually a mere form, for two careful readings sufficed to fix almost any composition indelibly on his impressible and retentive memory. His accuracy in regard to fact has never been successfully impeached, and his industry has never been questioned. The best edition of *The Decline and Fall* is that of Dr. W. Smith (1854-5), containing the notes and corrections of Guizot, Wenck, and Milman. See Morrison's *Gibbon* (1878).

GIBBONS, *gib'onz*, GRINLING: 1648-1721, Aug. 3; b. London, of Dutch extraction: English sculptor and wood carver. On the recommendation of Evelyn, he was, by Charles II., appointed to a place in the board of works,

GIBBONS.

and employed in the ornamental carving of the choir of the chapel at Windsor. For the choir of St. Paul's, London, he executed the foliage and festoons, and those in lime-tree which decorate the side-aisles. In marble and bronze he produced the statue of James II., behind the banqueting hall, Whitehall; of Charles I., at Charing Cross; and of Charles II., at the Bank of England. The wooden throne at Canterbury; the monument of Viscount Camden at Exton; and the baptismal font at St. James's Church, London, are by him.

GIBBONS, *gib'onz*, JAMES, D.D.: Cardinal Archbishop of the Rom. Cath. Church: b. Baltimore, 1834, July 23. He was educated partly in Ireland and partly in St. Mary's Seminary, Baltimore; was ordained priest 1861, June 30, was appointed by Abp. Spalding private sec. and chancellor of the archdiocese, became asst. chancellor of the second plenary council of the American Rom. Cath. Church 1866, was appointed vicar apostolic of N. C. with the rank and title of bp. 1868, and was translated to the vacant see of Richmond 1872. In 1877 he was appointed coadjutor to Abp. Bailey of Baltimore, and on the death of the latter, Oct. of that year, he succeeded to the vacant and oldest see in the United States. Pope Leo XIII. summoned him to Rome to confer on church matters in the United States 1883, appointed him pres. of the third plenary council of Baltimore 1884; and raised him to the dignity of cardinal archbishop His investiture occurred on the silver jubilee of his priesthood 1886, June 30. He made another visit to Rome 1887. He wrote *The Faith of Our Fathers; Our Christian Heritage*; and *The Ambassador of Christ*. The first work had a sale of about 250,000 copies.

GIBBONS, JAMES SLOANE: an American banker: 1810, July 1—1892, Oct. 17. He became a strong abolitionist many years prior to the civil war. During the draft riots in New York (1863) his house was sacked because he had illuminated it in honor of Abraham Lincoln. He will be remembered because of his song, popular during the war, *We are coming, Father Abraham, Three Hundred Thousand More*.

GIBBONS, ORLANDO, MUS. D.: 1583—1625; b. Cambridge: English musician. At the age of 21. he became organist of the Chapel Royal. He was the best church composer, and, according to Anthony Wood, 'one of the rarest musicians of his time.' His madrigals have always been popular. Of these, three, *Dainty Sweet Bird, O that the Learned Poets*, and *The Silver Swan*, are considered far superior to most compositions of the kind. He composed the music for the marriage-ceremonial of Charles I., 1625; but while attending it officially, he caught the small-pox, and died at Whitsunday thereafter. A monument to his memory, erected by his wife over his burial place in Canterbury Cathedral, is still shown. His anthems, *Hosannah to the Son of David! Almighty and Everlasting God!* and *O Clap your Hands together!* are reckoned by Wood 'masterpieces of the most ingenious and scientific writing in fugue

GIBBONS—GIBBS.

that musical skill ever brought forth.'—His two brothers, EDWARD G., organist of Bristol, and ELLIS G., organist of Salisbury, likewise were good musicians. Edward, sworn in a gentleman of the Chapel Royal 1604, was master to the famous composer Matthew Lock. During the civil wars Edward lent Charles I. £1,000, for which he was afterward deprived of a considerable estate, and, with his three grandchildren, thrust out of his house at a very advanced age. In the *Triumphs of Oriana* are two madrigals by Ellis Gibbons.—G.'s son, Dr. CHRISTOPHER, at the Restoration, was appointed principal organist to the king and to Westminster Abbey, and by a recommendatory letter from Charles II. was created doctor in music by the Univ. of Oxford. Celebrated for his organ playing, he is said to have been the instructor on that instrument of Dr. John Blow (d. 1708), well-known composer of the pieces published under the title *Amphion Anglicus*.

GIB'BONS, WILLIAM, M.D.: 1781, Aug. 10—1845, July 25; b. Wilmington, Del.: Quaker editor and author. He graduated in medicine at the Univ. of Penn. 1805, and passed his life in his native place. While practicing his profession he became eminent as a linguist, scholar, and nurseryman, pres. of the Del. Acad. of natural sciences, of the Peace Soc., and the Del. Temperance Soc.; and member of the soc. for preventing the kidnapping of colored people. In 1821 he presented a clear exposition of Quaker doctrines in replying to an attack by a Presb. clergyman on the Soc. of Friends, and 1824–28 conducted at his own expense *The Berean*, a religious publication devoted to the defense of the Friends. He was active in the controversy that led to the separation of the Soc. of Friends into two bodies, was an advocate of evangelical views, and published *Exposition of Modern Scepticism*.

GIBBOSE, a. *gĭb-bōs'* [L. *gibbus*, humped: It. *gibbo*, a swelling on the back: F. *gibbeux*, a branching out—from mid. L. *gibbōsus*, hunched]: humped; a term applied to surfaces having large elevations. GIBBOS'ITY, n. *-bōs'ĭ-tĭ*, a round or swelling prominence; a state of disease characterized by protuberance of a part of the body; applied chiefly to humpback or other distortions depending on disease (rickets, q. v.) of the spinal column; in *bot.*, a swelling at the base of an organ. GIBBOUS, a. *gĭb'būs*, swelling; protuberant; swollen at the base, or having a swelling on the surface; convex, applied to bodies which are double-convex, particularly to the moon in her second and third quarters. GIB'BOUSLY, ad. *-lĭ*. GIB'BOUSNESS, n.

GIBBS, *gĭbz*, ALFRED: 1823, Apr. 22—1868, Dec. 26; b. Sunswick, L. I.: soldier. He graduated at the U. S. Milit. Acad. 1846, was wounded in the Mexican war, and brevetted 1st lieut. and capt. for gallantry, took part in the campaigns against the Apache and Navajo Indians, was commissary at Albuquerque, N. M., 1860–1, promoted capt. 1861, May, taken prisoner by the Confederates, San Augustine Springs, N. M., 1862, Aug. 27, and paroled, and was appointed col. of the 130th N. Y. vols. 1862, Sep. 6.

He reorganized his regt. as the 12th N. Y. dragoons 1863. commanded a reserve brigade of cav. 1864-5, and was engaged in Sheridan's chief cav. raids. In 1864, Oct., he was promoted brig.gen. of vols., 1865 commanded a brigade in the pursuit of the army of n. Va., 1865, Mar., was brevetted maj.gen. U. S. A., 1866, Feb., mustered out of the vol. service, and July 28 appointed maj. 7th U. S. cav., serving with it till his death.

GIBBS, OLIVER WOLCOTT, M.D., LL.D.: chemist: b. New York, 1822, Feb. 21. He graduated at Columbia College 1841, and the College of Physicians and Surgeons 1845, spent two years studying chemistry in Berlin, Paris, and Giessen; was prof. of physics and chemistry in the College of the City of New York 1849-63, and in the latter year was elected Rumford prof. of chemistry in Harvard Univ., and chief of the laboratory of the Lawrence Scientific School. He was a member of the executive committee of the U. S. Sanitary Commission during the civil war, a founder, vice-pres. and foreign sec. of the National Acad. of Sciences, vice-pres. of the American Assoc. for the Advancement of Science 1866-67, and commissioner of the Vienna exhibition 1873. He received the degree LL.D. from Columbia College 1873, and has been an editor of the *American Journal of Science and Arts* many years.

GIBBSITE, n. *gībz'īt* [from Col. George *Gibbs*, original owner of the mineralogical cabinet in Yale Univ.]: hexagonal or monoclinic white, grayish, greenish, reddish-white, or reddish-yellow, translucent mineral, emitting, when breathed upon, an argillaceous smell; found in the Ural Mts. and in various places in the United States.

GIBE, n. *jīb* [W. *gwep*, beak, face: Norw. *gjeipa*; Sw. *gipa*, to wry the mouth, to make faces: Icel. *jeip*, idle talk: comp. Gael. *geob*, a wry mouth]: an expression of sarcastic scorn; a scoff; a railing; a sneer: V. to cast reproaches and sneering expressions at; to rail at; to taunt; to scoff. GI'ING, imp. GIBED, pp. *-jībd.* GI'BER, n. *-bēr*, one who. GI'INGLY, ad. *-lī.*—SYN. of 'gibe, v.': to rail; flout; flear; deride; jeer; sneer.

GIBEAH, *gīb'ē-ah* [Heb. signifying a 'hill']: name of several towns and places in anc. Palestine. The only one specially notable is *Gibeah-of-Benjamin*, small city about four m. n. of Jerusalem; the residence, probably the birth-place, of King Saul. *Gibeah-of-Benjamin* has been identified with the modern village of *Tuleil el-Fúl*.

GIBEL, *gīb'el* (*Cyprinus gibelio*): fish of the same genus with the carp, but of the division of the genus destitute of barbules of the mouth, by which it is easily distinguished from the carp, while from the crucian it is at once distinguished by its forked tail. The weight is seldom much more than half a pound, though specimens have been caught of two lbs. weight. The G. is common in parts of continental Europe; it is supposed to have been introduced into England from Germany, but it is now fully naturalized in ponds near London and in many other parts of the country. It is generally known in England as the Prussian

GIBELLINA—GIBLETS.

carp. It is a good fish for the table, but affords little sport to the angler, seldom taking any bait readily. It feeds partly on aquatic plants, partly on worms and mollusks. It is very tenacious of life out of the water, and has been known to recover after 30 hours.

GIBELLINA, *jē-bēl-lē'ná*: village of Sicily, province of Trapani, 34 m. s.e. of the town of Trapani. It is amid mountains and has a castle. Pop. about 5,000.

GIBEON, *gīb'ē-on* [Heb. 'belonging to a hill'] celebrated city of anc. Palestine, about 5 m. n.w. of Jerusalem. At the conquest of Canaan by the Israelites under Joshua, it was inhabited by the Hivites. By a clever stratagem, the Gibeonites insured the alliance and protection of the invaders, and so escaped the fate of Jericho and Ai; but their deceit being afterward found out, they were reduced to a condition of servitude, being appointed 'hewers of wood and drawers of water unto all the congregation.' When the five kings of the Amorites besieged G., on the ground of its having entered into a traitorous compact with the Israelites, the common enemy of all the Canaanites, Joshua hastened to its help, and overthrew the besiegers with great slaughter. The battle was attended, we are informed, with supernatural phenomena—viz., the standing still of the sun upon Gibeon, and of the moon in the valley of Ajalon; but as the passage where this occurs (Joshua x. 13) is immediately followed by these words: 'Is not this written in the book of Jasher?' some have chosen to think that it may perhaps be only an extract from that collection of national songs; and the fact of its forming two hemistichs, while the rest of the narrative is in prose, tends to favor this theory, resolving the miracle into a hyperbole of oriental poetry. While this view may be conceded as possible or even probable, the need of it in exegesis is not generally felt among Christian scholars. The city of G. is mentioned various times in the history of David and his captains; but its sanctity, in the eyes of the Jews, arose from the fact of it—or the hill near it—having been for a time the seat of the tabernacle of the congregation, and the brazen altar of burnt-offering. It was at the horns of this altar that the ruthless Joab was slain by Benaiah, son of Jehoiada; and here Solomon, in the beginning of his reign, with magnificent ceremony sacrificed a thousand burnt-offerings.

GIB'LAH: see **BYBLOS**.

GIBLETS, n. plu. *gīb'lēts* [OF. *gibelet*, the old form of F. *gibelotte*, stewed rabbit; comp. Gael. *giblion*, the entrails of a goose or fowl fit for food; *giaban*, a fowl's gizzard. It. *gibbo*, a hump]: the parts of a goose or of poultry, as the heart, liver, gizzard, etc., cut off before it is dressed. **GIB'LET**, a. made of giblets. **GIBLET-PIE**, a pie made of giblets.

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GIBRALTAR, *jī-brawl'tér*: rocky promontory, 3 m. in length, $\frac{2}{3}$ m. in average breadth, the southern extremity of Spain. It is at the extremity of a low peninsula, which connects it on the n. with Andalusia; its most s. headland, Point Europa, is in lat. $36^{\circ} 2' 30''$ n., and long. $5^{\circ} 15' 12''$ w. Five and a half m. across the sea is the Spanish town of Algesiras, between which and G. lies the Bay of Gibraltar, called also the Bay of Algesiras. On the e. side of this bay is the town of G. inhabited by a motley agglomeration of English, Spaniards, Jews and Moors. Pop. (1881) 18,381 including the garrison of 5,896 men; (1901) 27,460.

The strip of peninsula connecting G. with the Spanish territory is called the 'neutral ground.' It is so low, that, seen from the sea a few m. off, G. has the appearance of a detached rock. The approaches both from this neutral ground and from the sea are guarded by a great number of very powerful batteries, and by fortifications so strong in themselves and in their relative bearing on each other, that the rock may fairly be regarded as impregnable so long as a sufficient garrison remains for its defense, with sufficient provision for the maintenance of the troops and any civil inhabitants permitted there during hostilities. The rock is composed of gray primary marble, deposited in strata 20 to 40 ft. thick. The surface near the sea is sandy and red in appearance; higher up, the rock is covered only with short and scanty grass or moss. From the sea its aspect is uninviting, the whole appearing denuded of trees and verdure: nevertheless, there are grassy, wooded glens in the nooks of the mountain. In the crevices of the rock grow asparagus, capers, palmitas, aloes, and cacti, while the fauna disporting on the wild, rarely trodden upper portions, comprises rabbits, partridges, pigeons, woodcocks, and fawn-colored Barbary apes. For various military reasons, shooting is discouraged, and these animals therefore have the utmost impunity. The rock at its highest point, the Sugar Loaf, attains an elevation of 1,439 ft. above the sea. It is perforated by numerous caverns, the largest of which, called the 'Halls of St. Michael,' have an entrance about 1,000 ft. above the sea. Thence there is a descent through a succession of caves—some ample chambers, others mere passages, through which it is barely possible to creep—to a depth of 500 ft. below the entrance: at this point foul air has barred further ingress; but the roaring of the sea has been distinctly heard, which leads to the inference that these gloomy hollows have communication with the waves beneath. Large stalactites are found in most of the caverns, and interesting fossils abound throughout the peninsula.

The climate of G. is, as a rule, healthful, though the period from July to Nov., when the greatest heat prevails, is attended with some risk to visitors from northern and cooler climates: there is, however, a remarkable exception in the case of infants at the period of teeth cutting, to whom the atmosphere of the place is peculiarly fatal. Of late years, the energetic measures adopted by the engineer officers to improve the drainage of the town, coupled with stringent police regulations, have greatly diminished the

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death-rate; and G. is as remarkable now for its cleanly appearance as, before 1814, it was for being one of the dirtiest towns in Europe. The place is, however, subject to a periodical visitation, once in 12 years, or thereabout, called the G. fever, an epidemic which works sad havoc among the troops.

There are no springs of fresh water on the rock, and the inhabitants are therefore compelled to depend on the rainfall. In consequence of this, every precaution is adopted to preserve as much of the water as possible; tanks are fed systematically by the drops collected from private roofs, and conduits are made to guide the drainage from the rock surface into great public reservoirs. Among the latter, the navy tank, for the supply of ships coming to the port, is conspicuous, its capacity being from 9,000 to 11,000 tons of water. Large stores of grain are maintained in case of siege; but the peninsula does not produce sufficient food to furnish sustenance for its population. Provisions in plenty can, however, be procured at a cheap rate from the opposite African shore.

The Bay of Algesiras or Gibraltar, is about 8 m. long by 5 broad, with a depth in the centre of more than 100 fathoms. The anchorage, however, is not very good, and the bay is quite exposed, especially to the s.w. winds, which sometimes drag ships from their anchors and drive them ashore.

G. has been known in history from a very early period. The Phœnician navigators called it *Alube*, which the Greeks corrupted into *Calpe*, its classical name. With Abyla (now Ceuta) opposite, it formed the Pillars of Hercules, long deemed the western boundary of the world. It is impossible to doubt that such leaders as Hannibal and his fellow-Carthaginians must have been awake to the importance of this rock in their expeditions from Africa into Spain; but we have no certain information of its natural strength being made available for defensive or aggressive purposes until A.D. 711, when the Saracens, passing into Spain under Tarik Ibn-Zeyad, a general of the Caliph Al Walid, for the conquest of the Visigothic kingdom, fortified it, as a base of operations, and a ready point of access from the Barbary coast. From this chieftain it took the name of Gebel-Tarik, or Hill of Tarik, of which Gibraltar is a corruption. One of the old towers of this early castle remains. Subsequently, G. shared in the revolutions among the Moors of Spain, being now in the hands of Almoravide princes from Africa, and again in the power of native Arab monarchs. In 1309, after a gallant defense, it succumbed to the Christians of Castile under Don Antonio de Guzman. The king of Castile immediately constructed additional works and a dock-yard at the 'Old Mole,' and also took measures to induce a Christian population to settle in the town. The Moors besieged G. 1315 ineffectually, but 1333 it fell to the army of the king of Fez, whom a siege by the Castilian monarch failed to dislodge. In 1436, the Spaniards tried once more to take the stronghold; but they were unsuccessful, until, in a subsequent siege 1462, the place was captured

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through the treachery of a renegade Moor. From this time the Moorish power was too thoroughly broken for any serious attempt to be made for the recovery of G., which remained in the hands of the Spanish, and was so strengthened by additional fortifications, that the engineers of the 17th c. accounted it impregnable. A combined Dutch and English force, however, under Sir George Rooke and the Prince of Hesse-Darmstadt, demonstrated that G., as then fortified, could be taken; for in 1704, after a vigorous bombardment, and a landing in force, the gov. deemed it wise to capitulate. How great, even then, were the capabilities of the rock for defense is seen from the fact that the garrison, only 150 strong, placed 276 of of the English *hors-de-combat* before they surrendered.

Since 1704, G. has remained continuously in the possession of the British, but not without the necessity of their resisting many desperate efforts on the part of Spain and France to dislodge them. Before the victors had been able to add to the defenses, their mettle was severely tried by a siege 1704-5. In 1720 it was threatened, and 1727 actually attacked by an overwhelming force under the Count de las Torres. During this siege, the place was near falling into the hands of the assailants. The most memorable, however, of the sieges to which G. has been exposed, commenced 1779, when Britain, being engaged in the struggle with its revolted American colonies and at the same time at war with France, Spain took the opportunity of joining the coalition, and directed her whole strength against the isolated garrison of this small but redoubtable fortress.

The communications with Spain were closed 1779, June 21, and a strict blockade established by the Spanish fleet; the strength of the besieged force being at this period 5,382 men, including 1,095 Hanoverians, under Gen. Elliott, the governor. Famine speedily set in; the enemy pushed forward his works for the future bombardment, and commenced active annoyance 1780, Jan. 12, by firing several shots into the town. Five days later, Admiral Rodney overcame the Spanish admiral, threw a good supply of provisions into the fortress, added 1,000 men to the garrison, and, removing all useless mouths, left it dependent on its own strength. During 1780 little of importance happened; scurvy disabled many of the defenders; the besiegers advanced their works, continually increased their force, and by obtaining possession of the opposite African ports, cut off the last chance of provisions being obtained for the stronghold.

In April 1781, starvation stared the British in the face, when, on the 12th, Admiral Darby convoyed 100 merchant-vessels into the bay. The Spaniards instantly opened their fire, hoping to reduce the debilitated garrison before effectual aid was received. 114 pieces of artillery, including 50 13-inch mortars, poured their deadly missiles into the place: for many days this bombardment lasted with unabated vigor; and, though less incessant, it continued until Nov. 26, when, in a desperate midnight sally, the British succeeded in destroying the more advanced of the

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enemy's lines, in setting fire to many of his batteries, and in blowing up his principal depôt of ammunition. This daring enterprise, successfully carried out against lines mounting 135 guns, was attended with surprisingly small loss, and forms one of the most brilliant incidents in a magnificent defense.

After this repulse, the Spaniards ceased severe hostilities for several days, prior to which cessation the garrison had been incessantly bombarded for nearly eight months, and had had 568 officers and men placed *hors-de-combat*. The siege continued, however, throughout the winter and spring of 1782 without remarkable incident. In July, the Duc de Crillon took command of the assailants, and preparations were made for the grand assault. Additional batteries were constructed on the land-side, and floating batteries built for this special siege to batter the fortress from the sea. The latter consisted of ten large vessels, whose sides were fortified by seven ft. of timber and other materials supposed to be obstructive of shot; they were covered by slanting shot-proof roofs, and were intended to be moored by massive chains within half-range of the rock. Covered boats, destined to disembark 40,000 troops, were at the same time prepared. The effective force with which Gen. Elliott had to withstand these efforts comprised, with the marine brigade, about 7,000 men.

The great attack commenced Sep. 8, by a bombardment simultaneously on all sides; 9 line-of-battle ships poured in their broadsides; 15 gun and mortar boats approached the town; while from the Spanish lines, 170 pieces of ordnance of large calibre opened in one magnificent discharge. This terrific fire continued till the 12th; when the combined French and Spanish fleets, numbering 47 sail of the line, the 10 battering ships mentioned above, esteemed indestructible, with many frigates and smaller vessels, anchored in the Bay of Algeiras. On the 13th every gun of besiegers and besieged was in play. The battering vessels proved, as anticipated, invulnerable to shot and shell. At noon the enemy depressed their guns and did much damage; and the defenders then resorted to the expedient of red-hot balls. These, with carcasses, and incendiary shells, were concentrated on the battering ships in unceasing volleys. Success was doubtful for some hours, but toward evening the gigantic efforts of the British force began to show results. The ship of the Spanish admiral was in flames, the second in command was soon in the same condition and though by eight o'clock the attacking squadron was completely silenced, the fire of red-hot shot was continued without intermission till morning. By 4 A.M. on the 14th, eight of the battering ships were on fire. In short, of the ten invincible batteries, every one was finally burned; the Spaniards lost at least 2,000 in killed alone; and the naval attack was completely repulsed with a loss to the heroic garrison of only 16 killed and 68 wounded. It is worthy of record, that notwithstanding the fury to which the British soldiers were wrought, Brigadier Curtis, with a devoted band, made gallant and suc-

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cessful efforts to preserve the poor fellows who were left by their affrighted comrades to perish in the burning hulks.

The great bombardment of 1782, Sep. 13, was the crowning triumph of the siege; but the firing continued in a harassing degree from the Spanish lines, until 1783, Feb. 2, when the Duc de Crillon, as much to his own as to Gen. Elliott's satisfaction, announced the conclusion of peace. The Spaniards welcomed their late enemies with the enthusiasm due to heroes. The thanks of parliament were cordially awarded to the gallant band; while brave Gen. Elliott received the decoration of the Bath, and subsequently the title of Lord Heathfield. More than usual space has here been allowed to this memorable struggle, because of its glorious place in British annals, its length (3 years, 7 months, and 12 days), the disparity of force, the brilliant defense, and the comparatively small loss of the garrison—333 killed, 536 died of disease, 1,008 wounded, and 43 deserted.

Since 1783—more than a century—the British possession has been unmolested. England guards this formidable rock with jealous care; every available point for defense bristles with artillery; the mountain is honey-combed with galleries and bomb-proofs, steep escarps bar all approach, and batteries hewn in the solid stone, frown alike on friend and foe. Immense stores of provision, water, and munitions of war are constantly maintained; and the whole is garrisoned by a thoroughly efficient force of about 5,000 infantry, with 1,000 artillery, and a smaller body of engineers. The jealousy for its safety would appear to rest rather on making its preservation to the crown of England a point of honor than a matter of national importance; for beyond being a standing menace to Spain, and a source of constant irritation, it is difficult to see its actual use to Great Britain. The harbor is not of great value, and the fortress by no means commands the strait.

In the *town of G.* the law of England prevails. All religions have perfect toleration; Rom. Catholics are most numerous, having a bishop and a cathedral; next the Jews, who have four synagogues; the Protestants, less numerous also have a bishop. There are three good public libraries; the best and oldest being that started by the famous Col. Drinkwater, historian of the great siege. The town of G. consists of three parallel streets, in which the curious intermingling of English architecture with the Spanish houses spoils the effect of the whole. English domestic building is eminently unsuited to a climate light and hot, like Gibraltar. There are, nevertheless, some handsome structures.

G. is a free port, and a resort in consequence of Spanish smugglers, who drive an amazing trade by introducing contraband goods into Spain. The British govt. is not altogether free from a charge of breach of faith, in the toleration it has given to these dishonest men; for it is bound by many engagements to use its best exertions to prevent any fraud on the Spanish revenues, in consequence of its possession of this peninsula. The colony of G. was for

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many years a most costly one; but of late, by judicious management, it has been made to defray the expenses of its civil govt.; the heavy charge for the military force being of course, payable out of imperial funds. In 1900, the revenue amounted to £61,418, and was derived from customs, port and quarantine dues, etc.; expenditure, £61,812. In 1899 an attempt by Spain to strengthen Ceuta, a military post opposite G., was abandoned on representations from England.

GIBRAL'TAR, STRAITS OF (anciently *Straits of Hercules*): passage from the Atlantic into the Mediterranean, extending from Cape Spartel to Cape Ceuta on the African coast, and from Cape Trafalgar to Europa Point on the coast of Spain. The Straits narrow toward the e., their width between Europa Point and Cape Ceuta being only 15 m., while at the w. extremity it is 24 m. The length (e. to w.) is abt. 36 m. The tide at Tarifa rises 7 to 8 ft. Through these Straits a continual current runs from the Atlantic, and is so strong that sailing vessels bound westward can pass only by the aid of a brisk wind from the Levant. It is supposed that the waters of the Mediterranean find an outlet here by an undercurrent, as well as by the currents which flow westward along the European and African shores respectively.

GIBSON, EDWARD: see **ASHBOURNE, LORD.**

GIBSON, gib'son, JOHN: 1791-1866; b. Conway, N. Wales: sculptor. His father, a landscape-gardener, removed to Liverpool about the beginning of this century, and there G. received his education. His love of art showed itself in boyhood; and at the age of 16 he entered the service of a marble-cutter, by whom he was introduced to Roscoe, whose art-treasures were placed at his service. Through the kindness of some wealthy friends he was enabled in his 26th year, to go to Rome, where he studied under Canova, and Thorwaldsen. G. then fixed his residence in Rome, and seldom revisited his native country. His first reappearance in England was after a lapse of 28 years. At first, G. showed himself, naturally, a faithful follower of Canova, whose graceful softness he made his own; but he did not stop at that point. By the study of the antique, which Thorwaldsen was the very man to stimulate, G. finally rose to ideal purity, and a thorough realization of the grace of form. This advance is clearly traceable in his works. His first important work was a *Nymph unfastening her Sandal*. This was followed by a group, *Psyche borne by the Zephyrs*, for Sir George Beaumont (several times repeated). In the church of St. Nicholas, in Liverpool, is a bas-relief of G.'s representing a traveller conducted on the dangerous path of life by his guardian angel. Among his greatest works are his *Aurora rising from the Waves to announce the Day* (belonging to Lord Townshend); *The Wounded Amazon* (property of the Marquis of Westminster); *The Hunter and his Dog, Narcissus, Helen, Sappho, Proserpine, and Venus*. A spirit of the finest poetry breathes through

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these works:—they are thoroughly classical, and are marked by a refined and noble severity. His great innovation—tinting his figures, which he defended by a reference to Grecian precedents, has not commended itself to the public taste. Among his portrait-statues, those of Huskisson, Peel, George Stephenson, and Queen Victoria are the best. In 1836 G. was elected a member of the Royal Acad., to which he left a representative collection. See *Life* by Lady Eastlake (1869).

GIBSON, THOMAS MILNER, the Right Honorable: politician and statesman: 1807–1884, Feb. 25; b. Trinidad; only son of Major Milner-Gibson. He studied at Trinity College, Cambridge, where he took a wrangler's degree 1830. He entered parliament for Ipswich, 1837, on the Conservative interest. As his political views expanded, he threw off his allegiance to Sir Robert Peel, for which he lost his seat 1839. In this year he assumed the name of Milner, by royal license. In 1841 he successfully contested Manchester against the conservative candidate, and during the succeeding five years, was a prominent advocate of free trade, and one of the orators of the league. With the repeal of the corn laws, and the accession of the whigs to office 1846, July, he was made a privy councilor, and vice-pres. of the board of trade; which post he gave up 1848, Apr. When the war with Russia broke out, he espoused the unpopular doctrines of the 'Manchester school,' or the 'Peace party.' In 1857, the whigs and conservatives of Manchester united to unseat him and his colleague, John Bright; but Milner G. was returned at the end of 1857 for Ashton-under-Lyne, which he represented till 1868, Dec. In 1858, his amendment to the second reading of the conspiracy bill, including a censure of the govt., was carried, and the govt. of Lord Palmerston was shattered. When Palmerston again took office next year, he recognized the skilful parliamentary-tactics and influence of Milner-G., by offering him a place in his cabinet, and he was pres. of the board of trade 1859–66, honorably and gratefully remembered for his strenuous advocacy of the abolition of the taxes on knowledge. He was for twelve years president of the association for the repeal of these taxes. His labors for abolition of the tax on knowledge were successful, first by the repeal of the advertisement duty 1853, second, by the repeal of the compulsory stamp on newspapers 1855. He agitated against the paper duty, which remained, and at length, 1861, Oct. 1, the paper duty ceased to exist. Milner-G. received at a public banquet in London 1862, a presentation of plate from the members and friends of the Assoc. for the Repeal of the Taxes on Knowledge. From his defeat at Ashton under-Lyne, in 1868, till his death at Algiers, he took no prominent part in public life.

GIBSON, *gib'son*, WILLIAM HAMILTON: artist: b. Sandy Hook, Conn., 1850, Oct. 5. He was educated in the Brooklyn Polytechnic Institute, and begun his art career as an illustrator of botanical subjects, drawing a great number of

illustrations for the *American Agriculturist*, *Hearth and Home*, and the *American Cyclopædia*. Subsequently he furnished drawings on natural history subjects, was engaged on the *Art Journal*, *Picturesque America*, *Harper's* and other magazines, illustrated numerous books, and became author and illustrator of several. He was a member of the American Water-color Soc., and exhibited in New York, London, and Edinburgh. He d. 1896, July 16.

GID, n. *gĭd* [a corruption of *giddy*, unsteady, alluding to their tottering gait: Norw. *gidda*, to shake, to tremble]: the disease called 'sturdy' among sheep, caused by parasites on the brain—viz., the *Cœnurus cerebrālis*.

GIDDINGS, *gĭd'ingz*, JOSHUA REED: 1795, Oct. 6—1864, May 27; b. Athens, Bradford co., Penn.: statesman. He was brought up on a farm, received a very limited education; entered the army after Hull's surrender of Detroit 1812, and took part in a skirmish with Indians near Sandusky Bay. Returning from the army, he studied hard, taught school, read law with Elisha Whittlesey, and was admitted to the bar of Ashtabula co., Ohio, 1821. In 1826 he was elected member of the Ohio legislature, declined re-election in the following year, and was defeated for state senator 1828. He then applied himself closely to his profession till 1838, when he was elected member of Congress as a whig. In that body he at once became noted for his advocacy of the right of petition and the abolition of slavery and the domestic slave trade, his opposition to the Fla. war, and his participation in the debates on the tariff. In 1841 his name came prominently before the country by his action in the *Creole* case. That vessel had sailed from Norfolk for New Orleans with a cargo of slaves, who rose at sea, seized the vessel, and on making a landing at Nassau, N. P., were set free by British law. Daniel Webster as sec. of state, demanded of the British govt. compensation for the loss of the slaves. G. introduced resolutions in the house of representative declaring that the slaves had committed no crime in taking their freedom on the high seas as they were then beyond the jurisdiction of Va. For this action he was formally censured and cut off from an opportunity to defend himself. He immediately resigned his seat, but was at once and unanimously re-elected. After this he opposed the annexation of Tex., the bill to pay for the *Amistad* negroes, the joint occupation of Or. with Great Britain (claiming that the United States had a right to the whole territory), and the provisions in Indian treaties for the return of fugitive slaves, and urged the Wilmot proviso. 1848 he left the whig and joined the free-soil party, 1849 refused to vote for a whig candidate for speaker of the house, thus giving the office to a democrat, 1850 opposed the compromise measures (q.v.), and the fugitive slave and \$10,000,000 Tex. bills. 1855, as senior member of the house, he administered the oath to N. P. Banks, the first republican speaker, and 1859 closed his congressional career. He was appointed U. S. consul-gen. to Canada by Pres. Lincoln 1861, and died at his post in Montreal.

GIDDY—GIERS.

GIDDY, a. *gĭd'dĭ* [AS. *giddian*, to be merry: Gael. *godach*, giddy: Norw. *gidda*, to shake, to tremble]· having a confused sensation of swimming or whirling in the head; rotatory; that causes giddiness; unstable; changeable; thoughtless; elated by excitement. **GID'DILY**, ad. *-lĭ*. **GID'DINESS**, n. *-nĕs*, swimming of the head (see **VERTIGO**); inconstancy; levity. **GIDDY-HEADED**, very thoughtless.

GIDEON, *gĭd'ĕ-on* [Heb. 'hewer' or 'cutter down,' i. e., 'brave soldier']; greatest of the judges of Israel: lived abt. B. C. 1249; youngest son of Joash the Abi-ezrite. He lived with his father at Ophrah, in Manasseh. The period in which his youth was cast was a gloomy one for Israel: the people had fallen into idolatry, and as a punishment 'the Lord had delivered them into the hand of Midian.' It does not appear that the Midianites exercised their supremacy by any actual form of government. Being chiefly wandering herdsmen, like the Bedouin Arabs of the present day, they were rather in the habit of regularly coming up from the desert 'to destroy the increase of the earth.' So terrible were their marauding expeditions, that it is said they 'left no sustenance for Israel, neither sheep, nor ox, nor ass.' Only in the mountain strongholds, and in dens and caves among the hills, could the people preserve their liberty and the produce of their fields. At last, however, the Israelites began 'to cry unto the Lord,' and a prophet is sent to stir up their religious and patriotic feelings. They, at least portions of them, were obviously ripe for resistance to the enemy. It is at this point that G. is introduced by the writer of the Book of Judges, 'threshing wheat by the wine-press to hide it from the Midianites' (vi. 11). Pursuant to a divine message and commission, G. with a small but resolute force of Jewish patriots, fell suddenly upon the enemy in the neighborhood of Mount Gilboa, and utterly routed them. The pursuit of the fugitives was continued far across the Jordan toward the Syrian Desert. The effect of the victory was most decisive. The Midianites, we are told, 'lifted up their head no more,' and the land of Israel enjoyed 'quietness forty years in the days of Gideon.' The people wished to make him king, but he religiously refused to tamper with the theocracy.

GIEN, *zhĕ-ăng'*: small manufacturing town of France, dept. of Loiret, on the slope of a hill on the right bank of the Loire, 38 m. e. s. e. of Orleans. It is well built, is connected with the opposite bank of the river by a stone-bridge of 12 arches, has an old church (the church of St. Étienne), which has been much hurt by repairs; and, surmounting the hill, it has an interesting old castle, in a good preservation. G. has important manufactures of faience and leather, and some trade in wine, corn, salt, saffron, and wool. Pop. (1876) 6,493.

GIER-EAGLE, n. *jĕr-ĕ'gl* [Ger. *geier-adler*, a vulture-eagle: Dan. *gier*; Ger. *geier*, a vulture]: in *Scrip.*, a bird of the eagle kind; a vulture.

GIERS *gĕrs*, **NICHOLAS CARLOVITCH DE**: Russian statesman: b. 1820, May 9. He was educated at the Imperial

Lyceum of Czarskoe Selo, entered the Asiatic dept. of the ministry of foreign affairs 1838, was attached to the Russian consulate in Moldavia 1841, engaged on diplomatic service in Central Asia, Egypt, the Balkan States, and Turkey, was ambassador at Teheran 1863-69, minister at Berne 1869-73, several times acting minister of foreign affairs during Prince Gortschakoff's absence, and was appointed his successor 1882. Apr. He celebrated his golden jubilee of public service 1888, Oct., and received additional honors from his sovereign. He was married to Princess Kantakuzene. He d. 1895, Jan. 26.

GIESELER, *gē'zéh-lér*, JOHANN KARL LUDWIG: German church historian: 1792, Mar. 3—1854, July 8; b. Petershagen, near Minden, where his father was a clergyman. After attending the orphan-house school and Univ. of Halle, and after teaching for a year, he entered the army, 1813, Oct., as volunteer in the war of liberation. On the re-establishment of peace 1815, he returned to his former situation in Halle, where he taught for two years, and then became *conrector* of the Gymnasium at Minden. In the following year, he was appointed director of a new gymnasium at Cleves, and published an essay on the origin and early history of the gospels (*Historisch-Kritischer Versuch über d. Entstehung u. d. frühern Schicksale d. Schriftlichen Evangelien* (Leipz. 1818). In 1819, he became prof. of theology in the Univ. of Bonn, then recently established; there he began his great work on church history, of which three vols. appeared during his life, and two after his death. This work has been translated into English, and its first 3 vols. have gone through several editions, being greatly valued for the method of picturing the times in happy quotations from contemporary writings. In 1831, G. was called to a chair in Göttingen; became 1837, a consistorial councilor; and later knight of the order of the Guelphs. He was interested in many benevolent schemes, especially in the Göttingen orphan-house. Besides numerous contributions to periodicals and publications on contemporary questions, he edited *Narratio de Bogomilis* of Euthymius Zygabenus (Gött. 1842), and *Petrus Siculus' Historia Manicheorum seu Paulicianorum* (Gött. 1846): he left a vol. on the history of dogmas, published 1856. A notice of his life is prefixed to vol. V. of his *Church History*.

GIESSEN, *ghēs sèn*: principal town of the province of Upper Hesse, in the grand-duchy of Hesse, or Hesse-Darmstadt; in a beautiful and fertile plain at the confluence of the Wieseck and the Lahn, 34 m. n. of Frankfurt-on-the-Maine. It has a well-endowed university (founded 1607), which has commodious buildings for lecturing, well-appointed anatomical and other museums, a good library, observatory, a famous chemical laboratory (where the illustrious Liebig experimented), botanical garden, etc. There are also various endowed schools, as the Gymnasium, Real-Schule, etc., and several institutions for the preliminary instruction of different branches of medical knowledge, which are connected with the university. G. has manufac-

GIFFORD.

ories of tobacco, liqueurs, vinegar, soap, and leather, and is an active thriving town. Pop. (1880) 16,855; (1900) 25,491.

GIFFORD, *gĭf'ĕrd*, ROBERT SWAIN: painter: b. Naushon, Mass., 1840, Dec. 23. He received a public-school education, studied painting with Van Beest of Holland, opened a studio in Boston 1864, and settled in New York 1866. He made long sketching tours in Or. and Cal. for *Picturesque America* 1869, in Algiers and the Great Desert 1874, and Brittany and Southern France 1875. In 1866 he became a founder of the American Soc. of Painters in Water-color, 1867 was elected an associate of the National Acad. of Design, and 1878 an academician. He is also a member of several American and British art societies. He has painted many notable works in oil and water-color, exhibited at the Philadelphia centennial exhibition, New York, and Paris, and shows fondness for glimpses of oriental life.

GIFFORD, SANDFORD ROBINSON: 1823, July 10—1880, Aug. 29; b. Greenfield, N. Y.: painter. He was educated at Brown Univ., studied drawing, perspective, and anatomy in New York with John Rubens Smith, and at the National Acad. of Design; attended a course of anatomical lectures, and began his art career as a portrait-painter, which he soon abandoned for landscapes. In 1851 he was elected an associate of the National Acad., and 1854 an academician, 1855-57 studied in Europe, 1861 spent six months in the army with the 7th N. Y. regt., 1868-9 visited Europe, and then spent about 10 years sketching in Colo., Cal., Utah, Or., British Columbia, and the Rocky Mountains, and painting their most striking scenery. He was a member of the Union League and Century clubs of New York, and popular alike as man and artist.

GIFFORD, *gĭf'ĕrd*, WILLIAM: 1756-1826, Dec. 31; b. Ashburton, Devonshire: English poet, translator, and critic. At the age of 15 he was apprenticed to a shoemaker, but showing a taste for learning, he was enabled, through the kindness of friends, to enter Exeter College, Oxford. G.'s first publication appeared 1794, a satirical poem, the *Baviad*, directed against the *Della Cruscans* (q.v.). It crushed them, like the fall of a rock. Flushed with success, G. next year produced the *Maviad*, which satirized offenses in the high places of the drama. In his third satire, G. assailed *Peter Pindar* (Dr. Wolcot); and the coarse and witty doctor, the breath of whose nostrils was literary warfare, rushed to the fray with *A Cut at a Cobbler*, and bespattered his opponent with literary mud. G. was made editor of Canning's *Anti-Jacobin*, gained political influence, and was appointed to offices, which jointly yielded £900 per annum. In 1802, he translated *Juvenal*. He edited the works of Massinger, Ford, Shirley, and Ben Jonson, and in his notes assailed former editors with the utmost ferocity. In 1808, he was appointed editor of the *Quarterly Review*, started by Sir Walter Scott and his friends in opposition to the *Edinburgh*. The periodical attained great influence, and he continued his editorial duties till within two years of his death in London.

G. had much satirical acerbity and venom, but as a poet he holds no rank. As annotator and editor of the old English dramatists, he did good service, though his work is disfigured by suspicion and malignity. As a critic, he was bitterly partial and one-sided, and his praise and blame depended on the political leanings of the writer. Leigh Hunt was to be pursued like a wild-beast, because he was a Liberal; and the flower-garden of *Endymion*, every rose of which was fed by the dews of paradise, was to be trampled upon with critical hoof, because Keats was known to have written a sonnet in praise of Hunt, and was understood to be his private friend. G. had been rudely nurtured; he lived in a time of great political uncharitableness; and if a portion of the bitterness he displayed may be set down to natural disposition and turn of mind, the larger part, perhaps, must be explained by the pressure of his times.

GIFT, n. *gift* [Icel. and Dut. *gift*, a gift, a present—from GIVE, which see]: a present; anything given or bestowed; an offering; power of giving; faculty: V. to endow with any power or faculty. GIFT'ING, imp. GIFT'ED, pp.: ADJ. endowed by nature with any power or faculty; talented; endowed with gifts. GIFT'EDNESS, n.—SYN. of 'gift': donation; grant; benefaction; largess; gratuity; boon; bounty; endowment; talent; offering; bribe; oblation; power.

GIFT, in Law: gratuitous transfer of property. Any person is at liberty to do what he pleases (not to the injury of the public) with his own property, and to give it away with or without consideration. When he gives away goods or chattels, mere delivery of possession, accompanied by words of gift, is sufficient to transfer the property; and then the transaction is irrevocable. But if he does not give possession of the goods at the same time, then, in order to be binding upon him, he must execute a deed or writing under seal. The reason of this is, that a mere verbal promise, without some legal consideration, is nugatory and revocable; whereas, one who executes a deed, is stopped from ever afterward denying it. Where the property given is not personal, but real, then a deed is in general absolutely necessary to transfer the property. A will is the most familiar example of a gift of property both real and personal, for the testator generally, in such a case, gives away his property gratuitously. Each gift of personalty by will is known usually as a legacy; and a gift of land is known usually as a devise.

As sometimes the power of giving away property gratuitously is abused, to defraud and defeat creditors, statutes commonly provide that a voluntary conveyance, whether of chattels or land, made by a person at the time insolvent, shall be void as against such creditors; and they are entitled accordingly to recover the property from the donee. The gift, however, even in such a case, stands good against the donor himself. So, if any person give by deed gratuitously any land, and then sell the same land, the gift will be void against the *bonâ-fide* purchaser.

GIFTS—GIGANTIC.

There is a peculiar kind of gift, or rather a gift made in peculiar circumstances, called a *Donatio Mortis Causa*, i. e., a gift by a person on death-bed of some personal property, such as chattels, money bills of exchange, etc. Such gifts are usually held good, if they comply with certain conditions. This is in substance a mode of giving personal chattels to a particular individual, without the necessity or intervention of a will; but such gifts are so often afterward disputed, that it is better to include them in a will.—In Scotland, a gift may be made of goods in the same manner as in England; but it is usually called a *Donation* (q. v.). Gift, in the Law of Scotland, often denotes a grant or appointment by the crown or a court.

GIFTS, SPIRITUAL: gracious benefactions conferred, through Christ, on the spiritual nature of men, and at times visibly affecting his physical nature also. The supreme gift is the Holy Spirit himself through whose work all the rest are conferred, and who, Christ promised, would be given to Christians, individually and as a church, to abide with them forever. By the gifts of the Spirit Christians have their spiritual faculties strengthened and enlarged so that they can know the truths that God has revealed concerning himself in Christ; and concerning the relations, duties, privileges, and destiny of mankind for this life and for the ages to come. The work of the Spirit also purifies the desires of the soul and the outward conduct proceeding from them. By these general operations, and by other special endowments when the exigences of the church and the world require them, Christians themselves become precious spiritual gifts analogous to the unspeakable gift of Christ, and working together with him: thus they are made apostles, prophets, evangelists, pastors, and teachers, for the perfecting of the saints unto the work of the ministry, and the building up of the church.—In the early history of the church while as yet its power was undeveloped, many of the spiritual gifts bestowed were miraculous. These, Protestants in general think, were withdrawn as Christianity, by its prevalence and fruits, became sufficient evidence unto itself. Yet Christ promised that his disciples should do greater works than he himself did. And, in fact, as Christianity has prevailed in the world greater power to use nature has been acquired among Christian nations and among them (in the first instance) only, so that Christians now can do more without miracle than the first disciples did by miracle.

GIG, n. *gĭg* [F. *gigue*, a jig or rapid dance; *giguer*, to run, to leap: It. *giga*, a jig, an air for dancing; Icel. *geiga*, to rove at random]: a light two-wheeled carriage; a long light boat; anything light, swift, or whirling; a machine for forming the nap of cloth: see **JIG**.

GIGANTIC, a. *jĭ-găn'tĭk* [L. *gĭgan'tem*, a giant (see **GIANT**)]: very large; huge; of extraordinary size; enormous. **GIGANTICALLY**, ad. *-tĭ-kăl-lĭ*. **GI'GANTOL'OGY**, n. *-tŏl'ŏ-jĭ* [Gr. *logos*, a discourse]: an account or description of giants. **GIGANTEAN**, a. *jĭ'găn-tĕ'ăn*, belonging to a giant; gigantic.

GIGG—GILA.

GIGG, *jīg*, or **GIGA**, *jēg'a*, or **GIGUE**, *zhēg* [see **GIG**]: short piece of music, in vogue in olden times; of a joyful and lively character, and in $\frac{6}{8}$ or $\frac{1}{8}^2$ time, sometimes in $\frac{3}{8}$; used formerly as a dance-tune, and often introduced as a movement of a larger composition. It consists of two parts of eight bars each, and the shortest notes are quavers.

GIGGLE, n. *gīg'gl* [an imitative word: Dut. *gickelen*: Swiss, *gigelen*, to giggle: comp. Icel. *gagl*, a goose; Gael. *gigail*, tickling—from *gig*, to tickle]: a short tittering laugh: V. to laugh in a silly manner; to titter. **GIG'GLING**, imp. *-glīng*: ADJ. laughing in a suppressed way; tittering: N. half-suppressed or simpering laughter; the act of tittering. **GIG'GLER**, n. *-glēr*, one who.

GIGLOT, n. *gīg'lōt* [Icel. *gikkr*, a pert person: Dan. *giek*, a wag]: in *Scot.*, and *OE.*, a girl of light manners; a wanton woman.

GIGNOUX, *zhēn-yō'*, FRANÇOIS RÉGIS: 1816–1882, Aug. 6; b. Lyons, France: painter. He was educated at Fribourg, studied painting in the Acad. of St. Pierre at Lyons, the School of Fine Arts in Paris, and with Paul Delaroche; came to the United States 1840, and engaged in landscape-painting in New York and Brooklyn. He was elected a member of the National Acad. of Design 1851, became the first pres. of the Brooklyn Art Acad., returned to France 1870, and lived there till death. His *Mount Washington* was exhibited at the Paris Salon 1867, and *Spring* at the Philadelphia exhibition 1876.

GIGOT, n. *jīg'ōt* [F. *gigot*, a leg of mutton—from *gigue*, the thigh]: a joint; a leg of mutton.

GIJON, *chē-chōn'*: fortified town and seaport of Spain, province of Oviedo (former Asturias), 20 m. n.n.e. of the town of Oviedo; on a low peninsula projecting n. into the Bay of Biscay. It is the best and most regularly built town in the province; partly surrounded by old walls, and defended by an old castle and by coast batteries. It has a good port, at which steamers call regularly. There are manufactures of stone-wares, hats, and linen fabrics; nuts and other fruits are exported. Bermudez, historian of Spanish art, was born here. In 718, the Moors having been defeated at the battle of Canicas, were compelled to abandon G. Pop. (1877) 30,591.

GIL, *chēl*, **SAN** (sometimes called *St. Giles*): small town of United States of Colombia, dept. of Boyaca; lat. 6° 25' n., and in long. 73° 40' w., 64 m. s.w. of Pamplona. It was founded 1690, has a college, and manufactures of tobacco and cotton fabrics, and good trade in agricultural produce. Pop. 6,000.

GILA, *chē'lá*, **RIO**: river of N. America, rising in the territory of New Mexico, lat. 32° 45' n., long. 108° 30' w.; flowing nearly 450 m. w. till it joins the Colorado, about 70 m. above the fall of that river into the Gulf of California. For a part of its course it is wholly inaccessible, being imprisoned within wall of perpendicular rock nearly 1,000 ft.

GILBERT.

high. It is navigable for flat-boats abt. 180 m. Numerous ruins of stone houses, with fragments of pottery, indicate that the region of the G. was formerly populous.

GILBERT, *gĭl'bĕrt*, Sir HUMPHREY: 1539–1583, Sep. 9; b. Dartmouth, Devonshire: English navigator. He studied at Eton and Oxford; abandoned law for arms, and by good service against the Irish rebels earned knighthood and the government of Munster (1570), after which he saw five years' campaigning in the Netherlands. In 1576 appeared his *Discourse on a N. W. Passage to India*, and two years later he obtained a royal patent 'to discover and occupy remote heathen lands not actually possessed of any Christian prince or people.' With his younger half-brother, Sir Walter Raleigh, he sailed in quest of the 'Unknown Goal;' but this expedition (1578–9) which had cost all his own and his wife's estates, was frustrated by internal dissensions, tempests, and a fight with the Spaniards. Nothing daunted, he once more set sail from Plymouth, 1583, June, and in Aug. landed in Newfoundland, of which he took formal possession for Queen Elizabeth. Sailing southward, he lost, off Cape Breton, the largest of the three vessels left out of five, so was forced to steer homeward with the *Golden Hind* and the *Squirrel*, the latter a 'frigate' of only 10 tons burden. 'On Monday the 9th September,' writes the *Golden Hind's* captain, 'the *Squirrel* was near cast away, yet at that time recovered; and giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the *Hind*, "We are as near to heaven by sea as by land." The same Monday night the frigate's lights went suddenly out, and it was devoured and swallowed up by the sea.'

GILBERT, Sir JOHN: b. 1817, Blackheath, near London: English painter. After his school-days he was placed at a mercantile house in the city, but after two weary years was pronounced wholly unfit for business, and allowed to follow his true vocation—art. Except for some lessons from Lance. fruit-painter, he taught himself; his masters, the Old Masters—Rubens, Rembrandt, Velasquez. In 1836 he began to exhibit in oil and in water-colors, and 1852 was elected an associate, 1853 a member, 1871 the president of the Soc. of Painters in Water Colors, receiving soon afterward the honor of knighthood. He became an A.R.A. 1872, R.A. 1876, and a chevalier of the Legion of Honor. G. has well been called the 'Scott of Painting.' His favorite subjects are historical, chivalric, antiquarian; and his bold, though somewhat monotonous, style is familiar less by the numerous works that he has exhibited than through his countless wood-engravings in the *Illustrated London News*, and editions of Shakespeare, Scott's poems, *Don Quixote*, etc.

GILBERT, JOHN GIBBS: 1810, Feb. 27—1889, June, 17; b. Boston: actor. Receiving a public school education, he made his first professional appearance on the stage at the Tremont Theatre, Boston, 1828, Nov. 28, as Jaffier in *Venice Preserved*. He filled engagements in New Orleans, Boston, and

GILBERT—GILBERT DE LA PORRÉE.

New York; went to London 1847 and Paris 1848, reappeared in New York, Philadelphia 1851, Boston 1857, and 1862 joined the stock company of Wallack's Theatre, New York, with which he remained till its disbanding, 1888.

GILBERT (OR GILBERD), WILLIAM: the most distinguished man of science in England during the reign of Elizabeth: a physician: 1540–1603, Nov. 30; b. Colchester, of which town his father was recorder. A member, and subsequently fellow of St. John's College, Cambridge, he took his B.A. 1560, M.A. 1564, and M.D. 1569. In 1573 he settled in London, and practiced with such reputation that he was appointed physician to Queen Elizabeth. His spare time was given to philosophical experiments, particularly in relation to the magnet; and in these he was assisted by a pension from the queen. He was elected president of the College of Physicians 1600. On Elizabeth's death, he was continued as court physician by James I., but survived his royal mistress only a few months. His death seems to have taken place in London; but he was buried at Colchester, in the church of the Holy Trinity. He was never married. His works are *De Magnete Magneticisque Corporibus, et de Magno Magnete, Tellure, Physiologia Nova* (1600), and *De Mundo nostro Sublunari Philosophia Nova* (1651). The first has served as the basis of most subsequent investigations on terrestrial magnetism; and (to use Whewell's words, *History of the Inductive Sciences*) it 'contains all the fundamental facts of the science, so fully examined, indeed, that even at this day we have little to add to them.' He establishes the magnetic nature of the earth, which he regards as one great magnet; and he conjectured that terrestrial magnetism and electricity were two allied emanations of a single force—a view which was demonstrated with scientific strictness more than two centuries afterward by Oersted and Faraday. G. was the first to use the terms 'electric force' and 'electric attraction,' and to point out that amber is not the only substance which when rubbed attracts light objects, but that the same faculty belongs to the resins, sealing-wax, sulphur, glass, etc.; and he describes how to measure the excited electricity by means of an iron needle moving freely on a point. Galileo pronounced him 'great to a degree that might be envied;' and the publication of his treatise *De Magnete* will always be regarded as epoch-making in the history of magnetism and the allied sciences.

GILBERT, WILLIAM SCHWENCK: dramatist: b. London, England, 1836, Nov. 18. He was educated in the Univ. of London and called to the bar 1864, but afterward applied himself to literature and dramatic writing. His plays include *Dulcamara* (1866); *The Palace of Truth* (1870); *Pygmalion and Galatea* (1871); *The Wicked World* (1873); *Broken Hearts* (1876); farces, *Engaged* (1877); *Ne'er-do-Weel* (1878); and comic operas in conjunction with Sir Arthur Sullivan, *H. M. S. Pinafore*, *The Pirates of Penzance*, *Patience*, and *Iolanthe*.

GILBERT DE LA PORRÉE, *zhēl-bār' déh lá po-rā'*, (GILBERTUS PORRETANUS OR PICTAVIENSIS): bishop of

GILBERTINES—GILD.

Poitiers, logician, and theologian: b. Poitiers, France; d. 1154. He was educated at Chartres and served some time as teacher in the church there. Soon after 1135 he removed to Paris, and while delivering public lectures on dialectics and theology was recalled to Poitiers and elected bp. 1141. His works were condemned for their heterodox view of the Trinity, and 1148 his writings were condemned by the Synod of Rheims till he should correct them in accordance with four propositions made by the synod and sanctioned by the pope. To this judgment he assented, and experienced no further ecclesiastical opposition during his life. His chief logical work, *De Sex Principiis*, is a discussion of the Aristotelian categories, particularly of the six subordinate modes. In his commentary on the treatise *De Trinitate* he argued from the basis that pure or abstract being is prior in nature to that which is, and his distinction between Deitas or Divinitas and Deus led to the condemnation of his doctrine.

GILBERTINES, *gĭl'ber-tĭnz*: a religious order in the Roman Catholic Church, specially noteworthy as being of English origin. It was founded in the twelfth c. by St. Gilbert, a native of Sempringham, in Lincolnshire. The rule of the order was mainly derived from that of the Canons Regular of St. Augustine. St. Gilbert also founded an order of nuns after the Benedictine institute. Both orders were approved and had numerous convents in England at the time of the Reformation, when they shared in the general suppression.

GILBERT ISLANDS: group on the s.w. coast of the archipelago of Tierra del Fuego, offering a good harbor in Doris Cove.

GILBERT ISLANDS: cluster comprising 15 coral islands, part of the Mulgrave archipelago in the Pacific, lat. 1° s.—2° 30' n., and long. 172°—174° 30' e. The two largest are known as Drummond's Isle and Knox's Isle; the former 30 m. long by a little more than ½ mile broad, the latter 20 m. long. The inhabitants resemble the Malays in appearance, and are divided into three classes—chiefs, landholders, and slaves. See POLYNESIA. The chief, almost the only, cultivated products are the cocoa-nut and the pandanus. Pop. of group, abt. 35,200.

GIL BLAS, *zhĕl blá*, Sp. *chĕl blás*: hero of Le Sage's famous novel: see LE SAGE, ALAIN RENÉ.

GILBOA, *gĭl bō'a* [Heb. 'bubbling fountain']: range of hills, between 500 and 600 ft. high, overhanging the city of Jezreel, in the e. side of the plains of Esdraelon; memorable as the scene of the defeat and death of King Saul and his three sons.

GILD, v. *gĭld* [AS. *gilden*, golden, gilt: Icel. *gylla*, to gild (see GOLD)]: to overspread with a thin covering of gold; to overlay with gold leaf-metal or powder; to render bright; to adorn; to give a fair appearance to falsehood and the like. **GILDING**, imp.: N. the art or trade of overlaying with gold-leaf, etc. (see below); that which is laid on;

figuratively, superficial coating, as opposed to the solid metal. GILD'ED, or GILT, pp. or pt. *gilt*. GILDER, n. *gild'ér*, one whose trade is to gild.

GILD: see GUILD.

GILDAS, or GILDUS, *gĩl'dūs* (by some surnamed the Wise, by others Badonicus), abt. 516–570: earliest British historian. He visited France 550, and Ireland 565. His *De Excidio Britannie Liber Querulus* was printed first at London 1525, and has often been reprinted in England and on the continent. The best editions are Stevenson's, pub. by the English Historical Soc. (Lond. 1838), and Petrie's in *Monumenta Historica Britannica* (Lond. 1848). G. is a weak and wordy writer. Gibbon has justly described him in a single sentence: 'A monk, who, in the profound ignorance of human life, has presumed to exercise the office of historian, strangely disfigures the state of Britain at the time of its separation from the Roman empire.' His obscure and meagre narrative may be divided into two periods—the first, from the invasion of Britain by the Romans to the revolt of Maximus, at the close of the 4th c.; the second, from the revolt of Maximus to the author's own time. The second portion is even less satisfactory than the first.

GILDER, *gĩl'dér*, RICHARD WATSON, LL.D.: poet and editor: b. Bordentown, N. J., 1844, Feb. 8. He was educated in a private school, served through the emergency campaign during the Confederate invasion of Penn. 1863, became a reporter in Newark, N. J., 1865, and assisted in starting a morning newspaper there 1868, was appointed editor of *Hours at Home*, New York, 1869, assistant editor of *Scribner's Monthly* (now the *Century*), and editor-in-chief on the death of Dr. J. G. Holland 1881. He is a founder of the Authors' and Fellowcraft clubs, received the degree LL.D. from Dickinson College 1883, and has published *The New Day* (1875); *The Poet and His Master* (1878); *Lyrics* (1885); and *The Celestial Passion* (1887).

GILDERSLEEVE, BASIL LANNEAU: an American classical scholar; b. in Charleston, S. C., 1831, Oct. 23; was graduated at Princeton University in 1849, and then studied in Germany at the universities of Berlin, Bonn, and Gottingen. He was prof. of Greek and Latin at the University of Virginia in 1856-76. In the latter year he was made prof. of Greek at Johns Hopkins University. He is the editor of the *American Journal of Philology*, of which he was the founder. He wrote *Satires of Persius Flaccus*; *Justin Martyr*; *Odes of Pindar*. He also published a Latin grammar and a volume of *Essays and Studies*.

GILDING.

GILDING: coating with gold. There are many processes, varying with the substance to be gilded, and the effect to be produced; but all may be classified under three heads—1st, mechanical gilding; 2d, chemical gilding; 3d, encaustic gilding.

The first is used chiefly for gilding wood, plaster of Paris, leather, paper, and other substances. If the object to be gilt is a picture or mirror-frame, consisting of a plain wooden molding, then, after a coat of oil-paint, 4 to 10 coats of fine whiting mixed with fine glue are put on, each in turn smoothed with pumice-stone and fine sand-paper. This done, a coat of gold-size is given to those parts which are not to be burnished; but those to be burnished receive only a coating of clear animal size. Both of these prepared surfaces now receive the gold-leaf, laid on by means of a broad thin brush called a *tip*, and further pressed on with a thick soft-haired brush. Those parts which have been gold-sized are in this way oil-gilt, and will stand washing; while such portions as have been gilt on the size preparation in order to be burnished, will not bear soap and water. If the picture-frame is much enriched with raised ornament, then the various coatings of whiting are not smoothed with pumice or sand-paper. In many cases, especially with outside work, the surface to be gilt is previously prepared with oil-paint and gold-size alone. The *gold-size* used for oil-gilding is of different kinds: sometimes it consists of boiled linseed-oil and ground ochre alone; another kind has copal varnish and turpentine in addition. Japanners' gold-size is a mixture of $\frac{1}{2}$ lb. of linseed-oil, 2 oz. of gum-animi in powder, and some vermilion.

Japanner's gilding.—Where gilt ornaments are to be put on a japanned ground, they are, by one method, painted with gold-size, and gold-leaf is afterward applied. By another way, a little more than the space that the ornament is to occupy is wholly covered with gold-leaf, adhering with isinglass. The ornament is then painted on with asphaltum, which protects the gold beneath it while the superfluous leaf is being washed away. A little turpentine will then remove the protecting asphaltum so as to display the gilt ornament.

False gilding, though an old invention, has become in recent years an important trade in Germany. It is applied usually to moldings for pictures, mirrors, and room decoration. The molding intended to be 'gilt' in this way is first covered with silver-leaf or tin-foil on a surface prepared as above, and then coated with a yellow varnish. A cheap and very durable imitation of genuine gilding is thus obtained, with which most of the less costly picture-frame moldings are now covered.

Chemical gilding.—Metals are now gilded usually by the process of electro-gilding (see GALVANISM): but besides this, various methods of chemical gilding are still in use.

Water or wash gilding, as it is somewhat inappropriately termed, consists in applying to metal a paste formed of an amalgam of gold, and afterward evaporating the volatile mercury by heat, which leaves the gold firmly adhering.

to the surface of the metal. In preparing the amalgam, about 8 parts of mercury to 1 of gold are used, but when this is squeezed through chamois leather, some mercury is removed, so that the amalgam actually applied contains about 33 per cent. of gold. The metal to be gilt is cleaned with acid, brushed, and rubbed with bran or sawdust to make its surface perfectly clean. By means of a wire brush a solution of nitrate of mercury is then applied to it with a portion of the gold amalgam. The mercury is driven off by heating at a charcoal fire, and then the gilt surface is then ready for *burnishing*, which is done by rubbing with a hæmatite burnisher. The *deadening* is produced by coating the surface with a mixture of sea salt, nitre, and alum, and applying heat. Although modern appliances have diminished the evil, water-gilding is still injurious to those who work at it from the effect of the mercury fumes. This old method is really better and more durable than electro-gilding though the contrary is often believed. It is asserted that the introduction of the latter method has caused the decline of the once prosperous gilt-button trade; at all events, the more costly kinds of decorative work in metal are now gilt as of old by the mercury process. 30,000 buttons, one inch in diameter, may be gilded with one ounce of gold; 14 or 15 thousand is the number over which this quantity is commonly spread.

Gilding by immersion.—For this purpose a solution is used which slowly attacks the metal to be gilded, and at the same time deposits on its surface an equivalent of gold. Elkington's patent solution is made by dissolving $\frac{1}{4}$ ounce troy of fine gold in $2\frac{1}{2}$ ounces of nitro-muriatic acid, heating this until red and yellow vapors cease to be evolved, then diluting with $1\frac{1}{2}$ pint of distilled water, adding to this 1 pound of bicarbonate of potash, and boiling for two hours: the article to be gilded is dipped into this at nearly the boiling heat, and agitated in it for about a minute. Talbot's patent solution is made by adding a solution of gold to a solution of gallic acid in water, alcohol, or ether: the articles are dipped as above.

Grecian-gilding is a process intermediate between G. by immersion and water-gilding. Sal ammoniac and corrosive sublimate are dissolved in nitric acid, and gold is dissolved in this solution, which thus becomes a mixture of chloride of gold and nitrate of mercury with some ammonia. This solution, applied to a surface of silver, immediately blackens it, but on the application of heat, it is richly gilded.

Most articles gilded by either of the above chemical methods, or by electro-gilding, are submitted to an after-process of *coloring*. This consists either in acting on the surface with a saline solution, and heating the article afterward or in coating it with a kind of varnish of bee's-wax and yellow-ochre, and then burning it off. Various saline solutions are used, many of which are carefully guarded trade secrets. 1 oz. alum, 1 oz. of common salt, and 2 oz. nitre dissolved in half a pint of water, is recommended: also 24 parts of nitre, 10 alum, 5 sulphate of iron.

GILDING METAL—GILEAD.

5 sulphate of zinc boiled together in sufficient water to form a paste when cooled, with continual agitation. The articles are immersed in this, and then heated till the desired color is obtained.

Cold-gilding.—For this a gilding powder is first prepared by dissolving 5 drams of pure gold and 1 dram of copper in 10 oz. of nitro-muriatic acid, then moistening clean linen rags with the solution, and burning them to ashes. These ashes contain finely divided gold, which may be applied to surfaces of copper, brass, or silver, by simply rubbing it over them with a piece of cork moistened with a solution of common salt in water.

Sword-blades, lancets, and other steel articles are gilded in fancy devices by drawing the design with a camel's-hair pencil moistened in a solution of gold, prepared by agitating ether with a solution of terchloride of gold, and decanting the light liquid which floats on the top. Steel or iron can be gilded in a more durable manner by heating it and then applying gold-leaf,

Silks, artificial flowers, ivory, bone, etc., may easily be gilded by immersing them in, or painting them with, a neutral solution of 1 part of terchloride of gold to 4 or 5 of water, and then exposing them in a vessel containing hydrogen gas, which readily combines with the chlorine, and reduces the gold to the metallic state.

Encaustic-gilding is applied usually to glass and porcelain. The gold is first obtained in a finely divided state by precipitating from the chloride with protosulphate of iron, or by simply heating the chloride. This powder is ground up with $\frac{1}{2}$ of its weight of oxide of bismuth and some borax and gun-water, and then painted on the ware. It is then heated till the borax is vitrified and the gold thereby fixed. Sometimes the gold is ground with turpentine, or an amalgam of gold is used. It has a brown dingy appearance when it leaves the kiln; the gold lustre is brought up by burnishing.

GILDING METAL: metal of which goods are made to be coated in imitation of gold. It is required to have as nearly as possible the color of gold, so that when the surface gilding is worn off at the more exposed parts, the difference of color will not be readily apparent. This is obtained by making a kind of brass having a much larger proportion of copper than common brass. The following are three receipts from among a variety in use: 1st, 6 parts copper, 1 common brass; 2d, 4 parts copper, 1 Bristol-brass; 3d, 13 parts copper, 3 parts brass, 12 parts tin: this is much harder than the first two. See also **GILT JEWELRY**.

GILEAD [Heb. hard or rugged]: hilly, rocky district on the e. side of the Jordan, bounded n. by the river Hieromax (modern *Sheriat-al-Mandhûr*), which separated it from the rich levels of Bashan; e. by the desert tablelands of Arabia; s. by Moab and Ammon; w. by the Jordan. In spite of its name, the vegetation is luxuriant, especially in the middle, and round the brook Jabbok, where forests of oak and terebinth occur. The hills are

GILES—GILGAL.

not very high; they have broad summits almost like tablelands, 'tossed,' says Dean Stanley (*Sinai and Palestine*), 'into wild confusion of undulating downs.' G. anciently produced gums and spices. It was given by Joshua to the tribes of Gad and Reuben, because of the multitude of their cattle, and as a frontier land was much exposed to invasion. See Oliphant's *Land of Gilead* (1880).

GILES, *jilz*, SAINT (ÆGIDIUS, EGIDIO, GIL, or GILLES): pious and charitable Athenian of royal descent, who distributed his patrimony among the poor, spent two years with St. Cæsarius at Arles, and lived in the solitude of a desert till discovered by the king on a hunting expedition. A monastery was built on the site of the cave that he had inhabited, and he was its abbot till his death. He was credited with being the involuntary medium of many miracles, the best known being the cure of a sick man to whom he had given his tunic. Some authorities distinguish the saint from the first abbot of the same name, and assign the date of the former to the close of the 7th c. In the 11th and following c. the saint came to be regarded as the special patron of lepers, beggars, and cripples, and in England alone there are 146 churches dedicated to him. His day is Sep. 1.

GILET, n. *jil'ā* [F. *gilet*. a flannel waistcoat]: a style in which a bodice is made; a waistcoat; a coat-bodice.

GILFILLAN, *gil-fil'an*, GEORGE, 1813-1878, Aug. 13; b. Comrie, Scotland: critic and essayist. He studied at the Univ. of Glasgow, and at the divinity hall of the secession body, afterward the United Presbyterian Church, and 1835 he was licensed to preach. In 1836, March, he was ordained over the School Wynd Church, Dundee. His works are numerous. They display a rich but reckless fancy, and wide literary sympathies, though deficient in refinement of taste. Among them are, *A Gallery of Literary Portraits* (1845); a second *Gallery* (1849); *The Bards of the Bible* (1850); *The Martyrs, Heroes, and Bards of the Scottish Covenant* (1852); a third *Gallery of Literary Portraits* (1854); *History of a Man* (1856); *Alpha and Omega* (1860); *Night*: a poem (1867); *Life of Sir W. Scott* (1870); and *Life of Dr. W. Anderson* (1873). In 1853 he commenced an edition of the *British Poets* in 48 vols. His contributions to periodicals have been numerous.

GILGAL, *gil'gāl*: three ancient towns mentioned in the Bible.

The first and most important was w. of the Jordan, near Jericho, in Benjamin, where Jacob spent the first night after crossing the Jordan. Josephus located it 50 stadia from Jordan and 10 from Jericho; Jerome placed it 2 Roman m. from Jericho and spoke of it as a deserted place venerated by the people near; and Schokke, a German traveller, who recently discovered its site, and the English survey party, fixed it 2 m. e. of the site of Byzantine Jericho, and 1 m. from the modern Eriha. It is now called Jiljūlieh, and exhibits remains of a tamarisk, church, and large reservoir. (See Deut. xi. 30; Josh. iv. 19, etc.).

GILGIT—GILL.

The second G. was on the maritime plain between Dor and Tirsā. Jerome mentioned a town of the name, 6 Roman m. n. of Antipatris, supposed to be the modern Kalkilia; but other authorities incline to the belief that a large village 3 m. n. of Antipatris is the site of the biblical town. (See Josh. ix. 6, etc.).

The third G. was in the mountain district near Bethel, 12 m. s. of Ebol and Gerizim, 7 English m. n. of Beitin. It also was mentioned by Jerome, and its site is now supposed to be occupied by Jiljilia. (See II. K. ii. 1, etc.).

GILGIT, *gĭl-gĭt*: name applied to a river tributary to the Upper Indus, also to the whole of its basin, and to a secluded valley state. The remote source of G. river is Shundar Lake, above Mastúj. After a course of 60 m. it is joined by the Yassin river, flowing from the n. and comprising two streams that unite 6 or 8 m. above Yassin village. About 21 m. below the confluence of the Ghizar and Yassin rivers, another important stream, the Karambar, joins G. river, also flowing from the n.; and 40 m. below the Ghizar-Yassin confluence the G. river receives its last important confluent, the Nagar. The length of G. basin, as far as explored, on a line nearly w. to e. is 120 m., and its greatest width from n. to s. about 75 m. The n. limit of the basin is formed by the Muztagh mountains with peaks 23,330–25,050 ft. high; the s. limit by a watershed with peaks 18,490–19,440 ft. high; the e. limit by an offshoot of the Muztagh with peaks and glaciers 19,000–25,550 ft. high; and the w. limit the lofty watershed which divides the basin from the Mastúj valley. The states occupying the basin are Yassin, the upper or w. part, with chief town of the same name at height of 7,770 ft.; Punial or Punya, a tract of 25 m. in the narrow valley of the river, with 9 villages 5,500–7,000 ft. high; Nagar, on left bank of the river; and G., comprising all the lower part of the main valley to the Indus, a stretch of 35 m. The village of G. is 4,800 ft. above the sea, on a flat plain of the river alluvium, forming a terrace 30 or 40 ft. above the water. The houses are flat-roofed and built in clusters of twos and threes among groups of fruit trees. The fort of G. is the chief stronghold of the Maharaja of Kashmir in Dardestan.

GILL, n. *jĭl* [OF. *gelle*, a sort of wine measure: OE. *gylle*, a little pot: mid. L. *gillo*, a wine measure]: a liquid measure containing the fourth part of a pint or the 32d part of a gallon; a liquid measure varying in quantity locally.

GILL, n. *jĭl* [a shortened name for *Gillian*—from L. *Julĭana*—from L. *Julĭus*, Julius]: in *OE.*, formerly a generic name for a woman; ground-ivy—called *gill-creep-by-the-wall*. GILL-ALE, the herb ale-hoof. GILL-FLIRT, a wanton girl.

GILL, n. *gĭl* or *jĭl* [Icel. *gĭl*, a deep narrow glen with a stream; *geil*, a ravine]: in *prov. Eng.*, a woody glen with a rivulet flowing through it; a deep ravine.

GILL, *gĭl*, JOHN, D.D.: 1697. Nov. 23—1771, Oct. 14; b,

GILL—GILLESPIE.

Kettering, Northamptonshire, Eng.: Bapt. minister of some eminence as a theologian. He studied mainly in private, and by his unaided efforts attained proficiency in Latin, Greek, and Hebrew. He afterward applied himself to the study of the rabbinical writers, and is notable as one of the first English divines who brought rabbinical learning to bear on the interpretation of the scriptures. He became, 1719, pastor of a Bapt. church in Southwark; from which, 1757, he removed to a chapel near London Bridge, and there ministered till his death. His first important work was an *Exposition of the Song of Solomon* (fol. 1728), in which he vindicated the authenticity of that book against Whiston. His *Exposition of the New Testament* appeared 1746-48; and his *Exposition of the Old Testament* subsequently (republished as one work, 9 vols., 1810); *A Body of Doctrinal Divinity* (1769); and *A Body of Practical Divinity* (1770).

GILL, THEODORE NICHOLAS: an American educator; b. 1837, Mar. 21; was educated by special tutors; early turned his attention to natural history; became prof. of zoology at Columbian University 1884. Among his works are *Arrangement of the Families of Mollusks*; *Arrangement of the Families of Mammals*; *Catalogue of the Fishes of the East Coast of North America*; and *Scientific and Popular Views of Nature Contrasted*.

GILLEM, *gìl'lem*: ALVAN G.: 1830-1875, Dec. 2; b. Tenn.: soldier. He graduated at the U. S. Milit. Acad., 1851; entered the army as brev. 2d lieut. of artill.; was promoted 2d lieut. 1851, 1st. lieut. 1855, capt. and assist. quarter-master 1861, and col. 24th U. S. inf. 1866; appointed col. 10th Tenn. vols. 1862, provost-marshal of Nashville 1862, Aug.-Dec.; promoted brig.gen. vols. 1863; brevetted col. U. S. A. 1864, and maj.gen. vols. 1865, was vice-pres. of the Tenn. constitutional convention 1865, Jan., and as col. of the 1st U. S. cav. pursued the Modoc Indians and was conspicuous in the battle of the Lava Beds 1873, Apr. 15.

GILLENIA, *gìl-lé'nǎ-a*: genus of plants of nat. ord. *Rosaceæ*, sub-order *Spirææ*; perennials, natives of the temperate parts of N. America. The roots are used in medicine as a mild emetic, and in small doses as a tonic; and are often called INDIAN PHYSIC, sometimes *American Ipecacuanha*, *Indian Hippo*, *Dropwort*, and *Bowman's Root*. They grow to abt. 2 ft. in height, and are sometimes planted in shrubberies, for their graceful foliage.

GILLES, St., *sǎng-zhêl'*: old town of France, dept. of Gard, near the borders of the dept. of Bouches du Rhône, on the Canal de Beaucaire, 12 m. s.s.e. of Nimes. Its abbey church, the w. front of which is a masterpiece of Romanesque architecture, covered with the richest decoration, dates from the 11th c., and is the most notable building in the town. The neighborhood produces a strong red wine which is exported. Pop. 6,000.

GILLESPIE, *gìl-lés'pì*: GEORGE: 1613, Jan. 21—1648, Dec. 17; b. Kircaldy, Scotland: Presb. clergyman. He was the son of a parish minister, was educated at the

GILLESPIE—GILLISS.

Univ. of St. Andrews, became domestic chaplain to Lord Kenmure and afterward to the Earl of Cassilis, was ordained minister at Wemyss and chosen a member of the Glasgow Assembly 1638, appointed a chaplain to the commissioners of peace 1640, transferred to Edinburgh 1642, and appointed by the Scottish Church one of the four commissioners to the Westminster Assembly 1643. On his return to Scotland he was elected moderator of the assembly, but survived only a few months.

GILLESPIE, GEORGE LEWIS: an American military officer; b. 1849; engineer in the Army of the Potomac, 1862-64; chief engineer in the Army of the Shenandoah; witnessed the surrender of Lee. During the American-Spanish war, 1898, he was appointed brig.-gen., and assigned to the command of the Department of the East. In 1900 he was on the board to set apart lands in Porto Rico for the military and naval purposes of the United States; promoted chief of engineers with the rank of brig.-gen., 1901.

GILLIES, *gīl'iz*, JOHN, LL.D.: 1747, Jan. 18—1836, Feb. 6; b. Brechin, Forfarshire, Scotland. His youngest brother, Adam, was a judge of the court of session under the title Lord Gillies. G. was educated at the Univ. of Glasgow; and, after a time, went to London, with the view of following literature as a profession. For several years subsequently he was travelling tutor to the sons of John, second Earl of Hopetoun, who 1777 settled upon him an annuity for life. In 1778 he published a translation of the *Orations of Isocrates and those of Lysias, with some Account of their Lives*, 4to; and 1786 the first part of his *History of Ancient Greece* (2 vols. 4to, or 4 vols. 8vo). It was extremely popular on its first appearance, though much disfigured by verbosity, and dull and prolix disquisition; but it has dropped out of notice since the advance of Greek scholarship in the present century, and the publication of the histories of Thirlwall and Grote. His *View of the Reign of Frederick II. of Prussia* appeared 1789, 8vo. In 1793, on the death of Dr. Robertson, he was appointed historiographer to the king for Scotland, with a yearly salary of £200. Among his works are, a translation from the Greek of *Aristotle's Ethics and Politics*, with an analysis of Aristotle's speculative works; *History of the World from Alexander to Augustus*, 2 vols., 4to (1807-10); *Translation of Aristotle's Rhetoric* (1823).

GILLIESIA, n. *gīl-lēz'ī-a* [from Dr. Gillies, of Chili]: in bot., typical genus of the small order *Gilliesiaceæ*, an order of exogens, alliance *Liliales*.

GILLISS, *gīl'is*, JAMES MELVIN: 1811, Sep. 6—1865, Feb. 9; b. Georgetown, D.C.: astronomer. He was appointed a midshipman in the U. S. navy 1826, was promoted passed midshipman 1831, studied science in the Univ. of Va. and in Paris, was appointed asst. in the depôt of charts and instruments in Washington 1836, organized the first working observatory in the United States, published the first vol. of astronomical observations, and prepared the first catalogue of stars. He was promoted lieut.

GILLMORE—GILLRAY.

1838, given charge of the plans, construction, and arrangement of the U. S. naval observatory, made astronomical expeditions to various parts of the country and world, was an original member of the National Acad. of Sciences, and became supt. of the observatory 1861.

GILLMORE, *gĭl'mōr*, QUINCY ADAMS, PH.D., U.S.A.: 1825, Feb. 28—1888, Apr. 7; b. Black River, Ohio: engineer. He was graduated at the U. S. Milit. Acad. 1849, entered the army as brev. 2d lieut. of engineers, was asst. engineer of the defenses of Hampton Roads, Va., instructor of military engineering at the U. S. Milit. Acad. 1852-6, promoted 1st lieut. and placed in charge of the engineer agency at New York 1856, promoted capt. 1861, and appointed engineer-in-chief of Gen. Sherman's Port Royal expedition. He planned, erected, and commanded the batteries on Tybee Island, which reduced Fort Pulaski 1862, Apr. 11, for which he was brevetted lieut.col. U.S.A.: was brevetted col. for services in Ky. 1863, Jan.; in June following was given command of the dept. of the South; and in July of the 10th army corps. While holding the last command he took possession of Morris Island, near Charleston, reduced and captured Fort Wagner and Battery Gregg, and virtually demolished Fort Sumter, with batteries 2 m. distant. For these services, pronounced by Gen. Halleck as 'constituting a new era in the science of engineering and gunnery,' he was brevetted brig-gen. U.S.A., and promoted maj.gen. vols. He was in command of Washington when threatened by the Confederates under Gen. Early 1864, July, resigned his vol. commission 1865, Dec., was promoted col. of U. S. engineers 1883, Feb., received the degree PH.D. from Rutgers College, and was engaged on engineering duty to the close of his life. He was author of numerous engineering and technical works.

GILLOTT, *gĭl'ot*, JOSEPH: 1800-1872, Jan. 6; b. Warwickshire, England: manufacturer. He learned the cutlery trade in Sheffield early in life, and after his marriage removed to Birmingham and with his wife's aid began making steel pens, using a garret room for his workshop and personally peddling his products. In 1820 he conceived the idea of lessening the stiffness of his pens by giving them three slits instead of one, and this improvement led to his phenomenal success. He devised machinery to cheapen the cost of production, and at the time of his death his establishment used 5 tons of steel weekly, produced 150,000,000 pens annually, and was the largest in that line in the world. He acquired great wealth and made a notable collection of paintings.

GILLRAY, *gĭl'rā*, JAMES: celebrated caricaturist: 1757-1815, June 1; b. Chelsea, England; of humble parentage. He became known as a successful engraver about 1784; and 1779-1811 issued as many as 1,200 caricatures, numbers of which, it is said, 'were etched at once upon the copper without the assistance of drawings.' They are full of broad humor and keen satire, the subjects of his ridicule being generally the French, Napoleon, and the govt. min-

GILLRAY.

isters, though he frequently diverged to assail the social follies of his day. G.'s drawings have often been published, but the best edition is that of M'Lean (with illustrative description), in 304 sheets (Lond. 1830). An ed. with Life and Times of G., by T. Wright, was issued by Bohn (1851); new ed. 1873. Living at a period whose chief actors and events furnished abundant materials for the caricaturist, he was distinguished from all similar artists by the real art merit of his work. His natural humor, wide reading, familiarity with the people, the movements, and the foibles of the day, and his incomparable execution, made him a giant in his line. While his political sketches gave him the widest repute, his social sketches were equally effective. Nothing seemed to escape the touch of his satire. George III., the queen, the Prince of Wales, the entire British ministry, Napoleon, and every thing that they did, supplied subjects to his pencil, and the antipodes were reached in the changing fashions in men's and women's dress. His industry was astonishing, considering his dissolute habits. His sketches constitute an amusing history of the events in England and France in the latter part of George the Third's reign.

GILLS.

GILLS, n. *gîlz* [AS. *geafilas*; F. *gifle*, the chops, the jaws: Gael. *gial*; Sw. *gel*, a jaw, the gill of a fish: Dan. *giælle*, a gill]: the organs of respiration in fishes, reddish vascular folds on both sides of the head; the flaps below the beak of a fowl; in *bot.*, the thin, vertical, spore-bearing plates under the cap of certain fungi. GILL-BEARING, producing gills. GILL-FLAP, or GILL-LID, the covering of the gill; the operculum.

GILLS, or BRAN'CHIÆ: respiratory organs of those animals, e.g., fishes, which obtain the oxygen necessary for their well-being not directly from the atmosphere, but from the air held in solution in the water in which they live. In animals fitted for atmospheric respiration, the air enters the system to meet the blood, a peculiar set of movements, more or less complicated, being appointed for its constant renewal. In aquatic animals (excluding aquatic mammals), a different plan is required, in consequence of the small quantity of air contained in water; hence the aërating surface is extended outwardly, so as to yield a larger space than could be obtained in the interior. The blood is being perpetually driven along this surface, which is constructed to admit freely of the passage of air; and by the natural movements of the body, or by others of a special nature, a fresh supply of aërated water is constantly afforded. The chief forms of respiratory apparatus in different classes of animals are shown in the accompanying diagram, from Dr. Carpenter's *Comparative Physiology*. 'Let AB represent the general exterior surface of the body; then at *a* is shown the character of a simple *outward* extension of it, forming a foliaceous gill, such as is seen in the lower Crustacea; and in like manner, *b* may represent a simple *internal* prolongation or reflection, such as that which forms the pulmonary sac of the air-breathing gasteropods. A higher form of branchial apparatus is shown at *c*, the respiratory surface being extended by the subdivision of the gill into minute folds or filaments, as in fishes; and a more elevated form of the pulmonary apparatus is seen at *d*, the membranous surface extended by subdivision of the internal cavity, as

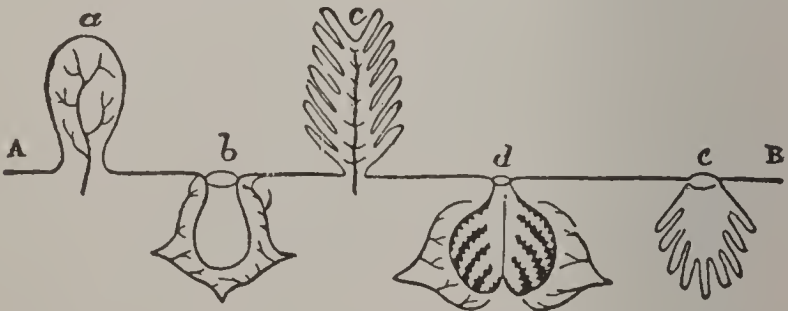


Fig. 1.

in birds and mammals. Lastly, at *e* is a plan of one of the 'pulmonary branchiæ' of the Arachnida, which forms a kind of transition between the two sets of organs—the extent of surface being given by gill-like plications of the membrane lining the interior, of a pulmonic cavity. See RESPIRATION, ORGANS AND PROCESS OF.

Noticing some of the different forms of G. in various

GILLS.

classes, we find in the Annelida the first distinct organs of this kind. Their blood is transmitted to a series of gill-tufts composed of a delicate membrane prolonged from the extreme surface, which may assume the form of branching trees or of delicate brushes made up of a bundle of separate filaments. These tufts are supplied freely with blood-vessels; and fresh portions of blood and of water are being constantly brought into contact by the natural movements both of the animal and of the surrounding medium, and by the action of the cilia covering the respiratory organs. The tufts are sometimes attached at intervals along the whole length of the body, as in *Arenicola*, in which there are 13 pair (see ANNELIDA); while in other cases they occur about the head only. In the latter case, they are extremely beautiful, having the appearance of a flower with the most brilliant tints. Two animals common in the aquarium, the *Serpula* and the *Terebella*, owe their resplendent beauty to these tufts (see figure under SERPULA). In all of the Crustacea, except some of the lowest forms, whose general surface is soft, G. are present. Thus the *Branchiopoda* are so called because their appendages present the form of simple plates or flattened vesicles, which swim in the surrounding fluid, and expose the blood to the oxygen which the water contains. The branchiæ may be appended to the thoracic limbs in the form of membranous plates (as in *Amphipoda*), or to the abdominal limbs as subdivided lamellæ (as in *Isopoda*), or the branchial plates may expand into vesicles attached to the thoracic feet (as in *Læmodipoda*). Among the *Stomapoda*, respiratory plates are external, and are appendages of distinct locomotive organs, each plate divided into a series of small filaments or tubes, so as to resemble a broad feather: their position is abdominal, as is seen in *Squilla*. Here the G. have begun to assume more of the character that they present in fishes, the laminated or leaf-like form being placed by one in which the surface is greatly extended by minute subdivisions into delicate filaments. In the order *Decapoda*, including the crab and lobster, the respiratory organs are tufts of filaments or lamellæ, and are lodged in branchial chambers protected by the carapace. A special apparatus, the 'scaphognathik,' consisting of the modified exopodite and endopodite of the second maxilla—beats rhythmically, so as to draw a constant current of water from behind forward over the aërating surface. The G. in these animals are in the form of long, slender, quadrangular pyramids, and consist either of numerous thin plates or minute cylinders arranged perpendicular to the axis of the pyramid. In crabs there are 9 such branchial pyramids on each side, in lobsters 20. For further details on the respiratory organs of the Crustacea, see Prof. Huxley's work on *The Crayfish*, International Science Series (Lond. 1880), or any of the larger works on the comparative anatomy and physiology of the invertebrates.

In the sub-kingdom Mollusca, there are several modifications of gills. In the *Lamellibranchiata*, or common bivalves, there are, as a general rule, two G. on each side.

GILLS.

Here the G. are delicate, highly vascular, vertical, leaf-like organs, formed by the union of numerous filaments into a perforated lattice-work covered with vibratile cilia, whose constant motion gives rise to regular respiratory currents: this form of gill may be readily examined in the oyster or common mussel. In the *branchiate gasteropoda*, the form and position of the G. are very variable. In the *Nudi-branchiata* (see Alder and Hancock's splendid monograph on this order as occurring in the British seas—*Ray Society*), they are disposed, as their name implies, without any protection, over various parts of the body, where they often form beautiful tufts of delicate leaf-like or arborescent appendages, as in *Doris* (q.v). One of the arborescent processes forming the gills of *Doris Johnstoni* separated and magnified is shown in the accompanying fig. 2. The highest and most numerous subdivision of the branchiate gasteropoda—Cuvier's *Pectinibranchiata*—derived its name from the peculiar comb-like arrangement of the G., which lie in a special cavity at the fore part of the back, caused by an arching of the mantle. The G. of *Paludina vivipara* are shown in fig. 3. Finally, in the highest class of mollusks—*Cephalopoda*—the G. are the organs used for classification; there being two order

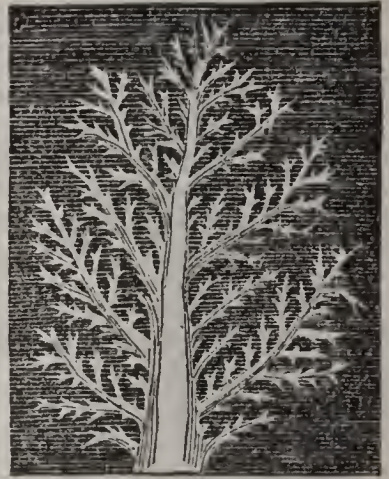


Fig. 2.—Gill-process of *Doris*, magnified.



Fig. 3.

The pectinated branchiæ alone are seen. The concave surface rests on the intestine.

—viz., the *Tetrabranchiata*, with four gills, and the *Di-branchiata*, with two gills. The arrangement of these gills, and their relations to other organs, are seen in the accompanying figure of *Sepia* (fig. 4).

To the brief notice of G., under the title **FISHES**, remarks are here added, condensed from Prof. Owen's *Anatomy of the Vertebrates*, I. 475-488. In the *Cyclostomi*, which, except the lancelet, constitute the lowest order of fishes, and include the genera *Myxine* and *Petromyzon*, of which the hag and lamprey are examples, the branchiæ or

GILLS.

G. are sacciform, with external openings, and six or seven in number on each side. Each gill-sac receives its proper artery either from the branchial artery or one of its

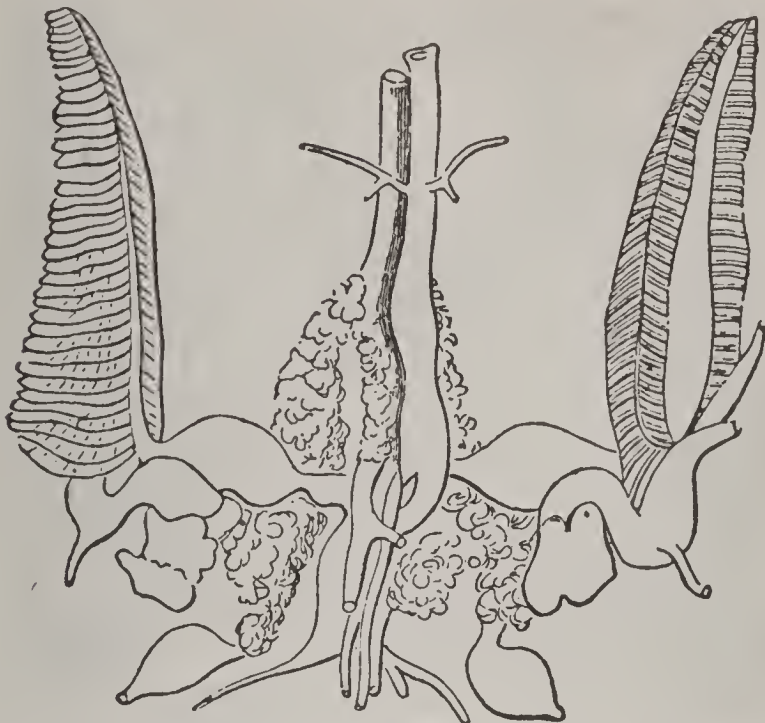


Fig. 4.—*Sepia officinalis*.

In the Dibranchiates, of which *Sepia* may be taken as an example, each gill consists of triangular vascular laminæ, extending transversely from either side of a fleshy glandular stem, and decreasing in size to the extremity of the gill. Each plate is composed of smaller transverse laminæ, which are themselves similarly subdivided; the entire gill presenting the tripinnated structure, which affords an extensive though close-packed surface for the subdivision of blood-vessels. The number of plates in a gill varies in different genera; in *Sepia* there are thirty-six pairs. The stem of the gill is not only attached by its base, but by a thin membrane, through most of its length, to the mantle. The above description, and the figure, have been borrowed from Owen's *Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals*, 2d edition, p. 624. The original figure is due to John Hunter.

branches. 'The leading condition of the G. in other fishes may be understood,' says Prof. Owen, 'by supposing each compressed sac of a *Myxine* (*m* in figs. 5 and 7) to be split through its plane, and each half to be glued by its outer smooth side to an intermediate septum, which



Fig. 5.—Two Gill-sacs of *Bdellostoma*.

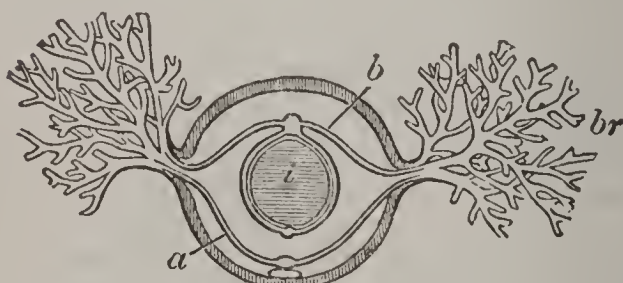


Fig. 6.—Two Gill-sacs of Lamprey.

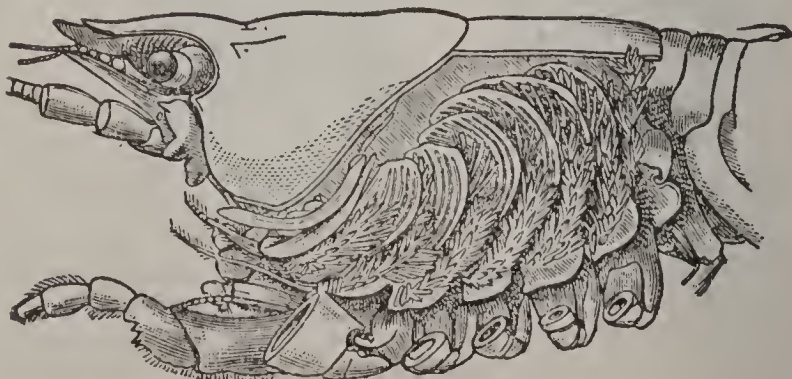
would then support the opposite halves of two distinct sacs, and expose their vascular mucous membrane to view. If the septum be attached by its entire margin, the condition of the gill in the *Plagiostomi* (sharks, dog-fish, rays, skates,



The Active Gibbon (*Hylobates agilis*).



Gills.—Section of an Annelid Worm: *br*, Gills; *a*, *b*, Blood-vessels; *i*, Intestine.



Gills of Craw-fish exposed

GILLS.

etc.) is effected. If the septum be liberated at the outer part of its circumference, and the vascular surfaces produced into pectinated lamelligerous processes, tufts or filaments proceeding from the free arch, the gill of an ordinary osseous fish is formed. Such a gill is the homologue, not of a single gill-sack, but of the contiguous halves of two distinct gill-sacs, in the Myxines. Already, in the lampreys, the first stage of this bi-partition may be seen (fig. 6), and the next stage in the sharks and rays; consequently, in these fishes a different artery goes to the anterior branchial surface of each sac or fissure from that which supplies the posterior branchial surface of the same fissure; whilst one branchial artery is appropriated to each supporting septum or arch between the fissures, as it is to the liberated septum or branchial arch in the ordinary osseous fishes.'—*Anatomy of Vertebrates*, I. 476.

The lampreys, myxinoids, and plagiostomes (sharks and rays) are termed fishes with 'fixed gills,' because in them each supporting septum of the anterior and posterior branchial mucous surfaces is attached to the pharyngeal and dermal integument by its entire outer margin, and the streams of water flow out by the same number of fissures in the skin (as at *k*, in figs. 5 and 6) as those by which they enter from the pharynx, *f*. In the osseous and in the ganoid fishes there are 'free gills,' the outer border of the supporting branchial arch being unattached to the skin, and playing freely backward and forward with its gill surfaces, in a common gill-cavity, which has a single outlet, usually in the form of a vertical fissure.

In the myxinoids (as the hag) there are (see fig. 7) six or seven branchial sacs, *m*, on either side, and their outlets are produced into short tubes, which open into a longitudinal canal, *k*, directed backward, and discharging its contents by an orifice, *h*, near the middle line of the ventral surface; between the two outlets, *h*, *h*, is a third larger one, *i*, which communicates, by a short duct, with the end of the œsophagus, *l*, and admits the water, which passes from that tube by the lateral orifices, *f*, leading into the branchial sacs. These sacs have a highly vascular, but not a ciliated, mucous membrane, arranged in radiating primary and secondary folds to increase the surface. In the lampreys, there is a further separation of the respiratory from the digestive tract, for each gill is supplied from the so-called water-trachea, a median canal, beneath and distinct from the œsophagus.

In all the higher fishes, the inlets to the branchial interspaces lie on each side of the gullet, and are equal in number with the interspaces; while, except in the plagiostomes, there is apparently only one outlet on each side, which is under the operculum or gill-cover. These outlets vary extremely in size, being relatively largest in the herring and

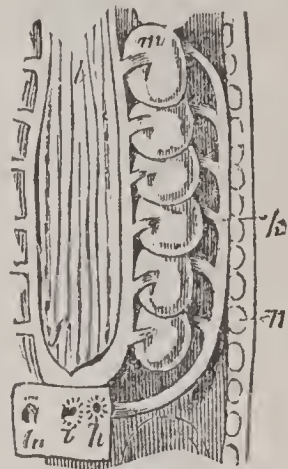


Fig. 7.—Branchial Organs of Myxine.

GILLS.

mackerel families, smallest in the eels and lophioid fishes (as the Angler, q.v.). The length of time that different fishes can exist out of water depends on the modifications for retaining water in the branchial chambers. As a general rule, the chamber is largest when the outlet is smallest, as in the eels, blennies, and lophioids, and these are the fishes that survive the longest out of water, except in such cases as the climbing perch (q.v.) or *Anabas*, in which the branchial apparatus possesses complex labyrinthic appendages. The main object of the G. of fishes being to expose the venous blood, in very thin-walled vessels, to streams of water, the branchial arteries rapidly sub-divide into capillaries, which constitute a net-work in one layer, supported

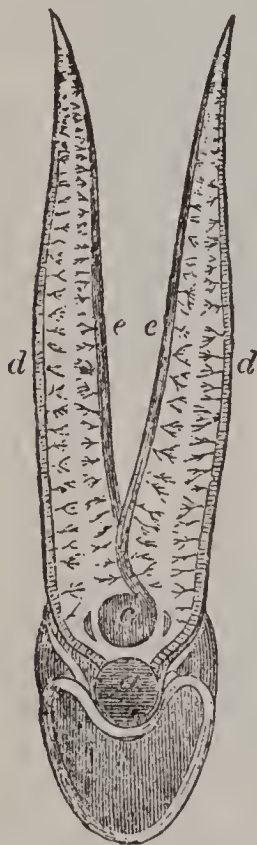


Fig. 8.—Diagram of the circulation of the blood through the Branchial Leaflets.

by an elastic plate, and covered by a tessellated but non-ciliated epithelium. This covering and the capillary wall are so thin as to admit free interchange to take place between the blood, loaded with carbonic acid, on the one hand, and the aerated water on the other. The extent of respiratory surface is increased in various ways, of which by far the most common is, 'by the production of the capillary-supporting plates from each side of long, compressed, slender, pointed processes, extending, like the teeth of a comb, but in a double row, from the convex side of each branchial arch.' In this figure, the course of the blood through a pair of branchial processes is shown; *a* is a section of the branchial artery; *d* is the branch going along the outer margin of the process; *e* is the vessel receiving the blood from the capillaries, after it has been changed, and returning it, along the inner border of the process, to the branchial vein, *c*. The number of vascular plates or lamellæ attached to each branchial process has been estimated at 135 in the carp, 700 in the eel, 1,000 in the cod, 1,400 in the salmon, and 1,600 in the sturgeon.

From the ordinary type of gill in fishes, we pass to consider these organs in Amphibia or Batrachia. In the lower or perennibranchiate members of this order, the G. exist permanently, but in the great majority they are mere temporary organs: see BATRACHIA. In the newt (*Triton*), a little animal easily kept in a vessel of fresh water, three pairs of external G. are developed, at first as simple filaments, each with a capillary loop, but speedily expanding and giving off looplets. The gill is covered with ciliated epithelium, which loses the cilia before the absorption of the organ, and this takes place after a few days of larval existence. In the larval frog, the G., which are on a simpler plan, diminish about the 4th, and disappear on the 7th day. The parts of the branchial framework

GILLY—GILMAN.

which supports the deciduous G. never develop beyond the cartilaginous stage: thus they readily shrink, and become more internal as the head increases in size. The G. of the



Fig. 9.—Head and Branchial Appendages of the Larva of a Newt, magnified.

perennibranchiate amphibians completely resemble those already described, and similar temporary external G. occur in young plagiostome fishes.

GILLY, or GILLIE, n. *gíl'í*, GIL'LIES, n. plu. *-líz* [Gael. *gille*, a servant-man, a lad: Ir. *giolla*, a boy]: in *Scot.*, a man or lad who attends on a sportsman, or who is employed in protecting game.

GILLYFLOWER, n. *jíl'í-flow'er* [F. *giroflée*, a gillyflower—from It. *garofalo*; L. *caryophyllus*, a clove]: popular name for some of the cruciferous plants most prized for the beauty and fragrance of their flowers, as wallflower, stock, etc. The clove-pink also, the wild original of the carnation, is called *Clove-Gillyflower*. The name G. has been regarded as a corruption of *July-flower*; but in Chaucer it appears in the form *gilofre*; and the French *giroflée* indicates the true derivation from *girofle*, a clove, the smell of the Clove-G. being somewhat like that of cloves.

GILMAN, *gíl'man*, DANIEL COIT, LL.D.: educator: b. Norwich, Conn., 1831, July 6. He graduated at Yale College 1852, spent three years in European study and travel, became librarian in Yale College 1855, afterward prof. of physical and political geography there, sec. of the Sheffield Scientific School board, supt. of public schools in New Haven, and sec. of the Conn. board of education. In 1870 he declined and in 1872 accepted the presidency of the Univ. of Cal., and in 1875 was elected first pres. of Johns Hopkins Univ., Baltimore. He was one of the original trustees of the John F. Slater Fund for the education of freedmen, and has been its sec., and pres. of the American Social Science Assoc. He is author of numerous addresses and papers on scientific and educational topics. He received the degree LL.D. from Harvard Univ. 1876 and Columbia College 1887.

GILMORE—GILPIN.

In 1896-97 he served on the commission to settle the boundary dispute between British Guiana and Venezuela, and in the latter year was a member of the commission to draft a new charter for Baltimore. In 1901 he resigned the presidency of Johns Hopkins University, and became editor-in-chief of the revised edition of the *International Cyclopaedia*. On 1902, Jan. 29, he was chosen president of the National University established by Andrew Carnegie. His publications include *Life of James Monroe*; *University Problems*; *Introduction to De Tocqueville's Democracy in America*, etc.

GILMORE, *gĭl'mōr*, JAMES ROBERTS: author: b. Boston, 1823, Sep. 10. He was educated for commercial business, became head of a cotton and shipping firm in New York 1848, and retired 1857. He began writing novels, war-songs and ballads under the pseudonym of 'Edmund Kirke' in the early part of the civil war, founded the *Continental Monthly* to advocate emancipation 1862, and had an unofficial interview with Jefferson Davis with the hope of restoring peace 1864. He was again in business 1873-83. His works include *Among the Pines* (1862); *Down in Tennessee* (1863); *Among the Guerillas* (1863); *Adrift in Dixie* (1863); *On the Border* (1864); *Patriot Boys* (1864); *Gospel History* (in conjunction with Dr. Lyman Abbott, 1880); *Life of Garfield* (1880); *The Rear Guard of the Revolution* (1886); *John Sevier as a Commonwealth Builder* (1887); and he was preparing a series of histories of the s.w. states 1888-9.

GILOLO, *jé-lō'wō*, or HALMAHERA, *hāl-mā-hā'rā*: one of the Moluccas or Spice Islands, between 2° n. and 1° s. lat., and 127° 27'—129° e. long.; e. of Celebes. 6,300 sq. m. It is very irregular in form, and consists of four peninsulas. The sultan of Ternate rules over the north and south, the sultan of the Tidore east, and native princes the interior. Malays live on the coasts, Alfoors inland. The island is mountainous, and covered with forests. Gold is found. There are buffaloes, oxen, wild swine, goats, etc. The soil is fertile, producing cocoa-nuts, sago, spices, bananas, bread-fruit, and fine wood. The exports are: edible nests, pearls, gold, mother-of-pearl, sago, spices, trepang, and tortoise-shell. The imports: opium, iron, cotton, manufactured and fancy goods. Pop., including neighboring small islands, 27,500.

GILPIN, *gĭl'pĭn*, BERNARD: 1517-1583, Mar. 4; b. Kentmire, Westmoreland, England: ecclesiastic. He was educated at Queen's College, Oxford, converted to Protestantism by public disputations with Hooper and Peter Martyr, and was appointed vicar of Norton, in the diocese of Durham, 1552. The same year he preached before King Edward VI. and was licensed to preach throughout the kingdom as long as the king lived. He then resigned his vicarage, pursued theological investigations at Louvain, Antwerp, and Paris, and returning to England near the close of

GIL POLO—GILTHEAD.

Queen Mary's reign, was appointed archdeacon of Durham by his uncle the bp., Dr. Tonstall. His sermons were characterized by extreme boldness, and he mercilessly attacked the vices of the clergy. For this charges were preferred against him to the bp., who not only dismissed them but appointed his nephew to the rich living of Houghton. Twice he was protected by his uncle. A third set of charges was preferred to the bp. of London, Dr. Bonner, who ordered his apprehension. He started for London, saying he was going to the stake, broke his leg on the way, and was laid up till the death of Queen Mary relieved him of apprehensions of personal danger. He returned to Houghton, declined the bishopric of Carlisle tendered by Queen Elizabeth, kept open house for his parishioners every Sunday from Michaelmas to Easter, built and endowed a grammar school, educated and maintained a large number of poor children at his own expense, provided the most promising scholars with means of pursuing a univ. education, and transformed a part of his domicile into a boarding-house to accommodate the large number of young people who flocked to his school. Every year he made a missionary tour of Northumberland, Yorkshire, Cheshire, Westmoreland, and Cumberland, whence he was called the 'Apostle of the North,' and personally maintained an asst. in his own parish. He lived frugally, gave away nearly all his annual income, and was exceedingly popular as rector and friend through the large field of his benevolent and pastoral operations.

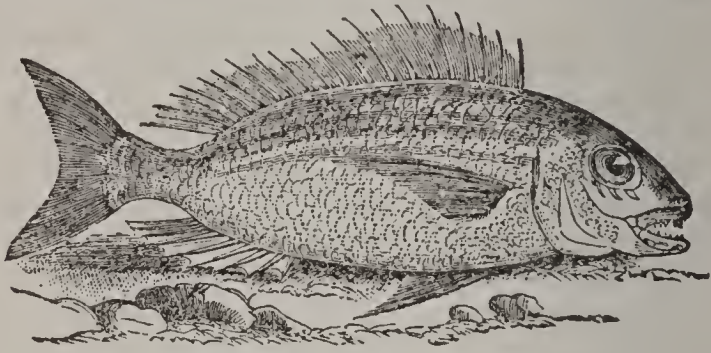
GIL POLO, *chēl pō'lo*, GASPAR: Spanish poet: b. Valencia, first half of the 16th c. While town clerk of his native place, he was called by Philip II., 1572, to high financial office in the kingdom of Valencia; and 1580 was sent to superintend the royal patrimony at Barcelona, where he died. Besides various lyrics, he wrote a continuation of Montemayor's *Diana*, which appeared 1564. Though inferior to the original romance in invention, G.'s continuation so greatly surpasses it in clearness of thought and expression throughout the metrical portions, that Cervantes exempts it from the condemnation of Don Quixote's other books as deserving as much respect 'as though Apollo himself had written it.' The best ed. is that of Cerda (Madrid 1778; new ed. 1802). Biographers generally have confounded G. with his son of the same name, eminent writer on jurisprudence.

GILT, v. *gilt* [see GILD and GOLD]: ADJ. overlaid with gold-leaf: N. gold laid on the surface of a thing; golden or outside show.

GILTHEAD, *gilt'hēd* (*Chrysophrys*): genus of acanthopterous fishes of the family *Sparidae*, having a deep compressed body, a single dorsal fin, the anterior rays of which are spinous, the cheeks and gill-covers covered with scales, the teeth of two kinds, six conical teeth in front of each jaw, and four rows of oval rounded grinding-teeth in the upper jaw, three rows in the lower. They feed chiefly on mollusks, the shells of which their teeth enable them to crush to pieces. The species are numerous; in-

GILT JEWELRY—GIMBALS.

habitants of the warmer seas. One species, the COMMON G. (*C. aurata*) abounds in the Mediterranean, and is much esteemed for the table. It seldom attains a length of more than twelve inches. It is generally found near the shore, in small shoals, and its presence is sometimes betrayed to fishermen by the noise which its teeth make in crushing shells. It is said to agitate the sand with its tail, in order to get access to the mollusks concealed in it. The back is silvery gray, shaded with blue; the belly like polished steel; the sides have golden bands; and there is a half-moon-shaped golden spot between the eyes, from



•Common Gilthead (*Chrysophrys aurata*).

which it derives the name G., the Latin name *Aurata* (gilded), and the Greek name *Chrysophrys* (golden eye-brow). From the Latin *Aurata* comes the French name *Dorado*. This fish was frequently kept in the *vivaria* of the ancient Romans, being much valued and easily fattened. Another species (*C. microdon*) also is found in the Mediterranean.—The name G. is given also to a British fish of a different family (*Labridæ*), a species of Wrasse (q.v.).

GILT JEWELRY—GILT TOYS: small articles, coated with gold; chiefly the cheap jewelry formerly manufactured almost exclusively at Birmingham, England; now made in various places in Britain, America, and other countries. The name in the English trade is Gilt Toys. Cheap jewelry of the most elegant forms is made from copper, which is drawn through rollers into small ribbons and wires, with elegantly embossed surfaces to represent the fine chasing on articles made from the precious metals. These the gilt-toy maker twists and solders into brooches, bracelets, rings, and a variety of trinkets, usually with a raised *bezell* for receiving a piece of polished colored glass, or a cheap stone. Previous to setting the glass or stone, the trinkets are strung on copper wires, and sent to the electro-plater, who gives them a coating of gold or silver, and returns them to the gilt-toy maker, who finishes them by burnishing and by setting the imitation gems. In this way a vast amount of really beautiful imitation jewelry, not easily distinguished by the eye from genuine, is produced at very small cost.

GIL VICENTE: see VICENTE, GIL.

GIMBALS, n. plu. *gim'bälz* [L. *gemellus*; *gemello*, a twin—from L. *geminus*, twin, double: F. *jumelles*, twins]: pairs of brass hoops or rings moving within one another on

diameters at right angles to each other, so that anything suspended in their centre will always retain a constant position. The apparatus on board a ship to which the mariner's compass is attached is an example. The outer hoop is attached to a box or other fixed object, while the inner hoop is constructed to allow of its moving freely within the outer, to which it is attached by two pivots at the extremities of a diameter. The compass-box is attached to the inner hoop by two similar pivots at right angles to the former. Thus the compass moves freely in two directions at right angles to each other, and can always retain its horizontal position, however the vessel may roll or pitch. G. are often applied to other instruments, such as the mountain barometer, etc.

GIMCRACK, n. *ĵim'kräk* [OE. *gimmals*, or *gimmers*, the corresponding members of a joint working into each other—applied to the mechanism for moving idols and puppets: L. *gemelli*, twins]: any trivial mechanism; a device; a toy. *Note*.—It is suggested that *gim* is for *gin*, an engine, a contrivance, and OE. *crack*, a lively, spirited boy.

GIME'NA, or XIME'NA: see JIMENA.

GIMIGNANO, *jē-mēn-yā'nō*, SAN: ancient town in the Italian province of Siena, 22 m. from Florence, on a hill 1,220 ft. above the sea. Of the many churches and monasteries which the town formerly contained, most are in ruins. Some still standing contain some fine old frescoes. Pop. 4,000.

GIMLET, or GIMBLET, n. *ĵim'let* [OF. *gimbelet*; F. *gibelet*, a gimlet: prov. F. *ĵhimbla*, to twist (see WIMBLE)]: small boring tool; a large one of the same kind is called an *auger*. Generally used when the hole is to be larger than can be bored with a brad-awl: it has a conical screw point, above which is a groove for clearing, and is fitted in a cross or T. handle. An improvement has been made by twisting the grooved part of the gimlet, so that it forms a long spiral groove. GIMLET, v. in a *ship*, to turn round an anchor by the stock. GIM'LETING, imp. GIM'LETED, pp.

GIMLI: in *Scandinavian myth.*, the dwelling-place of good men for eternity; a vast hall at the world's southern limit, of a radiance beyond that of the sun; the Norse Heaven.

GIMMALS, n. plu. *ĵim'älz*, or GIMMERS, n. *ĵim'mérz* [L. *gemelli*, twins]: in OE., a twin or double ring; rings or the corresponding parts of a joint working into each other, as the two parts of a hinge.

GIMMER, n. *ĵim'mér* [connected with OE. *gimmals*, or *gimmers*, a twin or double ring, jointed hinges: L. *gemellus*, a twin]: in *Scot.*, a ewe in its second year, which has had its first lamb; in OE., movement; machinery. GIMMERS: see GIMMALS.

GIMP, n. *ĵimp* [Ger. *gimf*, lace or edging of silk: F. *guipure*, lace—from *guiper*, to cover or whip about with silk]: kind of interlaced silk, wool, or cotton twist or edg-

ing, used for trimmings, for dress, curtains, furniture, etc., often beaded: its peculiarity is that fine wire is twisted into the thin cord of which it is made.

GIN, n. *jīn* [contraction of *L. ingēnīum*, natural disposition, invention, or *F. engin*, an engine, understanding: *Icel. ginna*, to allure, to deceive: comp. *Gael. dinn = jīn*, to press, to trample out]: contrivance; snare; trap; machine for driving piles, or for raising and moving heavy weights (see below); machine for disentangling the fibres of cotton (see COTTON): *V.* to catch in a trap; to separate the seeds from the cotton by a machine. GIN'NING, imp.: *N.* the act or process of clearing cotton from seeds. GINNED, pp. a. *jīnd*, caught in a trap; cleared from seeds, as cotton. COTTON-GIN, a machine for separating raw cotton (q.v.) from its seeds.

GIN, v. *gīn* [*AS. ginnan*, to begin]: in *OE.*, to begin. BEGIN is a mere derivation from the older form *gin*. GIN'NING, imp. GINNED, pp. *gīnd*.

GIN: machine for raising weights, driving piles, etc.; consisting of three poles, 12 to 15 ft. long, and 5 inches in diameter at the lower end, tapering to $3\frac{1}{2}$ inches at the upper. The poles are united at the top, either by an iron ring which passes through them or by a rope twisted several times round each, and to this 'joint' a pulley is fixed. Two of the poles are kept at an invariable distance by means of an iron rod, in order that they may support the windlass attached to them, its pivots running in iron cheeks fixed to the poles. The G. is set up over the weight to be raised; two blocks arranged according to the second system of pulleys (q.v.) are fixed, one to the top of the poles, the other to the weight; and the rope, after passing round both blocks, and over the pulley above mentioned, is attached to the windlass, by the revolution of which the weight can then be raised.—The G. used for raising coal, etc., and for communicating motion to thrashing mills, consists of an erect axis or drum, firmly fixed in sockets, to which are attached transverse beams, varying in number according to the power required. To the extremity of each beam a horse is yoked, and they are then driven round in a circle. If coal is to be raised, the horses must either be frequently unyoked, and turned in the opposite way, or the machine must be made reversible; the latter of which is preferable, as saving time and labor. This G. has mostly been superseded by the steam-engine.

GIN, n. *jīn* [contraction from Dutch *genever*, corrupted fr. *F. genièvre*, juniper-berry, gin: the Fr. word is fr. *Genève*, the town where made]: distilled spirit flavored with juniper berries; called also *Geneva* or *Hollands*. It is distilled from malt or from unmalted barley or other grain, and afterward rectified and flavored. The common gin of the drinking-shops, the popular drink of the lower classes in London, is flavored very slightly with oil of turpentine and common salt; each rectifier has his own particular recipe for the quantities, but it is usually about 5

GINCKELL.

fluid ounces of spirit of turpentine and 3½ lbs. of salt mixed in ten gallons of water; these are placed in the rectifying still, with 80 gallons of proof corn-spirit, and distilled until the feints begin to come over. It is then used either unsweetened or sweetened with sugar. In Holland, it is an article of great manufacture, chiefly at Schiedam; hence often called *Schiedam*. In Schiedam alone, 1875, the spirits distilled amounted to 9,212,631 gallons; the grain and malt mills supplying 53,001,245 lbs. of rye meal, and 46,628,865 lbs. of malt. Other distilleries are scattered about the country. Notwithstanding this immense manufacture of alcohol, the Dutch are not an intemperate people: much the largest part of the spirit made in Holland is exported, especially to N. America and n. Europe. It was formerly exported in bottles; casks also are now much used.

Perhaps nothing used as diet by man is liable to greater and more injurious adulteration than gin. Almost every gin-shop keeper has some vile recipe for increasing the pungency and giving a factitious strength to the much-diluted, sweetened spirit sold under this name. A mere enumeration of the articles usually employed will give some idea of the extent to which sophistication is carried on with this spirit: roach alum, salt of tartar (carbonate of potash); oils of juniper, cassia, nutmeg, lemons, sweet fennel, and caraway; coriander seeds, cardamoms, and capsicums; and, most injurious of all, creasote. It is said that sulphuric acid, even, is added; but this requires confirmation.

GINCKELL, *gînk'él*, GODART VAN, first Earl of Athlone: 1640-1703; b. Guelderland, Holland: soldier. The head of an ancient and noble family and bearing the title Baron van Reede, he entered the Dutch army when a youth, followed William of Orange on his expedition to England 1688, and distinguished himself as an officer by pursuing, defeating, and capturing the Scotch regt. that had mutinied at Ipswich and was returning to Scotland 1689. In the following year he went to Ireland with William III., and took part in the battle of the Boyne as commander of the Dutch cavalry. When the king returned to England he vested the conduct of the war in G., who established headquarters at Mullingar, took the field early in 1691, captured the fortress at Ballymore with all its garrison June, reconstructed the works, then marched to the fortified town of Athlone, whose garrison was commanded by the French gen. Saint-Ruth, attacked it June 19 and successfully stormed it 30th, and after the retreat of the Irish army to Aghrim, repaired the Athlone fortifications, garrisoned the town, and led the English to Aghrim July 12. An attack was made immediately, and the Irish offered a stubborn resistance till the fall of Saint-Ruth, when they became disorganized, were defeated, and fled. G. next took Galway, permitting its garrison to retire to Limerick, where Tyrconnel, the viceroy, was in command of a large force. The viceroy died early in Aug., and the same day G. reached the place and began bombarding.

GINGAL—GINGER.

He captured the Irish cavalry on the other side of the Shannon, stormed the fort on Thomond bridge, forced a capitulation, and thus completed the conquest of Ireland. For his military services he received the thanks of the house of commons, was created by the king first Earl of Athlone and Baron of Aghrim, and for a time was in possession of the fortified estate of the Earl of Limerick. Subsequently he accompanied the king to the continent, and took command of the Dutch serving under the Duke of Marlborough 1702. The title became extinct 1844.

GINGAL, *jīn'gal*, or JINGALL [see JINGALL]: musket used in Asia; large and clumsy, fired from a rest.

GINGEE, *jīn'jē*: one of the Virgin Islands—group of the n.e. bend of the grand arch of the W. Indies.

GINGER, *jīn'jer* [OF. *gengibre*; F. *gingembre*; L. *zingiber*; It. *zinzibo*, ginger], (*Zingiber*)· genus of plants of nat. ord. *Scitamineæ* or *Zingiberaceæ*, having the inner limb of the perianth destitute of lateral inner lobes, and the fertile stamen prolonged beyond the anther into an awl-shaped horn. The species are perennial herbaceous plants with annual stems, and creeping root-stocks (*rhizomes*); the stems produce leaves in two opposite rows; the flowers are in compact spikes with bracts. They are natives of the E. Indies. The root-stocks of most of the species are used as a condiment and in medicine. The most valuable and generally used are those of the COMMON G. (*Z. officinale*), sometimes distinguished as the narrow-leaved G.,



Common Ginger (*Zingiber officinale*):
a, a flower, detached; b, perfect anther.

which has been cultivated in the E. Indies from time immemorial, and is now cultivated in other tropical countries, particularly the W. Indies and Sierra Leone, from all

GINGER.

which countries its root-stocks—the ginger of commerce—are a considerable article of export. The root-stock is about the thickness of a man's finger, knotty, fibrous, and fleshy when fresh. The stems which it sends up are reed-like, invested with the smooth sheaths of the leaves, generally three or four ft. high. The leaves are linear-lanceolate and smooth. The flowers are produced not on the leafy stems, but on short leafless stems (scapes), in spikes about the size of a man's thumb, and are of whitish color, the lip streaked with purple. The cultivation of G. is extremely easy wherever the climate is suitable. In India it is carried on in moist situations as high as four or five thousand ft. on the Himalayas. The root-stock is taken up when the stems have withered, and is prepared for the market either by seething and scalding in boiling water—to kill it—and subsequent drying, or by scraping and washing. The first method yields *Black G.*, the second *White G.*; the blackest of Black G., however, being only of stone-color, and the whitest of White G. very far from white, unless bleaching by chloride of lime be afterward employed, as it frequently is, to improve its appearance, though not beneficial to its quality. There is considerable difference, however, in the original color of the root-stock in the G. of different countries, supposed to result from difference in the varieties cultivated. The uses of G. both in medicine as a stimulant and carminative, and in domestic economy as a condiment, are familiar. Its qualities depend much on a pale yellow volatile oil, lighter than water, called *Oil of Ginger*. It contains also considerable starch.—*Candied G.*, or *Preserved G.*, consists of the young root-stocks preserved in sugar, and is now exported from China, the E. Indies, and the W. Indies. It is a pleasant sweetmeat and useful as a stomachic.—*Essence of G.*, much used for flavoring, is in reality a tincture, prepared of G. and alcohol.—*Syrup of G.* is used chiefly by druggists for flavoring.—*Ginger Tea* is a domestic remedy considered useful in flatulence, and is an infusion of G. in boiling water, or a mixture of a small quantity of the tincture in hot water. G. was known to the Romans, and is said by Pliny to have been brought from Arabia.—Another species of G. is ZERUMBET (*Z. zerumbet*), called also Broad-leaved G., cultivated in Java, of which the root-stock is sometimes erroneously called Round Zedoary. The root-stock is much thicker than that of common G., and less pungent.—The root-stock of the CASSUMUNAR (*Z. cassumunar*), sometimes called Yellow Zedoary, has a camphor-like smell and a bitter, aromatic taste. It acquired high reputation as a medicine in England and throughout Europe about the close of the 17th c., but having been extolled not merely as a stimulant and stomachic, but as possessing virtues which it has not, it soon sank into oblivion.—The root-stock of the MIOGA (*Z. mioga*) is less pungent than G., and is much used in Japan.—Cattle sent to graze in the jungles of n. India, during the rainy season, are supplied with the root-stocks of a species of G. (*Z. capitatum*), to preserve their health.—The root of *Aristolochia* (q. v.)

GINGER-BEER—GINGER-WINE.

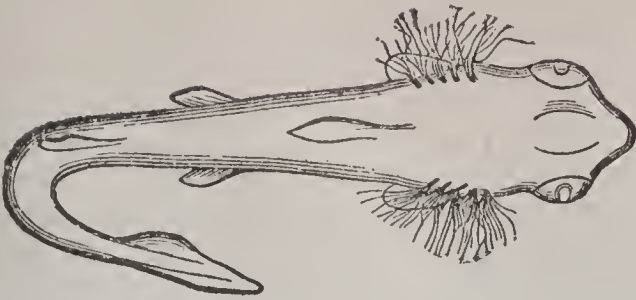
Canadense is sometimes called *Indian G.* or *Wild G.* in N. America, and is used as a substitute for ginger. It has a grateful aromatic odor and taste, and is stimulant, tonic, and diaphoretic.

GINGER-BEER: effervescing drink made by fermenting ginger, sugar, and some other ingredients, and bottling before the fermentation is completed. The following recipes are among the best known: Lump sugar 5 lbs.; crushed Jamaica ginger (unbleached is best) 5 oz.; cream of tartar, 4 oz.; 10 lemons, sliced; and 5 gallons of boiling water. They should be mixed in a vessel which can be kept covered until cool, but require stirring from time to time as the cooling goes on. When lukewarm, add 10 oz. of yeast, and keep it in a warm place to encourage the fermentation, which soon commences; after one day's fermentation, strain through a flannel filter, and let it stand to ferment again for a short time; then take off the scum, and bottle. The bottle must be tied or wired down. Another recipe is: Cream of tartar, 3 oz.; ginger, 1 oz.; refined sugar, $1\frac{1}{2}$ lbs.; 1 sliced lemon; $1\frac{1}{2}$ gallons boiling water; 1 oz. yeast; treated as above. A spurious G.-B. largely used, is made by putting a few drops of tincture of ginger and a little syrup in a bottle which is then filled with aerated water from the soda-water machine.

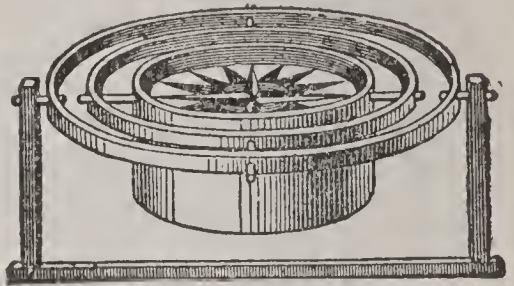
GINGERBREAD: article of food, in vogue certainly since the 14th c., when it was made and sold in Paris, according to Monteil in his *Histoire des Français* (II. 47, 48); it was then made of rye dough, kneaded with ginger and other spice, and honey or sugar. It was probably introduced into England by the court of Henry IV., and is in familiar household use in that country and in America. The expensive honey early gave way to the cheaper treacle, and the color was hidden under some coloring matter or gilding. 'To take the gilt off the gingerbread,' has become a proverb; and gilded G. is still occasionally seen. Three forms of G. are common. 1. Square soft cakes, from two to three inches in thickness. 2. Thin cakes of various forms, but usually round, stamped out with the top of a wine-glass, or other contrivance. 3. Small button-like cakes, called gingerbread-nuts. The last two should be baked very quickly, crispness being indispensable. The constituents of modern G. are treacle, or molasses, moist sugar, wheat flour, and butter; a little carbonate of magnesia and tartaric acid, or carbonate of ammonia, put in to give lightness.

GINGERLY, ad. *jīn'jēr-ŭ* [AS. *gyng*, young, tender; *gyngre*, younger, more tender: prov. Sw. *gingla*, to go gently]: cautiously; carefully, as from delicacy or timidity.

GINGER-WINE: cheap liqueur, partly of domestic manufacture, and partly made on a larger scale for sale. It may be made by dissolving about 6 lbs. of sugar in 14 gallons of water; adding 4 oz. of bruised ginger and the whites of 2 eggs, well beaten (chopped raisins may be added); mixing all thoroughly; boiling for a quarter of an hour; skimming carefully; and when the liquor has



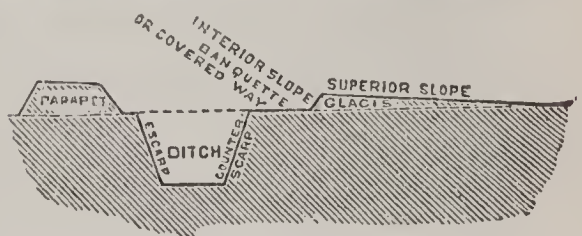
Young Dog-fish, showing transitory external Gills.



Gumbals, with Compass.



Gin for raising heavy Weights.



Glacis.



Glacier of Grindelwald, Switzerland.

GINGHAM—GINGKO.

cooled, adding the juice of 4 lemons, also their rinds for flavoring, with a tea-cupful of ale-yeast to promote fermentation; letting it ferment in an open vessel 24 hours, and then putting it into a cask of suitable size, closely bunged, in which it remains for a fortnight, before it is bottled. It is very common to increase the strength of G.-W. by addition of spirits, the flavor also being modified by the kind of spirits. A little spirits added makes G.-W. keep well, and it even improves in quality for many months. Its quality depends much on that of the sugar and of the ginger employed, also on care in the manufacture.

GINGHAM, n. *gĭng'ăm* [Fr. *gingan*—said to be from *Guĭngamp*, in Brittany, France: comp. Javanese *ginggang*]: cotton cloth, the yarn of which is dyed before being woven—thus distinguished from printed cotton or prints. This fabric with its name was introduced into Britain from India; now British manufacture supplies the Indian market. At first the Indian gingham consisted of cotton cloths, with two or more colors arranged as a small checkered pattern; now, a great variety of designs are found, and in umbrella gingham, the whole piece is woven with yarn of one color. The following are the chief kinds of G. known in the markets of Great Britain: plain common light grounds; plain common dark grounds; Earlston gingham; power-loom seersuckers and checks (imitations of the Indian patterns); muslin ground (stripes and checks); furniture stripes and checks; colored diapers; crossover stripes; derries, Hungarians; jean stripes, and umbrella gingham.

GINGILIE OIL, *jĭn'jĭl-ĭ*: bland fixed oil obtained by expression from the seeds of *Sesamum Indicum*: see SESAMUM.

GINGIVÆ, n. plu. *jĭn-jĭ'vĕ* [L. *gingĭva*, a gum]: the gums; a dense fibrous tissue, very closely connected with the periosteum of the alveolar processes, and covered by a red mucous membrane. GINGIVAL, a. *jĭn'jĭ-văl*, of or pertaining to the gums. GINGIVITIS, n. *jĭn'jĭ-vĭ'tis*, inflammation of the gums.

GINGKO, *jĭng'ko*, or GINKO, *jĭn'ko* (*Salisburia adiantifolia*): large tree of nat. ord. *Taxaceæ* (yew, etc.), with straight erect trunk and conical head, and leaves remarkably resembling the leaflets of the fronds of maidenhair, somewhat triangular, cloven and notched at the upper extremity, shortly stalked, leathery, smooth, shining, yellowish green, with numerous minute parallel ribs, and somewhat thickened margins. The fruit is a sort of drupe, of which the fleshy part is formed by the persistent calyx, about an inch in diameter; the nut or endocarp white, a thin shell with a farinaceous kernel resembling an almond in flavor with a little mixture of austerity. The tree is a native of China, but has been long known in Europe, and large trees are now seen in England. The wood is easy to work, receives a fine polish, is yellowish white, veined, and not resinous. In China and Japan, the

GINGLE—GINSENG.

G. is grown chiefly for the kernel, which is freed from austerility by boiling and roasting. The fleshy part of the fruit, though resinous and astringent, is eaten after being



Gingko:

a, branchlet of female tree; *b*, branchlet of male tree, in flower; *c*, male flowers; *d*, female flowers; *e*, fruit; *f*, anther.

slightly roasted. The male and female flowers are on different trees; but the Chinese plant several close together, which grow into a monstrous tree, producing both male and female flowers.

GINGLE, n. *jīn'gl*: see JINGLE.

GINGLYMUS, n. *gīng'gli-mūs* [Gr. *gingglūmōs*, a hinge or joint]: a joint allowing motion in two directions only, as the joint of the elbow and lower jaw. GIN-GLYMOID, a. *-moyd* [Gr. *eidos*, resemblance]: resembling a hinge.

GINNUNGA-GAP: in Norse myth., the primeval abyss; the abyss of abysses: see SCANDINAVIAN MYTHOLOGY.

GINSENG, n. *jīn'sēng* [Chinese, *genseng*, first of plants]: Asiatic plant, whose root, of aromatic flavor, is highly esteemed as a medicine among the Chinese, being universally regarded as possessing extraordinary virtues, and as a remedy for almost all diseases, but particularly for exhaustion of body or mind. The root is sold sometimes for its weight in gold. It was once introduced into Europe, but



Ginseng (*Panax quinquefolium*).

GIOBERTI.

soon forgotten. The G. is a species of *Panax*, of nat. ord. *Araliaceæ*, to which the name *P. Ginseng* has been given, and which is a native of Chinese Tartary; having a stem one ft. to two ft. high, leaves on long stalks, five-fingered, and almost quite smooth; and umbels on a long terminal stalk. It is doubted by many botanists if this species is really distinct from *P. quinquefolium*, a common N. American plant; the root of which is now an article of export from N. America to China, and is used as a domestic medicine in the states w. of the Alleghanies, but which European and American medical practitioners generally regard as almost worthless. It is mucilaginous, sweetish, and slightly bitter and aromatic.—*P. fruticosus* and *P. cochlearifolium* are fragrant aromatics, growing in the Moluccas, and used by the native practitioners of India.—The fruit of the genus *Panax* is succulent, compressed, with two or three leathery one-seeded cells.

GIOBERTI, *jo-bēr'tē*, VINCENZO: 1801–1852, Oct. 26; b. Turin: ablest philosophical writer of modern Italy. He was educated for the church, obtained the degree doctor of theology 1823, and was ordained to the priesthood 1825. He was appointed prof. of theology in the univ. of his native city, and from the accession of Charles Albert till 1833 was chaplain to the court. At this period of rising political agitation, G. was accused of promoting the liberal movement, was dismissed from court, and imprisoned four months. Having obtained permission to retire into exile, he went first to Paris, and soon to Brussels, where he spent 11 years as private tutor in an academy, pursuing in his leisure hours his private studies. A devout Rom. Cath., G. looked on the papacy as the divinely appointed agency for the elevation of Italy among the nations. A confederation of states subject to papal arbitration, and having in the king of Piedmont a military protector, was the scheme devised by G. for the unity and regeneration of his country. In short, in the 19th c. he advocated the Guelph policy of the middle ages. These views he elaborately developed in his work entitled, *Il Primato Civile e Morale degli Italiani* (The Civil and Moral Supremacy of the Italians). Its publication in Paris 1842, during the author's exile, was hailed with enthusiasm by Italy, with the exception of a limited and far-sighted section of the country. The liberal and conciliative policy adopted by Rome on the accession of Pius IX., appeared the verification of G.'s predictions, and increased his popularity. On his return to Italy, he was received with ovations from all classes of people, and chosen by several towns as their representative in parliament. The king appointed him senator, he subsequently was elected pres. of the chamber of deputies, and finally prime minister; but owing to the great divergence of opinion among his ministry, he held office only a few weeks. His successor dispatched him to Paris on some unimportant mission, in order it was thought to remove him from Turin; and thus ended G.'s political career. Broken in spirit by the failure of his plans for his country, he died at Paris, of apoplexy. As a politician, G. failed in far-sight-

GIOBERTINE TINCTURE—GIOCONDO.

edness; and with the course of events in Italy, his influence as a political guide inevitably declined; but the depth and range of thought and strength of conviction evinced in his various works, give him high standing as writer and thinker. G.'s remarkable gentleness in private intercourse gave no sign of the force with which his writings propound an opinion or denounce an opponent.

G.'s system of philosophy stands apart from modern schools of thought. In his *Introduction to Philosophy* (Paris 1839) he teaches that the source of all human knowledge is in God. 'The name which he gives it is "The Idea or Thought." This is communicated to man in proportion as he is capable of receiving it and is "the light which lighteth every man that cometh into the world." Man receives it by his reason, which is capable of directly beholding it. Supernatural knowledge can be conveyed only by means of language, and divine truths are not seen by intuition but are believed. The basis of all knowledge is the knowledge of being, not of its abstract idea, but of the personal Being, God himself acting as a cause and producing existences. The knowledge of this being is gained by revelation through the written word wherein he declares himself "*I am that I am.*" As God is the only Being, all other things are "existences:" and man learns from the written word that the One Being creates existences; not that he extends himself into these various manifestations, as Hegel says; not that he cause them to emanate from himself, as other pantheists say; but that he *creates* them. Nothing but the act of creation could assure to man the reality of external things. Man's permanent possession of the divine thought depends, in a measure, on himself: he may consent to and obey it, and thus secure it; or may rebel against it, and thus lose it. It is by participation of it that individuals possess a moral personality; it is the vital principle the entire withdrawal of which would result in annihilation.' The final hope of man and of the world is in God. 'The Being who creates existences also redeems them.' Among Gioberti's more popular works *The Moral and Civil Supremacy of the Italians*, and *The Modern Jesuit*, (8 vols. Lausanne 1847), produced great effect, and though perfectly 'orthodox' doubtless hastened the transfer of power from clerical to civil hands. Jesuit influence however succeeded in placing these books in the *Index*; yet they continue to be read by the people.

GIOBERTINE TINCTURE: see PALIMPSEST.

GIOCONDO, *jo-kon'do*, or JOCUNDUS (FRA GIOVANNI): 1450-1530; b. Verona, Italy. architect. He was educated for the priesthood, became a Dominican friar, studied archeology and architecture in Rome, planned the fortifications of Treviso, was architect to the emperor Maximilian at Verona and built the council palace and the church of Sta Maria della Scala 1494-98, and entered the service of Louis XII. of France 1500. During the next seven years he was occupied in building the bridges of Notre Dame and the Hotel Dieu, in Paris. After constructing the Fondaco de

GIOJA—GIORDANO.

Tedeschi, on the Venetian Rialto, he was appointed by the pope architect of St. Peter's, in Rome 1514, where he labored cotemporaneously with Raphael. He was thoroughly versed in philosophy, theology, and Greek and Latin literature.

GIOJA, *jō'yâ*: town of Italy, province of Reggio (Calabria), a mile from the sea, 28 m. n.e. of Reggio. It is said to be of ancient origin, and has sustained several severe sieges. It was almost destroyed 1783 by an earthquake, and now has a pop. of only 2,800.

Another GIOJA is a town in the province of Aquila, 34 m. s.s.e. of Aquila, 60 m. from the sea, in a mountainous though productive territory.

Another GIOJA is a town in the province of Caserta, six m. n.w. of Cerreto. Pop. 1,800.

GIOJA, *jō'yâ*, DEL COLLE: town of s. Italy, province of Bari, 26. m. s. of Bari. It is a thriving industrious place, surrounded by a fine fertile territory; formerly famous for the beauty of its woods, favorite hunting-grounds of Emperor Frederic II. Pop. (1881) 17,016.

GIO'JA, MELCHIORRE: 1767, Sep. 20—1829, Jan. 2; b. Piacenza: Italian statistician. He was educated for the priesthood, and was for a time tutor in a noble family, but through the liberality of his brother was enabled to follow his own bent toward social and economic science. When the invading forces of France descended into Italy, G. had already attracted much notice by his political writings; and 1797 he quitted Piacenza for Milan, and was appointed state historiographer, of which post he was deprived 1803, through dissatisfaction with his work on divorce. In 1806, he was appointed director of the statistical dept., and 1809 was charged with the preparation of a grand statistical report of all Italy. A change of government interrupted this great labor. G. died at Milan. His laborious habits and immense knowledge enabled him to accomplish an incredible amount of labor; but he showed weakness in resenting with bitter personal invective the least unfavorable criticism of his works. Some of his chief works are: *Sul Commercio de' Comestibili e caro prezzo del vitto* (Milan 1802, 2 vols. 12mo); *Teoria civile e penale del divorzio ossia necessità, cause nuova maniera di organizzarla* (Milan 1803, 8vo); *Nuovo prospetto delle scienze economiche, ossia somma totale delle idea teoriche e pratiche in ogni ramo d'amministrazione privata e pubblica* (Milan 1815-19, 6 vols. 4to); *Filosofia della Statistica* (Milan 1826, 2 vols. 4to); *Dell' ingiuria, dei danni, del soddisfacimento e relative basi di stima* (Milan 1802, 2 vols. 8vo).

GIOJOSA, *jō-yō'sâ*: town of s. Italy, province of Reggio; about 7 m. n.e. of Gerace, in a fertile and beautiful district. It is supposed to have risen on the ruins of the anc. city of Mitra, mentioned by Pliny. Its air is remarkable for purity, and its inhabitants for physical vigor and beauty. Pop. 8,000.

GIORDANO, *jor-dâ'nō*, LUCA: Italian painter: abt. 1632-1705, Jan. 12; b. Naples, of impoverished parents. He

GIORGIONE—GIOTTO.

studied under Ribbena or Spagnoletto. He had fine imagination and delicate touch, yet both his early productions and those of his mature years, indicate a power of beautifully correct imitation rather than any marked originality or genius. G. went to Rome, then to Lombardy and Venice, to familiarize himself with the schools of art. In 1692 he went to Madrid at the request of Charles II., King of Spain, who desired his assistance in the embellishment of the Escorial. His pleasing manner and genial humor made him a special favorite at the Spanish court. At the death of the king, ten years later, he returned to Italy. His extreme rapidity of execution, for which G. was remarkable, enabled him to produce a prodigious number of works, but lowered their quality; they possess, however, many beauties, such as animation, harmonious freedom of treatment, boldness and perfection of foreshortening. The palaces Riccardi and Pitti contain fine specimens of this artist's style, but his best paintings are in the galleries of Dresden and Naples, and the Escorial at Madrid. The name *Fa presto*, which distinguished him through life, referred to his father's incessant injunctions to *work quickly*, in order that the proceeds of his labor might relieve the indigence of the family.

GIORGIONE, *gor-jō'nā*, or GIORGIO BARBARELLI, *gor'jō bār-bā-rēl'lē*: abt 1478-1511; b. Castelfranco, in the Venetian territory of Trevisano: one of the most poetical and fascinating of Italian painters. He studied under Giovanni Bellini, but quickly surpassed his master; for while Bellini's style is distinguished for its minute finish and cramped precision, that of G. revels in freedom and breadth of outline, and gorgeous depth of color. Unfortunately for art, G. died at the early age of 33. His few works are among the most rare and exquisite examples of the Venetian school. Scriptural scenes, highly original in idea and treatment, portraits, and a few sweet idyllic scenes, representing pastoral concerts and sylvan enjoyments, are his subjects. The Lombard galleries and the Louvre possess the best authenticated originals of G., whose imitators were numerous.

GIOTTO, *jōt'to*, or AMBROGIOTTO BORDONE, *ām-brō-jōt'tō bor-dō'nā*: great Italian painter, architect, and sculptor: 1276-1336; son of a poor shepherd. He passed his earliest years in watching flocks in his native Tuscan valley of Vespignano. Here he first essayed to reproduce on a fragment of slate the forms of nature surrounding him, foreshowing his later achievements in depicting nature in her purest and most winning aspects. One of these simple pictures of sheep having fallen under the notice of Cimabue was the occasion of G.'s being received into Cimabue's studio. G.'s intuitive perception of the *true* in art speedily emancipated him from the conventionalities, though Cimabue himself had previously moved in this direction. In G.'s paintings, however, we first markedly observe instead of the flat elongated forms and lifeless features of the Byzantine types, figures imbued with the varied action and expression of nature, and exhibiting an ideal elevation and grandeur of character. He first also practiced the art of grouping with due

GIOVANNI A TEDUCCIO—GIP.

regard to the sentiment and action of the composition, and gave simplicity and grace to the draping outline; in short, he effected a profound reformation in the style of art, which from his era assumed its rightful alliance with the beautiful in nature. G. was also an eminent architect, and was employed in designing the w. front of the cathedral of Florence, and its detached Campanile (q.v.). The beloved friend of Dante, and of all the great souls of his age, he presented a rare union of genius, knowledge, and wit, with the utmost equanimity of humor and massive good sense. The restorer of portraiture, his pencil has transmitted to our day the features and personality of his cherished Dante, of Brunetto Latini, Corso Donati, and other celebrities; and in return we find his name enshrined with reverence in all the grand literary works of the times, especially in those of Dante, Boccaccio, and Petrarca. The works of this illustrious man are too numerous to be recorded here: some of the principal are *The Coronation of the Virgin*, in the church of Santa Croce at Florence; *A Last Supper*, in the refectory; the famous mosaic, executed at Rome for Pope Boniface VIII., named *La Navicella*, and representing Peter walking on the waves, a wonderful work, which has unhappily suffered severely in the successive repairs that it has required; the frescoes of the *Seven Sacraments*, painted at Naples in the church of the Incoronata, one of the most perfect of his works in point of preservation; and the frescoes of *Assisi*, illustrating the life of St. Francis, and innumerable other minor works. G. died at Florence, and was interred in the church of Santa Maria del Fiore, where a marble monument was erected to his honor by Lorenzo de' Medici.

GIOVANNI (SAN) A TEDUCCIO, *jō-vân'nē â tâ-dôt-chō*: town of Italy, three m. e. of Naples, near the sea-shore in a fertile plain. Its neighborhood is well cultivated, and embellished with beautiful villas. Its origin is supposed to be very ancient, and its name is attributed to Emperor Theodosius, whose name is carved on a small ancient column discovered in the vicinity of the town. Pop. 5,400.

GIOVANNI (SAN) IN FIORE, *jō-vân'nē ïn fē-ō'rā*: town of s. Italy, 24 m. e. of the town of Cosenza. Pop. 9,500.

GIOVANNI (SAN) ROTONDO, *jō-vân-nē rō-tōn'dō*: town of s. Italy, province of Foggia, 19 m. n.e. of the town of Foggia, near Mount Gargano. There are manufactures of linen and woolen fabrics. Pop. 8,000.

GIOVENAZZO, *jō-vā-nât'sō*: thriving little town in s. Italy, province of Bari, on the shore of the Adriatic, 14 m. w.n.w. of the town of Bari. It is considered the Natiolum of the Romans, and possesses some remains of its ancient walls. In the 11th c. it belonged to the Greeks, and eventually passed into the possession of the Gonzaga family. Here is an excellently organized asylum for the poor, with extensive juvenile reformatories. G. is encircled by vineyards and rich plantations of olive, almond, and other fruit-bearing trees. Pop. 10,000.

GIOVIO, PAUL: see **JOVIVS, PAULUS**.

GIP, n. *jǐp*: see **GYP**.

GIPSIES—GIRAFFE.

GIPSIES: see GYPSY.

GIPSIRE, n. *jǐp'sīr* [F. *gibecièrè*; OF. *gibecer*, a game-pouch—from mid. L. *gibācērīā*, a large pouch]: in *OE.*, a game-bag; a purse or pouch formerly worn at the girdle.

GIRAFFE, n. *jǐ-rāf'* or *zhǐ-rāf'*, or CAMELOPARD [F. *giraffe*—from Sp. *girafa*—from Ar. *zirāf*, or *zirāfah*, a giraffe], (*Camelopardalis Giraffa*): tallest of quadrupeds, ranked by some naturalists among deer (*Cervide*), but properly regarded as a distinct family of ruminants, which contains, however, only one species. It is a native of Africa, from Nubia to the Cape of Good Hope, extensively diffused, but apparently nowhere abundant. It occurs generally in small herds of 5-40. It feeds on the leaves and small branches of trees. Its general aspect is remarkable from the height of the foreparts and great elongation of the neck, the head being sometimes 18 ft. from the ground. The number of vertebræ in the neck, however, is not greater than in other quadrupeds, and it has no extraordinary flexibility, though its form and movements are very graceful. The body is short, and the back slopes from the shoulder to the tail; but the greater height of the foreparts is not owing, as often alleged, to the greater length of the fore-legs, which are not really longer than the hind-legs, but to processes of the vertebræ, which form a basis for the muscular support of the neck and head. The articulation of the skull to the neck is such that the head can be easily thrown back until it is in the same line with the neck, thus giving the animal additional power of reaching its appropriate food. The skull has empty cavities, which give lightness to the head, with sufficient extent of surface for the insertion of the ligament which supports it. The legs are long and slender; the feet have cloven hoofs, but are des-



Giraffe.

titute of the small lateral toes or spurious hoofs of the other cloven-footed ruminants. The head is long; the upper lip entire, projecting far beyond the nostrils, and

GIRALDUS CAMBRENSIS.

endowed with considerable muscular power. The tongue is remarkably capable of elongation, and is an organ of touch and of prehension, like the trunk of an elephant; it can be thrust far out of the mouth, and employed to grasp and take up even very small objects; it is said that its tip can be so tapered as to enter the ring of a very small key. The usefulness of such an organ for drawing in leaves and branchlets to the mouth is obvious. The G. adroitly picks off the leaves of acacias and other thorny plants, without taking the thorns into its mouth. The dentition of the G. agrees with that of antelopes, sheep, goats, and oxen; the upper jaw of the male is destitute of the canine teeth which are present in the male of most kinds of deer. The head is furnished with two remarkable protuberances between the ears, generally described as horns, but very different from the horns of other animals, and each consisting of a bone united to the skull by an obvious suture, permanent, covered with skin and hair, and terminated by long hard bristles. There is also a projection on the forehead. The ears are moderately long; the tail is long, and terminates in a tuft of long hair that nearly reaches the ground. There is a callosity on the breast. The neck has a very short mane. The hair is short and smooth; the color is a reddish white, marked by numerous dark rusty spots. The eye of the G. is very large and lustrous, and so placed that the animal can look all around without turning its head, so that in a wild state it is not easily approached. Its nostrils have a muscle by which they can be closed; a provision, as Owen supposes, for excluding particles of sand. It is an inoffensive animal, and generally seeks safety, if possible, in flight, though it is capable of making a stout resistance, and is said to beat off the lion. It fights by kicking with its hind-legs, discharging a storm of kicks with extraordinary rapidity. It is not easily overtaken even by a fleet horse, and has greatly the advantage of a horse on uneven and broken ground. Its pace is described as an amble, the legs of the same side moving at the same time. The G. was known to the ancients, and was exhibited in Roman spectacles. Representation of it appear among Egyptian antiquities. It has been supposed to be the *zemer* of the Jews, translated *chamois* in the English Bible (Deut. xiv. 5). In 1836, giraffes were added to the collection in the Zoological Gardens of London, and interesting opportunities of studying their habits have since been enjoyed. They are fed chiefly on hay placed in high racks, greatly enjoy carrots and onions, and a lump of sugar is a favorite delicacy. They have bred in England. The flesh of the G. is said to be pleasant, and its marrow is a favorite African delicacy.

GIRALDUS CAMBRENSIS, *jǐ-rǎl' dǔs kǎm-brĕn'sĭs* (literary name of Girald de Barri): abt. 1146—abt. 1219; fourth son of William de Barri, a Norman noble who had settled in Pembrokeshire and allied himself by marriage to the family Rhys ap Theodor, prince of S. Wales. G. was educated by his uncle David, Bp. of St. David's; entered the Univ. of Paris in his 20th year, and after three years of lit-

GIRALDUS CAMBRENSIS.

erary distinction returned to England, entered into holy orders 1172, and was soon appointed Archdeacon of St. David's. He was from the first a zealous churchman; strenuous in the enforcement of discipline, especially as to clerical celibacy; and was the chief agent in the establishment of the payment of tithes within the principality. On the death of his uncle, the chapter of St. David's elected him bishop; but as the election was made without the royal license, G. renounced it. The king, Henry II., directed a new election; and on the chapter's persisting in their choice of G., the king refused to confirm the selection, and another bishop, Peter de Leia, was appointed. G. withdrew to his old residence in the Univ. of Paris, and on his return was required, by the Abp. of Canterbury, to take the administration of the diocese of St. David's, which had utterly failed in the hands of De Leia. He held it four years, when being appointed a royal chaplain, and afterward preceptor to Prince John, he accompanied that prince 1185 in his expedition to Ireland, where he remained after John's return, to complete the well-known descriptive account of that country, which, though very valuable as a whole, has in its details called forth angry criticism from Irish scholars and antiquaries. On his return 1187, he read this work publicly in the Univ. of Oxford, giving a full day to each of the three divisions of which it consists. A tour of Wales (1188) in the company of Baldwin, Abp. of Canterbury, led to a similar descriptive work, *Itinerarium Cambriæ*. In the following year he accompanied the king to France, where he remained till the king's death. His later years, after his return, were full of disappointment. On the see of St. David's again becoming vacant, he was again unanimously elected by the chapters; but the Abp. of Canterbury having interposed, G., notwithstanding an appeal to Rome, in prosecuting which he made three different journeys in five years of the contest, failed to obtain a confirmation of the nomination. He soon resigned his archdeaconry, and devoted the remaining 17 years of his life to study. Once again the see of St. David's became vacant, but though it was offered to G. on certain conditions, he declined to accept it. He died at St. David's in the 74th year of his age. The reason why G.'s appointment to the bishopric was so much opposed is not clear, but the king, it is said, had resolved that no native of Wales should obtain the dignity. G.'s writings, though disfigured by credulity, and, in the personal narratives with which they abound, by excessive vanity, are of great value as materials for the history and the social condition of the age and the countries which he describes. But they must be read with careful critical consideration of the sources of the information which they embody. Several of his works are still preserved in manuscript in the British Museum, the Bodleian, the Lambeth, and Corpus Christi College Libraries. His printed works are *Itinerarium Cambriæ*; *Topographiæ Hiberniæ*; *Expugnatio Hiberniæ*; *Descriptio Cambriæ*; and several smaller pieces, printed in Vol. II. of Wharton's *Anglia Sacra*,

GIRANDOLE—GIRARD.

Barri's work on Ireland called forth several rejoinders, the most valuable of which is that of John Lynch (under the pseudonym *Gratianus Lucius*), entitled *Cambrensis Eversus*. Sir Richard Colt Hoare translated *Itinerarium* (2 vols. 1806); and his complete works have been edited by J. S. Brewer and J. F. Dimock (7 vols., Rolls series 1861-77).

GIRANDOLE, n. *jīr'ān-dōl* or *zhīr'ān-dōl* [It. *girandola*—from L. *gyrārē*, to turn round in a circle]: a large kind of branched candlestick; a candelabrum.

GIRARD, *zhē-rār'*. PHILIPPE HENRI DE: 1775, Feb. 1—1845, Aug. 26; b. near Avignon, France: inventor. At the beginning of the Revolution he accompanied his family to Italy, supported himself by painting sometime, established a soap factory at Leghorn 1793, and after the fall of Robespierre returned to France and opened a chemical factory at Marseilles. Soon afterward he became prof. of chemistry and natural history at Nice. In 1800 he returned to Marseilles, and went thence to Paris, where with his brother Frederick he began manufacturing soap. In 1804 the brothers took out a patent for the 'fountain' lamp, and 1806 he received a gold medal for his invention of a one-cylinder direct-acting steam-engine. In 1810 he began experiments to produce a machine for spinning flax for which Napoleon had decreed a reward of 1,000,000 fr.; succeeded in his attempts, and started factories in Paris and Charonne, where he used his invention 1813. The fall of the emperor 1815 deprived him of the decreed reward, but he was officially declared to have earned it. Failing to secure the reward with which he expected to pay the expenses of his experiments, he was obliged for financial reasons to leave France. He went first to Austria where he established a flax-mill at Hirtenberg and built the first line of steamships on the Danube, then 1825 to Poland, on the invitation of the emperor of Russia, where he built another flax factory and became chief engineer of the mines, and 1844 returned to Paris. Among his exhibits at the exposition of that year were a machine for combing flax, a machine for making gun-locks, several improvements in guns, a double-octave piano, and a new instrument called the *tremolophone*. He received a gold medal for his various flax-treating inventions, a pension from the Russian govt. for services in Poland, and shortly before his death a further pension from the Soc. of Inventions.

GIRARD, *jē-rār'*, STEPHEN: 1750, May 24—1831, Dec. 26; b. near Bordeaux, France: philanthropist. He was brought up a sailor, became capt. of a vessel, engaged in the American coasting and West India trade, and settled in Philadelphia 1769, where he carried on the shipping and mercantile business till the revolutionary war, and then established himself as a grocer, sutler, and liquor dealer. 1780-90 he was again in the W. India trade, became custodian of a large amount of money and valuables belonging to Haytian planters during the insurrection 1791-1804, and which was never called for, invested largely in Philadelphia real-estate and the shares of the old Bank

GIRARD COLLEGE—GIRARDIN.

of the United States, and 1812 bought the bank building and conducted the business in his own name. In 1814 he loaned the govt. \$5,000,000, 1816 became a director of the second U. S. Bank, and at the time of his death was counted the richest man in the United States, possessing property worth \$9,000,000. He organized a yellow-fever hospital during the great epidemic 1793, and acted as head-nurse during its continuance. He gave large sums to local charities for local improvements and churches though despising Christianity, but would not answer appeals for aid from any source. In his will he bequeathed \$30,000 to the Penn. Hospital, \$20,000 to the Penn. Institution for the Deaf and Dumb, \$10,000 to the Philadelphia Orphan Asylum, \$10,000 to the Philadelphia public schools, \$10,000 to the city to provide fuel for the poor every winter, \$10,000 to the Soc. for the Relief of Distressed Shipmasters, \$20,000 for Masonic uses, \$500,000 to the city of Philadelphia for street improvements and public buildings, \$300,000 to the State of Penn. for the improvement of its canal navigation, a large amount of real-estate to the city of New Orleans, and \$2,000,000, a plot of ground in Philadelphia, and the residue of one portion of his estate for the erection and support of an orphans' college. His will further provided that no minister or ecclesiastic of any church or sect should ever be connected with the college or even permitted to visit it. See GIRARD COLLEGE.

GIRARD' COLLEGE: in Philadelphia, founded by Stephen Girard (q. v.) for the benefit of poor white male orphans, and built and managed according to the founder's instructions in his will. The grounds have an area of 41 acres, are surrounded by a stone wall 10 ft. high, and contain a main building and five subordinate ones. The college proper is in the form of a Corinthian temple, 169 ft. long, 111 ft. wide, 97 ft. high, with outer walls, staircases, floors and roof of white marble and inner walls of brick, and with a portico of 34 columns, each 55 ft. high and 6 ft. in diameter. The founder died 1831, Dec. 26, the buildings were begun 1833, July, and opened 1848, Jan. 1. Two of the subordinate buildings, also of marble, stand on each side the main structure, and the fifth, near by, is used for laundry, bakery, and laboratory purposes. The buildings cost between \$1,900,000 and \$2,000,000, and the value of the residuary fund was estimated 1887 at \$10,684,580. Applicants for admission must be poor white male orphans, between the ages of 6 and 10 years. They are fed, clothed, educated, and bound out to mechanical, agricultural, or commercial occupations between the ages of 14 and 18 years. The number of beneficiaries 1902 was 1,677, and the pres. Adam H. Fetterolf, PH.D., LL.D.

GIRARDIN, zhē-hār-dǎng', EMILE DE: French journalist and politician: 1802-1881, Apr. 27; b. in Switzerland; illegitimate son of the royalist gen. Alexandre de G. and Madame Dupuy. He was educated in Paris, and 1823 was appointed gen. sec. of the royal museums. After the July revolution, G. established the *Journal des Connaissances*

GIRARDIN—GIRARDON.

utiles, for which he secured 120,000 subscribers; in 1832, the *Musée des Familles*; and in 1834, the *Almanach de France*. He published also *Atlas de France* and *Atlas Universel*. These publications were set forth as emanating from a *Société Nationale pour l'émancipation intellectuelle*, and had considerable influence on the progress of public instruction in France. In 1836 he founded the *Presse*, as an organ of political conservatism, and soon found himself in violent controversies: one result of these was his duel with Armand Carrel, editor of the *National*, in which the latter fell. From this time till the revolution of 1848, he was ardently occupied with politics both as journalist and deputy; and from being a defender of Guizot and moderate liberalism, he became a decided republican.

G. was the first to propose Louis Napoleon as a candidate for the presidency, but only four weeks after the triumph of Louis Napoleon, he opposed him with the greatest virulence—the reason generally given, being the president's disagreement with the political scheme which G. submitted to him. G. then threw himself into the arms of the socialists. In 1856 he sold his share of the *Presse*, but became ed. of it 1862, eventually abandoning it for the direction of *La Liberté*, which he continued till 1870. In 1874 he became ed. of the *Journal La France*. He wrote a few pieces for the stage; his political ideas he gave to the world in a host of brochures.—MADAM E. DE GIRARDIN (1804–55), wife of Emile de G. (maiden name, Delphine Gay) had brilliant reputation as poetess, novelist, and play-writer. Her best known work is *Lettres Parisiennes*, in her husband's periodical *La Presse*, under the pseudonym Le Vicomte de Launay.

GIRARDIN', ST. MARC (real name MARC GIRARDIN): 1801–73, Apr. 11; b. Paris: French journalist and professor. He studied at the Collège Napoléon and the Collège Henri IV., and 1827 obtained a professorship in the Collège Louis-le-Grand. Afterward he was appointed to succeed Guizot as prof. of history in the Faculty of Letters, was named master of requests to the council of state, and 1834 was called to the chair of poetry at the Sorbonne. About the same time he was elected to the chamber of deputies, and acquired reputation by his report on the organization of secondary instruction 1837. In 1844 he was received into the Académie. G. took no special part in the revolution of 1848. In 1863 he resigned his professorial chair. His great influence and popularity as a lecturer, were due to his clearness, good sense, and humor. He became a member of the national assembly 1871, and was more than once elected its vice-pres. Besides his numerous contributions to the *Débats*, which he partly edited from 1827, and to the *Revue des Deux Mondes*, he published several large works, among which are *Notices Politiques et Littéraires sur l'Allemagne* (1834); *Cours de Littérature Dramatique* (1843); and *Tableau de la Littérature au 16e Siècle, suivi d'Etudes sur la Littérature du Moyen Age et de la Renaissance* (1862).

GIRARDON, zhê-râr-dông', FRANÇOIS: 1628, Mar. 16—

GIRASOL—GIRD.

1715; b. Troyes, France: sculptor. He was apprenticed when a boy to a joiner and wood-carver in his native town, and while working at the château of Liebault attracted the attention of Chancellor Seguier, by whom he was aided to study in Paris and Rome. He returned to France 1650, began working under Le Brun, the gen. inspector of sculpture, and was subsequently given large commissions by the king for groups and statues in several royal palaces and gardens. In 1650 he became a member of the Acad., and 1690 successor to Le Brun. He executed four figures for the Bains d'Apollon; a bronze equestrian statue of Louis XIV. erected by the city of Paris on the Place Louis le Grand, and melted down during the Revolution; the tomb of Richelieu in the Church of the Sorbonne; the tombs of St. Eustache and St. Nicolas du Chardonneret; and decorative sculptures in the Galerie d'Apollon and Chambre du Roi, in the Louvre.

GIRASOL, or **GIRASOLE**, *jír'a-sól* [It. *girasole*—fr. L. *gyro*, I turn round in a circle; *sol*, sun]: precious stone, exhibiting in strong lights a peculiar and beautiful reflection of bright red or yellow light, which seems to come from the interior. There are different kinds of G., variously referred by mineralogists to quartz and opal, though very nearly allied. One kind is known as *Fire Opal*, found only at Zimapan, in Mexico, and in the Faroe Islands. The Mexican specimens are of a rich topaz-yellow color, and the reflection is very bright. Another kind is the *Quartz Resinite* of Häüy, so called because of its characteristic resinous fracture. It is of various colors, sometimes of a fine yellow or emerald green, but generally bluish white. For a specimen of extraordinary brilliancy, not an inch and a half in diameter, \$5,000 has been refused. The ancients held this stone in high estimation. They called it *Asteria* [Gr. *aster*, a star]. They obtained it from Caramania and from India: the Caramanian were preferred. The brightest are at present brought from Brazil, but fine specimens are brought also from Siberia. Imitation girasols are made of glass, in which a little oxide of tin is mixed.—The name G. is sometimes given to a kind of sapphire, called also *Asteria sapphire*, exhibiting a similar reflection of light; and sometimes to *Sunstone*, an aventurine felspar.

GIRASOLE, or **GIRASOL**, n. *zhír'ä-sól* [It. *girasole*—from L. *gyro*, I turn round in a circle; *sol*, sun]: plant called turn-sole; the Jerusalem-artichoke or sunflower.

GIRD, v. *gêrd* [Icel. *gærdr*, a fence or hedge; *girda*, to inclose or surround with a fence: Goth. *gairda*, a girdle: L. *gyräre*, to turn]: to bind round; to surround with a flexible substance, as a bandage, twig, or cord; to invest; to encircle: N. in *Scot.*, a hoop. **GIRD'ING**, imp. **GIRD'ED**, pp., or **GIRT**, *gêrt*. **GIRDER**, n. *gêr'dêr*, that which binds, ties, or encircles; in *arch.*, a principal beam in a floor for supporting the binding or other joists, used also for supporting the roadway of a bridge (see below). **GIRDLE**, n. *gêrdl* [Icel. *gyrdill*; Sw. *gördel*]: a band or belt for the

GIRD—GIRDLE OF VENUS.

waist; a zone (see below); in *Scot.*, a round iron plate on which bread is baked: V. to surround; to bind; to inclose. GIR'DLING, imp. GIR'DLED, pp. *-dld.*

GIRD, n. *gèrd*, or GIRR, n. *gér*: in *Scot.*, a hoop: see GIRD 1.

GIRD, v. *gèrd* [Ger. *gerte*; Dut. *gard*, a rod, as for chastising: Bav. *garten*, switches]: in *OE.*, to lash with sneers or reproaches; to sneer at: N. a sharp retort; a sarcasm. GIRD'ING, imp. GIRD'ED, pp.: see GRIDE.

GIRD'ER: a main beam used to support joisting walls, arches, etc. Girders may be of wood or iron, and are now usually of cast-iron. They are used as temporary support for upper walls of houses, while the lower part is cut away to allow of rearrangement. Wooden girders strengthened with iron trusses are called trussed girders. Sometimes a beam is cut in two, and an iron plate inserted between the pieces, and the whole bolted together: this girder is called a sandwich beam. Girders are much used in railway works, generally of wrought iron: the Menai and Britannia Bridges are simply very large boxed girders. The *lattice G.* is a form in which the sides are made somewhat like wooden lattice-work. See STRENGTH OF MATERIALS.

GIRDLE, n. *gér'dl*: see under GIRD 1.

GIRDLE, *gér'dl*: strip or band of various materials, plain or ornamented according to the fancy of the wearer, used around the waist to gather in the loose and often flowing outer robes, or to fasten and support other garments. The Romans used it to confine the tunic, and no one of good repute would be seen without one; Greek and Roman soldiers were never without it while in service, and when they laid it aside the act denoted their retirement from military life; and from remote days it has been a common article of dress in s. Europe and in all eastern countries. At various periods it was customary to carry the purse, dagger, rosary, pen and inkhorn, and bunch of keys, suspended from it. Bankrupts acknowledged their condition by removing and surrendering their girdles in open court, and widows renounced various rights by placing their girdles on their husbands' graves or tombs. In time great extravagance in girdles and girdle-buckles prevailed. From the 12th to the 16th c. the favorite style, as shown on brasses and monumental effigies, was a G. of leather or woven silk, adorned with gold and costly gems, and fastened with a buckle of some precious metal inlaid with gems. Edward III. prohibited the wearing of gold and silver girdles except by persons of knightly rank or those with £200 a year. The G. was an important feature of the dress of the Levitical priesthood, but does not appear as an ecclesiastical vestment in the Christian church till the 8th c., and a few centuries afterward it was denounced there as unbecoming, and fostering extravagance.

GIRD'LE OF VE'NUS (*Cestum Veneris*): very remarkable animal, one of the *Acalephæ* (q.v.), inhabiting the Mediterranean, gelatinous, of ribbon-like shape, sometimes

GIRGEH—GIRNAR.

five or six ft. in apparent length, by about two inches in breadth; though considered with reference to the structure of the animal, the apparent length is really its breadth, and the apparent breadth its length. The mouth is in the middle of the inferior edge, and the stomach is imbedded in the gelatinous substance. The edges are fringed with



Girdle of Venus (*Cestum Veneris*).

cilia, by the movements of which the creature seems to be propelled in the water. It exhibits lovely iridescent colors by day, and beautiful phosphorescence by night. Its substance is so delicate, that there is difficulty in obtaining a perfect specimen.

GIRGEH, *jirjè*, or GIRGA, or JIRJEH: town of Egypt, on the left bank of the Nile, lat. 26° 20' n., and long. 31° 58' e. Here the discontented Mamelukes rallied against Mohammed Ali. It contains eight mosques, a large bazaar, and a cotton manufactory. G. is cap. of a dist. with pop. (1882) 521,413. The town has a convent of Rom. Cath. missionaries, and there are abt. 800 Christians in its total pop. of 10,000.

GIRGEN TI: see AGRIGENTUM.

GIRL, n. *gerl* [Low Ger. *göre*, a child: prov. Ger. *görr*, a girl: Swiss, *qurrlì*, a depreciatory term for a girl]: formerly, a youth of either sex; a female child; a young woman; in *heraldry*, the young of the roe in its second year. GIRL'HOOD, n. the state of a girl. GIRL'ISH, a. *-ish*, like a young woman or child; youthful. GIRL'ISHLY, ad. *-li*. GIRL'ISHNESS, n. the manners of a girl.

GIRN, v. *gèrn* [see GRIN]: in *Scot.* and *OE.*, to whine and cry from ill-humor or fretfulness; to snarl; to grin; to gape: N. a crying from fretfulness; a grin. GIR'NING, imp. GIRNED, pp. *gèrnd*.

GIRNAL, n. *gèr'näl*. or GARNELL, n. *gâr'nël* [F. *grenier*; OF. *grainier*, a granary]: in *Scot.*, a granary; a large chest for holding meal.

GIRNAR, *ger'nar*: sacred mountain in India, of most remarkable aspect, in the peninsula of Kattywar (part of the native state of Guzerat), lat. 21° 30' n., and long. 70° 42' e. Above the mass of luxuriant hills and valleys which surround its base, rises a bare and black rock of granite about 3,000 ft. above the sea. The summit is broken into various peaks, its n. and s. sides being nearly perpendicular. An immense boulder, which seems poised on one of the scarped pinnacles, is called the Beiru Jhap, or Leap

GIRODET—GIRONDIST.

of Death, from its use by devotees for the purpose of self-destruction.

GIRODET DE ROUSSY, *zhe-ro-dā' dē rô-se'*, ANNE LOUIS (known as GIRODET-TRIOSON): 1767, Jan. 5—1824, Dec. 9; b. Montargis, France: painter. On the death of his parents he was educated and adopted by his guardian, whose name, Trioson, he added to his own. He studied painting in Paris with David, secured the Prix de Rome when 22 years old, spent 5 years in Italy, and settled in Paris 1795. While studying in Rome he painted and sent to Paris *Hippocrates Refusing the Gifts of Artaxerxes* and the *Sleeping Endymion*, which attracted special notice in the Salon of 1792, and on his return painted portraits of Chateaubriand and Hortense. *The Four Seasons* and *Danae* for the king of Spain; *Fingal, Ossian, and their Descendants welcoming to their Aerial Palace the Manes of French Heroes*, for Napoleon I. (1802); and the *Scene of the Deluge*, which was awarded the decennial prize in competition with David's *Sabines* at the Salon of 1806. The last, considered his greatest work, was followed by the *Reddition de Vienne* and *Atala au Tombeau* (1808); *Revolte de Caire* (1810); a *Tête de Vierge* (1812); *Pygmalion et Galatée* (1819); and portraits of Cathelineau and Bonchamps (1824).

GIRONDE, *jê-rōnd'*, F. *zhê-rōngd'*: maritime dept. in s.w. France; formed out of part of the old province of Guienne; bounded w. by the Bay of Biscay, on the n. by the dept. of Charente-Inférieure, on the e. by those of Dordogne and Lot-et-Garonne, and on the s. by that of Landes; 3,750 sq. m. It is watered mainly by the Garonne and the Dordogne, and by the Gironde, formed by the union of these two rivers. The surface of the land is in general flat, but in the e. are some hills. The climate is temperate, and except in the Landes or sandy tracts, which occupy nearly all the w. half of the dept., is healthful. In the e. and n.e. the soil is chiefly calcareous. Wine, including the finest clarets, is the great product. The principal growths are those of Lafitte, Latour, Château-Margaux, Haut-Brion, Sauterne, Barsac, St. Christophe, and the Vins de Grave, and the quantity produced annually averages 50,000,000 gallons. Grain, vegetables, fruit, and hemp, are produced largely. On the w. coast, on the downs or sand-hills, are extensive plantations of pine, from which turpentine, pitch, and charcoal are obtained. The shepherds of the Landes traverse the sands on high stilts, and travel with stilts also to markets and fairs. Among the manufactures salt, calico, muslin, chemical products, pottery, paper, vinegar, and brandy are chief. Bordeaux is the cap. Pop. of dept. (1881) 746,649; (1901) 821,131.

GIRONDIST, n. *jÿ-rōn'dist* [Fr. *Girondin*, fr. the dept. of Gironde]: one belonging to the moderate republican political party during the French Revolution. When the legislative assembly met 1791, Oct. the Gironde dept. chose for its representatives the advocates Vergniaud, Guadet, Gensonné, Grangeneuve, and a young merchant named Ducos, all of whom soon acquired great influence

GIRONDIST.

by their rhetorical talents, and by their political principles derived from a hazy notion of Grecian republicanism. They were joined by Brissot's party and the adherents of Roland, as well as by several leaders of the centre, such as Condorcet, Fauchet, Lasource, Isnard, and Henri La Rivière, and for some time had a parliamentary majority. They directed their efforts first against the reactionary policy of the court, and the king saw himself compelled to select the more moderate of the party, Roland, Dumouriez, Clavière, and Servan, to be ministers. Ultimately, however, he dismissed them, which led to the insurrection 1792, June 20. The encroachments of the populace, and the rise of the Jacobin leaders, compelled the Girondists to assume a conservative attitude; but though their eloquence still prevailed in the assembly, their popularity and power out of doors were wholly gone, and they were unable to prevent such hideous crimes as the September massacres. The principal things which they *attempted* to do after this—for they never succeeded in accomplishing anything—were to procure the arrest of the leaders of the September massacres, Danton, etc.; to overawe the mob of Paris by a guard selected from all the depts. of France; to save the king's life by the absurdest of all possible means, viz., by first voting his death, and then by intending to appeal to the nation; and, finally, to impeach Marat, who, in turn, induced the various sections of Paris to demand their expulsion from the assembly and their arrest. This demand, backed by 170 pieces of artillery under the disposal of Henriot (q. v.), leader of the sans-culottes, could not be resisted; 30 of the Girondists were arrested on a motion of Couthon, but the majority had escaped to the provinces. In the depts. of Eure, Calvados, and all through Brittany, the people rose in their defense, and under the command of Gen. Wimpfen, formed the so-called 'federalist' army, which was to rescue the republic from the Parisian populace. Movements for the cause of the Girondists took place likewise at Lyon, Marseille, and Bordeaux. The progress of the insurrection was, however, stopped by the activity of the convention. On July 20, the revolutionary army took possession of Caen, the chief station of the insurgents, whereupon the deputies of the convention, at the head of the sans-culottes, forced their way into the other towns, and commenced a fearful retribution.

1793, Oct. 1, the prisoners were accused before the convention by Amar, as the mouthpiece of the committee of public safety, of conspiring against the republic with Louis XVI., the royalists, the Duke of Orleans, Lafayette, and Pitt, and it was decreed that they should be brought before the revolutionary tribunal. On the 24th, their trial commenced. The accusers were such men as Chabot, Hébert, and Fabre d'Eglantine. The Girondists, however, defended themselves so effectually, that the convention on the 30th was obliged to come forward and decree the closing of the investigation. That very night, Brissot, Vergniaud, Gensonné, Ducos, Fonfrède, Lacaze, Lasource, Valazé, Sillery, Fauchet, Duperret

GIRONNÉ—GIRVAN.

Carra, Lehardy, Duchâtel, Gardien, Boileau, Beauvais, Vigée, Duprat, Mainvielle, and Antiboul, were sentenced to death, and, with the exception of Valazé, who stabbed himself on hearing his sentence pronounced, all perished by the guillotine. On their way to the Place de Grève, in the true spirit of French republicanism, they sang the *Marseillaise*. Coustard, Manuel, Cussy, Noel, Kersaint, Rabaut St. Etienne, Bernard, and Mazuyer, were afterward guillotined. Biroteau, Grangeneuve, Guadet, Salles, and Barbaroux ascended the scaffold at Bordeaux; Lidon and Chambon, at Brives; Valady, at Périgueux; Dechézeau, at Rochelle. Rebecqui drowned himself at Marseille, Pétion and Buzot stabbed themselves, and Condorcet poisoned himself. Sixteen months later, after the fall of the Terrorists, the outlawed members, including the Girondists Lanjuinais, Defermon, Pontécoulant, Louvet, Isnard, and La Rivière, again appeared in the convention. A somewhat flattering picture of the party has been drawn by Lamartine, in *Histoire des Girondins* (8 vols. Paris 1847).

GIRONNÉ, or **GYRONNÉ**, *jî-rôn'nâ*, or **GYRONNY**, *jî-rôn'nî* [Lat. *gyrus*, a circle]: term in heraldry, indicating that the field (q.v.) is divided into six, eight, or more triangular portions, of different tinctures, the points of the triangles all meeting in the centre of the shield.

GIROUETTE, n. *zhîr'û-ët'* [F. a weather-cock—from OF. *gîrer*—from L. *gyrârê*, to turn]: a politician who turns with every prevailing side.

GIRT, *gért*: pt. or pp. of **GIRD**, which see.

GIRT, v. *gert* [from **GIRD**]: to gird; to surround. **GIRT'ING**, imp. **GIRT'ED**, or **GIRT**, pp.

GIRTH, n. *gérth* [Icel. *gerd*; Dan. *giord*, a girth: AS. *gyrd*; Ger. *gurt*, a girth (see **GIRD** 1)]: the band or strap by which a saddle is made fast on a horse by passing it under his belly; the circumference or round measurement of timber, or of animals.

GIRTON COL'LEGE, *gér'ton*: most notable college for women in England, instituted at Hitchin 1869, removed to Girton, near Cambridge, 1873. Instruction is given in divinity, modern languages, classics, mathematics, moral science, natural science (including physiology and chemistry), history, music. There are ten lecturers, mostly connected with Cambridge University. The mistress and two resident lecturers are ladies. The candidates, who number above 60, are admitted after an entrance examination, the ordinary course extends over three years, half of each year being spent in college. 'Degree Certificates' are granted to those who satisfy their examiners as to their proficiency according to the standard of the examinations for the B.A. of Cambridge Univ.; the 'College Certificate' is granted for a somewhat different group of subjects. £85 per term covers all college charges.

GIRVAN, *gêr'van*: seaport and burgh of barony in Ayrshire, Scotland, at the mouth of the river G., about 21 m. s.w. of Ayr. It is connected with Glasgow and with

GISORS—GIULIO ROMANO.

Stranraer by railway. The valley of the Girvan is fertile and well cultivated and abounds with coal and with limestone. The town is opposite the 'Ailsa Craig,' and is frequented for sea-bathing. Pop. (1871) 4,776; (1891) 4,081.

GISORS, *zhē-zor'*: town of France, dept. of Eure, on the river Epte, 33 m. n.e. of Evreux, and on the high-road from Paris to Rouen. In a battle here, 1198, Oct. 10, the French were completely defeated by the English. Richard I., who commanded the English, gave, as the 'parole,' or watchword, *Dieu et mon Droit* (God and my right), which ever since has been the motto of the royal arms of England. Pop. of G. abt. 4,000.

GIST, n. *jīst* [OF. *giste*, a lying or lodging: F. *gīter*, to lodge: originally a lodging-place to a traveller for the night]: the main point of a question; that on which it rests or turns; point to arrive at: see GEST 2.

GITSCHIN, *gitch'in*, or JICZIN: town of Bohemia, on the Cydlina, 48 m. n.e. of Prague; it was formerly the cap. of the duchy of Friedland, and here Wallenstein built a splendid palace. In 1866, the Austrians were severely defeated here by the Prussians. Pop. abt. 8,000.

GITTERN, n. *gīt'térn*: see CITHERN.

GITTITH, n. *gīt'tīth* [Heb.]: this word, which is found in the titles of Ps. viii., lxxxi., lxxxiv., is by some supposed to signify a musical instrument (perhaps as used at Gath); by others, a vintage-song, or well-known tune, to which the Psalm could be sung. Various other explanations have been offered. The form *Gitteth* is an error.

GIUGLIANO, *jól-yá'nō*: market-town of s. Italy, eight m. n.w. of Naples. Pop. 12,000.

GIULINI, *jól-lē'nē*, GIORGIO: 1714-1780, Dec. 24; b. Milan: historian and antiquary. He studied law at the Univ. of Padua, and received the degree of doctor. After 20 years of patient labor, he published a valuable historical work, *Memoirs concerning the Government of Milan, with Description of the City and Milanese Territory from the Early Ages*, 4 vols., for the period from the destruction of the Lombard domination, to the opening of the 14th c. In three subsequent books, he descends to 1447. The work is considered by G.'s countrymen a masterpiece of learning, impartiality, and judgment: much of its history is based on the evidence of coins, seals, documents, and monuments of the various ages.

GIULIO ROMANO, *jól-lē-ō rō-má'nō* (real name GIULIO PIPPI, *jól-lē-ō pīp'ē*): 1492-1546; b. Rome (whence his name Romano): one of Raphael's most distinguished and beloved pupils. His excellence as architect and engineer almost equalled his genius as painter. He assisted Raphael in the execution of several of his finest works, and by special desire of the great master, he was intrusted with the completion of all his unfinished designs after his death. He likewise inherited a great portion of Raphael's wealth. The works executed by G., in imitation of Raphael, reflect so wonderfully, not alone the style and character, but the sen-

GIUNTA PISANO—GIUSTI.

timent and spirit of the original, that in many instances uncertainty has arisen as to the hand from which they came; but the more original creations of G. are deficient in the ideal grace of his master, and display rather breadth, power of treatment, and boldness of imagination, than poetical refinement or elevation. Unlike Raphael, the chief excellence of G. does not lie in his conception of the *divine* or Christian, but rather of the *classical* ideal.

The principal architectural works designed by G. were executed at Mantua, during his lengthened residence at the court of Duke Frederick Gonzaga. The drainage of the marshes surrounding Mantua, and the securing the city from the frequent inundations of the rivers Po and Mincio, attest his skill as engineer; while his genius as an architect found free scope in the restoration and adornment of many of the chief public edifices of Mantua, and especially in the erection of the splendid palace known as Il Palazzo del Te, which he also embellished with mythological frescoes, and a profusion of exquisite decorations. Many of G.'s finest pictures passed into the possession of Charles I. of England, who purchased, 1629, the celebrated collection of the Dukes of Mantua. Several are now in the Hampton Court Gallery; but the finest of all, a *Nativity*, was sold to France, and now adorns the Louvre. The Naples gallery of Capid'Opera possesses a Holy Family by G., called the *Madonna della Gatta*, and considered the greatest of his pictures; it is strongly imbued with the spirit and influence of Raphael. The Loggia of Raphael, in the Vatican, also contains some fine frescoes executed by G.; and in the Palazzo Farnese there is a grand frieze attributed to him.

GIUNTA PISANO, *jôn'tâ pē-sá'nō*: probably abt. 1180—abt. 1236; b. prob. in Pisa: earliest Italian painter whose name appears on any work now remaining. He painted on cloth sketched on wood and prepared with plaster; and his works are of a low grade in art.

GIURGEVO, *jôr-jã'vō* (Rumanian *Giurgiu*): town of Rumania, on the left bank of the Danube, directly opposite Rustchuk, 40 m. s.s.w. from Bucharest, of which town it is the port. It was originally the Genoese settlement of St. George. It is the great landing-place for steamers in Wallachia. A bridge across a narrow channel connects G. with Slobodse, an island in the Danube, on which stands a fortified castle. Here the Turks defeated the Russians, 1854, July 7. Pop. 15,000.

GIUSTI, *jôs'tē*, GIUSEPPE: most celebrated and popular poet and satirist of modern Italy: 1809, May 12—1850, May 31; b. Pescia, in the vicinity of Florence; from prominent Tuscan family. G. was intended for the bar, and studied at the Univ. of Pisa, where he obtained his degree doctor of laws. In college, G. was not a great student. Quitting Pisa, G. was domiciled at Florence, and attempted poetry in lyrical compositions of the romantic school, evincing elevated and nervous thought; but he soon discovered that satire was his forte. G. is pre-eminent in all the requirements of a great lyrical satirist—terse, clear, and brilliant, he de-

GIUSTINIANI—GIVE.

picts, alternately with pathetic regret and mocking laugh, the decorous shams and conventional vices of his age. His impartiality gives keener sting to his denunciation. While scourging tyrants he does not flatter the people, whose champion he avowedly is. His writings exercised a positive political influence. When the functions of the press were ignored, and freedom of thought was treason, his flaming verses in manuscript were in general circulation in Italy, and powerfully assisted in preparing the revolutionary insurrection of 1848. Then, for the first time, he appended his name to a volume of verses on the events and aims of the times. All his compositions are short, rarely blemished with personalities, and written in the purest form of the popular Tuscan dialect. The elegant familiarity of idiom presents great difficulties to foreigners, and greater to the translator. G.'s writings are not only Italian, but essentially Tuscan. The style often reaches an almost Dantesque sublimity. His most celebrated pieces are *Stivale*, or the History of a Boot (Italy), a humorous narration of all the misfits, ill-usage, and patching allotted to this down-trodden symbol of his country; *Gingillino*, a sarcasm, deemed his masterpiece, portraying the sycophant: *Il Re Fravicello*, or King Log; *Il Brindisi di Girella*, or the Weathercock's Toast, dedicated to the suggestive name of Talleyrand; and the *Dies Iræ*, or Funeral Oration of Emperor Francis I. An authorized and correct edition of his works was pub. at Florence 1852 by Le Monnier: a good edition, with valuable annotations by Prof. Giovanni Fioretti, was pub. Vienna 1876. Mrs. T. A. Trollope's English translations, which are good, were pub. in the *Athenæum*.

GIUSTINIANI, *jôs-tê-nê-â'nê*: illustrious Italian family to which the republics of Venice and Genoa owed more than one doge. It was originally of Venice, but established itself in Genoa also, and had branches elsewhere. One of the palaces of Rome was erected toward the end of the 16th c. by a descendant of the family, Marquis Giustiniani. The site that he selected was a portion of the ruins of Nero's baths, and he enriched the palace with a magnificent private gallery of paintings, and a fine collection of sculptures. He also formed a museum of antiquities. In 1807, the G. family conveyed the collection of paintings to Paris, where they disposed of the greater part by auction, and privately sold the remainder, consisting of 170 fine paintings, to the artist Bonnechose, who resold them to the king of Prussia. This fragment of the famous G. Gallery now enriches the Berlin Museum, and a very few of its former treasures are still in the G. palace at Rome.

GIUSTO, ad. *jûs'tō* [It.—from L. *justus*, just]: in music, in just or equal time.

GIVE, v. *giv* [AS. *gifan*; Icel. *gefa*; Goth. *giban*, to give: Dan. *give*, to give: Gael. *gabh*, to take, to lay hold of]: to bestow; to confer; to pay, as a price; to grant without price or reward; to impart; to grow moist; to soften; to resign or yield up; to render or utter; to yield to pressure or other force. GIV'ING, imp. GAVE, pt. *gāv*, did give.

GIVET—GLABROUS.

GIVEN, pp. *giv'n*, bestowed; conferred; addicted. **GIV'ER**, n. *-er*, one who. **TO GIVE AWAY**, to confer on without an equivalent. **TO GIVE BACK**, to return; to restore. **TO GIVE CHASE**, to pursue. **TO GIVE EAR TO**, to listen to. **TO GIVE FORTH**, to publish; to tell; to send forth, as light. **TO GIVE IN**, to yield. **TO GIVE OFF**, to yield or produce from a surface, as vapor or a smell. **TO GIVE OUT**, to report; to publish. **TO GIVE OVER**, to cease; to addict; to attach to; to conclude lost; to abandon. **TO GIVE PLACE**, to give way; to yield. **TO GIVE UP**, to resign; to quit; to abandon; to deliver. **TO GIVE UP ONE'S SELF TO**, to devote one's self to without restraint. **TO GIVE WAY**, to yield; to make room for; to break. **TO GIVE IN TO**, to adopt; to yield; to embrace.—**SYN.** of 'give': to grant; yield; allow; deliver; pay; communicate; announce; pronounce; render; utter; permit; license; commission; produce; show; exhibit; devote; apply; move; recede.

GIVET, *zhē-vā'*: town of France, and fortress of the first rank, in the dept. of Ardennes, on both banks of the Meuse, close to the border of Belgium, 145 m. n.e. of Paris. The town consists of three districts—Charlemont, G. St. Hilaire, and G. Notre Dame, all within the line of fortifications. The citadel of Charlemont, built 1555, is on a precipitous rock 705 ft. high. G. is well situated in a commercial point of view, is regularly built, has handsome squares, a good port, barracks, a military hospital, and manufactures leather, white-lead, clay-pipes, sealing-wax, and nails; there are marble-works near. Pop. (1891) 7,083.

GIVORS, *zhē-vōr'*: town of France, dept. of Rhone, on the right bank of the Rhone, 14 m. s. of Lyon. Bottles, window-glass, and iron are extensively manufactured, and trade in ironstone and coal is carried on. Pop. (1891) 10,856.

GIZZARD, n. *giz'erd* [F. *gésier*; prov. F. *grezié*, a gizzard—from prov. F. *gres*, gravel—from mid. L. *gīgēriā*: F. *gresil*, gravel]: the strong muscular stomach of birds and of some other animals. The purpose of the G. is to complete the process of chymification of food. In most animals this is aided by the teeth, but in birds and some invertebrates that are without teeth the G. is provided. It varies in size and structure; in carnivorous birds it is thin and membranous, in granivorous thick and muscular. It is sometimes called the third stomach. Some birds have gizzards fitted with fine teeth or calcareous plates, as do also many insects and crustaceans; others swallow fine pebbles or pieces of gravel which aid the G. in grinding food. The skin of the pigeon's G. has long been used in the treatment of indigestion or dyspepsia, and in late years the stomachs of sheep and swine, dried and ground to a fine powder, have been similarly employed under the name of 'pepsin.'

GLABELLA, n. *glā-bē'l'lā* [L. *glābel'lus*, without hair, smooth—dim. from *glāber*, smooth]: in *anat.*, the triangular space between the eyebrows; the nasal eminence lying between the superciliary ridges.

GLABROUS, a. *glā-brūs* [L. *glaber*, smooth, without hair: It. *glabro*: F. *glabre*]: in *bot.*, smooth; devoid of hair; bald.

GLACIAL—GLACIAL PERIOD.

GLACIAL, a. *glā'shal* [F. *glacial*, icy—from L. *glaciālis*—from *glaciēs*, ice: It. *glaciale*]: consisting of ice; frozen; relating to glaciers. **GLACIERS**, n. plu. *glās'ī-ērz*, or *glā'shī-ērz* [a Savoy word—from F. *glacier*]: vast fields or accumulations of ice, or snow and ice, which collect in the valleys and ravines of snow-capped mountains like the Alps, and slide downward till they melt in warmer regions—the mounds of debris which they often leave in their movements downward being called *moraines*, and the deep dangerous rents in them being called *crevasses* (see **GLACIER** below). **GLACIATION**, n. *glā shī-ā shūn*, the act of freezing; the effects of glaciers on a country, as the rounding of hills, the scratching of rocks, the production of moraines, etc. **GLACIER-TABLES**, the name given to large table-like blocks of stone lying on the surface of glaciers in Alpine regions. **GLACIÈRES**, n. plu. *glās'sī-ērz* [F. *glacières*, ice-houses]: a name given to caves full of ice, found chiefly in the Alpine mountains.

GLACIAL PERIOD, or **ICE AGE**: in Geology, the period when the greater part of the n. hemisphere was enveloped in one great ice-sheet. This period belongs to the post-tertiary or later formations in the geological succession, and is important in its relations to the general question of the earth's history, and especially to the appearance of man upon the earth. Its existence is easily traced in the numerous relics which it has left. These are chiefly: (1) The till or boulder clay, believed to be the product of the grinding process by which the glaciers smoothed down the surface of the land, consisting of mud of various colors, according to the nature of the rock from which it has been derived, its name being due to the number of irregular-shaped stones of various sizes found mixed with it; (2) Perched blocks and erratics, that is, large angular blocks found resting on hill-tops, hill-slopes, and occasionally low grounds, and which have been borne some distance from the rocks of which they formed a part, being carried by glaciers, and stranded in their present position by the melting of the ice; (3) Kames or eskers, and ledges, i.e. long ridges, mounds, and conical heaps, or undulating accumulations and terraces of gravel and sand, evidently formed by the waters that escaped from the melting glaciers; (4) Moraines, heaps of angular earthy debris lying in mountain valleys, and marking the final stage in the disappearance of the glaciers—the moraines being formed by the mass of stones, earth, and other debris which the glacier collected on or in front of it. All these are collectively termed glacial deposits, and are characteristic of the Glacial or Ice Age: see **PLEISTOCENE**.

These deposits contain abundant evidences of their origin. The stones found in the stony or boulder clay are usually more or less smoothed and polished, and covered with striæ or scratches. The rock-surface on which the deposit rests is often well smoothed and striated. Such striated surfaces in a great part of Europe and N. America are believed to be due to the action of great confluent glaciers, underneath which the country was at one time buried to a depth of thousands of feet. Rocks which have been

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rounded into dome-shaped bosses and hummocks by ice, are called *roches moutonnées*. The stony or boulder clays are unfossiliferous as a rule, but in maritime regions they sometimes contain marine shells of northern and arctic species. The shells are often crushed and broken. In Scotland, the till contains, in some places, intercalated or interglacial beds of freshwater origin, which have yielded remains of mammoth, Irish elk, reindeer, horse, and urus or great extinct ox. Peat, also, and remains of oak, alder, and other plants, have been found in the same position. In England, especially in Lancashire and in the old district of East Anglia, and in Ireland, marine deposits of sand, gravel, etc., containing shells which indicate temperate conditions of climate, occur intercalated between upper and under masses of stony clay. The highest level at which these shelly deposits have been found in Britain is in N. Wales, 1,390 ft. above the sea.

The chief lessons which the deposits of this period teach are these: (1) The cold of the glacial period came gradually on until it reached a climax, when the lowest masses of till were formed; at this time the northern temperate regions were enveloped in one great ice-sheet; (2) This intense arctic condition was interrupted more than once by intercalated mild periods, when the ice melted away, and the land was clothed with vegetation, and occupied by a well-marked mammalian fauna; (3) During the accumulation of the glacial deposits, there were one or more periods of submergence; (4) The last stage of the period was one of cold, which passed gradually away.

During the Pleistocene period, or that to which the Ice Age belongs, Britain and corresponding parts of America, had assumed much of their present configuration, but there were several considerable oscillations of level. It was a period of great alternations of cold and warm climatic conditions. The men who then occupied Britain were a savage race, who used rudely chipped flint implements, and were contemporaneous with many mammalian animals, some of which are not now found in temperate latitudes, while others are confined now to arctic and southern latitudes, and yet others are wholly extinct. Similar climatic conditions are known to have obtained in various regions during this period. Scandinavia, like Britain, was invested with an ice-sheet which filled up the Baltic, and extended into n. Germany. All N. America was covered with ice down to a wave-like line running w. from the latitude of New York. But in Sweden, Switzerland, Carinthia, Piedmont, Lombardy, and N. America there are interglacial deposits, which point to great fluctuations of climate like those which obtained in Britain during the so-called Glacial period. The Swiss interglacial deposits have recently yielded relics of man.

The most reasonable explanation of these great climatic changes is that given by Mr. Croll's theory. Such an alternation of climates would come about during a period of great eccentricity of the earth's orbit. Glacial conditions would then supervene in that hemisphere whose winter happened

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in aphelion, while in the opposite hemisphere a mild climate would extend up to polar regions. The precession of the equinoxes, by changing the incidence of the seasons, would revolutionize the climate over both hemispheres, causing the ice to melt gradually away from the one hemisphere, and cold conditions to supervene gradually on the other, and thus in course of time what had been the warm hemisphere would become the cold one, and *vice versa*. Such alternations of climate would occur every 10,000 or 11,000 years, so long as a period of great eccentricity lasted. The last period of eccentricity to which the Ice Age is believed to have been due, began more than 200,000 years ago, and lasted 160,000 years.—See GLACIER.

GLACIER.

GLA'CIER: immense mass of ice, formed above the snow-line on lofty mountains, and descending into the valleys to a greater or less distance, often encroaching on cultivated regions. The materials of glaciers are derived from the snow which falls during summer as well as winter on the summits of high mountains. Every fresh fall of snow adds a little to the height of the mountain, and, were there no agents at work for riddance of it, the mountains would be gradually rising to an indefinite elevation. Avalanches and glaciers, however, carry the snow into warmer regions, where it is reduced to water; in the one, the snow slips from the steep mountain slopes, and rushes rapidly down; in the other, it gradually descends, and is converted into ice in its progress. The snow which forms the G. at its origin has a very different appearance and consistence from the ice of which it consists at its lower termination. The minute state of division of the ice, in its snow condition, and the quantity of air interspersed through it, gives it its characteristic white color. Two causes operate in causing this change into ice: first, pressure expels the air, by bringing the particles of the lower layers of snow more closely together; and second, the summer's heat melting the surface, the water thus obtained percolates through the mass beneath, and as it passes among the particles whose temperature is below 32° F., it increases their size by external additions till the particles meet, and the whole becomes a solid mass. The snowy region of the G. is called by the French



Glacier on the Alps.

name *névé*. In large glaciers, the *névé* is of great extent, a large quantity of material being required to make up the waste. The *névé* is, however, often confined to narrow valleys, and, as a consequence, produces glaciers which soon perish. The increase of a G. by snow falling on its surface takes place only above the snowline—below that line, all the accumulated winter's snows are speedily melted by the summer's heat. The ice of the G. seldom shows any traces

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of the horizontal stratification found in the *névé*, but is generally intersected with vertical veins of clear blue ice.

The most remarkable feature of glaciers is their motion. It has been long known to the natives of the Alps that they move, but it is only within the last few years that the fact has received due attention from scientific men; the account of their observations and theories, form one of the most interesting chapters in the history of glaciers. See the writings of Agassiz, Forbes, and Tyndall. The continual waste of glaciers below the snow-line, both along its surface and at its extremity, is ever being repaired, so that the G. does not recede from the valley, nor decrease in depth. That the materials of the reparation are derived not from the fall of the winter's snow and the influence of the winter's frost, is evident, inasmuch as these additions speedily disappear with the return of the summer's heat, and in the end form but a small proportion of the year's total loss. The true repairing agent is the motion of the G., which brings down the glacified snow from the upper regions to be melted below. To account for this motion, Charpentier supposed the water, which saturated the G. in all its parts, and filled the innumerable capillary fissures, was, during night and during the winter, frozen, and that the well-known and almost irresistible expansion which would take place in the conversion of the water into ice, furnished the force necessary to move the G. forward. This theory, known as the *dilatation theory*, was for some time adopted by Agassiz, but ultimately abandoned. Agassiz showed that the interior of the G. had a temperature of 32° F., and subsequent observations have shown that the G. moves more rapidly in summer than in winter. In 1799, De Saussure published a second theory, known as the *gravitation* or *sliding theory*, in which he supposed that the G. moved by sliding down the inclined plane on which it rested, and that it was kept from adhering to its bed, and sometimes even elevated by the water melted in the contact of the G. with the naturally warmer earth. While correctly attributing the motion to gravity, De Saussure erred in considering glaciers as continuous and more or less rigid solids—indeed, the motion he attributes to them would, if commenced, be accelerated by gravity, and dash the G. from its bed as an avalanche. Principal Forbes was the author of the next important theory. Considerable attention had meantime been given to the subject by Rendu, Agassiz, and others. Rendu had shown that the G. possessed a semi-fluid or river-like motion in explaining the difference between observations made by him at the centre, which 'moves more rapidly,' and others made at the sides, 'where the ice is retained by the friction against its rocky walls.' The results based on Rendu's observations were established by the repeated and exact measurements of Forbes, who in the progress of his examinations, made the further discoveries, that the surface moves more rapidly than the ice near the bottom, and the middle than the sides; that the rate of motion is greater where the G.-bed has the greatest inclination; and that the motion is continued in winter, while it is acceler-

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ated in summer by the increase of the temperature of the air. The only theory which, as it appeared to Forbes, could account for these phenomena is thus expressed by him: 'A G. is an imperfect fluid or a viscous body which is urged down slopes of a certain inclination by the mutual pressure of its parts': this is known as the *viscous theory*. He considered a G. as not a crystalline solid, like ice tranquilly frozen in a mould, but that it possessed a peculiar fissured and laminated structure, through which water entered into its intrinsic composition, giving it a viscid consistence similar to that possessed by treacle, honey, or tar, though less in degree. Prof. Tyndall has published another theory, which he designates the *pressure theory*. This differs little from that of Forbes, except that it denies that G. ice is in the least viscid. By a number of independent observations, he established the facts first noticed by Rendu and Forbes, and added the important one, that the place of greatest motion is not in the centre of the glacier, but in a curve more deeply sinuous than the valley itself, crossing the axis of the glacier at each point of contrary flexure—in fact, that its motion is similar to that of a river whose point of maximum motion is not central, but deviates toward that side of the valley toward which the river turns its convex boundary. This seems a further corroboration of the viscous theory, but Tyndall explained it and the other facts by a theory which, while maintaining the *quasi-fluid* motion of the G., denied that this motion was owing to its being in a viscous condition. The germ of his theory, as he tells us, was derived from some observations and experiments of Faraday 1850, who showed, 'that when two pieces of ice, with moistened surfaces, were placed in contact, they became cemented together by the freezing of the film of water between them, while, when the ice was below 32° F., and therefore *dry*, no effect of this kind could be produced. The freezing was also found to take place under water.' By a further series of experiments, Tyndall found that ice at 32° F. could be compressed into any form, and that no matter how great the bruising of its particles and change of its shape, it would from this property of regelation, re-establish its continuous solid condition, if the particles of ice operated on were kept in close contact. These facts he applied to the motion of glaciers, asserting that the pressure of the parts of a G. on each other, in a downward direction, produced by gravitation, was more powerful than the attraction which held the particles of the ice together—that, consequently, the ice was ruptured, to permit the motion of the G., the particles being, however, speedily reunited by regelation. The supposed viscous condition of ice he believed to be refuted by the fact that, whenever the G. is subjected to tension, as in passing over a cascade, it does not yield by stretching, but always by breaking, so as to form crevasses. This theory, equally with that of Forbes, is by many deemed to explain the known phenomena of glaciers, while the advantage is claimed for it of not drawing upon our imagination as to a required condition of the ice, but, by

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experiment, exhibiting ice from known causes producing effects on the small scale similar to those produced in nature on the large. Forbes, however, maintained (*Occasional Papers*, etc., 1859) that all that is peculiar to Tyndall's theory was included in his own; and that the facts discovered and expounded by Faraday 1850 had already been used by him in 1846 as part of his theory. He said that his viscous theory included the notion 'of an infinity of minute rents; that it also embraces the substitution of the finite sliding of the internally bruised surfaces over one another;' and that it includes 'the reconsolidation of the bruised glacial substance into a coherent whole by pressure acting upon ice, softened by imminent thaw.'

Prof. Tyndall re-introduces and re-asserts the gravitation theory of De Saussure as in part the cause of the glacier's motion; but the phenomena which he considers produced by a sliding motion of the whole mass over its bed—viz., the polishing and grooving of the rock below—can be produced by a substance whose motion is the result of a yielding of its parts, if that substance has sufficient consistence to retain firmly imbedded in its lower surface portions of rock to act as polishers, and it cannot be doubted that the ice of glaciers has such a consistency.—Some scientists consider that all the theories are rather statements of facts than explanations of the cause, and that the problem of glacial motion still awaits a satisfactory explanation.

Some of the more remarkable phenomena of glaciers remain to be noticed. The surface of the G. does not long retain the purity of the snow from which it is derived, but it is speedily loaded with long ridges of débris called *moraines*. The mountains which rise on either side of the valley occupied by the G. are continually suffering loss from the action of the rain, disruption by frost, and the impulse of avalanches. The materials thus liberated find their way to the G. and form a line of rock and rubbish on its two^d borders, of greater or less size, dependent on the friability or compactness of the adjacent mountains. The *lateral moraines* often reach to a great height, as much as 40 or 50 ft. above the level of the glacier. The whole ridge appears to consist of débris, but it is really a ridge of ice with a covering of foreign materials, which by protecting the underlying ice from the heat which they radiate and only partially transmit, leave the moraine as a more and more elevated ridge, while the surface of the G. is speedily melting. *Glacier tables* have a similar origin. A large and isolated mass of rock, resting on the glacier, protects the ice below; and as the glacier melts, it leaves the rock poised on the summit of an icy column. As the rays of the sun play on the table all day obliquely, the column is gradually melted from under the rock, until it slips off, and begins to form another table; while the unprotected column speedily melts and disappears. Where two glaciers unite, the trails of rock on the inner margins unite also, and form a single ridge, which runs along the middle of the large trunk G., and is called a *medial moraine*.

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It is evident that the number of the media. moraines must thus depend on the number of the branch glaciers, and must indeed be invariably one less. The G. terminates amid a mass of stones and débris, which having been carried down on its surface, are finally deposited by its melting at its extremity, forming there a *terminal moraine*. Sometimes a G. decreases in size, either withdrawing from the valley and leaving the terminal moraine as a barren waste of rocks, or melting on its superficies throughout its length, and depositing its lateral moraines as a ridge of débris on either side at some height above it on the mountain. The existence of such collections of rocks is plain evidence of the former position and altitude of glaciers and even of their former occurrence in countries where they are now unknown.

It has been stated, that when the G. is subjected to tension, the continuity of its parts is destroyed, and fissures, called *crevasses*, are formed. In passing over a brow on the channel, the ice invariably yields; at first, a deep crack is formed, which gradually widens until a fissure or chasm is produced across the glacier. Transverse crevasses disappear when the G. reaches a level portion of its bed; the pressure bringing the walls again together, the chasm is closed up. Longitudinal crevasses are produced when the G. escapes from a confined channel, and spreads itself over a wider area. The spreading of the margins causes a tension in the body of the G., which yields, and longitudinal fissures are formed. These occasionally rend the terminal front of a glacier. The smaller marginal crevasses are formed from the tension of the ice, produced by the normal motion of the G. being retarded by the friction against the sides of its channel. The motion of the G. is gradually accelerated from the margin inward, consequently the lines of greatest tension are inclined downward and toward the centre, more or less, in proportion to the rapidity of the motion. The crevasses formed by the yielding of the ice are at right angles to the lines of tension, and consequently point up the glacier.

The *veined structure* is apparently the result of pressure. The veins consist of blue ice penetrating the white mass of the G., and occur either in irregular directions, or producing a regularly laminated structure. The blue veins are portions of ice from which the air-bubbles have been expelled, and which are consequently more compact than the general substance of the glacier. The pressure is exerted in three directions, producing veins complementary to the three kinds of crevasses above noticed. When the G. passes over a level, or perhaps a gently rising channel, transverse veins are formed; when it is pressed through a narrower channel, longitudinal veins are produced; and the pressure at the margins produced by the retardation of the flow by friction causes the formation of marginal veins in the lines of greatest pressure, that is, at right angles to the marginal crevasses.

The melting of the ice on the surface of the G. produces streams, whose course is often broken by crevasses, down

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which the water descends, finding egress at last through the cavernous mouth at the termination of the G., where it issues after being increased by other streams, which have by similar channels reached the bottom, as well as by the melting of the ice from the contact of the earth. The rushing water wears a shaft of greater diameter than the crevasse, and this shaft often remains after the margins of the crevasse have been reunited. In the progress of the G. another crevasse intersects the bed of the stream, and down this the water is diverted, leaving the formed shaft or *moulin*, as it is called. The forsaken moulin has at its base a quantity of earth and stones collected by the stream from the surface of the G.; these are gradually raised to the surface by the melting of the G., and eventually appear as cones of débris, sometimes rising high on columns of ice under the same influences as the glacier tables.

Glaciers are not necessarily peculiar to any country or zone, but wherever there are mountains of sufficient height, it may be expected that they may exist. In Europe, they are chiefly confined to the Alps and Norway. Having their origin in the region of perpetual snow, they reach far down into the valleys, the largest pushing themselves furthest down. That of Bossous at Chamouni, which comes from the highest part of Mont Blanc, reaches a point 5,500 ft. below the snow line, where it is embosomed among luxuriant wood. The Himalaya has its share; and in 1880, Mr. Whymper found that many of the chief peaks of the Andes are flanked by extensive glaciers. Iceland and Spitzbergen abound in them. In northern localities the ends of the glaciers, resting on the waters of the ocean, are broken off, and float away as icebergs.—See GLACIAL PERIOD.

GLACIS, n. *glá'se*, or *glā'sis* [F. *glacis*—from L. *glācĭēs*, ice, allied to glade in the sense of a lawn]: a gentle slope; a smooth sloping bank: in fortification (q.v.), a bank of earth, usually turfed, bare and open, and gently sloping from the covered-way toward the country: its object is to bring assailants, as they approach, into a conspicuous line of fire from the parapet of the fortress, also to mask the general works of the place.

GLAD, a. *glād* [Sw. *glad*, joyful: Dan. *glad*, smooth, slippery; *glad*, joyous: Icel. *gladr*, bright, shining: comp. Gael. *tlachd*, pleasure]: pleased; elevated with joy; wearing the appearance of joy; expressing joy, as a glad sound; moderately joyful: V. to gladden or make glad. GLAD'LY, ad. *-lĭ*, with pleasure. GLAD'NESS, n. a moderate degree of joy; pleasure of mind. GLADDEN, v. *glād'n*, to cheer; to please; to excite joy in. GLAD'DENING, imp. *-nĭng*: ADJ. cheering; exhilarating. GLADDENED, pp. *glād'nd*. GLAD'SOME, a. *-sŭm*, pleased; joyful; causing joy. GLAD'SOMELY, ad. *-lĭ*. GLAD'SOMENESS, n. *-nĕs*, moderate joy; pleasure of mind.—SYN. of 'glad': joyful; joyous; delighted; gratified; exhilarated; animated; cheerful; exhilarating; animating.

GLAD'BACH, usually BERGISCH-GLADBACH, *bĕrg'ish-*

GLADBACH—GLADHEIM.

gläd'bách: manufacturing town of Rhenish Prussia, eight m. n.e. of Cologne. Pop. (1890) 9,538.

GLAD'BACH, or MÖNCHEN-GLADBACH, *mön'chèn-gläd' bách*: rapidly growing manufacturing town of Rhenish Prussia, 14 m. w. of Düsseldorf. Linen, cotton, and silk and damask are manufactured; there are dye-works and bleachfields, iron-foundries, and machine-shops. It has an evangelical and three Rom. Cath. churches—one of the latter having a crypt dating from the 8th c. and a nave from the beginning of the 12th c. G. is a very ancient town, and formerly contained a famous Benedictine abbey, founded 972. Pop. (1855) 4,398; (1880) 37,387; (1900) 63,776.

GLADDEN, *gläd'en*, WASHINGTON, D.D., LL.D.: Congl. minister: b. Pittsgrove, Penn., 1836, Feb. 11. He graduated at Williams College 1859, studied theology, was ordained pastor of the State Street Congl. Church Brooklyn, 1860, and has held pastorates in Morrisania, N. Y., 1861, North Adams, Mass., 1866-71, North Chh., Springfield, Mass., 1875-83; and First Cong. Chh., Columbus, O., 1883-. From 1871 till 75 he was on the editorial staff of the New York *Independent*, and 1878-80 was editor of *Sunday Afternoon*. He has contributed frequently to secular and religious periodicals, achieved wide reputation as a lecturer on social questions, and published *Plain Thoughts on the Art of Living* (Boston, 1868); *From the Hub to the Hudson* (1869); *Workingmen and Their Employers* (1876, 85); *Being a Christian* (1876); *The Christian Boy* (1877); *The Lord's Prayer* (1881); *The Christian League of Connecticut* (1883); *Things New and Old* (1884); *The Young Men and the Churches* (1885); and *Applied Christianity* (1887). He received the degree D.D. from Roanoke College 1884, and LL.D. from the Univ. of Wis. 1881.

GLADE, n. *gläd* [Norw. *glette*, a clear spot among clouds: Icel. *glita*; Scot. *gleit*, to shine: Dan. *gade*, a street]: an opening or passage in a wood through which the light may break in and shine; any long opening or space in a wood or plantation, covered as a lawn with grass.

GLADE-NET: net used for capture of birds, especially woodcocks, in the glades of forests. It is made of a breadth suitable to the glade through which the birds are accustomed to pass; and is made of fine thread-netting, edged with cords, having weights attached to it below. It is hung so that when the rope by which it is held up is let go, it falls at once to the ground; a rope from the upper part of it passing over a pulley in a tree, and being held by the hand of the fowler. When the net is ready, the neighboring parts of the wood are beaten, to disturb the woodcocks; and when they approach it, it is let down, or drawn up, as may be necessary. Sometimes hares are caught in this way. In England, the use of the G. N. is chiefly by poachers and dishonest gamekeepers.

GLADHEIM: in Scandinavian mythology (q.v.), vast and noble structure, the home of Odin, in which is Valhalla (hall of heroes), radiant abode of those slain in battle.

GLADIATE—GLADIATOR.

GLADIATE, a. *glăd'î-ăt* [L. *glădiŭs*, a sword]: in *bol.*, shaped like a short straight sword. **GLADIATOR**, n. *-ă-tër*, [L.]: a prize-fighter with swords; in *anc. Rome*, a man who engaged in mortal combat with another for the entertainment of the people. **GLADIATORIAL**, a. *-tõ'ri-ăl*, pertaining to; also **GLADIATORY**, a. *-tër-î*. **GLADIATORSHIP**, n. *-tër-shîp*, the conduct or quality of a gladiator.

GLADIATOR: in classical antiquity, one who fought in the arena, at the amphitheatre at Rome, and in other cities, for the amusement of the public. The gladiators were generally slaves, bought and trained for the purpose, by masters who made this their business. The custom is supposed to have been borrowed from the East, and to have had its origin in the practice of human sacrifices, or that of taking the lives of captives or prisoners of war, in honor of heroes who had died in battle. Thus, in the *Iliad*, we read that Achilles sacrificed 12 Trojan prisoners to the manes of his friend Patroclus, and Virgil speaks of captives sent to Evander, to be sacrificed at the funeral of his son Pallas. The 'great custom' of the king of Dahomey thus has its counterpart in classic antiquity; and the N. American Indians, in putting their prisoners to death with tortures, have reproduced an ancient barbarism.

After a time all considerable funerals were solemnized by human sacrifices, which took the form of combats, in which, to increase the interest of the spectators, the prisoners were required to sacrifice each other; and as prisoners, and afterward other slaves, were kept for this purpose, they were trained to fight with skill and courage, to make the spectacle more impressive. These contests took place first at funerals, but afterward in the amphitheatre; and in process of time, instead of a funeral rite, became a common amusement. The first recorded in Roman history was the show of a contest of three pairs of gladiators, given by Marcus and Decius Brutus, on the death of their father, in the year of Rome 490 (B.C. 264). Forty-seven years afterward a show of 22 pairs was given in the Forum. Ten years later the first Africanus diverted his army at New Carthage with a gladiatorial exhibition. The fashion then rapidly increased. Magistrates, public officers, candidates for the popular suffrages, gave shows to the people, which consisted chiefly of these bloody and generally mortal encounters. The emperors exceeded all others in the extent and magnificence of these cruel spectacles. Julius Cæsar gave a show of 320 couples; Titus gave a show of gladiators, wild-beasts, and sea-fights, for 100 days; Trajan gave a show of 123 days, in which 2,000 men fought with and killed each other, or fought with wild-beasts for the amusement of the 70,000 Romans, patricians and plebeians, the highest ladies and the lowest rabble, assembled in the Colosseum. Domitian, at the Saturnalia of A.D. 90, arranged a battle between dwarfs and women. An edict forbidding women to fight was passed so late as A.D. 200. A vast number of slaves from all parts of the world were kept in Rome and trained for these exhibitions. There were so many at the time of Catiline's conspiracy, that they were thought dangerous to the

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public safety, and it was proposed to distribute them among the distant garrisons. This sport grew so popular throughout a large part of the Roman empire that from Britain to Syria every considerable town had its arena.

Efforts were made to limit the number of gladiators, and diminish the frequency of these shows. Cicero proposed a law, that no man should give one for two years before becoming a candidate for office. Emperor Augustus forbade more than two shows in a year, or that one should be given by a man worth less than half a million sesterces.

These shows were announced by show-bills and pictures, like the plays of our theatres. The gladiators were trained and sworn to fight to the death. If they showed cowardice, they were killed with tortures. They fought at first with wooden swords, and then with steel. When one of the combatants was disarmed, or upon the ground, the victor looked to the emperor, if present, or to the people, for the signal of death. It was formerly thought that the thumb raised meant that his life should be spared, and the thumb turned downward meant death. Now it seems agreed that to close down the thumb was a sign of approbation; to extend it, of disapprobation. A gladiator who had conquered was rewarded with a branch of palm, and sometimes with his freedom. Though the gladiators at first were slaves, freemen afterward entered the profession, and even knights. Senators and knights fought in the shows of Nero, and women in those of Domitian. The emperor Constantine prohibited the contests of gladiators, A.D. 325; but it was not till 500 that they were finally abolished by Theodoric.

GLADIOLUS, n. *glă-dî'ô-lūs*, popularly *glăd'î-ô'lūs* [L. a small sword—from *glădiūs*]: genus of plants of the nat. ord. *Iridew*, with a tubular perianth, the limb of which is divided into six unequal segments, thread-like, undivided stigmas, and winged seeds. The roots are bulbous; the leaves linear or sword-shaped, whence the name. The Cape of Good Hope produces the greater number of the known species, as well as of several allied genera formerly included in this. A few, however, are natives of other countries, and two or three are found in Europe. Most of the species have flowers of great beauty. They are propagated either by seed or by offset bulbs; and in the former way many fine new varieties have been produced. Among popular names of the various species are sword-lily, and corn-flag. Extraordinary medicinal virtues were formerly ascribed to the bulb of *G. communis*, one of the European species. The Hottentots eat the bulbs of some of the species, which contain a considerable quantity of starch. GLADIOLE, n. *glăd'î-ôl*, a lily-like plant of the genus gladiolus; the court-flag. GLADIUS, n. *glăd'î-ūs* [L. a sword]: the horny endoskeleton or pen of certain cuttle-fishes.

GLADLY, GLADNESS, GLADSOME: see under GLAD.

GLADOVA, *glă-dô'vâ*: small town of Servia, immediately below the 'Iron Gate' or rapids of the Danube, 110 m. e. of Belgrade. It is an important station of the Danube Steam Navigation Company

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GLADSTONE, *glăd'ston*, The Right Hon. WILLIAM EWART: statesman and orator: b. 1809, Dec. 29, at Liverpool; fourth son of Sir John G., Bart., of Fasque, in Kincairdineshire, Scotland. His father, originally of Leith, had won eminence and wealth as a West India merchant in Liverpool. G. was sent to Eton, and afterward to Christ Church, Oxford, where he closed a brilliant college career by taking a double first-class degree 1831. He entered the house of commons 1832 for the borough of Newark. He held the post of lord of the treasury, and afterward that of under-sec. of state for the colonies in the Peel govt. for a few months 1835. In 1838, he published his first work, *The State in its Relations with the Church*, which gave occasion to Mr. Macaulay to describe him, in a celebrated review of his work, as a 'young man of unblemished character, the rising hope of those stern and unbending Tories' who followed Sir Robert Peel while they abhorred his cautious temper and moderate opinions. In 1841, G. became vice-pres. of the board of trade in the Peel administration, and 1843, pres of the board. Next to his chief, he took the most prominent part in the revision of the tariff and reduction of import duties, which reached their natural development in the repeal of the corn laws. He resigned office 1845, Feb., when Sir R. Peel proposed to increase the endowments of the College of Maynooth. He rejoined the ministry 1845, Dec., succeeding the Earl of Derby as colonial secretary. He rendered Sir R. Peel eloquent and effective aid in carrying the great measure of free-trade through the house of commons; but paid the penalty in the loss both of his office and his seat, for the then Duke of Newcastle, claiming to 'do what he liked with his own,' refused to sanction his re-election for Newark. In 1847, he was elected M.P. for the Univ. of Oxford, which he continued to represent for 18 years. He visited Naples 1850. The dungeons of the kingdom of the Two Sicilies at this period swarmed with political prisoners, and G., in a letter to the Earl of Aberdeen, made all Europe ring with the story of their sufferings and their wrongs; and afterward he advocated the cause of Italian independence in many eloquent speeches. In 1851, he opposed the Ecclesiastical Titles Bill, brought in by Lord John Russell. After refusing an offer of office under Lord Derby, he became chancellor of the exchequer in the coalition govt. formed by the Earl of Aberdeen 1852. This may be regarded as the turning point in G.'s political career. Till this time he might be described as a Tory or a Peelite; henceforth he is a liberal. When the Aberdeen govt. fell before a motion in the house of commons for inquiring into the state of the army before Sebastopol, G. continued for a brief period a member of the cabinet of Lord Palmerston, but soon retired. G. then went into opposition, and 1857 made an eloquent and damaging speech on Mr. Cobden's motion condemnatory of Sir John Bowring's proceedings in China, which brought about the defeat of Lord Palmerston, and the dissolution of parliament. In 1858, G. accepted a special mission of importance to the



Gladiators: 1, Retiarius; 2, Secutor.



1



3

Gladiators, variously armed: 1, Secutores; 2, Retiarii; 3, Thracian and Mirinillo.



Gladiolus Ramosus

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Ionian Islands. In the same year, he published an elaborate work, *Homer and the Homeric Age*, 3 vols. In the second Palmerston administration, he resumed the post of chancellor of the exchequer. In 1860, he carried through parliament a commercial treaty with France. His financial scheme that year involved among other proposals the abolition of the paper-duty, which was strongly but unsuccessfully opposed in the house of commons. In the upper house, the Paper-duty Repeal Bill was thrown out on financial grounds. G. boldly denounced this interference with the taxing privileges of the commons. In 1861, he incorporated the repeal of the paper-duty in the successful financial scheme of the year. Rejected by his academic constituency at the general election 1865, he was returned by S. Lancashire. In 1866, G., now leader of the house of commons, brought in a Reform Bill, whose defeat caused Earl Russell to resign. At the general election 1868, S. W. Lancashire rejected, and Greenwich returned him. Acceding to office as first lord of the treasury at the close of that year, G., 1869, disestablished the Irish Church; 1870, carried his Irish Land Bill; 1871 abolished, by the exercise of the royal prerogative, purchase in the army; and 1872 carried the Ballot Bill. The Washington Treaty, dealing with the Alabama claims, was negotiated 1871. The Judicature Act passed 1873; but a govt. measure on Irish university education having been rejected, the ministry resigned. As Mr. Disraeli declined to form a govt., G. returned to office; but 1874 he unexpectedly dissolved parliament, and, on the unfavorable result of the ensuing election, the G. ministry resigned. G. was re-elected for Greenwich. In 1875 he retired from the formal leadership of the liberal party in the house of commons. In 1876 he led in denouncing the cruelties perpetrated by the Turks in Bulgaria, and in protesting against all attempts, especially by England, to bolster up the effete Ottoman power at the expense of the subject Christian races. During the next three years, the Eastern Question largely engrossed the British political world; and G. advocated the diplomatic coercion of Turkey by the concerted European powers. He also raised an energetic protest against the government's 'imperialistic' policy in Afghanistan and s. Africa. In 1880, Mar., parliament was dissolved, and the new elections gave the liberals an overwhelming majority; the most exciting contest being that which returned G. for Midlothian. Ere the new parliament met, G., again the actual leader of the liberal party, was made prime minister. In its foreign policy, the new govt. sought to secure the carrying out by Turkey of the yet unfulfilled conditions of the Berlin Treaty; Afghanistan was evacuated by British troops; and conciliatory terms were granted to the rebellious Boers of the Transvaal. In Ireland, where numerous agrarian crimes accompanied a wide-spread agitation for the suppression of 'landlordism,' a Coercion Bill was speedily followed by the conciliatory Land Act of 1881. In 1881, G.'s cabinet felt itself compelled to interfere in Egypt, and had to dispatch three military

expeditions thither in 1882 and 84. G. carried a new Franchise Bill 1884, and a Redistribution Bill 1885; in which latter year he gave place for seven months to a conservative govt. under Lord Salisbury. Restored to power through the general election of 1885, Nov., he again appealed to the country in the summer of 1886 on the defeat of his Irish Home Rule and Land Purchase Bills by the conservatives and unionist liberals (Hartington, Goschen, Trevelyan, Bright, etc.); and once more defeated, he once more gave place to Lord Salisbury.

Since his conversion to 'home-rule' for Ireland he has zealously advocated its principles and necessity, in and out of parliament. He opposed the coercive measures of 1888-9, denounced the arrest and severe prison treatment of Irish members of parliament and other home-rule leaders, championed the freedom of speech, and warned the party in power of the certain progress and early triumph of liberal principles. On the exposure of the forgeries of the alleged Parnell letters before the parliamentary commission 1889, Feb., he again demanded justice for Ireland and denounced the govt.'s aid in the prosecution of the London *Times* case against Parnell and his associates. In the by-elections of Feb. and Mar. for parliament the Gladstonian candidates were generally successful, a result attributed to the govt.'s excessive measures, and believed by many to indicate an early return of G. to power. He thus summed up his opinions on the situation Mar. 14, 'the Irish crisis has become acute to an unusual degree, and is pressing itself beyond all former experience on the mind and conscience of the people of England.' After the O'Shea divorce (see PARNELL, CHARLES STEWART), G. urged the retirement of Parnell from the leadership of the Irish party. Parnell responded with a manifesto (1890, Nov. 28) soliciting retention and disclosing confidential conferences with liberal leaders; whereupon G. refused further aid, unless Parnell was displaced. Dec. 6 a majority of the nationalist members of parliament chose Justin McCarthy leader. In the general parliamentary elections 1892, July, G. secured a majority of forty in the new house of commons, which assembled Aug. 4, and Aug. 10 he was summoned by the queen to form a new government. G. is author of *The State in its Relations with the Church* (1838); *Church Principles Considered* (1840); *A Manual of Prayers* (1845); *Remarks on Recent Commercial Legislation* (1845); *Studies on Homer and the Homeric Age*, 3 vols. (1858); *Essay on 'Ecce Homo'* (1868); *A Chapter of Autobiography* (1868); *Juventus Mundi: the Gods and Men of the Heroic Age* (1869); *The Vatican Decrees in their Bearing on Civil Allegiance: a Political Expostulation* (1874); *Vaticanism: an Answer to Replies and Reproofs* (1875); *Homeric Synchronism: and Inquiry into the Time and Place of Homer* (1876); *Bulgarian Horrors and the Question of the East* (1876); *Lessons in Massacre: an Exposition of the Conduct of the Porte in and about Bulgaria since May, 1876* (1877); *Gleanings of Past Years* (1879); *The Irish Question* (1886); *Robert Elsmere and the Battle of Belief* (1888);

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Landmarks of Homeric Study (1890); and *The Impregnable Rock of Holy Scripture* (1890).

Recurring to our historical summary, when G. was called once more to administer the government he courageously addressed himself to the carrying through parliament of a bill giving Ireland self-government. After prolonged discussion of many amendments the bill was finally passed by the commons, 1893, Sep. 2, by a vote of 303 to 269. In this fierce debate of more than 80 days, G.'s leadership was continuous and conspicuous. The bill was thrown out by the house of lords, after 4 days' debate, by a vote of 419 to 41. When the commons reassembled G. gave notice, indirectly, that the subject of home rule would not be reintroduced to the sittings. The closing hours of the parliament prorogued 1894, Mar. 5, were made memorable by the retirement of G. from the premiership. With mental powers and vital energy still unimpaired, he found himself compelled by the merely physical infirmities of extreme age to decline longer to bear the burden of government. His withdrawal was received with dismay by his own party, with elation by his opponents, and with doubt and suspicion among his Irish allies. G. favored Lord Rosebery as his successor, and his choice was soon found to be the choice of the majority of the recognized local leaders in the Liberal party. In 1895 and subsequently, G. gave serious and forceful attention to the horrors in Armenia, and speeches and letters made and written by him have gone far to increase English opposition to the bloodthirsty rule of the sultan. He died in his 89th year from cancer and tuberculosis of the bone, at Hawarden Castle, May 19, 1898.

GLAGOL—GLAIVE.

GLAGOL, *glá'gol*, or GLAGOLITZA, *glá-gol-ít'za*, or GLAGOLITES, *glá'gol-íts* [word or speech]: ancient Slavonic alphabet, used principally in several Rom. Cath. dioceses of Istria and Dalmatia, in the psalms, liturgies, and offices of the church. Among these Illyrian adherents to the communion of Rome, mass is celebrated not in Latin, but in an anc. Slavonic dialect, written in this peculiar alphabet, whose invention is popularly attributed to St. Jerome. The use of this liturgy was confirmed to the priesthood by a bull of Pope Innocent IV., 1248. Of the antiquity of this alphabet, the savants have held great variety of opinions. Dobrowsky laid the foundation of a critical investigation of the subject, and has been followed by Kopitar, Jacob Grimm, Ivan Preis, etc. A Glagolitic ms. of the 11th c., belonging to Count Kloz, published under the title of *Glagolita Clozianus* (Vienna 1836), proves a higher antiquity than some had been willing to allow. Good authorities hold that Isaac Taylor, in his work on *The Alphabet* (1883), has proved the G. to be derived from the cursive Greek alphabet of the 9th c. The name is supposed by Kopitar to have been taken from the word *glogolati*, which, though unknown to the Servo-Croatians, signifies, in the ecclesiastical idiom, *to speak*.

GLAIR, n. *glär* [Scot. *glair*, or *glaur*, mud or slime: F. *glaire*, white of an egg—from mid. L. *clārū*, white of an egg—from L. *clārūs*, clear]: the white of an egg; any viscous transparent substance resembling it: V. to smear or varnish with the white of an egg. GLAIR'ING, imp. GLAIRED, pp. *glärd*. GLAIR'Y, a. -*ī*, having the character of glair; slimy. GLAIRE, n. *glär*, the white of an egg beaten up in an equal amount of water, a little sugar-candy being added, used as a glaze for pastry and leather.

GLAIRE, *glair*, JEAN BAPTISTE: 1798–1879; b. Bordeaux: Orientalist and theologian. He received a classical education, studied theol., published a *Hebrew and Chaldee Hand-Lexicon* (1830), an *Arabic Concordance of the Koran*, and other works, was chosen prof. of Hebrew at the Sorbonne, 1841 and became councilor of the Univ. 1845.

GLAISHER, *glä'shër*, JAMES, F.R.S.: astronomer: b. London, England, 1809. He was appointed asst. on the principal triangulation of the ordnance-survey of Ireland, and charged with the meteorological observations on Bencarr Mountains in Galway 1829, was asst. at the Cambridge Observatory 1833–6, was appointed asst. in the astronomical dept. of the Royal Observatory in Greenwich 1836. and was supt. of the magnetical and meteorological dept. of the observatory 1840–74. Between 1863 and 66 he made 29 balloon ascents for scientific purposes, in one of which (1863, Sep. 5) he attained the greatest height yet reached, nearly 7 m. He was a founder of the Royal Meteorological Soc., its sec. nearly 20 years, and its pres. 1867–78. Was author of over 100 books and papers relating to astronomy, meteorology, and theory of numbers. D. 1903, Feb. 8.

GLAIVE, or GLAVE, n. *glāv* [F. *glaiive*—from L. *glādiūs*,

GLAMORGANSHIRE—GLANCE.

a sword: comp. Gael. *claidheamh*, a sword (see CLAYMORE)] a broadsword; a scimiter.

GLAMORGANSHIRE, *gla-mawr'gan-shër* [in Welsh, *Gwlad Morgan*]: most southerly of the counties of Wales; bounded s. and s.w. by the Bristol Channel, w. by the county of Caermarthen, n. by Brecknock, and e. by Mounmouth; 516,959 acres. Pop. (1871) 397,859; (1881) 511,433; (1901) 601,080, the increase of pop. since 1801 (700 per cent.) is unequalled in the kingdom. The coast-line following the principal windings, is about 90 m. in length, and its irregularities occur chiefly in the w. of the county, and are formed by Swansea Bay and the peninsula of Gower (q.v.). The whole of the n. district is covered with mountains, the highest of which, however, Llangeinor, is only 1,859 ft. This district comprises one of the richest coal-beds in the kingdom. The s. portion of the county, the 'Vale of Glamorgan,' forms a great level, is richly wooded, with a mild climate, and is by far the most fertile part of S. Wales. Its soil is a reddish clay, resting on limestone, and is excellently adapted for the growth of cereals. The mountainous district is intersected by numerous picturesque valleys affording good pasturage for sheep and cattle. The chief rivers are the Rumney, the Taff, the Neath, the Tawe, and the Llwchwr—all running southward from the mountains into the Bristol Channel. Besides coal, anthracite or stone-coal, and coking-coal, with ironstone and lead are found. The iron-works at Merthyr-Tydvil are probably the most extensive in the world, and there are many others scarcely less important in the county. At Neath and Swansea are large copper-smelting works, to which ore is brought from S. America and Australia. Lead and tin ores also are brought from considerable distances to be smelted. Wheat, barley, oats, and potatoes are the chief crops; and butter and cheese are largely produced. The farms, however, are generally small, and agriculture is in a backward state. Owing to the immense development of the coal and iron-works, the map of the county has of late years become a network of railways and tramways, and no part of Britain is better supplied with means of transport. G. sends five members to parliament; and the represented boroughs are Merthyr-Tydvil (with two), Swansea town, and the districts of Swansea and Cardiff, which have one member each. G. contains interesting Roman remains, and many memorials of the middle ages. Of these, Oystermouth Castle, Caerphilly Castle, Cardiff Castle, and Margam Abbey, are the finest remaining specimens.

GLAMOUR, n. *gläm'ër* [Scot.: Dan. *glimmer*, glitter, false lustre]: a charm on the eyes making them see things different from what they are.

GLANCE, n. *gläns* [Ger. *glanz*; Dut. *glans*, lustre, splendor: Dan. *glindse*, to glisten]: a rapid or momentary view; a sudden shoot of light or splendor; a name applied to minerals, chiefly sulphides, possessing a semi-metallic lustre: V. to dart aside; to shoot, as a ray of light or splendor; to fly off obliquely: to snatch a momentary view;

GLANCE—GLANDERS.

in *OE.*, to censure in an indirect or covert way. **GLAN'-CING**, imp. *-sing*: **ADJ.** shooting; darting; casting suddenly: **N.** the act of one who glances; in *OE.*, oblique censure. **GLANCED**, pp. *glänst*. **GLAN'INGLY**, ad. *-li*. **GLANCE-COAL**, anthracite, in allusion to its semi-metallic lustre: see **ANTHRACITE: COAL**.

GLANCE: in Mineralogy, a numerous order or family of minerals, of which *Galena* (q.v.) or *Lead-G.* may be regarded as a type. All are metallic, and many are known by names indicating the metal which is their principal constituent, as *Lead-G.*, *Silver G.*, *Bismuth-G.*, etc. In these and many other species, the metal is combined with sulphur, so that the mineral is a sulphuret, but there are also numerous species of *G.* in which sulphur is not present, but selenium, arsenic, or tellurium takes its place. In some kinds also, two or more metals are present instead of one, in combination with one or other of these non-metallic or semi-metallic substances. Thus, *Gold-G.*, or *Silvanite*, consists of gold and silver in combination with tellurium: it occurs in veins in porphyry, in Transylvania, and is wrought for both the precious metals which it contains. Several kinds of *G.* are very valuable ores, as *Lead-G.* or *Galena*, *Copper-G.* or *Redruthite*, and *Silver-G.* or *Argentite*. Although mineralogists have adopted the names *Pyrites*, *Glance*, and *Blende* as names of orders or families, the limits and distinctions of these groups are not well marked. All kinds of *G.* are fused without much difficulty by the blow-pipe. They are also soluble in acids.

GLANDERS: virulent and highly contagious disease afflicting the equine species and communicable to man. It affects the nasal mucous membrane which becomes highly inflamed. Ulceration soon follows accompanied by the discharge of thin matter, which soon becomes viscid, and an enlargement of the lymphatic, submaxillary glands. When the glandular trouble predominates the disease is termed *Farcy* (q.v.). An attack of *G.* is sometimes preceded by general debility, a rough appearance of the coat, difficulty of breathing, and loss of flesh and appetite. The characteristic discharge then appears and rapidly increases in quantity. The nasal membrane changes to a dull color and exhibits a dropsical appearance, and the ulceration spreads, frequently extending to the throat. *G.* is caused by confinement in close and ill-ventilated stables where respiration fails to purify the blood, which becomes loaded with carbonaceous matter; also by improper feeding, excessive and long-continued labor with insufficient nourishment, exposure to storms, and general neglect and abuse. It may follow a common cold or any of the diseases which reduce the system or interfere with the oxygenation of the blood. Horses which, from any case, are in low condition are peculiarly susceptible to *G.*, originating spontaneously; but the most vigorous readily take it by contagion. A horse that is otherwise vigorous, and which has a strong constitution, may have *G.* in a chronic form, and if well fed and kept under the best pos-

GLANDFORD BRIGG.

sible hygienic conditions may live for many years and perform considerable labor, but a radical cure cannot be expected and he will always be a source of danger to all other horses with which he comes in contact and to everyone who feeds or uses him. A slight quantity of the nasal discharge coming in contact with any of the mucous membranes or with an abraded portion of the skin, is very sure to communicate the disease to man or to any of the equine race. In the human species G. runs more than a year, but has been known to prove fatal in a few days. On account of the malignant and contagious nature of the disease the use in the public streets of horses suffering with G. is, in many places and should be in all, prohibited by law. Affected horses should be destroyed as soon as the disease is proved to be G., or else sent to the headquarters of a veterinary school for treatment by competent physicians in hope that they may find an efficient remedy. But before radical means are resorted to the horse should be examined by a competent veterinarian. Many horses have been killed on the supposition that they were effected with G. when they were suffering from a disease which might have readily been cured. But as soon as G. is suspected, the affected horse should be separated from others and handled with the greatest care until the real nature of his malady has been determined. A generic name for G. is EQUINIA (q.v.).

GLANDFORD BRIGG, *glāndford brīg* (or BRIDGE), market-town in the Parts of Lindsay, county of Lincoln: 22 m. n.n.e. of the city of Lincoln. The town is clean and regularly built, has churches, a corn exchange, schools, etc. Its free grammar-school was founded 1669. Trade is carried on by means of the Ancholme, in corn, coal, and timber. Pop. (1881) 3,107.

GLANDS.

GLANDS, n. plu. *gländz* [OF. *glande*, a kernel: F. *gland*, an acorn—from L. *glandem*, an acorn]: organs of manifold forms and structure which perform the functions of secretion, or when ductless are believed to modify the composition of the blood—found in all parts of the body; small sap-receptacles in plants. **GLANDER**, v. *glän'dér*, to affect with glanders. **GLAN'DERING**, imp. **GLAN'DERED**, pp. *-dèrd*. **GLANDERS**, n. *glän'dèrz* [OF. *glandre*, a swelling of the glands]: a disease of horses, generally affecting the lungs and mucous membrane of the nostrils, in which foul matter runs from the nose (see above). **GLAN'DERED**, a. *-dèrd*, affected with glanders. **GLAN'DULAR**, a. *-dū-lér*, containing glands; consisting of or pertaining to glands; in *bot.*, applied to hairs having glands at their tips. **GLAN'DULARLY**, ad. *-lī*. **GLAN'DULA'TION**, n. *-lā'shūn*, the situation and structure of the secretory vessels in plants. **GLAN'DULE**, n. *-dūl*, a small gland or secreting vessel. **GLAN'DULIF'EROUS**, a. *-līf'ér-ūs* [L. *fero*, I carry]: bearing acorns, or fruit like acorns. **GLAN'DULOUS**, a. *-dū-lūs*, consisting of or pertaining to glands.

GLANDS, in Anatomy: organs divided into two great classes, viz., true secreting glands, and ductless glands — The first class constitute special organs for the production of the chief secretions; e.g., the lachrymal, mammary, and salivary glands, the liver, pancreas, kidneys, etc., while the suprarenal capsules, the spleen, the thymus, and the thyroid belong to the second class.

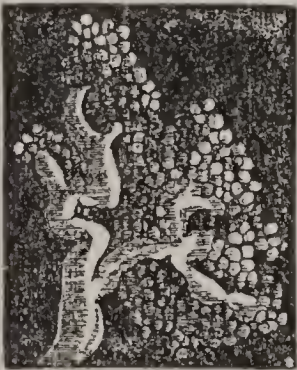


Fig 1.—Lobule of Parotid Gland of an infant: Filled with mercury, and magnified 50 diameters.

An ordinary secreting gland consists of an aggregation of follicles all opening into a common duct by which the glandular product is discharged. The follicles contain in their interior, cells (q.v.), the active agents in the secreting process; while their exterior is surrounded by a net-work of capillaries, from whose contents the materials of secretion are extracted.

The simplest form of a gland is the inversion of the surface of a secreting membrane into follicles, which discharge their contents upon it by separate mouths. Of this we have examples in the gastric G. and follicles of Lieberkühn (see DIGESTION). Dr. Carpenter very well exhibits the commencement of the progressive complication observed in most of the glandular structures occurring in man and the higher animals in the accompanying diagram (fig. 2), where A represents a portion of the proventriculus of a falcon, in which follicles formed by simple inversion occur, while B represents a gastric gland from the middle of the human stomach, and C a still more complicated form, produced by the follicles doubling upon themselves, taken from near the pylorus. The articulata (e.g., insects) present glandular structures which can be traced and understood more easily than the G. of vertebrate animals; and the forms, in all of which a

GLANDS.

large amount of secreting surface is presented in comparatively little space, are often very graceful. In the group

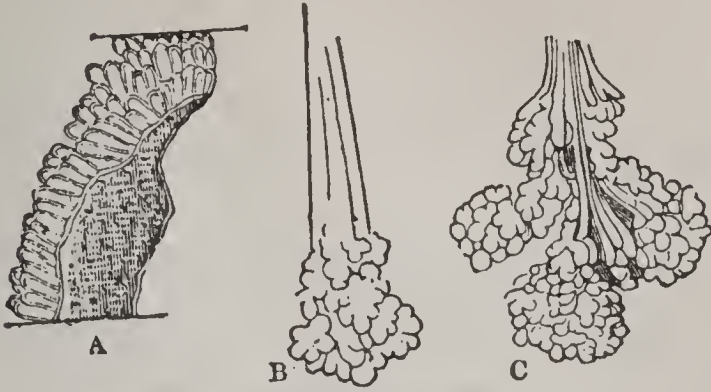


Fig. 2.

(fig. 3), the first two represent different forms of salivary G., the third is a reproductive gland, while the fourth and fifth are glands yielding the acrid matter which some insects secrete.

To understand the structure of a complex gland like the liver or kidney, it must be followed from the simplest form



Fig. 3.

1, Part of the salivary gland of *Nepa Cinerea* (after Ramdohr); 2, salivary vessel of *Cicada Ormi* (after Succow); 3, testes of *Staphylinus Maxillorus*; 4, secreting gland of *Chlænienus Velutinus*; 5, secreting gland of *Calathus Fulvipes*.

in which it is known to occur, through its various degrees of complication. In this way the liver may be traced, from the lowest mollusca (where it exists as simple follicles, lodged in the walls of the stomach, and pouring their product into its cavity by separate orifices) up to man, in whom it is an organ of extreme intricacy; and similarly in the early foetal state of the higher animals, the liver and other secreting organs more or less resemble the persistent state

GLANDS.

of those parts in animals lower in the animal scale. In the same way, the mammary gland (q.v.), a structure of considerable complexity in the higher mammals, presents a very simple arrangement in the lowest type of this class, the ornithorhynchus, in which it is merely a cluster of cæcal follicles, each discharging its contents by its own orifice. Sometimes a gland has several ducts (e.g. the lachrymal



Fig. 4.—Mammary Gland of Ornithorhynchus.

gland), but, as a general rule, the most important G. have only a single canal, formed by the union of the individual ducts, which conveys away the product of the secreting the general arrangement of the elements of a gland in action of the whole mass. Whatever be the complexity in the higher animals, these elements are always found to resolve themselves into *follicles* or *tubuli*, which enclose the true secreting cells.

The second class of G. resemble the secreting G. in external conformation, and in the possession of a solid parenchymatous tissue, but differ from them in the absence of a duct or opening for removal of the products of secretion; and indeed, except in the thymus, no material resembling a secreted product is yielded by any of them. In all of them, the tissue consists mainly of cells and nuclei, with great abundance of blood-vessels. They may probably be regarded as appendages to the vascular system; and from the absence of any excretory duct, they have received the name of *vascular ductless glands*.

For the *Lymphatic Glands*, a different class of structures: see LYMPHATIC SYSTEM.

DISEASES OF THE GLANDS.—The lymphatic G. are subject to enlargement from acute inflammation and abscess, usually in consequence of irritation of the part from which their lymphatics spring, as in scarlet fever, in which the G. of the throat are affected; in gonorrhœa, the G. of the groin. etc. The treatment of such abscesses belongs to the ordinary principles of surgery: see ABSCESS. A much more troublesome affection of the G. is the slow, comparatively painless, at first dense solid swelling which they undergo in scrofula (q.v.), which tends very slowly, if at all, to suppuration, and sometimes remains for years. In syphilis (q.v.) and cancer (q.v.), there are also enlargements of the lymphatic glands. Scrofulous or tubercular disease of the mesenteric G. in children constitutes *Tabes mesenterica* (q.v.). The larger G. as the Liver, Kidney, Pancreas, Spleen. Thyroid, Thymus, Testicle, and even the Pituitary Gland, all have their special diseases: see those titles.

GLANS—GLAREOUS.

GLANS, n. *glänz* [L. *glans*, any acorn-shaped fruit (see **GLAND**)]: In *bot.*, applied to the acorn or hazel-nut, and suchlike fruit, which are inclosed in bracts; the nut-like extremity of the penis.

GLANVIL, *glän'vīl* (or **GLANVILL**, or **GLANVILLE**), **RANULPH DE**: born Stratford, in Suffolk; died 1190: chief justice of England in the reign of Henry II; earliest writer on English jurisprudence. Of his work *Tractatus de Legibus et Consuetudinibus Angliæ*, Prof. Robertson says (*Hist. of Charles V.*), that it is supposed to have been the first undertaking of the kind in any country in Europe. G. either wrote or superintended this work, about 1181. Lord Campbell (*Lives of the Chief-Justices*, i. 25) remarks that G., in some points, is still of authority, 'and may be perused with advantage by all who take an interest in our legal antiquities. This author is to be considered the father of English jurisprudence. Bracton, who writes in the following century, is more methodical, but he draws largely from the Roman civil law, and is often rather speculative; while Glanville actually details to us the practice of the *Aula Regis* in which he presided, furnishes us with a copious supply of precedents of writs and other procedure then in use, and explains with much precision the distinction and subtilities of the system which, in the fifth Norman reign, had nearly superseded the simple juridical institutions of our Anglo-Saxon ancestors.' This work was printed first in 1554. It closely resembles the Scottish *Regiam Majestatem* (q.v.). 'The latter,' says Coke (*Inst.* iv. 345), 'doth in substance agree with our Glanville, and most commonly *de verbo in verbum*, and many times our Glanville is cited therein by special name.' A dispute has arisen, in consequence of this close similarity, as to which country shall claim the original work. Mr. Erskine does not hesitate to claim the distinction for Scotland; but Lord Stair, following the opinion of Craig, frankly admits 'that those books, called *Regiam Majestatem*, are no part of our (Scottish) law, but were compiled for the customs of England, in 13 books, by the Earl of Chester, and by some unknown and inconsiderate hand stolen thence, and resarcinate in those four books which pass amongst us' (Stair, i. 1, s. 16).—G. founded Butterley Abbey 1171. With other Yorkshire barons, he opposed William the Lion, king of Scotland, who invaded England 1174, and he took that king prisoner at Alnwick. He became chief-justice 1180. He died at the siege of Acre.

GLARE, n. *glär* [Norw. *glora*, to shine: Dut. *gloren*, to glimmer: Swiss, *glare*, to stare]: a bright dazzling light; overpowering lustre: a fierce piercing look: V. to shine with a dazzling light; to look with fierce piercing eyes. **GLA'RING**, imp.: **ADJ.** shining, so as to distress the eyes; clear; notorious; barefaced. **GLARED**, pp. *glärd*. **GLA'RINGLY**, ad. *-lī*, openly; notoriously. **GLA'RINGNESS**, n.—**SYN.** of 'glare, v.': to flare; flash; flicker; glitter.

GLAREOUS, a. *glär'v-ūs* [F. *glaireux*, slimy, mucous—see **GLAIR**]: resembling the white of an egg.

GLARUS—GLASERITE.

GLARUS, *glâ-rûs*: canton in the n.e. of Switzerland, triangular in shape, bounded n.e. by the canton of St. Gall, s.e. by that of Grisons, w. by those of Schwyz and Uri; 262 sq.m. Pop. (1900) 32,349 inhabitants, of whom near 7,000 were Rom. Catholics, almost all the others Calvinists. The surface is mountainous, the highest peak being Tödiberg or Dödiberg in the s.w., 11,880 ft. From the foot of this mountain, the Linth, the chief river, flows n.n.e., through the middle of the canton, and empties into the Lake of Wallenstadt. The principal valleys, after that of the Linth, are the Sernfthal and the Klönthal, both formed by tributaries of the Linth. The climate is very severe, and only one-fifth of the land is arable. This canton, in which the rearing of cattle was formerly the main pursuit of the inhabitants, is now an important manufacturing district. The principal manufactures are cotton, woolen, muslin, and silk goods, and paper and slates. Great part of the manufactures are exported to the East, to n. Africa, America, and China. The green cheese called Schabziger, which is wholly made here, and other agricultural products are exported. In no other Swiss canton does the population increase so slowly. The old homely manners, and many even of the customs of antiquity, still prevail. In the earliest times, G. was reckoned sometimes as part of Rhoetia, sometimes as part of Swabia, and was peopled by German settlers. After various changes, it passed into the possession of the Dukes of Austria, but ultimately secured its independence by the victories of Näfels 1352-88, when it joined the Swiss confederation.

GLARUS, cap. and chief town of the canton, environed by mountains, has a large Gothic church which serves both for Rom. Catholics and for Protestants and in which Zwingli was parson 1506-16. Pop. about 6,000.

GLAS, JOHN: 1695-1773; b. Auchtermuchty, Fife, Scotland, where his father was parish minister: founder of the sect of Glassites, now known as Sandemanians. He studied at the Univ. of St. Andrews, and of Edinburgh, and was ordained minister of Tealing 1719. Here he developed peculiar opinions—against a state church and the Presb. polity and the orthodox doctrine as to ‘justifying faith’ (see further, SANDEMANIANS): for which he was tried, and deposed 1730. He afterward gathered some adherents in Dundee, Edinburgh, and Perth. In 1739, the decree of deposition was removed, though he was declared still ineligible to a pastoral charge in the Established Church until he should have renounced his avowed antagonism to its constitution. He died at Dundee.

GLASERITE: see under **GLASS**.

GLASGOW.

GLASGOW, *gläs-gō*: the industrious metropolis of Scotland, and, next to London, the most populous city (1901) in Great Britain. It is on the Clyde; in the lower ward of Lanarkshire, and occupies chiefly the n. side of the river, but has large and populous suburbs on the s. side. The river here is crossed by seven bridges: two of granite and one of iron are much admired for their light and graceful architecture: two are suspension-bridges, and two viaducts of the Union and the Caledonian railways. Below the bridges ferry-boats ply at all hours.

The ground upon which G. is built is mostly level, but in the n. and n.w. districts are considerable elevations. Owing to the number of cotton-factories, chemical works, foundries, and workshops of all kinds, the city has a somewhat dingy and smoky aspect. In other respects, it has many attractions. The houses facing the river stand well back, leaving spacious thoroughfares on each side, and affording full and noble views of the bridges, of several handsome street ranges and public buildings, and of the harbor with its forests of masts and steam funnels. Most of the leading streets run from e. to w., parallel with the river, and almost all the streets, except in the oldest parts of the city, are straight. The houses are generally lofty, and built of freestone, the several floors of each tenement being frequently occupied by separate families, entering by a common stair. In the fashionable quarters, 'self-contained' houses prevail. G. has comparatively few squares or other open spaces; but it has four public parks—one in each quarter of the city—the Green (140 acres) occupying the level next the Clyde at the e. end; Queen's Park (more than 100 acres), finally situated on a rising-ground to the south; Kelvingrove, or West End Park (40 acres) rounding the face of a hill crowned with noble terraces, and sloping down to the Kelvin, at the w. end; and the Alexandra, or n.e. park (85 acres). The city is abt. three m. in length from e. to w., and about eight m. in circumference.

G. had its nucleus first in the cathedral, afterward in the university. The former is situated in the n.e. of the city on a height on the banks of the Molendinar stream which flows between the old burying-ground and a steep rocky eminence formerly known as the Fir Park, now transformed into the Necropolis, a modern cemetery studded and crowned with monuments. From this ravine the name G. is supposed to have been derived, etymologists professing to find in it two Celtic words signifying a 'Dark Glen.' St. Kentigern, or St. Mungo, founded a bishopric on the banks of the Molendinar about 560; but for more than 500 years afterward the history of the place is a blank. About 1115 David, prince of Cumbria (afterward king of Scotland), restored the see, and appointed his preceptor, John, to the bishopric, who laid the foundations of a cathedral, which was replaced by the present pile founded by Bp. Jocelin 1181. In 1180, King William the Lion erected G. into a burgh, with the privilege of an annual fair; but for a century and a half later, it continued an insignificant town of not more than 1,500 inhabitants. In 1345, Bp. Rae built the first stone

GLASGOW.

bridge across the Clyde; and 1451 Bp. Turnbull established the university, having obtained a bull for that purpose from Pope Nicholas V. The latter event gave considerable impetus to the place; yet, 1556, G. ranked only 11th in importance among the towns of Scotland.

The city as it now exists is almost wholly modern, having quintupled in dimensions during the last 70 years. This immense growth has arisen from its situation in a district abounding in coal and iron, and from the facilities afforded by the Clyde for a world-wide commerce. At the same time much of its prosperity is due to local ingenuity and enterprise. Here, James Watt, 1765, made his memorable improvement on the steam-engine; here Henry Bell, 1812, first (in the old world) demonstrated the practicability of steam-navigation. An enormous sum has been expended on the widening and deepening of the river, now navigable by vessels 300 ft. long, and drawing 23 ft. of water. The Queen's Docks at Stobcross, opened 1877, have a depth of 20 ft. of water, and an area of 34 acres, and have cost £1,600,000. The enterprising spirit of the inhabitants began to manifest itself during the 17th c. Sugar-refining, the distillation of spirits from molasses, and the manufacture of soap, were among the earlier industries. The opening of the American colonies to Scotch enterprise after the Union with England (1707) gave immense increase to its commerce. G. became the chief emporium of the tobacco trade, and its Virginian merchants formed a local aristocracy, remarkable for wealth and *hauteur*. This trade was at length paralyzed by the American war of secession; but sugar cultivation in the W. Indies, and the introduction of the cotton manufacture, opened new paths to opulence. Calico-printing, Turkey-red dyeing, beer-brewing and other branches followed; and with the rapid expansion of the iron trade, including machine-making and ship-building, the city has attained its present magnitude. Ship-building is one of the most important industries of G., and Clyde-built ships are famous throughout the world. In 1880, 241 vessels were built, including 8 men of war, and having a joint tonnage of 240,000. Among the thousand chimney-stalks of G. one is nearly 460 and one is about 440 ft. high, both belonging to great chemical works.

The city is governed by a lord provost, 16 bailies, and 58 concilors, to whom are added the dean of guild from the Merchants', and the deacon-convener from the Trades' House. The sheriff, five sheriff-substitutes, and a stipendiary magistrate exercise within the city a co-ordinate jurisdiction with the civic magistrates, and preside over various civil and criminal courts. Corporation halls, comprising a valuable gallery of paintings, have been secured; public parks have been purchased at great cost: and 1859 a supply of water was introduced from Loch Katrine at the bountiful rate of 34,600,000 gallons a day. In all that relates to lighting, paving, sewerage, and the like, G. deserves laudatory mention. Magnificent new municipal buildings were begun 1882. G. had (1885-6) 75,293 registered parliamentary voters, and sends seven members to the house of commons.

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Many of the public buildings are noticeable. The cathedral, recently restored and enriched with stained glass chiefly from Munich, is one of the finest first pointed churches in the kingdom. The Royal Exchange, in Queen street, several of the banks, and many of the churches, likewise present fine specimens of architecture in a variety of styles. G. has several equestrian statues, including those of William III. at the Cross, the Duke of Wellington in front of the Royal Exchange, and Queen Victoria in George Square: the last two are by Marochetti. In the Green there is an obelisk, 144 ft. high, to Nelson, a conspicuous object in the landscape. In George Square there are a column surmounted by a statue of Sir Walter Scott; a fine statue of Sir John Moore, by Flaxman; one of James Watt, by Chantrey; one of Sir Robert Peel, by Mossman; and statues of Robert Burns, Thomas Campbell, and David Livingstone. The St. Andrew's Halls, opened 1877, are spacious and elegant. The Institute of the Fine Arts, the Stock Exchange, and the Merchants' House, are new and handsome buildings: the post-office has recently been rebuilt and much extended. Under the City Improvement Act (1866), great changes have been made, at an estimated cost of £375,000, in some of the most densely populated and unhealthy localities in the e. part of the city. The venerable university buildings in this region have been partly pulled down and partly transformed into a railway station.

The Caledonian, the North British, and the Glasgow and Southwestern railways have each one or more stations in Glasgow; the latter line is now accommodated, with the City Union railway, in the vast St. Enoch Square station. The Caledonian has lately built a large central station in Gordon Street; and the North British also has added largely to its accommodation. There are tramways in the principal lines of street.

Charitable institutions and benevolent societies abound in G. The city has about 300 churches and chapels; and is liberally provided with schools of all degrees. For Anderson's College, see ANDERSON, JOHN. Northwest of the city is the Botanic Garden, about 40 acres, with the Kibble Conservatory. Pop. (1801) 83,769; (1861) 446,639; (1871) 477,710; (1881) parliamentary burgh. 487,985; municipal burgh, 510,816; city with suburbs 647,095; (1901) 760,423. See MacGeorge's *Old Glasgow* (1880).

GLAS'GOW, UNIVERSITY OF: founded 1451 by Bp. Turnbull, who procured a bull of ratification from Pope Nicholas V. In 1460, James, first Lord Hamilton, endowed a college on the site—in the densest part of the High Street—of the late buildings, the older portions of which were erected 1632–56. Queen Mary bestowed on the univ. 13 acres of adjacent ground. In 1577, James VI. granted increased funds in a new charter. In 1864, the univ. buildings and adjacent lands were sold, and handsome new buildings, designed by Sir G. Gilbert Scott, were erected at Gilmore hill, overlooking the West End Park, and opened 1872. The total cost was about £470,000, of which £120,000 were granted by parliament, and above £165,000 were

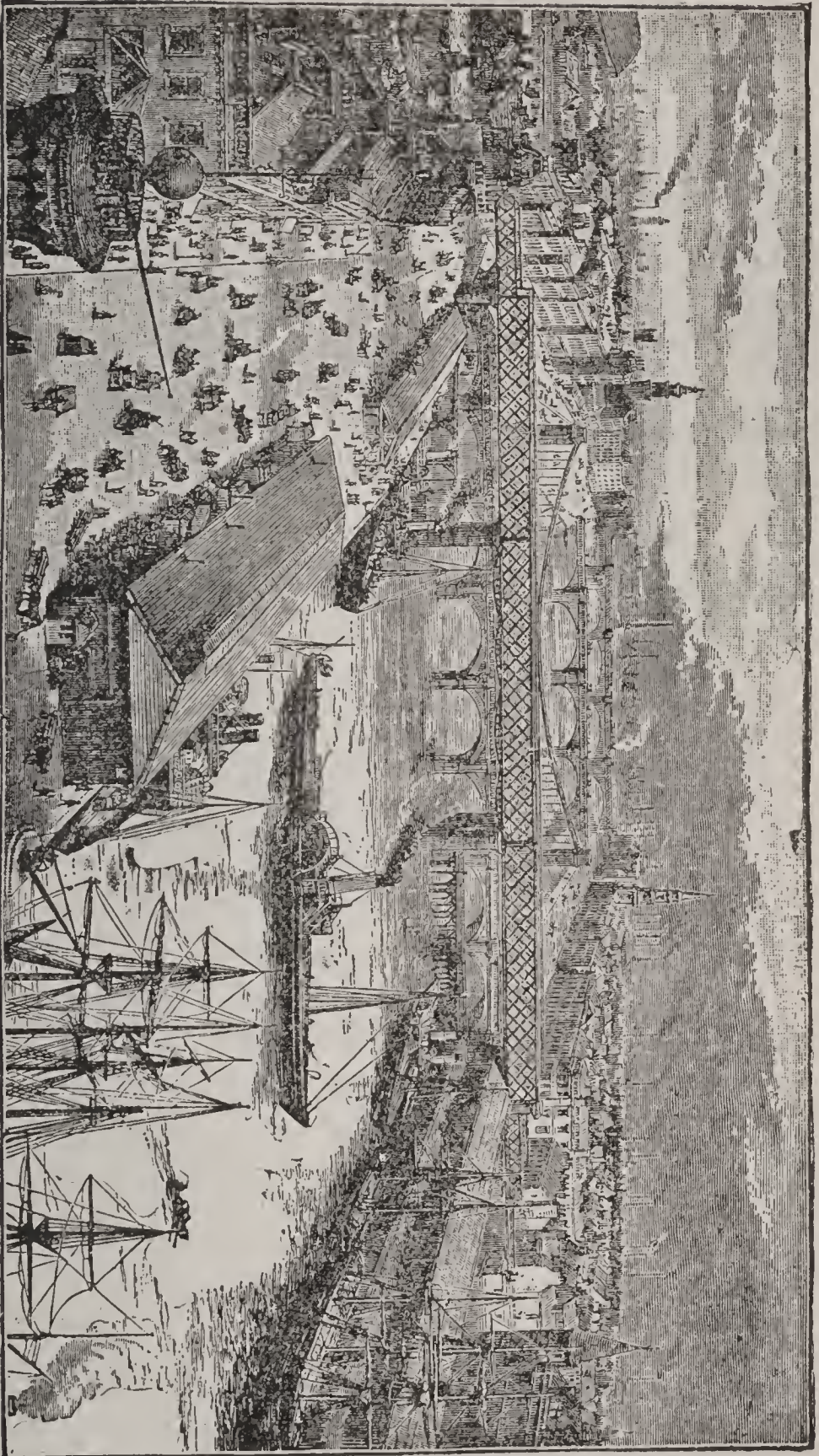
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subscribed, chiefly in Glasgow. The Marquis of Bute built a chapel 1878.

Chairs, Office-bearers, Degrees.—The office-bearers are chancellor, rector, principal, and dean of faculties. The chancellor holds his office for life, and was formerly elected by the senate, but since 1875 he is elected by the general council; the rector is elected triennially by the matriculated students, who are divided, according to their place of birth, into four nations—*Glottiana* (Lanarkshire), *Transforthana* (Scotland n. of the Forth), *Rothseiana* (Buteshire, Renfrewshire, and Ayrshire), *Loudoniana* (all other places). The Dean of Faculties is elected annually by the senate. The duties of chancellor and rector are chiefly honorary. The chairs are Latin, Greek, mathematics, logic, natural philosophy, moral philosophy, English language and literature, anatomy, physiology, materia medica, practice of physic, natural history, chemistry, clinical surgery and medicine, midwifery, botany, surgery, medical jurisprudence, institutes of medicine, Oriental languages, divinity, church history, biblical criticism, civil law, conveyancing, civil engineering, and practical astronomy. The degrees granted are master of arts, bachelor of science, doctor of medicine, master of surgery, bachelor of divinity, bachelor of law, bachelor of laws, doctor of divinity, and doctor of laws, the last two honorary. The ceremony of graduation was of old conducted with no little pomp through all its stages, from its beginning in what was called 'the Black Stone Examination,' to its close in the act of 'Laureation' in the College Hall, or one of the city churches. The number of matriculated students 1870-1 was 1,279; in 1901-2, it was more than 2,100. The students reside outside the college walls; and those in the faculty of arts wear scarlet gowns.

Bursaries and Exhibitions.—There are nearly 190 bursaries for students still attending lectures, ranging in value from £6 to £80; and of exhibitions, fellowships, and scholarships (besides 9 common to Glasgow with the other Scottish universities) there are 40. Of the latter the most valuable are the four Clark scholarships, founded 1872, and each worth £200 a year. The oldest are the Snell exhibitions, founded by John Snell, native of Ayrshire, who 1677 presented to the univ. a landed estate, for supporting at Balliol College, Oxford, 10 students who had previously studied at Glasgow. Owing to the rise in the value of land, the foundation now maintains 14 exhibitioners, who each receive £110 a year for five years.

Libraries, Museums, etc.—The library, founded prior to the reformation, now contains about 105,000 vols.: it is supported by an annual grant of £707 from the treasury, graduation fees, contributions of students, etc. Subsidiary libraries are attached to several of the classes, the books being selected with a view to the subjects treated of in each class. In 1781, July, the celebrated Dr. William Hunter of London framed a will, leaving to the principal and professors of the univ. his splendid collection of coins medals, and anatomical preparations; and for the accommodation and conservation of these, a building was erected 1804, but they



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are now located in the new univ. The univ. has an observatory and a botanical garden, and several of the professors have collections of apparatus attached to their classes, illustrative of the courses delivered.

Eminent Professors and Students.—Among the men of eminence who have taught or studied in the univ. are Bp. William Elphinstone, John Major, John Spottiswoode, Andrew Melville, James Melville, Robert Boyd of Trochrig, John Cameron, Zachary Boyd, Robert Baillie, James Dalrymple, first Viscount of Stair; Gilbert Burnet, bp. of Salisbury; Dr. John Douglas, bp. of Salisbury; Dr. Robert Simson, Francis Hutcheson, Dr. William Hunter, Dr. James Moor, Dr. Adam Smith, Dr. Thomas Reid, Dr. William Cullen, Dr. Joseph Black, Dr. Matthew Baillie, Prof. John Miller, Thomas Thomson, Francis Jeffrey, John Gibson Lockhart, Sir William Hamilton, and Abp. Tait, late of Canterbury.

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GLASS, n. *gläs* [Dan. *glas*; Ger. *glas*, glass; Norw. *olas*, a window; *glisa*, to shine through; F. *glacé*, polished, shining; Gael. *glas*, pale-green: L. *glacies*, ice]: hard, brittle, transparent substance, made by fusing powdered flint or fine sand with some alkali; a small drinking-vessel; the quantity contained therein; a mirror; an hour-glass—a measure of time; a draught of a liquid; a scientific instrument, as a *prospect-glass*, a *weather-glass*: ADJ. made of glass: V. in *OE.*, to see as in a glass; to case in glass; to glaze or cover with vitrifying matter. GLASSING, imp. GLASSED, pp. *gläst*, cased in glass. GLAS'SY, a. -*sī*, made of or resembling glass. GLAS'SILY, ad. -*lī*. GLAS'SINESS, n. -*nēs*. GLASS'FUL, n. -*fūl*, as much as a glass will hold. GLASS-BLOWER, one who makes glass vessels. GLASS-FURNACE, a furnace in which the materials for glass are fused. GLASS-HOUSE, a place where glass is made; a house made of glass. GLASS-PAPER, or GLASS-CLOTH, made by powdering glass more or less finely, and sprinkling it over paper or calico still wet with a coat of thin glue: the powdered glass adheres as it dries. It is sold in sheets, and used in polishing metal and wood-work. GLASS-SPONGE, kind of siliceous sponge whose spicules are prolonged into a strand of flexible glassy threads. GLASS-WORK, a place where glass is made. HOUR-GLASS, an instrument made of glass for measuring an hour or other portion of time by the running out of dry sand from one compartment into another. GREEN or BOTTLE GLASS, a coarse semi-transparent glass made of the silicates of alumina, iron, magnesia, and potash or soda. FLINT-GLASS, a silicate of potash and lead. WINDOW-GLASS, a silicate of soda and lime. PLATE-GLASS, a silicate of potash and lime. MUSCOVY-GLASS, *mūs'kō-vī-*, mica. CROWN-GLASS, glass formed in large circular plates or disks, used as common window-glass. STAINED-GLASS, glass in which the coloring matter is mixed with the glass while in a state of fusion. GLASERITE, n. *gläs'ér-īt*, a sulphate of potash, occurring in delicate white or yellowish-white crystallizations sublimed around the fumeroles of active volcanoes.

GLASS: essentially a combination of silica with some alkali or alkaline earth, such as lime, barytes, etc. Generally speaking, it is understood to be a silicate of soda, or a combination of silica or flint with one or more of the salts of sodium, with the addition of certain metallic oxides, etc. (see *Raw Materials*, below).

History.—The invention of G. dates from the earliest antiquity, and the honor of its discovery has been contested by several nations. As the oldest known specimens are Egyptian, its invention may with great probability be attributed to that people. It is mentioned as early as the 5th or 6th dynasty, and called *bashnu*, the Coptic *bijni*; and articles made of it are represented in the tombs of the period; while its fabrication is depicted in sepulchres of the 12th dynasty—i. e., about B.C. 1800. An Egyptian specimen now in the British Museum has on its underside hieroglyphics giving the name Nuantef IV., whose date is as

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signed by Lepsius as B.C. 2423-2380. The G. of Egypt was generally opaque, rarely transparent, and always colored, the articles made of it being of small size, and principally for adornment, as beads, vases, small figures, and objects for inlaying into wood or other material. Specimens exist of this G. bearing the name of the queen Hatasu of the 18th dynasty, B.C. 1445, and vases of blue G. with wavy lines in white, light-blue, yellow, black, red, and green, of that and a later age, have been discovered. The Egyptians also successfully imitated precious and other stones in G.—as emeralds, lapis lazuli, turquoises, jaspers, onyx, and obsidian; for this purpose, they used nearly the same materials as at present—manganese, copper, iron, cobalt, gold, and tin. Transparent G., indeed, does not appear earlier in Egypt than the 26th dynasty, about B.C. 750, when bottles and a few other objects—as figures for inlaying, and beads imitating gems—were made of it. According to Herodotus, the Ethiopians, two centuries later, placed their mummies in G. coffins; but the fact has never been proved by the discovery of such coffins.

Under the native Pharaohs, Egyptian G. seems to have been extensively exported to Greece and Italy, and its reputation continued under the Ptolemies, when the furnaces of Alexandria produced G. vases of numberless shapes and considerable size. At this period, the Egyptians invented the *millefiori* G., consisting of small threads of G. arranged vertically and then fused, so that the whole rod thus formed was of one pattern; and by cutting off slices, each piece reproduced the same pattern. The beads of *madrepore* G. found in the tombs of Greece and Italy, and formed by placing slices of such rods in a mold and fusing the whole, are probably of Egyptian or Phœnician origin. Egypt retained the pre-eminence in the manufacture under the Romans, the sand of Alexandria being indispensable for the finest qualities, and it exported G. to Rome. Hadrian, on his visit, was struck with the activity of the manufacture, and sent to his friend, the Consul Servianus, one of the vases, called *allosontes* or 'opalescent;' and the Roman writers mention with admiration the melting, turning and engraving of Egyptian glass. To the most flourishing period of the empire are to be referred certain vases and slabs with white camei figures of fine execution in relief on a blue background, and plates of opaque G. for inlaying the walls of rooms, such as those which are said to have decorated the mansion of the usurper Firmus. The art of G.-making, in fact, has never become extinct in Egypt, the Fatimite caliphs having issued G. coins in the 10th and 11th c., and beautiful lamps of G. enamelled on the surface with various colors having been made in the 14th c. Although the art has fallen to the lowest ebb in Egypt the workmen are said to show aptitude in its production.

After the Egyptians, the people of antiquity most renowned for G. were the Phœnicians, who were the legendary inventors. Certain of their merchants, it is

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said, returning in a ship laden with natron or soda, and having been compelled by stormy weather to land on a sandy tract under Mount Carmel, placed their cooking pots on lumps of natron on the sand, which, fused by the heat of the fire, formed the first glass. Sidon, indeed, was long celebrated for G.-wares made of the sand brought down from Mount Carmel to the mouth of the river Belus. The nature, however, of the earliest Phœnicians G. is unknown, unless the opaque little vases of the toilet found in the tombs of Greece and Italy, and the beads of the same discovered in the barrows and tumuli of the old Celtic and Teutonic tribes, were imports from the Phœnicians. The vases of Sidon were, however, highly esteemed at Rome under the Antonines, fragments of bowls of blue and amber G. with the names of the Sidonian G.-makers, Artas and Irenæus, stamped in Latin and Greek, having been found in the ruins. Perhaps the Assyrian G. vases were made at Sidon; at all events, the earliest stated specimen of transparent white G. is the vase having upon it stamped or engraved in Assyrian cuneiform a lion and the name of Sargon (reigned B.C. 722), found at Nimrud by Mr. Layard; and G. seems to have been imported to or even made in Assyria as late as the time of the Parthians, when Nineveh became the Roman colony of Claudiopolis. Under the Sassanides, molded G. vessels, elaborately decorated, were made, as is shown by the cup of Chosroes, A.D., 531-579, in the Louvre; and Persia continued to manufacture G. vessels in the middle ages. The Arabs seem to have derived their G. from the Byzantines, and specimens introduced into Europe by



Fig. 1.—Glass Vase, Bearing the Name of Sargon, from Nimrud.

the Crusaders were called in royal and other inventories Damascus G.; this was colored and not plain. Although the art of G.-making appears to have been practiced in remote times this nation does not appear to have attained any proficiency in it, and is content at the present day to remelt European G.; while some of its highest

efforts do not exceed the imitation of jade and other stones. There is still in the East an extensive use of G. beads, made chiefly at Khalib or Heron. G. was equally unknown to the Hindus, except in the production of a few trinkets and inferior objects, till the settlement of Europeans in India; and the country was, at the remotest period, supplied by Phœnician, and, in the middle ages, by Venetian traders. Although Josephus claims the invention of the art for the Jews, no remains of Jewish G. are known, and it is probable that the Jews were indebted for their supplies principally to the neighboring cities of Tyre and Sidon. Even in Greece itself G. was not ancient. In the days of Homer it was unknown. Herodotus, indeed, mentions its employment for ear-rings, but these may have been of Phœnician fabric. It was called *hyalos*, crystal or ice, and *lithos chyte* or fusible stone. Aristophanes, B.C., 450, mentions G. or crystal vessels, and various inscriptions confirm its use, but its value was next to gold, which could hardly have been the case if it had been of native manufacture. B.C. 4th c., Pausias, a celebrated painter, had depicted *Methe*, or 'Intoxication,' drinking from a transparent G. bowl which revealed her face. Glasses and plates, amphoræ and diotæ, large two-handled jars, were made of it, also false stones for finger-rings, called *sphragides hyalenai*. These last, called by archæologists *pastes*, were imitations of engraved stones in colored glasses, used for the rings of the poorer classes, and were no doubt often copies or impressions of engraved stones of celebrated masters; false gems and camei having a subject in opaque white, sometimes like the sardonyx, with a brown layer superposed on the parts representing the hair, and the whole laid on a dark-blue ground, appear before the Christian era. Lenses also were made of G., and the celestial sphere of Archimedes was of the same material. The supposed Phœnician colored G. vases for the toilet, found in the oldest sepulchres of Greece, it must be observed, have Greek shapes. G.-makers *hyalopsoi hyalepsæ*, also are mentioned at a later period, there can be no doubt the art was practiced. Of the Alexandrian G. mention has already been made and the body of Alexander the Great was shown to Augustus in a G. coffin.

The G.-making art in Italy does not date earlier than the commencement of the Roman Empire, importations from Sidon and Alexandria having previously supplied the lack of native manufacture; but there is ample evidence of its extensive manufacture at that period having been introduced in the days of the Ptolemies, large plates being used for incrusting chambers, *vitreae cameræ*; and hollow columns of this material, with lamps inside, were used to illumine the public theatres. As early as B.C. 58, the theatre of Scæurus had been decorated with mirrors or G. plates, disposed on the walls. G. was used also for paving, and for the blue and green tesserae of mosaics (see MOSAIC).

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Window-G. does not appear till about the 3d. c. after Christ, the houses at Herculaneum, destroyed in the reign of Titus, being glazed with talc and some doubt remaining as to the use of G. for this purpose at Pompeii. Lactantius in the 3d c. and St Jerome, 422, mention G. windows. Older windows of this material are said to have been found at Ficulnea, and even in London. Under the Romans,



Fig. 2.—Molded Glass Roman Cup, with the Circus and Gladiators, found in London.

colored as well as white G. was extensively used; it had a greenish tint in the first days of the Empire, but had sensibly improved in color and quality in the days of Constantine. The first production of a white G. like crystal was in the days of Nero. Its use was most extensive, and it was either blown or stamped according to the objects required. G. vases, *vasa vitrea escaria potoria*, are mentioned. So are costly cups of many colors, purple ones of Lesbos, and balsamarii, especially the kind long called lachrymatories, which held perfumes, medicine, drugs, and other substances like modern vials, amphoræ, ampullæ, pillar-molded bowls, bottles for wine (*lagenæ*), urns (*urnæ*) for holding the ashes of the dead, and pillar-molded bowls or cups (*pocula*).

Besides these articles of amusement and luxury, hair-pins, beads, rings, balls, draughtsmen, dice, knuckle-bones (*astragali*), mirrors, multiplying-glasses, prisms, magnifying-glasses, telescopes, and water-clocks were made of this material.

Many vases are stamped, and some, principally of square shape, have the initials and devices of their makers, or contents (as eye-waters). impressed on the bottom. Most of the precious stones were successfully imitated in G. pastes; and Empress Salonina was egregiously cheated by a fraudulent jeweller. But the most remarkable works in G. are the camei vases (*toreumata vitre*); of which the most cele-

brated is the Portland vase in the British Museum, a two-handled vessel about 10 inches high, of transparent dark-blue G., coated with a layer of opaque white G., which has been treated as a cameo; the white coating having been cut down, so as to give on each side groups of figures delicately executed in relief. The subject is the marriage of Peleus and Thetis, and the urn held the ashes of a member of the imperial family of Severus Alexander, who died A.D. 221—235, and who had imposed a tax on G. It was found in a magnificent sarcophagus in the Monte del Grano, near Rome. A vase of smaller size, but of similar fabric, with arabesques, found at Pompeii, is in the Naples Museum; and numerous fragments of even



Fig. 3.—Portland Vase.

finer vases, some with five colors, are in different museums. In the reign of Tiberius, an adventurer pretended that he had invented flexible G., and threw down a vase which only bent, and which he readjusted with a hammer; he seems to have connected it in some way with the philosopher's stone, and the emperor is said to have banished him or put him to death. This invention is said to have been twice reinvented in modern times—once by an Italian at the court of Casimir, king of Poland. In the 3d c. appeared the *diatreta* or 'bored vases,' consisting of cups (*pouela*) having externally letters, and net work almost detached from the G., but connected by supports; all which must have been hollowed out by a tool, involving great labor. One vase of this class, bearing the name of Maximianus, (reigned 286–310), fixes their age. At a later period, bowls of engraved G., having subjects of gladiatorial fights, came into use. Still later, apparently in the 5th c., a new style of G. ornamentation was introduced, consisting of the figures of Christ and legends of saints, and the portraits of private persons laid on in gold on one layer of glass, over which was placed another through which they appeared. At the close of the Byzantine Empire, the G. art was still rich and ornamental. Achilles Tatius describes a vase which, when filled with wine, made the portion representing the bunches of grapes seem red, as if ripened by the autumn. The numerous beads called serpents' eggs or adder stones (*glain nerdryr*), found throughout Roman Britain, were imported by route of Gaul to Britain, or made in Britain. G. was cheap under the Roman Empire, and Strabo informs us that in his days in Rome a G. cup and saucer cost only an *as* (about a cent). Such articles, indeed, must have been of the poorest kind, as Nero is said to have paid 6,000 sesterces or about \$250,000, for two cups of moderate

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dimensions. Aurelian made the Alexandrians pay a tax of glass. A peculiar white G. seems to have been made at Carthage under the Roman empire. G. gems for rings (*vitrea gemmæ*) were in extensive use. G., however, was considered always something costly and rare, and is mentioned as such in the *Revelations* and in the *Recognitions of St. Clement*, in which St. Peter is described as praying to see some marvellous columns of this material in the island of Aradus. At the close of the Roman Empire only two kinds of G. appear to have been manufactured—bottles of greenish G. in the west, and the *hyalina diachrysa*, or gilded G. of many colors in the east. A few G. vessels of later date have been found in the Anglo-Saxon graves of England, and Frankish sepulchres of France, of a peculiar fabric of green G., with projecting knobs, bent round to the body of the G., and apparently a rude imitation of the *diatreta*. The Romans knew the use of soda and lead as fluxes for G., and made both crown and flint-glass. They made most of the fancy varieties at present in use, and were acquainted with the art of coloring it blue by cobalt, green by copper, rose or ruby by gold. Many of their imitations of gems and other fanciful colors were also of *Schmeltz* glass. But the great site of the G. manufactories of the dark and middle ages was Venice, whither it was transplanted on the foundation of that city in the 7th c. The art, however, seems to have improved on the conquest of Constantinople by the French 1204, and in 1291 the establishments were removed to the island of Murano, the manufacturers forming a guild with a *libro d'oro*, or register of nobility, and the secret kept with the greatest jealousy. In 1436, their color-G. came into note, and continued so till the close of the century, and in the 16th c., lace-patterns and mirrors were introduced. In the 15th and 16th c., plain G. with nice ornaments gilt and enamelled; in the 16th, crackled lace and reticulated G., *vitrodi trino*; and in the 17th c., variegated or marbled glasses were produced. The *millefiori* G. extends through all periods, and seems to have been derived from the Roman, being continued to the present day, when large quantities of it are annually imported to England, and transported to Africa and Asia in trade. The Venetian G. engaged for a long time the monopoly of commerce, their mirrors, goblets, and cups being exported all over the world, but it has been superseded by manufactures of England and Germany. The forms of the Venetian G. reflected its Oriental origin, and the earlier G. of other countries of Europe in their turn show the derivation of their art from Venice. In Germany the oldest G. (which was flint) dates from the 16th c., and consists of goblets and tankards of white color, enamelled with colored coats of arms and other devices, millefiori, and schmeltz glass. Engraved G. was introduced by Caspar Lehmann at Prague 1609, under imperial protection, and continued by his pupil G. Schwanhard; and ruby G. by Kunckel 1679. G. is said to have been made 1294, at Quinquengrone, in Normandy, and before the 16th c., in the reign of Philip VI.; and John and the Dukes of Lorraine established manufactories in their

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domains, and a common kind was made in Dauphiny and Provence. Cast plate also is said to have been established at Cherbourg by artists from Venice, and 1688 the art was



Fig. 4 — German Drinking-glass.



Fig. 5.—Venetian Glass on open-work stem.

declared noble. Potash, lime, silica, and no lead was employed. Thevart introduced G. casting and plate-G. works at Paris. In France, oxide of lead flint-G. was made at St. Cloud 1784; another manufactory was established at St. Louis 1790; and the St. Cloud establishment was removed to the vicinity of the Mont Cenis, where it flourished till 1827. It is uncertain whether G. was made in England before the 16th c., as that mentioned may have been imported from Flanders or Venice. Window-G. is mentioned by Bede 674, but was not in general use for windows till the 15th c. In 1557 flint-G. was manufactured at the Savoy and Crutched Friars; 1565 there were G.-works under Cornelius de Launoy; and 1557, Jean Quarre and other Flemish manufacturers established works at Crutched Friars which Quarre's descendants extended to Sussex. In 1615, Sir R. Maunsell obtained a patent for making G., in consideration of using pit coal instead of wood, and oxide of lead was then introduced in 1635; and in 1673, Venetian artists, brought over by the Duke of Buckingham, manufactured mirrors of plate-G. at Lambeth, and drinking

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glasses were made at this period. But Venetian G. was extensively imported. In 1771, the company of British plate-glass manufacturers was established at Ravenhead, near Prescot, Lancashire; and 1728, plate-G. was made by the Cooksons at South Shields, and by the Thames Plate-glass Company 1835-6. Patent plate was made first 1840. In Scotland, the manufacture was introduced in the reign of James VI., and George Hay obtained a patent for 31 years. The first G. was manufactured at Wemyss, Fifeshire; afterward at Prestonpans and Leith. In 1661, only the principal chambers of the king's palace had glass. In America, attempts seem to have been made to establish glass-works 1746, at Jamestown, Va.; subsequently, 1780, at Temple, N. H., 1789, at New Haven, and 1809, at Boston. Plate-G. was made there first in 1853. It is made at Boston, Baltimore, and New York.

At an early period the application of G. for magnifying lenses appears to have been known. Ptolemy II. had a telescope mounted at the Pharos, and globes filled with water were in use for magnifying under the Romans. Lenses are mentioned in the 12th c., by Alhazan, and by Roger Bacon in the 13th c., toward the close of which Salvino d'Armato invented eye-glasses, subsequently improved by Alessandro Spina. G.-reflectors for telescopes, of great size and accuracy, have been made in France: see TELESCOPE.

As regards processes of making, that called the cylindrical was used by the ancients, and is mentioned by Theophilus at the end of the 12th c. The rotatory process was introduced first in Bohemia, subsequently into France 1730, but not into England till 1832. Pressed G. was invented in America. In England, the tendency has been to throw the trade into fewer hands, there having been 24 window-G. factories in 1847, and only 7 in 1866; but the value of the export increased from £26,694 in 1848 to about £500,000 in 1855. The value of the exports of the chief kinds of G. (1876) was £917,043; (1877) £854,469; (1878) £755,884.—Franks, *Vitreous Art in the Art Treasures of the United Kingdom (Manchester) Exhibition (1855)*; Pelat, *Curiosities of Glass-making (1849)*; *Illustrated Catalogue of the Slade Collection of Glass in the British Museum*, by A. Nesbitt (1871); Froehner's *La Verrerie Antique (1879)*.

Manufacture.—Before giving a sketch of the processes by which it is made, it will be well to notice the nature and kinds of glass. In its ordinary state, G. is a solid body with a characteristic lustre called vitreous, and a conchoidal or shell-like fracture when broken, best seen in pieces of some thickness; further, it is more or less brittle, a property which arises from its outer and inner molecules cooling from a state of fusion at a very unequal rate. It is usually said to be amorphous, but perhaps it rather represents a stage between the perfectly amorphous and the crystalline states. One of the things that a glass-maker dreads is a tendency in his G. to crystallize in cooling. G. is commonly transparent, though this property is not essential, since a true G. may be almost opaque, or at most only translucent, when very thin.

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The chemical composition of G. differs in the different kinds. It is essentially a silicate of soda or of potash combined with a silicate of some alkaline earth or other basic body, such as the oxide of lead. Silica with potash or soda alone, or with both, forms a soluble G. unfit for windows or vessels of any kind. The following table gives the composition of the chief kinds:

1. Window-G., including crown, sheet, and plate: silicate of soda and lime.
2. Bohemian Crystal-G.: silicate of potash and lime. Some window-G. is of this composition.
3. Flint-G., often called crystal-G. or simply crystal: silicate of potash and lead.
4. Bottle-G., that is, of the common kinds: silicate of lime and alumina; with smaller quantities of the silicates of potash or soda, iron and manganese; the silicates of baryta and magnesia also being frequently present.

There are some other kinds made on a limited scale, such as optical G., strass, and enamel glass, Any of the above kinds may be colored by the use of certain metallic oxides.

Raw Materials.—For the better kinds of G., these are the following: *Silica*, employed chiefly in the form of sand, white and comparatively pure: sometimes for very pure G. rock-crystal is used instead of sand. *Potash*, as pearl-ash, or wood-ashes, or the sulphate of potash. *Soda* in the form of carbonate or sulphate of soda. *Lime* in the state of marble, chalk, or ordinary limestone, if sufficiently pure. *Baryta*, from heavy spar or witherite; but barium compounds are as yet used to only a limited extent. *Lead* is used most safely in the form of red-lead (peroxide), a quality free from copper, which would impart color, being specially made for G.-makers. *Cullet* or broken G. of the kind intended to be made. All the above materials must be as free as possible from iron or other impurities when colorless G. is required; and to prevent any iron or carbon present from tingeing the G., small quantities of oxidizing agents, as nitre, arsenious acid, and peroxide of manganese also are employed. Bottle-G. is made of comparatively coarse materials, as will be presently seen.

Glass Pots or Melting-vessels.—These require to be very carefully made of some very refractory clay, since the cracking of one in the furnace, which sometimes happens when it is newly put in, is a considerable loss to the manufacturer. In Great Britain, the famous Stourbridge fire-clay is nearly always used for them. It is almost wholly composed of silica and alumina with water, and is therefore nearly free from oxide of iron or other easily fusible ingredients. Much attention is given to the preliminary preparation of the clay, called tempering. The clay, already so far prepared at Stourbridge, is received at a G.-work in a state of powder. It is then put into large cisterns, mixed with water, and kneaded with the naked feet, which renders the clay of a uniform consistency and free from air cavities; but it requires to be turned over and kneaded re-

peatedly. After a week or two, it is removed to large tables, where it is mixed with the ground fragments of old melting-pots, and carefully worked into a plastic mass. This prepared clay is next made up into small rolled pieces, with which the pot-maker slowly builds up the pot, adding only a few inches to its height in a day. The pots are usually kept several months in stock, after which they are annealed by being kept for a few days at red heat, in which state they are transferred to the glass-furnace for use. New pots require to be 'glazed' by throwing in a quantity of broken G., which protects them from the further action of the materials used in G.-making. Fig. 6 represents a pot for window or bottle G. and fig. 7 a flint-G. pot, which has always a covered top.

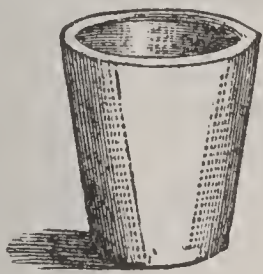


Fig. 6.

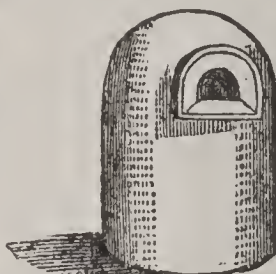


Fig. 7.

Furnaces.—The furnaces long in use for different kinds of G. will be noticed in turn under the respective processes; as, however, the Siemens furnace has now come into extensive use in various departments of the manufacture, it is necessary to give an idea of its construction. For a general description of it, see IRON: here is given a plan (fig. 8), and a cross section (fig. 9)—the latter showing the brick regenerators—of that form called the continuous tank furnace, in which no pots are used—a form as yet employed chiefly in making bottle-glass and rolled plate. For most kinds of G., pots are still used in the Siemens as well as in the older kinds of furnaces; but where pots are preferred, the chief difference is that a flat platform is prepared for their reception, instead of the bed of the furnace being in the shape of a tank or cistern.

The figures are to some extent rather diagrams than exact representations of the furnace. In the plan (fig. 8), RM is the compartment into which the raw materials are fed by the doors, D. When the G. is partially melted, it passes under the first floating bridge of fireclay, B, which keeps back floating impurities. In compartment P the G. is completely melted, and it then passes in a pure state under the second floating bridge, B', into the compartment W, where it is ready for use; *h, h, h*, being the working holes. The space under RM in fig. 9 is an air-flue for keeping the tank cool. In the section (fig. 9), A and G. represent the air and gas regenerators on the left, and A' and G' the corresponding ones on the right. The gas-producers are not shown, but as explained under IRON, the air and gas are fed for a certain time through A and G respectively to the bed of the furnace; and while this is the case, the products of

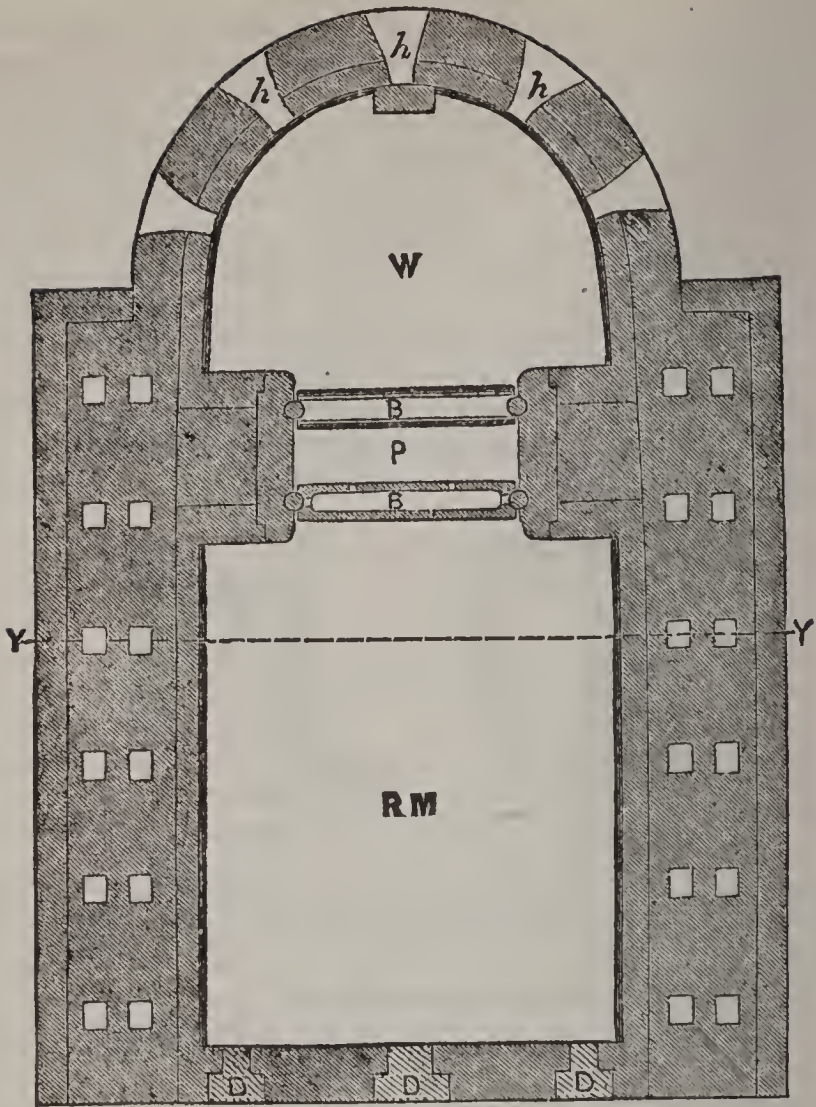


Fig. 8.

combustion descend through A' and G' on the right, by which the piles of open brick-work become in time highly

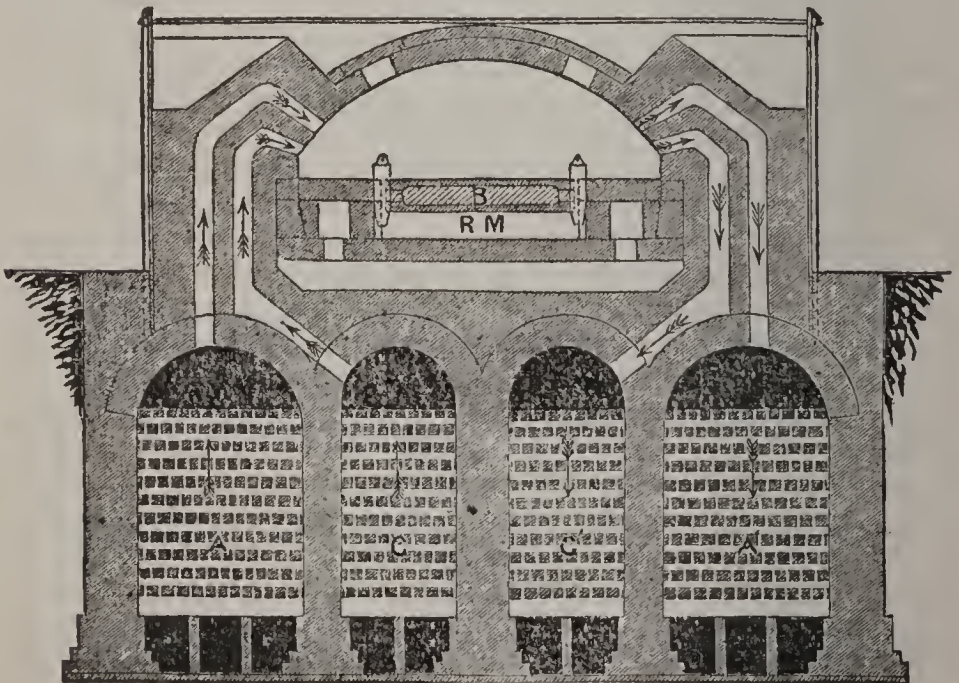


Fig. 9.

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heated. By a proper arrangement of flues and valves, this process is then reversed, so that the gas and air now enter the furnace on the right, robbing in their course the hot bricks in A and G of their heat, and carrying it back to the bed of the furnace. This time, of course, the products of combustion escape through A and G on the left, by which these regenerators become in turn heated, thus saving heat which is lost by escaping up the chimney in ordinary furnaces.

Bottle-glass.—For the dark varieties, such materials as common sand, spent-lime from gas-works, soap-makers'

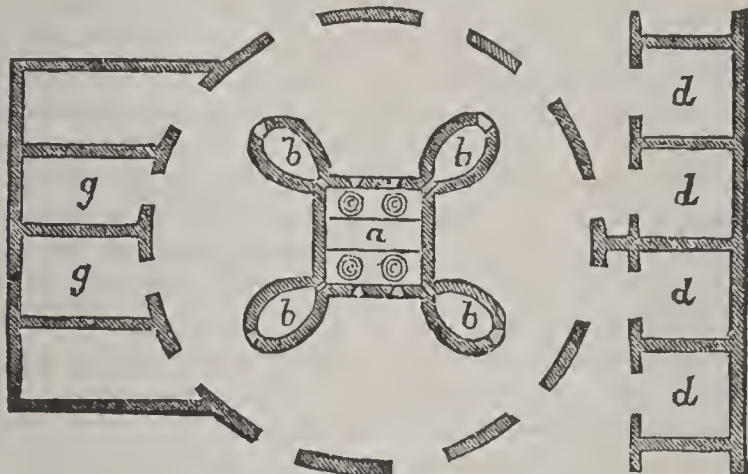


Fig. 10.

waste, kelp-waste, brick-dust, marl, and broken G. (cullet) are used. For lighter-colored bottles, a purer sand and a whitish limestone, are substituted for dark sand and gas-lime, and manganese-waste is added. In France a basaltic earth is used with other materials, and indeed these vary much with the locality of the G.-house. Fig. 10 represents a bottle-G. furnace of the old type, which, however, is now largely superseded by that of Dr. Siemens: *g, g,* and other similar apartments not shown, are stores for materials; and *d, d, d,* are annealing arches. For bottle-G. the materials are first calcined in the arches, *b, b, b, b,* and afterward transferred to the melting-pots, four of which are shown at *a*. When the G. is properly melted and skimmed a workman dips a long iron tube called a blow-pipe into a pot, and takes up (on repeating the operation) a 'gathering,' or sufficient metal to make a bottle (*a, fig. 11*). Another

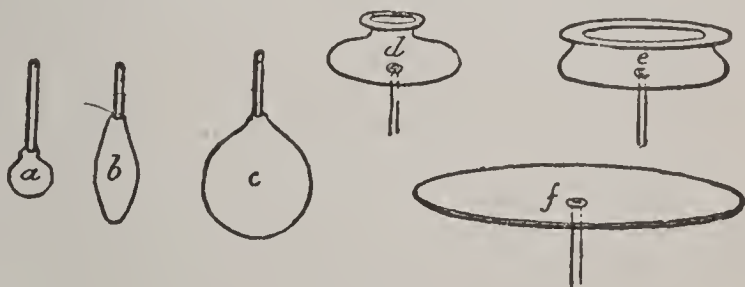


Fig. 11.

workman brings this into a pear-shape (*b, fig. 11*) by slightly blowing and turning it on a stone or iron table, called a *marver*. Formerly, the further manipulation of the bottle

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was done by hand, but molds are now used. These are usually of cast-iron or brass, and open or close by the pressure of the foot on a spring. Into such a mold the partially distended glass is inserted, and made to fill it by blowing down the tube, the bottom being pushed up with a pontil, and the ring round the mouth afterward made by the addition of a strip of metal. In France, where the process of blowing differs in its details, clay molds are often used for champagne bottles, and some other kinds, in which case every bottle passes in succession through three molds, taking its perfect shape in the last.

Annealing.—When the G.-blower has finished a bottle, it is immediately taken to the annealing oven, where it remains about 36 hours, during which time it cools very gradually from almost a softening heat to the ordinary temperature of the air. This process is very important in the manufacture of all kinds of G., because when newly made into vessels or sheets, it is so fragile that it will scarcely endure touching. The molecules are then under a strain from the outside portion of the G. cooling much quicker than the inner; but this is in a great measure rectified by annealing it, and so a proper strength is acquired.

Window-glass.—Crown and sheet-G. are the very same in respect to composition, and plate-G. differs from them only in that the proportion of lime is usually less, and the materials more carefully selected for purity. In England, sheet-G. is made from mixtures of which the following is an example: Sand, 100; quicklime, 32; carbonate and sulphate of soda, 40; and cullet, 100 lbs.; small quantities of those bleaching or oxidizing agents already noted being added as required.

Crown-glass.—Of this, the manufacture is now largely given up in favor of sheet-G., at first called German or Bohemian sheet. Crown-G. being in large circular disks, much waste is caused by cutting these into rectangular pieces, and by the thickened lump or bull's-eye in the centre of the disk. In past days these objectionable bull's-eye pieces were stuck into cellar-windows, and it is a curious fact that these are now being made, though of smaller size and in colored G., in large numbers for ornamental windows.

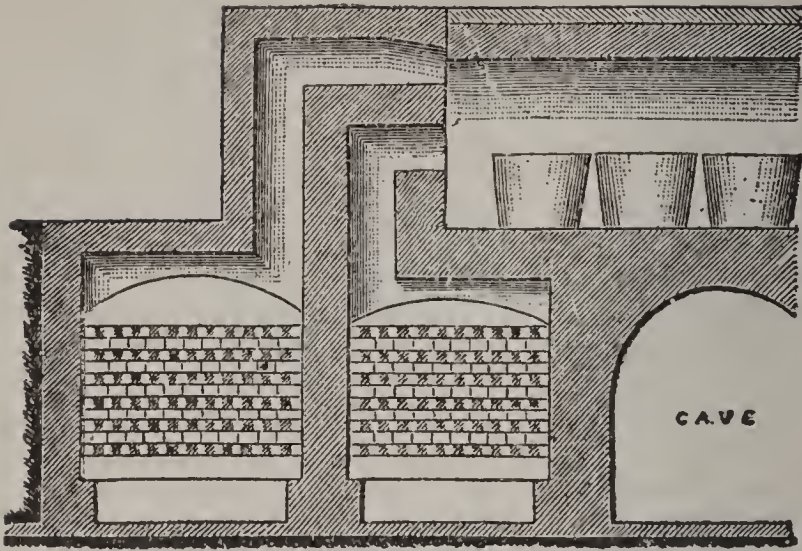
The metal being brought to a workable condition and skimmed, a sheet of crown-G. is made in this way: A workman, by dipping his long iron blow-pipe two or three times into the pot, takes up on the end of it a gathering of about 10 lbs. of metal, which, when the tube is held upright, lengthens by its own weight into a bulb shape (*a*, fig. 11). Rolling this on the marver, the workman makes the outer portion conical, and then, by blowing, forms it into a pear shape (*b*, fig. 11). Further heating and blowing, in the intervals of which the gradually expanding bulb is rolled on a smooth iron bar, called a bullion-bar, brings it into the shape of a flattened sphere, and to a much increased size (*c*, fig. 11).

At this stage the G. is transferred from the blowing-tube to an iron rod (pontil), on the end of which a little hot

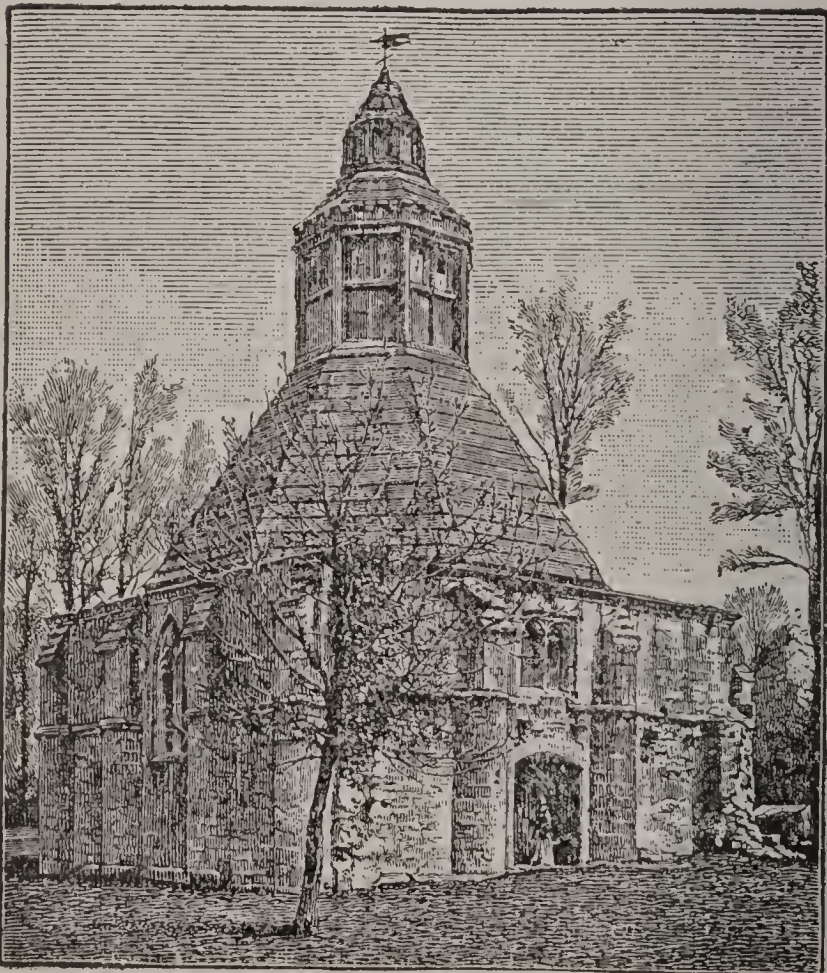
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metal has been placed. What is called a casher-box is used to rest the blowing-iron upon, for the purpose of attaching the pontil to the opposite point of the oblate sphere. The tube is now detached by means of a piece of iron dipped in cold water (*d*, fig. 11). The globe of G. is now held with the pontil. The operator next carries it to the nose-hole, and presents the opening formed by the detachment of the blow-pipe to the action of the furnace; this again softens the G. which is then taken to the flashing furnace, and kept continually revolving, by turning the pontil on a rest in front of the furnace opening. The revolutions are at first slow, but are gradually accelerated as the softening goes on, and the centrifugal force so produced throws the edges of the orifice outward as in *e*, fig. 11. As the G. flattens, it is revolved with greater rapidity, and advanced so near to the mouth of the furnace as to draw the flames outward, by contracting the draught. This completes the softening of the G. it then opens suddenly, with a rushing noise like the unfurling of a flag in the wind, caused by the rapid flying outward of the softened G. and the rush of the flames outward. It becomes perfectly flat, and of equal thickness, except at the bullion or centre, formed, as before described, by the bullion-bar and the punty. The *flashing* is now complete; and after being detached from the pontil, it is taken to the annealing oven, into which it is passed through a long horizontal slit which forms the opening, and when fairly in, it is dexterously turned on its edge. Here it remains at a temperature somewhat below that required to soften G., until the oven is filled with these so-called *tables* of glass, when the heat is suffered to decline, until the whole is cold, when they are removed to the packing-room, to be packed in crates for sale.

Sheet or cylinder glass, as already stated, has now almost entirely displaced crown-G. for windows. The Bohemian process, at present practiced, was introduced from France though a very rude kind of sheet-G. had been before that time (1832) made in England. Sheet is made in a quite different way from crown-G. inasmuch as a long and perfect cylinder is sought to be produced by the *blower* instead of a sphere of glass. This necessitates also a different arrangement of the G.-house, as is seen by the ground-plan in fig. 12: *aa* is the furnace, *b* is the annealing oven, heated by the flue *b'*, which opens into the main furnace; the *leer*, or annealing oven, is often, however, an independent structure; *c, c, c*, are the eight pots, the number usual in these works. These, of course, are opposite to the openings for working them, and in front of each opening is a long opening in the ground about eight ft. deep and three ft. wide, *d, d, d*. The workman stands on the edge of this pit, and having made his gathering (*a*, fig. 13), he forms it into a cylindrical mass in the hollow of a block of wood, into which a stream of water is run. It is further manipulated by blowing and turning into this hollowed wood till it reaches the diameter required. By more blowing and swinging over the head, the workman brings it by



Glass.—System of heating by radiation, as adapted to a long furnace.



The Abbot's Kitchen, Glastonbury.

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degrees nearer to the form of an elongated cylinder (*c, d*, fig. 13). As it cools rapidly in this operation, he from time to time places his pipe in the rest before the furnace-mouth, and gently turning it round, he brings it again nearly to the melting-point; then he repeats the blowing and swinging, standing over the pit, to enable him to swing

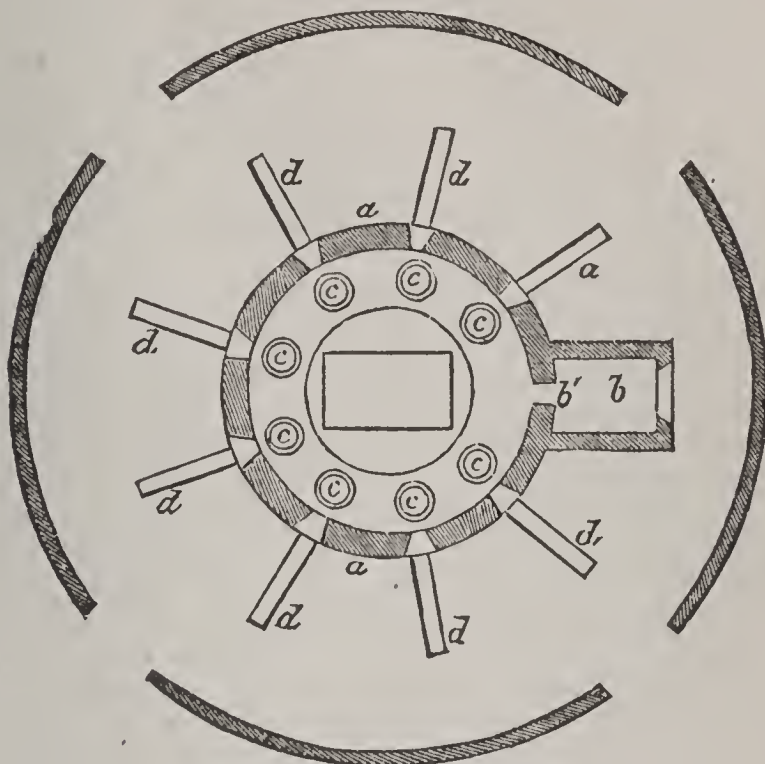


Fig. 12.

it completely round as it lengthens out. These operations are continued until the cylinder has reached its maximum size—that is, until it is of equal thickness throughout, and sufficiently long and broad to admit of sheets, of the required size being made from it (*e*, fig. 13). These cylinders often are made 60 inches in length, allowing sheets of glass 49 inches in length to be made from them, but the Belgians make them much larger: in the Vienna Exhibition, they exhibited sheets 10×4 ft. The next operation is to place the pipe in the rest, and apply the thumb so as to close the opening at the blowing end: the heat of the furnace soon

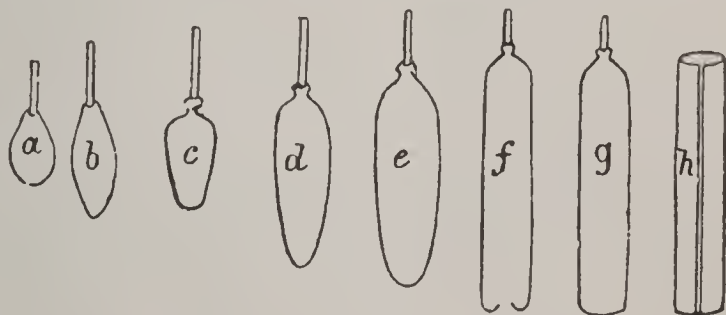


Fig. 13.

softens the glass at the closed extremity of the cylinder, and as the inclosed air is prevented escaping, as it rarefies, by the thumb placed on the opening of the blow-pipe, it

bursts at the softened part (fig. 13, *f*); the operator then quickly turns the cylinder, still with its end to the fire, and the softened edges of the opening, which at first are curved inward, are *flushed* out until they are in a straight line with the sides of the cylinder (*g*, fig. 13). It is then removed, and placed on a rest or casher-box, when just at the shoulder near the blow-pipe, the workman wraps round a thread of red-hot glass, which after a few seconds he withdraws, and touching it quickly with his cold shears, the shoulder and neck drop off as neatly as if cut with a diamond. The removal of this neck of glass can be effected also by drawing a red-hot iron rod round the shoulder, and then dropping a little cold water on it. Formerly, the finished cylinder was cut open longitudinally by means of a red-hot iron rod.

The cylinder (*h*, fig. 13) is now placed for a short time in the annealing oven (*b*, fig. 12), where it is prepared for cutting; it is next placed in a groove lined with green baize, and a diamond fixed to a sliding rule makes a straight cut from end to end. The split cylinder is then taken to the *flattening* arch or furnace, where it is laid on the bottom, with the diamond-cut upward. The bottom is a smooth stone, kept constantly free from dust by the workman; here the heat is sufficient to soften without melting the glass, and the *flattener*, as it softens, opens the two edges of the crack until by its own weight the sheet falls flat on the stone; he then takes an implement in the form of a rake, made by placing a piece of charred wood transversely at the end of a long handle, and this is gently rubbed over the G. producing a very smooth surface. The annealing kiln is immediately at the back of the flattening arch, and the flattening stone mounted on a wagon and carrying the sheet of now flat G. is moved into the annealing chamber. Here, when cooled enough to bear moving, the sheet is first placed horizontally and afterward with others piled upright. The wagon is in this way moved from one chamber to the other with successive sheets of G. till the annealing oven is filled. The oven is then closed so that it may be free from draughts and allowed to cool slowly down for a period varying from three to five days. Very much larger sheets are obtained by this than by the crown-G. process.

G.-shades are made in the manner above described; they are nothing more, indeed, than the rounded ends of the cylinders before being burst. When wanted oval or square, these forms are produced by the use of boxes of wood charred inside, of the size the shades are required, through which the cylinder is passed when being blown, until the soft G. touches, and receives shapes from the inside of the box or mold; they are afterward annealed, and cut to the lengths required.

Plate-glass is made in a totally different manner from crown or sheet. Great care is taken in the selection of the materials, as they require to be purer than for ordinary window-glass. From its thickness any impurity of color is readily noticed, and on account of its flat surface when

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polished, air-cavities are conspicuous defects. The sand requires to be as free as possible from iron, the staining power of which is usually corrected in the case of plate-G. by the addition of a little arsenious acid. Almost every manufacturer has his own private recipe for the mixture of materials, but the following is one said to be in use: Fine white sand well washed, 720 lbs.; sulphate of soda, 450 lbs.; slaked lime, 180 lbs.; nitrate of potash 25 lbs.; and cullet of plate-G., 425 lbs. When melted and ready for use, the pot is lifted out of the furnace (*aa*, fig. 14) by means of the forceps, and wheeled up to the casting-table (*cc*, fig. 14); here it is seized by a crane and tackle, by which it is lifted, and so nicely poised over the table, that it can be easily tilted so as to pour out its contents. All this requires so much care and steadiness, that the men, impressed with the great danger of carelessness, usually keep perfect silence during their work. The table is of large size—20 ft. or more in length, by 8 or 10 ft. in width. When the red-hot G. which is not in a very liquid state is poured on, it immediately begins to spread; two bars of iron, a little thicker than the plate is intended to be, are quickly laid on each side of the table, and a steel roller is laid across, resting on these bars: this roller is worked by hand, and rapidly spreads the G. all over the table, the bars preventing it from running over the sides, and regulating its thickness. In a very short time, it begins to cool; the men then seize the end of it with pincers, and pull it forward with great dexterity on to an endless band of wire-gauze, which, being made to revolve, moves the immense plate forward to a slit-like opening to the annealing oven (*f, f*, fig. 14), where it is worked on to another table on wheels, which is pushed forward to make room for another. The annealing

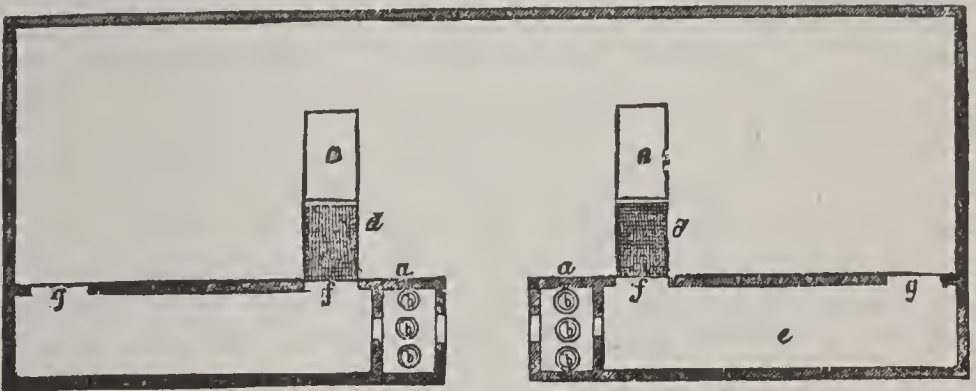


Fig. 14.

oven is usually of immense length, as, in the case of plate-G. the sheets cannot be set on edge. The ovens are in sheds, often two ovens to each shed; and the sheds more than 300 ft in length. The ground plan in fig. 14 gives a general idea of the arrangement of one of these vast workshops. The main building is a shed, with the doors at each end; and both doors and windows are made so as to exclude draughts of air, which if admitted during the operation of casting, are highly injurious to the quality of the manufacture. *a, a*, are the two melting furnaces; *b, b, b, b, b, b*, the pots; *c, c*, the casting-tables; *d, d*, the endless bands of

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wire-gauze for moving the plates to the annealing ovens, *e, e*, where they enter by the narrow openings *f, f*; and, after they have sufficiently cooled, are removed through the openings at each end, *g, g*.

The plates are next removed to the first polishing-shed, where each is imbedded in a matrix of stucco, leaving one surface exposed; the whole is inclosed in a frame, which holds both G. and stucco securely. Two of these frames are placed one over the other, with the two exposed surfaces of G. in contact. The lower frame is fixed, and the upper is made to move by machinery somewhat quickly backward and forward with a swinging motion, so as to describe an opposite curve with each backward and forward motion. Sand and water are continually thrown on the surface of the fixed plate, and thus the first stage of polishing, called grinding, is performed. The plates are then readjusted in the frames, and the other surfaces are brought face to face and receive a similar rubbing down with sand and water. The plates now receive a second grinding or rather smoothing on the same table with emery powder and water, the emery used being of increased fineness as the process proceeds. Formerly this was done by hand, the operators being women; now machinery is employed, and the finishing touches only are by hand. After both sides have received this smoothing, the plates are removed to another room, where they are again imbedded on tables which are movable by machinery, so that the whole surface of the plate may be brought under the action of the polishers. These are padded iron buffers attached to short iron rods passing through holes in a beam acted on by springs. The buffers are covered with leather, and rub the G. as it passes from side to side, the surface of which is supplied with oxide of iron in a very fine state of division and mixed with water. When any inequalities are encountered, the springs yield and allow the buffers to pass freely over them. An older plan of polishing is to use wooden rubber-blocks covered with felt.

Rolled Plate.—About 1850 was introduced a very successful method of making unpolished plate-G. variously figured, which has been very successful. Sheets of this G. are made by ladling from the pots given quantities of G., and pouring them on casting tables which have reverses of the required patterns formed upon them. The process is adapted only for sheets of moderate size and thickness.

Patent Plate.—Sheet-G. made by the cylinder process, when free from flaws and of good color, is to a limited extent ground and polished much in the same way as ordinary plate-glass, but it is rather higher in price. However, its lightness is an advantage for some purposes, such as the glazing of picture frames and for photographic negatives. It is called patent plate to distinguish it from thick plate-glass.

Qualities of Plate-glass.—There is great difference in the quality of plate-G. from different manufacturers. We do not refer to air-cavities or other imperfections which can

be readily seen, and from which the highest-priced G., such as that used for mirrors, is almost free; but to a defect by which the transparency of the whole surface of the G. is impaired. It is often found, for example, that of two plates apparently equally pure and free from flaws, one will take on a peculiar dimness a few days after being cleaned, while the other will remain quite clear and transparent for as many weeks. Plate-G. which does not keep long clean—to use a homely phrase—may often pass unnoticed for a long time until experience of a better quality calls attention to it. Some inferior qualities of ‘pressed glass,’ noticed below, also take on a kind of scum even when newly cleaned, a fault most readily noticed in plain articles.

Flint-glass is chiefly a silicate of lead and potash. Such a mixture as the following yields a good G. of this kind: 100 parts of pure white sand, 50 parts of pearl-ash, 100 parts of red-lead, 3 parts of borax, and a very little arsenious acid and peroxide of manganese. Cullet is usually added to the extent of about one-fourth part of the whole mixture. The pots for flint-G. (fig. 7) are covered or hooded, so as to protect the melted G. from any impurities in the flames of the furnace. The materials used are very carefully selected, as the G. requires to be of great purity; the greenish tint in sheet or plate, due to the soda, would be very objectionable in flint-glass. Its brilliant flashing appearance, when cut into suitable patterns, is owing to its high power of refracting and dispersing light, a property arising from its comparatively high density. The working of flint-G. resembles in a general way that of the other kinds: the following list of the stages in making a wine-glass, gives an idea of the process to the point where the manipulation of the metal in a welding state finishes: 1. Gathering of metal; 2. Same marvered, and bowl formed; 3. G. with metal for stem dropped on; 4. Same with stem formed; 5. Same with foot stuck on; 6. Same with foot heated and half opened; 7. Same with foot opened, bowl cracked off, heated, and sheared; 8. Same finished. It is then annealed.

Optical Glass.—This is made both of flint and crown glass. In the case of lenses for a telescope, e.g., a combination of the two kinds is necessary to make it achromatic—their unequal densities giving them different refractive powers. Good flint-G. for optical purposes is extremely difficult to make, especially when the required slabs or disks are of large size. It must be perfectly homogenous and free from striæ, and it will be deficient in refractive power if it does not contain a very large proportion of lead, which, from its weight, has a strong tendency to settle at the bottom of the crucible, and so destroy the homogeneity of the glass. ‘The fused G. is therefore continually stirred until it has cooled to a consistency sufficiently thick to prevent the lead settling, and is then left still in the crucible to complete the cooling. When cold, the crucible is broken away, and the result is a cake of immensely heavy G., of which it is not yet known whether

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the value is to be calculated in pounds or pence. It is afterward reheated, brought to the required disk-like shape, and then tested for flaws. If these are numerous, as many smaller disks or slabs are taken from it as possible. Two exceptionally large disks of optical glass, 24 inches in diameter, were purchased a few years ago from Messrs. Chance of Birmingham, England, for £1,000 each. The heaviest crown and flint G. for optical purposes made by that eminent firm, have the respective densities of 2.55 and 4.45. A great many experiments in connection with optical G. have been tried of late years with chemical substances other than those above named, the result of which will be found in the Reports of the British Assoc. for the Advancement of Science.

Slag-glass.—The slag from iron blast-furnaces is itself a coarse G., but until lately it has been a waste product. Bricks, however, have been successfully made from it of late years; and still more lately, G. bottles are made from it. The slag is used in the molten state as it runs from the iron-furnaces, which, of course, so far saves fuel, but it requires to be mixed to the extent of nearly one half its bulk with other materials. The process is said to be successful; yet it seems that there must be great difficulty in procuring, for any length of time, slag of nearly the same composition. *Slag-wool* is a name for this same iron-slag when blown into G. threads of a hair-like fineness, in which state it somewhat resembles wool, and is now much used for covering steam-boilers, it being, like all glass, a powerful non-conductor of heat.

Toughened Glass.—Much curiosity was excited when, 1875, M. de la Bastie, French engineer, announced that he had succeeded, after many experiments, in making G. so 'tough,' that it could scarcely be broken. His original process consists in heating any piece or pieces of G. till they are about to soften, and then plunging them into a bath of oil at a greatly lower temperature. Usually, however, a mixture chiefly of oily substances, such as oils, tallow, wax, rosin, etc., is put in the bath; and some manufacturers, who worked the process for a time, dropped the newly-made G. vessels while still hot into the oleaginous mixture, by which plan neither reheating nor annealing by the ordinary process is required. After the articles acquire the temperature of the bath, they are removed. Either from the want of care or from some other cause, the results of the treatment by De la Bastie's process are not uniform, because many samples of his toughened, or, as it should rather be called, hardened glass, are almost as easily broken as ordinary glass. Objects such as tumblers, when allowed to fall, nearly always break if they strike the floor on the lip or mouth. Still, there is no doubt that most G. treated by this process will stand much rough usage, and that some examples are practically unbreakable. In the case of window-G. there is the disadvantage that a diamond will not cut it, and no variety of G. so hardened can be safely engraved or 'cut,' because when the tool penetrates much below the skin, the glass falls to pieces—al-

GLASS.

most to dust. These defects, as well as the high price, have as yet prevented its coming into extensive use.

Glass Sleepers.—Quite recently (1879), sleepers made from a kind of bottle-G., toughened by a process which somewhat resembles De la Bastie's, have been partially tried on the London tramways, with promise of success. A strong black G. for architectural purposes was made years ago from basalt, but it was not a commercial success.

Coloring of Glass.—Any kind of G. can be colored by metallic oxides, and the chief colors given by these are noted in the following list. *Crimson* of various shades, from gold, 'Purple of Cassius' (a compound of gold and tin) being the compound generally used. So small a quantity as $\frac{1}{100000}$ part of gold imparts a rose color. A red color is also got from protoxide of copper. *Purple or violet-red* is obtained from peroxide of manganese. *Blue* from oxide of cobalt or oxide of copper, chiefly from the former. *Green* from the same oxides, together with sesquioxide of iron; a fine green is got likewise from sesquioxide of chromium. *Yellow* from oxide of antimony or sesquioxide of iron; sometimes from carbon. Sesquioxide of uranium gives a beautiful opalescent-yellow with a greenish cast. Chloride of silver is used to stain G. yellow. Arsenious acid produces an opaque *white*; so also does the mineral Cryolite (q.v.), as well as aluminate of soda. Aventurine G. is a beautiful material of a brownish-red color, with gold-like spangles, in imitation of aventurine (or Avanturine, q.v.) quartz. It is largely used in the ornamental G. made at Venice.

Colored G. is made in several ways. When the color is all through the body, the G. consists of *pot-metal*; but for some purposes, and especially when the coloring material is expensive, it is *flashed*, that is, a thin veneer of colored coats a greater thickness of clear glass. In this case the two layers are 'gathered' from different pots on the blowing-iron, and blown out together as one sheet. Sometimes a very thin colored coating is put on clear G. by spreading, say a red glassy powder on the surface of the latter, and then carefully fusing it. When the chloride or other salt of silver is used to give a yellow, orange, or red, the G. is merely *stained* on the surface. In painted G., the decoration is usually produced by enamel colors painted on with a brush, and afterward fired at a moderate heat. Single sheets of G., each with several shades of the same color, are now made for G.-stainers, by which much shading by hand is dispensed with. A pane or vessel of flashed G. may be ornamented by partially removing the colored layer, either by cutting or etching, and in the case of many designs additional enamel color are added. Hydrofluoric acid, which corrodes G., is commonly used to produce etched patterns upon it by protecting certain portions with a varnish, and allowing the acid to act upon the unprotected parts.

For one application of colored G. to ornamental purposes apart from painted windows, see GEMS, ARTIFICIAL; but the recent success of M. Feil of Paris, in his attempts to

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imitate not the color only, but also the hardness of real gems, is very wonderful. Venice, which a quarter of a century ago produced almost nothing in G. but beads, is once more making on a large scale G. articles, whose quaint forms and rich colors are little, if at all, inferior to her best ancient products. The well-known Bohemian G., much of which is colored and gilt, but which in past days was often more showy than tasteful, has very recently shown remarkable advances in the character of its decoration. Some very tastefully ornamented colored G. is made in France.

Glass-cutting and Engraving.—It is usually flint-G. that is so treated; and vessels intended to have cut-patterns are blown with thick walls. The first operation in G.-cutting is usually done on an iron grinding-wheel, 10 or 12 inches in diameter, and about three-fourths of an inch thick, made to revolve vertically by a belt and pulley. Immediately above a hopper-shaped cistern is placed, which supplies the wheel with the necessary mixture of sand and water. If a faceted pattern is to be given to a decanter or other object, it is first roughed out on this wheel by the grinder holding the vessel against it. The facets now formed on the G. are next made smoother by a fine sandstone wheel, fed with water only, and similarly driven. For many purposes, this wheel is of an angular section on the edge. The ground parts are finally polished upon a wooden wheel, supplied with moist putty-powder (oxide of tin) or other fine polishing material. The obscuring of G. by the ordinary process is done with sand and water alone; but much of this kind of work is now done by Tilghman's sand-blast process, noticed below. Engraved patterns are produced by means of small copper disks revolving in a lathe, emery powder, mixed with oil, being applied to the edges of their circumference. We have already referred to the use of hydrofluoric acid for etching glass.

Tilghman's Sand-blast.—This is a very striking invention. The well-known fact that windows exposed to the action of wind-blown sand by the sea-shore, eventually become completely obscured, appears to have suggested the process. It consists in producing patterns on G., marble and other materials by a strong blast of fine sand, emery, or corundum. In the case of G., for which the process is as yet chiefly used, the sand-laden air-blast is produced by a fan (q.v.), but high-pressure steam can be resorted to in order to obtain great velocity of blast for very hard surfaces. If a pattern, say of a fern leaf, is wished, it can be cut out of sheet india-rubber or other material (the leaf itself will do), and gummed on the glass. On this being exposed for a short time to the sand-blast, the bare portions are worn down, and the pattern formed. When the whole surface of a pane of G. is exposed to the blast, it is, of course, quickly obscured.

Pressed Glass.—By this name is known a certain cheap class of objects, such as tumblers, small dishes, etc., with patterns in imitation of cut glass. It appears to be an American invention, and the process consists in pressing or

GLASSCHORD—GLASS-CRABS.

shaping G. into form by means of a metal mold and reverse, called a plunger. By a somewhat similar but much older process, 'pinched glass' objects such as buttons are made.

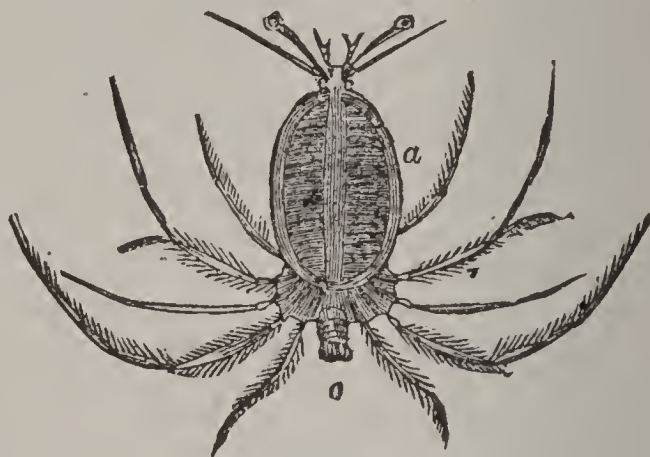
Soluble Glass.—Both silicate of soda and silicate of potash, when they contain an excess of alkali, are soluble in water. They are then called soluble silicates, or sometimes, if prepared in the glassy state, soluble glass.—Fuch's soluble G. is a peculiar silicate, prepared by melting together 8 parts of carbonate of soda, or 10 parts of carbonate of potash, with 15 of pure quartz sand, and 1 part of charcoal added to facilitate decomposition of the alkaline carbonate. A black G. is thus obtained, which is not soluble in cold water, but dissolves in about six times its weight of boiling water. Fuchs commenced his experiments on this subject 1825, and continued and varied them for many years. The above is, we believe, the most approved formula. The practical uses of the soluble G. to which he especially directed his attention were two—(1), as a varnish, which, applied in the fluid form to stone surfaces, would harden into a G., and prevent the ordinary effects of atmospheric influences; (2) as a means of fixing fresco-colors by the process known as stereochromy: see FRESKO: WATER-GLASS. Prof. Kuhlmann of Lille 1857 published his method of producing a stone-protecting silicate; and used it successfully for preventing the decay of walls and houses built of inferior stone. He also employed soluble G. in print-works and tapestry factories for fixing colors on cotton and on paper. It has been utilized also in washing wool, 40 parts of water being mixed with 1 of soluble G. at a heat of about 130° F.—Other processes employ concentrated solutions of silicate of potash, or of soda, as a cement for consolidating silicious sand into a very hard, durable, artificial sandstone, capable, before it is fired, of being molded into any desired form; also they produce a vitreous varnish, consisting of silicate of potash, after which is applied a coating of a solution of chloride of calcium: a silicate of lime is thus formed, said to be very successful in protecting the surface of stone. The U. S. Census of 1900 reported 355 glass manufactories, employing \$61,423,903 capital and having finished products valued at \$56, 539,712 per annum.

GLASS'CHORD: musical instrument with keys like a pianoforte, but with bars of glass instead of strings of wire; invented in Paris 1785 by a German named Beyer. The name was given to the instrument by Franklin. The G. found no favor with the instrument-makers, and none were ever made after that exhibited in Paris by the inventor, as possibly its construction and mechanism remained a secret with him.

GLASS'-CRABS (*Phyllosomata*): formerly classed as a family of crustaceans, of the division *Malacostraca*, order *Stomapoda* of Cuvier; now considered, at least in most cases, as larval forms of decapods in a certain stage of development. They are remarkable for the transparency of their bodies, whence their popular name, while the

GLASSITES—GLASS-PAINTING.

scientific name (Gr. leaf-body) refers to the great horizontal expansion of the carapace. They have little resemblance to crabs. The head is represented by a large oval plate, bearing eyes mounted on very long stalks; a second plate, the breadth of which much exceeds its length, represents the thorax, and bears the feet, most of which are long, and some of them, as in a few other crustaceans, bifid, with one branch much longer than the other. The abdomen is small. Milne-Edwards supposes these creatures to have no special organs of respiration, but that the blood



Glass Crab :
a, head; *b*, thorax; *c*, abdomen.

is aerated through the general surface of the body. They are found in tropical and sub-tropical seas; and so transparent are they, that, when floating on the surface of the water, they would not be perceived but for the beautiful blue of their eyes.

GLASS'ITES, or GLAS'ITES: see SANDEMANIANS.

GLASS'MEN: in England, wandering rogues or vagrants, under statutes 39 Elizabeth c. 4, and 1 James I. c. 7.

GLASS'-PAINTING: application of colored glass to the artistic decoration of windows.

A method of making ornamental glass-windows was to produce the pattern in outline with finely made leaden frames, into the grooves of which pieces of colored glass or of stained glass were fitted. This method, with modifications, is still employed; and glass with the old, rough character of surface has been much used in recent work. But modern chemistry has so improved the art of glass-staining, that large pictures are now produced on single sheets of glass, as in the case of windows shown in the London Exhibition 1851, one of which was nine ft. high by three ft. broad. It was on plate-glass, and had to be fired 15 times, yet it was perfectly smooth, and though somewhat deficient in brilliancy of color, was an effective composition.

One of the best known early applications of glass to window decoration is in the monastery of Tegernsee, Upper Bavaria, which was secularized 1802, and is now a private residence; but these windows (executed in the latter half of the 10th c.), like all of the first attempts, were only tasteful arrangements of colored glass in imitation of the stone

GLASS SNAKE—GLASTONBURY.

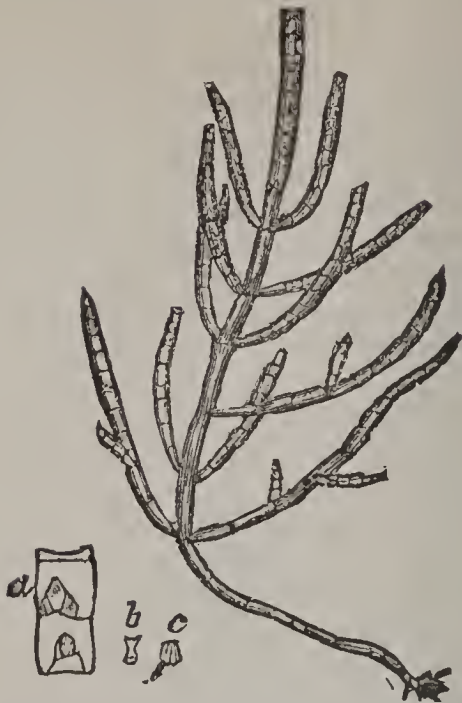
mosaics used for floors, etc.; nor did the art rise much above this for at least three centuries after its origination, but in the 13th c., owing to the full development of the Gothic style of architecture, it became of immense importance, colored glass taking the place of tapestried curtains in filling the spaces within groined arches. The mosaic patterns were superseded by elaborate designs, not only in beautiful arabesque and other styles, but even pictorial compositions were attempted; and to such perfection did this come, that many of the works of the 15th c. are marvels of art. In all of these, the figures, excepting the faces, were made of pieces of self-colored glass combined with great skill and taste; the features were painted in enamel colors, and burned in. Gradually the art of shading, by removing certain portions of the colored surface, and other improvements, were introduced. This was the culminating point in the first period of glass-painting, as it is called; at this point the art seemed to have attained the highest perfection of which it is susceptible, for the efforts which followed to improve it by assimilating it to oil-painting signally failed, and with this failure began that decline in art which was perhaps more remarkable in the instance of glass-painting than in any other. It was soon felt that the true art was lost. In the present century, rapid improvement has been made, and the renaissance bids fair to eclipse the glory of the first epoch. The great seats of this art are now in Munich, Nürnberg, Paris, Birmingham, Edinburgh, and one or two more places; and it never received more liberal patronage in its palmy days than it now does.

GLASS' SNAKE (*Ophisaurus*): genus of lizards, of sub-order *Brevilingua*, family, *Ptychopleuridæ* (*Zoneuridæ*, q.v.); allied to the *Scincidæ*. The only known species is found in the United States; it is serpent-like in form, may be over three ft. long, and is destitute of limbs. The body and tail are marked with transverse lines of black, green, and yellow. It feeds on insects, mollusks, etc., and can neither climb nor swim. It is remarkable for the readiness with which the joints of the tail break off upon any irritation, the joints thrown off being soon reproduced. The caudal muscles do not pass from one joint to another, so that the breaking of the tail involves no rupture of muscular fibres, but only a separation of one muscular plate from another.

GLASS'WORT (*Salicornia*): genus of plants of the nat. ord. *Chenopodiaceæ*, having uniform hermaphrodite flowers, with a single fleshy obscurely lobed perianth inbedded in an excavation of the *rachis*, one stamen or two, and a short style, the fruit a *utricle* inclosed in the enlarged perianth. Some species, abundant on the Mediterranean shore, contain much soda, and are used, as is Saltwort (q.v.), in making *barilla*. One species (*S. herbacea*), a leafless plant with jointed stems, growing in salt marshes, is made into a good pickle and is sometimes sold for this purpose.

GLASTONBURY, *glá'sen-bër-i*: ancient municipal burgh and market-town in the county of Somerset, England, 25

GLASTONBURY.



Glasswort (*Salicornia herbacea*):
a, joints of stem bearing flowers; *b*, style; *c*, stamen.

m. s.w. of Bath; built in the form of a cross, on a peninsula formed by the river Brue, or Brent, called the Isle of Avalon. It has small manufactures of silk; and has some export trade in timber, slates, tiles, and agricultural produce, by means of a canal connecting it with the Bristol Channel, and by the railway between the Bristol and Exeter and Wilts and Somerset lines which passes through the town. The town owes its origin to its celebrated abbey, which, according to the tradition, was founded A.D. 60, and was one of the earliest seats of Christianity in Britain. Its traditional founder was Joseph of Arimathea, and the 'miraculous thorn,' which flowered on Christmas-day, was, till the time of the Puritans, believed by the common people to be the veritable staff with which Joseph aided his steps from the Holy Land. The tree was destroyed during the civil wars, but grafts from it still flourish in the neighboring gardens. In 605 the monks adopted the dress and rules of the Benedictine order. This magnificent pile at one time covered 60 acres; but as most of the houses in G., and also a causeway across Sedgemoor, have been constructed of the materials, the extent of the ruins is now much diminished. The most interesting remains are the Abbey Church, with St. Joseph's Chapel, St. Mary's Chapel, and the Abbot's Kitchen. St. Joseph's Chapel is one of the most elegant specimens extant of the transition from Norman to Early English architecture, and is supposed to have been built during the reigns of Henry II. and Richard I. It is now roofless, and the vaulting of the crypt is nearly destroyed. The entrance is adorned with sculpture. Below the floor is a Norman crypt, within which is St. Joseph's Well. Of the Abbey Church, few fragments remain. The Chapel of St. Mary is roofless, but the remains of its pointed windows and archways are exceedingly elegant. The Abbot's Kitch-

GLATZ--GLAUBER'S-SALT.

en, now separate from the rest of the ruins, is a square massive structure, the walls strongly buttressed, and dates from about the 15th c. G. has the honor of ranking St Patrick (415) and St. Dunstan among its abbots. In 1539 Henry VIII. summoned Abbot Whiting to surrender G. and all its treasures; and on his refusal, condemned him to be hanged and quartered, and the monastery confiscated to the king's use, which sentence was immediately carried into execution. According to tradition, King Arthur and his Queen Guinevere were buried in the cemetery of the abbey, and Giraldus Cambrensis states that 'a leaden cross, bearing the following inscription, "Hic jacet sepultus inclytus Rex Arthurus in insula Avallonia," was found under a stone seven ft. below the surface; and nine ft. below this was found an oaken coffin, containing dust and bones.' This disinterment took place by order of Henry II. Other objects of interest are the Church of St. Benedict; the Church of St. John the Baptist, with a tower 140 ft. high; the Weary-all Hill, where, in the legend, Joseph of Arimathea rested from his weary pilgrimage; and the Tor Hill, where the last abbot of G. was put to death, 500 ft. above the sea-level. crowned by a tower. the ruin of a chapel of St. Michael. Pop. of town about 5,000.

GLÄTZ, *glatz*: town of Prussia, province of Silesia; a fortress of the second rank, between two fortified hills, on the left bank of the Neisse, 52 m. s.s.w. of Breslau. It has four Rom. Cath. churches and a gymnasium; and carries on manufactures of linen, damask, and woolen fabrics, and of leather and rose-garlands. During the Thirty Years' and the Seven Years' wars. G. was frequently besieged and taken. Pop. about 14,000, including 1,657 of a garrison.

GLAUBER, *glow'ber*, JOHANN RUDOLPH: 1603-68; b. Karlstadt, Franconia: German chemist and physician. Little is known of his life, except that he resided long at Salzburg, then at Kissingen, then at Frankfurt-on-the-Maine, then at Cologne, whence he probably removed to Amsterdam. Although a believer in the philosopher's stone and in the universal medicine, he contributed materially to the progress of chemistry. Poggendorff (in his *Biographisch-literarisches Handwörterbuch*) gives a list of about 30 of his works, of which a collected edition to the date of publication appeared, in two 4to vols. 1658-9, at Frankfurt, and another seven 8vo vols., Amsterdam, 1661. An English translation by Packe, in one large folio vol. was published, London, 1639. G. is known chiefly for his discovery of sulphate of soda, which he termed *sal mirabile*, and regarded as a cure for all diseases. See Kopp's *Geschichte der Chemie*, I. 128-133.

GLAUBER'S-SALT, n. *glaw'bers-sälvt* [after Johann Rudolph Glauber, who discovered it 1658]: popular name of the neutral sulphate of soda, chemical composition $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$. It occurs in long four-sided translucent prisms, terminated by dihedral summits, and containing ten atoms of water. On exposure to the air the crystals lose all their water, and become resolved into a white powder.

GLAUBER'S SPIRIT OF NITRE—GLAUCOMA.

When heated, they readily melt in their water of crystallization; and if the heat is sufficiently continued, the whole of the water is expelled and the anhydrous salt remains. Glauber's salt has a cooling, bitter, and saltish taste; it is readily soluble in water; its solubility (in the ordinary crystalline form) increasing up to 92°, when it appears to undergo a molecular change, and to be converted into the anhydrous salt, which at this temperature is less soluble than the hydrated compound, and separates in minute crystals. This and other anomalies which occur in the solubility of this salt have been carefully studied by Löwel (*Ann. de Chimie*, 3d ser. IX. 50).

G.-S. is a constituent of many mineral waters, and occurs in small quantity in the blood and other animal fluids. It occurs, under the name of *Thénardite*, near Madrid, in the form of anhydrous octahedra deposited at the bottom of some saline lakes; and is found combined with sulphate of lime, as *Glauberite*, in the valley of the Ebro.

The anhydrous salt is prepared in enormous quantity from common salt and oil of vitriol, with the view of being afterward converted into carbonate of soda: see SODA.

For medical use a purer form is required. The salt which remains after the distillation of hydrochloric acid—this salt being sulphate of soda contaminated with free sulphuric acid—is dissolved in water, to which is added powdered white marble (carbonate of lime), to neutralize the free acid, and to precipitate it as an insoluble sulphate; the solution is boiled down till a pellicle appears, is strained, and set aside to crystallize. It is used as a common purgative, and is especially applicable in fevers and inflammatory affections, when it is necessary to evacuate the bowels without increasing or exciting febrile disturbance. The usual dose is from half an ounce to an ounce; but if it is previously dried, so as to expel the water of crystallization, it becomes doubly efficient as a purgative. It is now much less frequently used than formerly, having given place to milder aperients.

GLAUBER'S SPIRIT OF NITRE: one of the old terms for nitric acid.

GLAUCHAU, *glaw'chow*: thriving manufacturing town of the kingdom of Saxony, picturesquely situated on the right bank of the river Mulde, 8 m. n.e. of Zwickau. Owing to the unevenness of its site, it is irregularly built; but its appearance is striking. It is the second in rank among manufacturing towns of Saxony. Here and in the neighborhood, the weaving of every kind of goods flourishes; there are also important dye-works, print-works, iron-foundries, and machine-factories. Pop. (1900) 25,677.

GLAUCOMA, n. *glaw-kō'ma* [Gr. *glaukōma*, a certain disease of the eye—from *glaukos*, blue-gray, or sea-green: L. *glaucus*, bluish-gray]: disease of the eye, being an opacity of the vitreous humor, characterized by a bluish tint seen from without, and the absence of the peculiar characters of cataract (q.v.), which, in some respects, it resembles as regards the gradual obscuration of vision. It is almost incurable. GLAUCO'MATOUS, a. *-kō'mă-tūs*, re-

GLAUCOPIS—GLAUCUS.

sembling or pertaining to glaucoma. GLAUCOUS, a. *glaw'kūs*, of a sea-green color; a grayish blue; in *bot.*, covered or frosted with a pale-green bloom. GLAUCONIE [French term introduced by Brogniart]: name of several strata of different ages: the Glauconie Crayeuse and Sableuse are equivalent to the Upper and Lower Greensand, while the Glauconie Grossier is an Eocene deposit contemporaneous with the Bracklesham beds. GLAUCONITE, n. *-kōn-īt*, silicate of iron and alumina, forming small round grains in greensand, and in chloritic marls; composition, silica 46-56 per cent., ferruginous oxide 20-25, potash 5-13, water 0-10.

GLAUCOPIS, n. *glaw-kō'pīs* [Gr. *glaukōpis*, having fierce gleaming eyes; *glaukos*; *ops*, the eye]: typical genus of *Glaucopinae*, the wattle-crows, a sub-family of *Corvidæ*.

GLAUCUS: genus of mollusks, referred to the class *Gasteropoda*, but having no distinct respiratory organs.

The body is long and slender, gelatinous; furnished with three pair of digitated fin-like appendages, formerly supposed to be gills. The mouth has horny jaws, adapted for preying on other small marine animals. These small mollusks—about an inch and three-quarters long, of a blue color, and extremely delicate and beautiful—inhabit tropical parts of the Atlantic Ocean, and float inertly with irregular movements of the slender branches of their fins on the surface of the water.



Glaucus Atlanticus.

GLAUCUS, *glaw'kūs* [Gr. bright, gleaming]: name of several figures in Greek mythology or legend, among which the following are notable:

GLAUCUS, surnamed PONTIUS, fisherman of Bœotia who ate some of the magical herb sown by Cronos, was transformed into a god and endowed with the gift of unerring prophecy, became builder of the *Argo* and helmsman of the Argonauts, and is represented in art as a hearty old man with flowing hair and beard, whose body terminates in a scaly tail.

GLAUCUS, surnamed POTNIEUS, son of Sisyphus and father of Bellerophon, worshipped as a deity chiefly in Corinth. Venus, offended at his conduct toward her, inspired his mares with such fury while at the funeral games of Pelias at Iolcus that they tore his body to pieces. He was the subject of a lost tragedy of Æschylus, and is represented in art in a group of frantic horses.

GLAUCUS, son of Minos, who when a child was smothered by falling into a cask of honey, and was afterward discovered by the soothsayer Polyidus. Minos desired Polyidus to restore the child's life, and when he failed shut him up with the body in a tomb till he should do so. While in the tomb Polyidus killed a serpent, and saw a second one revive it by laying a certain herb on the

GLAUX—GLAZOUNOFF.

dead body. Whence he gathered the herb and restored G. by rubbing his body with it. Minos made Polyidus teach G. the art of divination and prophecy before he would release him, and when he was allowed to return to his native country he deprived G. of all his new powers.

GLAUCUS, son of Hippolochus and grandson of Bellerophon. He was a Lycian prince, assisted Priam in the Trojan war, exchanged his golden suit of armor with Diomedes for an iron one, showed great bravery in his encounters with the Greeks, and was killed by Ajax.

GLAUX, *glawks*: genus of plants of nat. ord. of *Primulaceæ*, having a 5-lobed calyx, no corolla, and a 5-valved capsule with about five seeds. *G. maritima*, sometimes called SEA MILKWORT and BLACK SALTWORT, common on some muddy seacoasts, is a small plant, with branching stems, often procumbent, and small fleshy leaves. It is made into a good pickle.

GLAVE, n. *glāv*: see GLAIVE.

GLAZE, v. *glāz* [from *glass*, which see]: to furnish with panes or windows of glass; to cover with a smooth coating of glass, as in earthenware; to give a smooth glassy surface to; to cover with anything smooth and shining: N. the vitreous or glasslike surface given to earthenware, etc. (see POTTERY). GLA'ZING, imp. giving a smooth shining surface to: N. the act of giving a smooth shining surface to; the vitreous substance with which potters' ware is covered; the act of furnishing or covering with glass; that part of oil-painting which consists in the application of an extremely thin layer of color over another to modify its tone. GLAZED, pp. *glāzd*: ADJ. furnished with glass; incrustated with a glasslike substance; rendered smooth or shining. GLAZIER, n. *glā'zher*, one who sets glass in window-frames.



Sea Milkwort (*Glaux maritima*)

GLAZE BROOK, RICHARD TETLEY: an English physicist; b. in Liverpool, 1854, Sept. 18; was educated at the University of Cambridge; became instructor of experimental physics there in 1882, and later was appointed assistant director of the Cavendish laboratory. In the same year he was made a fellow of the Royal Society of London. His publications include *Physical Optics*; *Practical Physics* (with W. N. Shore); *James Clerk Maxwell and Modern Physics*; and many papers, principally on optics. Also wrote *Heat, Light, Dynamics and Statics*, joints vols. in *Physical Series of Cambridge Natural Science Manual*, of which he became general editor.

GLAZOUNOFF, ALEXANDER: a Russian composer; b. in St. Petersburg, 1865, Aug. 10; studied under Rimsky-Korsakoff. Many striking effects are noticeable in his works. In 1893, the jury of the Columbian Exhibition,

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Chicago, awarded him a medal in recognition of his compositions. Among his best known works are *Suite*, op. 2; *Waltzes*, op. 23; *Two Morceaux*, op. 22; *Prelude and Two Mazurkas*, op. 25; *Grande Valse de Concert*, op. 41; etc.

GLEAM, n. *glēm* [Sw. *glänna*, to glitter: Norw. *glima*, to shine bright: Icel. *glampa*, to glitter]. a shoot or stream of light; a beam; a ray; transient lustre. V. to shoot out, as a ray of light; to shine. GLEAM'ING, imp.: ADJ. shining with a gleam: N. a shoot or shooting of light. GLEAMED, pp. *glēmd*. GLEAM'Y, a. -y, darting beams of light; flashing.—SYN. of 'gleam, n.': a beam; glimmer; shoot; ray; glitter; sparkle; shine; brightness; splendor; lustre.

GLEAN, v. *glēn* [F. *glaner*, to glean—from *glane*, a handful of ears of corn—from mid. L. *glenārē*: prov. Dut. *glema*, a bunch of straw or sedge: comp. Gael. *glan*, to clean]: to gather on the field what the reapers have left behind; to collect things thinly scattered: N. a collection made by gleaning, or by slow degrees. GLEAM'ING, imp.: N. the act of gathering what is left behind by the reapers; what has been gathered or gleaned. GLEANED, pp. *glēnd*. GLEAN'ER, n. one who gathers after reapers; one who gathers slowly and laboriously.

GLEAM'ING, in Law: privilege of the poor, upheld by positive command in the Mosaic law, that the gleanings of the harvest should be left to the poor and to the stranger (Lev. xix. 9; xxiii. 22). Hence there has been almost everywhere a popular feeling to the effect that the farmer was not entitled to prevent the poor from gathering what the reaper had left. In England, the custom of G. had nearly passed into a legal right. for there is an extra-judicial dictum of Lord Hale, in which he says that those who enter a field for this purpose are not guilty of trespass; and Blackstone (iii. 12), seems disposed to adopt his opinion; but the question has since been twice tried, and decided in the negative in the court of common pleas, the court finding it to be a practice incompatible with the exclusive enjoyment of property, and productive of vagrancy and many mischievous consequences, 1 H. Bl. Rep. 51. It is still, however, the custom all over England to allow the poor to glean, at least after the harvest is carried away. Such a privilege, though ideally gracious and admirable, is liable to abuses, which farmers in various districts have sought to check through rules regulating the practice of gleaning. Some curious statistics of G. were published in the *Journal of the Statistical Soc. of London*. In Bohn's *Political Dictionary* ('Gleaning'), it is stated that the total gleanings of 388 families was £423, 12s., and the average for each family £1, 1s. 10d.—one-fifth of the average harvest wages of each of the same number of families; which may show either that the G. was too free or that the wages were unjustly low.

In Scotland, it has been more than once decided that, at common law, the poor possess no right to glean, and that the farmer may exclude them from his fields (Hutch, *Justice of the Peace*, ii. 47; Dunlap's *Paroch. Law*, 223). In the United States though G. may in many cases be per-

GLEBE—GLEE.

mitted, it is not an established custom. Other modes of putting into practice the spirit of the abrogated Hebrew law are judged more helpful.

GLEBE, n. *glēb* [F. *glèbe*—from L. *glēbă*, a clod or lump of earth: It. *gleba*]: soil; ground; a tract of land belonging to a church living or benefice. GLE'BY, a. *-bī*, cloddy; turf. GLEBULÆ, n. plu. *glē'bū-lē*, in *bot.*, masses in appearance like crumbs.

GLEBE, in Ecclesiastical Law of England and Scotland: the land possessed as part of an ecclesiastical benefice, or from which the revenues of the benefice arise. The assignment of G.-lands was formerly held to be of such absolute necessity that without them no church could be regularly consecrated. In England the word manse includes both the parsonage-house and the glebe, whereas in Scotland it is applied exclusively to the house. The fee-simple of the G. is held by the law of England to be in *abeyance*, from the French *bayer*, to expect—that is to say, it is only 'in the remembrance, expectation, and intendment of the law;' but after induction the freehold of the G. is in the parson, and he possesses most of the powers of a proprietor, with the exception (since the Reformation) of the power of alienation. In England, in addition to his glebe lands, the rector or vicar is seized also in the edifice of the church itself. See CHURCH.

In Scotland, as in England, a glebe forms, as a general rule, a portion of every ecclesiastical benefice of the Established Church, and is thus an addition to the stipend, and sometimes a very important one. Ministers in royal burghs, however, cannot in all cases claim glebes; and where a parish is separated into two portions, it does not necessarily follow that the new parish shall contain a glebe.—See TEIND COURT.

GLEDE, or GLEAD, n. *glēd*, also GLED, n. *glēd* [from *glide*, in allusion to its gliding or hovering motion]: rapacious bird, called also a kite; in common English versions of the Bible, prob. the vulture.

GLEDE, or GLEED, n. *glēd* [Icel. *gloa*; Ger. *glühen*, to glow: Dut. *gloed*, hot coals; *gloeden*, to glow]: in *Scot.* and *OE.*, a hot ember; a live coal; flame.

GLEE, n. *glē* [AS. *glig*, music, sport; *gliowian*, to sing, to play: Icel. *gly*, laughter, gladness: comp. Gael. *ceòl*, music]: joy; merriment; gayety; English name of a vocal composition sung in parts, for three or more voices, and in one or more movements: the style is quite different from that of the part-songs of Germany (see W. A. Barrett's *The English Glee and Madrigal Writers*); a song. GLEE'FUL, a. *-fūl*, merry; cheerful. GLEE'FULLY, ad. *-lī*. GLEE'SOME, a. *-sūm*, merry; joyous. GLEE'MAN, n. a minstrel.

GLEE, or GLEY, v. *glē* [Scot. *gley*, to look obliquely: Icel. *glæa*, to glance]: in *Scot.* and *OE.*, to squint; to look obliquely from a malformation of the eyes. GLEE'ING, imp. GLEED, or GLEID, a. *glēd*, in *Scot.*, glee-eyed; having squinting eyes,

GLEEK—GLENCOE.

GLEEK, v. *glēk* [Dut. *glicken*, to shine: Scot. *glaiiks*, reflection from a shining body in motion; *glaiik*, a deception: Icel. *leika*, to play]: in *OE.*, to jeer; to banter; to scoff. GLEEK'ING, imp. GLEEKED, pp. *glēkt*.

GLEET, n. *glēt* [F. *glette*, the froth of an egg: Low Ger. *glett*, slippery]: a slimy or glairy discharge from a wound; a thin humor running from an ulcer, now generally restricted to the result of gonorrhœal disease (see GONORRHŒA). GLEETY, a. *glēt'ī*, thin; limpid.

GLEG, a. *glĕg* [Gael. *glic*, wise]: in *Scot.*, sharp; lively; keen; quick of perception: N. a glimpse; a short time.

GLEICHENIA, n. plu. *glī-kē'nī-ă* [after Baron *Gleichen*, a German botanist]: genus of the ord. *Filicēs*, or ferns, admired for their graceful forms, and tender, feathery, drooping branches.

GLEIG, *glĕg*, GEORGE ROBERT, M.A.: clergyman of the Scottish Episcopal Church, and author: b. 1796, Stirling, Scotland; son of Bp George G., Primus of the Scottish Episcopal Church. In 1812, while a student at the Univ. of Oxford, he joined as a volunteer a regiment then marching through that city on its way to Lisbon. Soon obtaining a commission in the 85th regt. of light infantry, he served in the Peninsula. During the war with America, 1812-14, he was severely wounded at the capture of Washington, 1814, Aug. After the war, he completed his studies at Oxford, entered into holy orders, and 1822 was presented to the living of Ivy Church, Kent. In 1844, he was appointed chaplain of Chelsea Hospital, and 1846-75 was chaplain-gen. of the forces. He devised a scheme for the education of soldiers, and was appointed inspector-gen. of military schools. In 1848, he was made a prebendary of St. Paul's Cathedral, London. Of his great variety of biographical, historical, and religious books, the most interesting and important is *Life of the Great Duke of Wellington* (1859). He d. 1888, July 9.

GLEIWITZ, *glī'vīts*: town of Prussia, in the s.e. of the province of Silesia, on the Klodnitz, a small affluent of the Oder, 43 m. s.e. of Oppeln. It contains three churches, a synagogue, and a Rom Cath. gymnasium, and is noted for its royal foundries, iron works, machine-works, flour mills, etc. Pop. (1890) 23,554.

GLEN, n. *glĕn* [W. *glyn*: Gael. *gleann*, a valley: W. *glan*, brink, bank]: a hollow space between hills; a narrow valley.

GLENCOE, *glĕn kō'*: valley in Scotland, memorable for a terrible massacre of which it was the scene, and famous for its wildness and sublimity; in the n. of Argyleshire, near the border of Inverness, at Loch Leven. It is about eight m. in length, and is divided into an upper and lower valley, by a gentle ridge. It is traversed by a mountain-stream called the Cona, and its scarred sides show the beds of numerous mountain torrents. There is a solitary inn.—MASSACRE OF GLENCOE. After the civil war in Scotland, and the accession of William and Mary to the British

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throne, the Edinburgh authorities issued a proclamation exhorting the refractory Highland clans to submit, and offering pardon to every rebel who would swear on or before 1691, Dec. 31, to live peaceably under the government of their majesties. All the chiefs submitted before Dec. 31, except MacIain, chief of the Macdonalds of Glencoe, whose submission, from unforeseen causes, was delayed till Jan. 6. The magistrate's certificate explaining the case was never laid before the council at Edinburgh, but was suppressed by an intrigue, directed (it is supposed) by Sir John Dalrymple, afterward second Viscount and Earl of Stair, on whom rests the chief blame of this odious transaction. Pursuant to an order from the king, obtained by the Master of Stair, against 'MacIain and that tribe,' 120 soldiers—most of them Campbells, who had a personal spite against the Macdonalds—marched Feb. 1 to Glencoe. They had been warned by Stair to do nothing by halves, and exhorted to be 'secret and sudden.' Claiming to come as friends they lived 12 days in the glen, waiting till Lieut. Col. Hamilton, who was approaching with troops, could secure the passes through which the Macdonalds might escape. The night before the intended slaughter, their leader was supping and playing at cards with those whom he meant to assassinate before dawn. When the day dawned, 38 corpses, among which were several women, were lying in their blood in or around the village. But Hamilton not having come up in time, the passes were open, and about 150 men, and probably as many women, escaped, though in many cases to perish from cold or hunger among the snows in the high mountain gorges. When Hamilton arrived he was disappointed in finding the work so imperfectly done, and seizing an old Highlander, whom, being above 70 years of age, the other butchers had agreed to let live, murdered him in cold blood. The huts of the village were then set on fire, and the troops departed, driving away with them all the flocks and herds of the glen.

The question as to the share of King William in the guilt of this transaction has been discussed with no little warmth on both sides. Lord Macaulay pleads, in vindication of the king's conduct, that the certificate detailing the submission of MacIain had been suppressed; that he knew the Macdonalds only as a rebellious clan, who had rejected his conciliatory offers; and that, in signing the order for their extirpation, he certainly never intended them to be murdered in their sleep, but merely that their organization as a predatory gang should be broken up. In 1884, a monument was erected to mark the scene of the massacre, which is visited annually by increasing numbers of tourists.

GLENDOWER, *glèn'dow-ér* (or GLENDWR, *glèn'dōr*), OWEN: the last native Welsh chief who assumed the title Prince of Wales, and one of the most active and formidable enemies of Henry IV. of England; b. abt. 1354; descended from Llewelyn, last crowned Prince of Wales. He was brought up to the law but seems never to have practiced. He followed the fortunes of Richard II. to the close, when, 1399, Henry of Bolingbroke usurped the crown and as-

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sumed the title King Henry IV. Taking advantage of G.'s known attachment to the dethroned monarch, Lord Grey of Ruthyn seized part of his land. G.'s suit for its restitution was dismissed by parliament, and then Lord Grey seized the rest of his land. Revenge and despair, conspiring with a martial disposition, and the encouraging prophecies of the Welsh bards, drove him to take up arms, and provided him with followers. In 1400, he seized the estates of Lord Grey. The king ordered his subjugation, and granted his estates to his brother the Earl of Somerset. G.'s forces were inferior in number to those of his adversaries. He was sometimes victorious, chiefly through surprises, ambushes, and the like, but sometimes defeated, and forced to retire to the hills, where his positions and rude fortifications could not be approached. In 1402, he drew Lord Grey into an ambush and took him prisoner. This nobleman was ransomed on paying 10,000 marks, and the king, out of jealousy of the Earl of March (a boy of ten, the true heir to the crown), or some similar cause, left Grey to pay his own ransom. Immediately on his release, Lord Grey married a daughter of G.; and it appears that Sir Edmund Mortimer, uncle of the Earl of March, married another, having been captured also a little later by G., in a battle (1402, June 22) in which 1,100 of Mortimer's Herefordshire followers were left dead on the field. Treason seems to have been falsely imputed to Mortimer as the cause of his defeat; but Henry IV.'s suspicions and G.'s kindness soon made the treason real, for Mortimer induced his sister's husband, Harry Percy (Hotspur) to conspire with him and G. (now proclaimed Prince of Wales) against the government. Percy led with him into the same enterprise the Scotch Earl Douglas, whom he had just taken prisoner at Homildon Hill. The king sent Prince Henry (Falstaff's 'Hal') with an army against the coalition, and in the battle of Shrewsbury, 1403, July, Hotspur fell, and the late arrival of G. gave the victory to the king and his forces. In June of the following year, G. entered into a treaty with Charles IV. of France against the English; but when a large French force landed at Milford Haven, G. had sustained severe reverses, and was driven to wander among the caves of the mountains with a handful of adherents. For some years his fortunes fluctuated after the manner of the petty warfare of a bold barbarous chief, with mountains to escape to against the advance of superior civilized numbers, which he could no more resist on the plains than they could destroy him among the mountains. He died, it is said, in the house of one of his daughters, 1415, but the date and place are uncertain. His successes show that he had the highest talents and the faults of his class of chieftains. The popular idea of him is found in Shakespeare's *King Henry IV*. From the first, he has been a kind of mythical hero, and the lapse of centuries does not clear his history. His rebellions were the expiring fires of the independence of Wales, which the English kings had been contesting for nearly a century and a half.

GLENELG, *glèn-èlg'*: shallow river of considerable

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length, rising in the s.w. of Victoria, and after crossing the boundary into s. Australia, entering the Southern Ocean between Cape Northumberland on the w. and Cape Bridgewater on the e. Its mouth is about lat. 30° s., and long. 141° east.

GLENLIV'ET: vale or district in the s.w. of Banffshire, Scotland, extending along the Livet, a small feeder of the Avon, about 21 m. s.w. from Huntly. It contains iron ore and lead, and has long been famous for finely flavored whiskey. Here a battle between the Earl of Argyle and the Earl of Huntly 1594, resulted in the defeat of Argyle.

GLENOID, a. *glē'noyd* [Gr. *glēnē*, the pupil of the eye, a socket for a bone; *eidōs*, form]: in *anat.*, applied to a round shallow excavation in a bone to receive the head of another bone. **GLENE**, n. *glē'nē*, the hollow part of a bone, a socket.

GLENROY, *glēn roy'*, **PARALLEL ROADS OF:** three terraces in the alluvial coating of the sides of the valley of the Roy, Scotland. The Roy is a small stream in the dist. of Lochaber, Inverness-shire, having a course of about 15 m., and falling into the Spean opposite to the eastern spur of Ben Nevis. The faces of its steep narrow valley are marked with three shelves, which appear as lines running round it; they are everywhere perfectly horizontal and parallel to each other, and in each case the line on one side of the glen corresponds exactly in elevation to that on the other. The granitic and metamorphic rocks, of which the mountains are composed, are covered with a layer of angular fragments and earth, and an examination of the shelves shows that they are worn out of this soft alluvial coating. They almost invariably form a gentle slope from the hill-



Glenroy.

side, from 3 to 30 ft. wide. The highest is 1,140 ft. above the sea-level; the second is 80 ft. lower; the third 212 ft. lower than the second. It may be traced along both sides of Glenroy, and round the mouth of the glen into the valley of

GLEN'S FALLS—GLENTILT.

the Spean, whose sides, at the same elevation of 347 ft., is marked from within 3 miles of the river Lochy up nearly as far as Loch Laggan. What is very curious, the elevation of the highest shelf corresponds with that of the watershed at the head of Glenroy (where it opens toward the valley of the Spey); the second corresponds with the watershed at the head of Glen Glaster (where it opens toward Glen Spean); and the third is at the same level with the valley of passage between Spean and Spey at Muckall. Many explanations of these terraces have been given. Playfair, 1816, supposed they were aqueducts for artificial irrigation. Macculloch believed them to be the shore-lines of fresh-water lakes, which gradually washed away their barriers, remaining for a longer space at the height of the various shelves. Sir T. D. Lauder embraced and illustrated the same view. Darwin considered that the glens were former arms of the sea, and that the shelves indicated periods of rest in the elevation of the land. Agassiz and Buckland returned to the opinion of Macculloch, but finding no indication or remains of any solid land barrier, they referred the lake to the glacial period, and held that two large glaciers came down from Ben Nevis, and dammed up the water in the included portion of Glen Spean and in Glenroy. In a paper subsequently published by David Milne, the lacustrine theory was reverted to, with several new and plausible illustrations. For a full account of this district, see a work of Robert Chambers (*Ancient Sea-margins*, 1848). He enumerates 22 terraces or shelves, in addition to the three already described, at heights from 325 to 1,495 ft.; and uniting all these into a regular series, he endeavors to show that they resulted from the recession of the sea from these glens. See Tyndall in *Popular Science Review* (1876); and Macfadzean's *Parallel Roads of G.* (1883).

GLEN'S FALLS: village of Warren co., N. Y., on the Hudson river and the Del. and Hudson R. railroad; 9 m. s. of Lake George 49 m. n. of Albany, 190 m. s. of Montreal, 202 m. n. of New York. It is noted for its waterfalls and water-power, picturesque cave, rugged scenery, black marble-quarries, and extensive lime and plaster-works. The river provides power for a paper, stone-sawing, several lath, planing, and plaster-mills; beside which there are 30 lime-kilns, iron-foundry, machine-shop, and gas and water-works. G. F. contains Elmwood Female Seminary, G. F. Acad., 7 churches, 2 opera-houses, 2 national banks (cap. \$248,400), and 3 daily and weekly newspapers. It was known to the Indians as Che-pou-tuc (difficult place to get around), as Abraham Wing's Falls 1765, and Col. Johannes Glenn's Falls 1775. Pop. (1870) 4,500; (1880) 4,900; (1890) 9,509; (1900) 12,613.

GLENTILT, *glèn-tilt'*: deep, narrow valley in the n. of Perthshire, Scotland; attending s.w. from the Grampians on the n. to Strathgarry on the s. and 15 m. in length. Through the bottom of the glen the Tilt rushes with great impetuosity, and the mountains on each side are scored with innumerable torrents. Its upper half is inclosed

among mountains of 3,350 to 3,589 ft. high, and its left boundary is mainly formed by the huge Ben-y-Gloe, which rises from a broad base, and has many summits, the highest 3,725 ft. above sea-level. The lower half is less wild. This glen is classic-ground to the geologist. Several elaborate accounts of its geological phenomena have been published—one by Dr. M'Culloch, in *Transactions of the Geological Society*.

GLIADIN, n. *glī'ă-dīn* [Gr. *glīā*, glue]: an albuminoid found in crude wheat gluten; vegetable glue; gluten.

GLIB, a. *glib* [Low Ger. *glippen*, to slip: Dut. *glibberig*, slippery: Dan. *glippe*, to slip: L. *glaber*, smooth]: slippery; voluble; easily moved, as the tongue. GLIBLY, ad. *glib lī*. GLIB'NESS, n. *-nēs*, smoothness; volubility of the tongue.—SYN. of 'glib': fluent; smooth; flippant.

GLIB, n. *glīb* [Ir. and Gael. *glīb*, a lock of hair]: in *OE.*, a bunch of thick, curled hair made to hang over the forehead and eyes.

GLIB, v. *glīb* [Dut. *lubben*; Scot. *lib*, to castrate]: in *OE.*, to castrate. GLIB'ING, imp. GLIBBED, pp. *glībd.*

GLIDDON, *glīd'on*, GEORGE R.: American Egyptologist, antiquary, and ethnologist: 1807–57; b. Grand Cairo, Egypt, where his father, John G. was for many years U. S. consul. G. resided 32 years in the valley of the Nile and in the Levant, and for several years, was U. S. consul of Cairo. About 1840, G. visited London, Paris, and his own country to which he had been entirely a stranger; and lectured in all the principal cities, on Egyptian and other Oriental antiquities. Of his earliest work, *Ancient Egypt, her Monuments, Hieroglyphics, History, and Archaeology*, etc., 18,000 copies were sold in America in three years. He published about the same period, *Appeal to the Antiquaries of Europe on the Destruction of the Monuments of Egypt; Discourses on Egyptian Archaeology; A Memoir on the Cotton of Egypt; and Otia Ægyptiaca*. He found a generous friend in Richard K. Haight of New York, who furnished him with money for a visit to London, Paris, and Berlin. The results are in two quarto vols., published by Mr. G. with the co-operation of Dr. Nott, of Mobile, and several other savants, European and American. In 1854 was published *Types of Mankind, or Ethnological Researches based upon the Ancient Monuments, Paintings, Sculptures, and Crania of Races*, etc., by Nott and G., and containing papers by Dr. Morton, craniologist, of Philadelphia, Prof. Agassiz, and Drs. Usher and Pattison of Philadelphia. In 1857 was published, under the joint names of Nott and G., a quarto vol., *Indigenous Races of the Earth, or New Chapters of Ethnological Inquiry*, including Monographs by Alfred Maury, librarian of the French Institute; Francis Pulszky, learned Hungarian; and Prof. Meigs of Philadelphia. Mrs. Gliddon, an accomplished artist, drew on wood its numerous illustrations. Just as this work was published, G. died at Panama, whither he had gone on ethnological research. He was an enthusiast in investigation and in the advocacy of his theories, and unsparing in criticisms of opponents. He

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labored to prove the great antiquity and diversity of origin of the human races. His works have met severe criticism on these points. The materials which he brought together are valuable and suggestive; but his treatment of them is not satisfactory; and he is not free from indications of a bias in favor of the enslavement of the races that he considered inferior.

GLIDE, v. *glīd* [AS. *glidan*, to slip down gently: Dan. *glide*; Sw. *glida*; Dut. *glijden*, to slide: Icel. *gladr*, shining, clear]: to flow gently, as water; to move silently and smoothly; to pass rapidly and easily: N. the act or manner of moving smoothly and swiftly. **GLI'DING**, imp. **GLI'DED**, pp. **GLI'DER**, n. *-der*, one who. **GLI'DINGLY**, ad. *-lī*.

GLIFF, n. *glīf*: in *Scot.*, a glimpse; a transient view; a moment; sudden fear.

GLIMMER, v. *glīm'mēr* [Low Ger. *glimmern*, to shine: Dan. *glimre*, to glimmer: Sw. *glimma*; prov. Sw. *glimmer*, to glitter]: to send forth feeble or scattered rays of light; to shine faintly: N. a feeble light; mica or muscovy-glass. **GLIM'MERING**, imp.: **ADJ.** shining faintly: N. a faint beaming of light; a faint view. **GLIM'MERED**, pp. *-mērd*.—**SYN.** of 'glimmer, v.': to gleam; glitter, etc.: see **GLEAM**.

GLIMPSE, n. *glīms* [Swiss, *glumsen*, a spark: Dut. *glimpen* and *glinsen*, to glow, to sparkle]: a short transitory view; a glance; a weak faint light: V. to appear by glimpses. **GLIMP'SING**, imp. **GLIMPSED**, pp. *glīmst*.

GLINKA, *glīngk'â* **MICHAEL IVANOVICH**: 1804–1857, Feb. 14; b. Novospassky. govt. of Smolensk, Russia: musical composer. He studied music in St. Petersburg, in Italy 1830–3, and finished his training with Dehn in Berlin. He then returned to Russia, and 1836, Nov. 27, produced in St. Petersburg his first operatic composition, *Life for the Czar*, which had great success and became the basis of the present Russian school of national music, beside winning for its author the appointment of imperial chapel-master and conductor of opera. His next composition was an overture and four entre-actes for Kukolnik's drama *Prince Kholm'sky*, and in 1842, he produced his second opera *Ruslan and Lyudmila*, based on Poushkin's poem. Two years later he again went abroad and spent the most of his time in Paris and Spain. After returning to St. Petersburg he composed and arranged several pieces for the orchestra and numerous songs and romances; among the former the *Kamarinskaya* obtained popularity beyond Russia. He died suddenly in Berlin as he had just begun another foreign tour.

GLINKITE, n. *glīng'kīt* [named after Lieut. Gen. *Glinka*]: pale-green variety of olivine, by some placed under chrysolite; found in talcose schist.

GLINT, n. *glīnt*, or **GLENT**, n. *glènt* [Dan. *glimte*, to gleam, to flash: Gael. *glinn*, the sky, a light]: in *Scot.* and prov. *Eng.*, a glance or flash from; a sly glance; a smart or sudden stroke: V. to glance or flash from. **GLINT'ING**, imp. **GLINTED**, pp. *glīnt'éd*.

GLIOMA—GLOBĚ.

GLIOMA, n. *glī-ō'mā*, **GLIOMATA**, n. plu. *glī-ō'mā-tā* [Gr. *glia*, glue]: tumor peculiar to the connective tissue which holds together the nerve substance in the brain and similar nervous structures, generally in the brain or retina; nearly allied to the sarcoma, consisting of primitive cells resembling those of the interstitial substance of nervous structure: see **TUMORS**.

GLIRES, *glī'rēz* [Lat. pl. of *glis*, a dormouse]: in the Linnæan system of zoology, an order of mammalia corresponding to the *Rodentia* (q.v.) of Cuvier and recent naturalists.

GLISSON, *glīs'n*, **OLIVER S.**, U.S.N.: b. in Ohio, 1809. Jan. 18. He was appointed a midshipman 1826, Nov. 1, promoted passed midshipman 1832, commissioned lieut. 1837, promoted commander 1855, capt. 1862, commodore 1866, rear-admiral 1870, and retired 1871, Jan. 18. He was in command of the *Reefer* during the Mexican war, on the Japanese expedition under Com. Perry, and commanded the *Santiago de Cuba* in the attacks on Fort Fisher 1864, Dec., and 1865, Jan. After the war he commanded the League Island Station, and, as rear-admiral, the European squadron.

GLISSON'S-CAPSULE, n. *glīs'sonz-kāp'sūl* [from Dr. Francis *Glisson*, b. 1597, prof. at Cambridge Univ., who first pointed it out]: a sheath of areolar tissue, surrounding the branches of the portal vein, the hepatic artery, and the hepatic duct.

GLISTEN, v. *glīs'n* [Dut. *glisteren*, to sparkle: AS. *glisian*, to glisten: Icel. *glyssa*, to sparkle, to glitter]: to shine; to sparkle with light. **GLISTENING**, imp. *glīs'nīng*. **GLISTENED**, pp. *glīs'nd*. **GLISTER**, v. *glīs'tēr*, to shine; to be bright. **GLISTERING**, imp.: **ADJ.** sparkling with light; shining. **GLISTERED**, pp. *-tērd*.

GLITTER, v. *glīt'tēr* [Icel. *glitra*, to sparkle, to glitter (see **GLISTEN**)]: to sparkle with light; to gleam; to be showy or striking: N. lustre; bright show; splendor; show of splendor which has no solid foundation. **GLIT'TERING**, imp.: **ADJ.** sparkling; brilliant; splendid. **GLIT'TERED**, pp. *-tērd*. **GLIT'TERINGLY**, ad. *-lī*.—**SYN.** of 'glitter, v.': to sparkle; glare; shine; glisten; beam; shoot; ray; flash.

GLOAMING, n. *glōm'īng* [AS. *glomung*: prov. Dan. *glomme*, to glow, to begin to shine (see **GLOOM**)]: in *Scot.*, twilight; the fall of the evening.

GLOAT, v. *glōt* [prov. Sw. *glutta*; Norw. *glytta*, to look out from the corner of the eye: Icel. *glotta*, to grin: comp. Gael. *glut*, voracity: Ger. *glotzen*, to regard with fixed staring eyes]: to gaze upon earnestly or with admiration; to contemplate with exultation, in a bad sense; to enjoy immoderately. **GLOAT'ING**, imp.: **ADJ.** looking eagerly or greedily. **GLOAT'ED**, pp. **GLOAT'ER**, n. *-ēr*, one who.

GLOBE, n. *glōb* [F. *globe*—from L. *glōbūs*, a round body, a ball: It. *globo*]: a round or spherical body (see **SPHERE**); a ball; the earth; the round body on which the various regions of the earth are depicted. or on which the constella-

GLOBE-FISH—GLOBES.

tions of the heavens are laid down, the former being called the *terrestrial*, and the latter the *celestial globe* (see GLOBES). GLOBATE, or GLO'BATED, a. *glō'bāt*, or *-bā-tēd* [L. *glōbātus*, globe-shaped]: having the form of a globe. GLOBOSE, a. *glō-bōs'* [L. *glōbōsūs*, round as a ball]: having the form of a ball; spherical GLOBOUS, a. *glō'būs*, spherical; round. GLOBOSITY, n. *-bōs'ī-tī*, the quality of being round; sphericity. GLOBULAR, a. *glōb'ū-lēr*, round; spherical. GLOB'ULARLY, ad. *-lēr-lī*. GLOB'ULAR'ITY, n. *-lār'ī-tī*, state of being globular. GLOB'ULE, n. *-ūl*, a little globe; a very minute particle of matter of a round form; in *bot.*, the male organ of the Charatribe, consisting of a small spherical body filled with elastic filaments; in *bot.*, the round transparent granules formed in the cellular tissue, which constitute fecula: see PARAGLOBULIN. GLOBULIN, or GLOBULINE, or CRYSTALLIN, one of a family of proteine bodies or albuminates; insoluble in pure water, but soluble in diluted solutions of salt. In association with hæmatine, as hæmatoglobulin or hæmoglobin (q.v.) it is the main ingredient of the blood globules; and it occurs, mixed with albumen, in the cells of the crystalline lens of the eye, forming, according to Simon, from 10 to 14 per cent. of the dry lens. Hence its two names. In most of its relations it resembles albumen, but differs from that substance in being precipitated both from acid and alkaline solutions by exact neutralization, and in being completely thrown down from its solutions by carbonic acid gas: see PROTEIDS. The globulins are now enumerated as follows: Globulin (or Crystallin), Paraglobulin (or Fibrinoplastin), Fibrinogen, Myosin, Vitellin. GLOB'ULOUS, a. *-lūs*, having the form of a small sphere or globe.—SYN. of 'globe': sphere; orb; circle.

GLOBE-FISH: see DIODON.

GLOBE-FLOWER, (*Trollius*): genus of plants of nat. ord. *Ranunculaceæ*, having a calyx of colored (yellow) sepals, in number five or some multiple of five, the petals small and linear. There are several species, natives of colder parts of the n. hemisphere. The common G., the LUCKEN GOWAN of the Scotch (*T. Europæus*), is one of the finest ornaments of moist grounds and river-banks in elevated districts in n. Britain, and is sometimes cultivated in flower-gardens. The flower has a globe-like appearance.

GLOBES: pair of artificial spheres, hollow, of cardboard coated with a composition of whiting, glue, and oil, on which is laid paper bearing certain delineations of the earth or the heavens. On one of the pair—the *celestial globe*—are represented the stars, so placed that, to an eye supposed to observe them from the centre of the globe, their relative position and distance correspond to those actually observed; while on the *terrestrial globe*, the distribution of land and water, the divisions and sub-divisions of the former, together with a few of the most important places, are shown.

The usual mode of manufacture is as follows: A ball of wood or iron is used as a matrix, and a layer of damped

GLOBIGERINA.

paper is carefully and closely placed upon this, without paste, and other layers are successively pasted over the first one; ordinary card-board is thus produced, but instead of being flat, as usual, it forms a spherical shell. When sufficiently thick, this is cut into two hemispheres, the section being made in the line of the intended equator. The hemispheres are then taken off the matrix, and again glued together on an axis, and the whiting composition laid on, the outside of which is smoothed and finished to shape in a lathe. This composition is so laid on as to balance the globe that it may rest at whatever point it is turned. The smooth surface is now marked with the lines of latitude and longitude (see ARMILLARY SPHERE under ARMILLARY), and is covered with the paper on which the required geographical or astronomical delineations are engraved. In order to adapt the plane surface of the paper to the curvature of the sphere, it is printed in pieces, small circles for the Arctic and Antarctic regions, and the rest in lens-shaped gores, varying from 20° to 30° of longitude, and meeting these circles which are pasted first. Great care is required in laying on these curved pieces, so that their edges shall meet exactly without overlapping. The surface is then colored and strongly varnished, and mounted in its frame and stand. G. of india-rubber and gutta-percha have been made; and others of thin paper to be inflated and suspended in a school-room. Bett's paper-G. fold up when not in use. Embossed G. show, in exaggerated relief, the elevations and depressions of the earth's surface. Compound G. including the celestial and terrestrial, are made with an outer glass sphere for the celestial, and orrery mechanism to show the varying relative positions of the sun and moon, etc. As apparatus for instruction, G. are used to illustrate the form and motion of the earth, the position and apparent motion of the fixed stars, and for the mechanical solution of a number of problems in geography and practical astronomy. For this purpose, each globe is suspended in a brass ring of somewhat greater diameter, by means of two pins exactly opposite to each other—these pins forming the extremities round the axis which it revolves, or the n. and s. poles. This brass circle is then let into a horizontal ring of wood, supported on a stand (see ARMILLARY SPHERE). The G. in common use in schools are 12 inches in diameter; those in private libraries are frequently 18 inches.

The problems to which the globes are applied are such as: To find when a star rises, sets, or comes to the meridian on a given day at a given place: the mode of solution is given in any school-book on the subject. The answers obtained in this way to such questions are only rough approximations, and are in themselves of no value. But the 'use of the globes,' serves to show the mode in which many of the appearances connected with the motions of the earth and the heavenly bodies are caused, and to give a clear conception of the nature of the connected problems. The accurate solutions can be obtained only by trigonometrical calculations.

GLOBIGERINA, n. *glō-bŭ'ēr-ī'nă* [L. *glōbŭs*, a globe;

GLOBUS HYSTERICUS—GLOGGNITZ.

gero, I carry]: genus of Protozoa (q.v.) belonging to the order Foraminifera (q.v.), the shells of which form the great bulk of the calcareous ooze or mud found in the bed of the ocean. The body of G. is of simple protoplasm, inclosed in a shell of minute and irregularly arranged spheres of lime, through *foramina* or apertures in which are exuded filaments (*pseudopodia*) of the animal substance. The pseudopodia are used in locomotion and the capture of food. G. still swarm in the upper strata of the ocean, and the shells are covered with fragile spines, which drop off as the organism dies and sinks to the sea-bed. Hence the shells were formerly described as without spines. The calcareous matter deposited in this way at the bottom of the ocean can be shown to be merely chalk in a non-consolidated state, and thus illustrates the process of chalk-formation: see OOZE. *G. bulloides* is the common species. Fossil species abound in the chalk and tertiary formations.

GLOBUS HYSTERICUS, or BALL IN THE THROAT: name applied to a peculiar sensation in the throat: see HYSTERIA.

GLOCHIDATE, a. *glök'î-dāt* or *glō'kē-dāt*, or GLOCHIDATE, a. *glō-kēd'î-āt* [Gr. *glochis*, the angular end of anything, as of an arrow]: in bot., applied to hairs, the divisions of which are barbed like a fish-hook.

GLOCKNER, or GROS GLOCKNER, *grōs glök'nēr*: highest peak of the Noric Alps, on the boundary between Tyrol, Carinthia, and Upper Austria; 12,431 ft. in height.

GLOGAU, or GROSS-GLOGAU, *grōs glō'gow*: town and important fortress of Prussia, province of Silesia, on the left bank of the Oder, 80 m. s.e. of Frankfort, 35 m. n.n.w. of Liegnitz. It is surrounded by walls, and otherwise fortified; and is connected by a wooden bridge with a strongly fortified island in the Oder. It has a beautiful castle, two gymnasiums, one Rom. Cath., the other Protestant. On the island in the Oder is a cathedral dating from 1120, and containing a Madonna, the masterpiece of the elder Cranach. There are manufactures of machinery, iron, pottery, bone-dust, tobacco, sugar, etc., and some trade and commerce. Pop. (1880) 18,630, including a garrison of more than 3,000 men; (1885) 20,028; (1890) 20,529.

GLOGGNITZ, *glōg'nīts*: small town of Austria, province of Lower Austria, on the Schwarza, at the n. base of the Semmering Alp. a branch of the Noric chain, 45 m. s.s.w. from Vienna. Pop. (1880) 1,982. It is a station on the Vienna and Trieste railway, and stands at the n. extremity of that portion of it known as the *Semmeringbahn*, or railway of the Semmering. This portion of railway is perhaps the most extraordinary work of its kind in Europe. It sweeps up the steep rocky face of the mountain in many curves, and descends its s. slope, after having passed through 15 tunnels and crossed as many bridges. It extends from G. on the n. to Mürzzuschlag on the s., 25 miles. The greatest elevation is reached 23½ m. s. of G., where the line is 2,872 ft. above sea-level, and 1,504 ft. above its height at Gloggnitz. To this point the line rises in gradients

GLOME—GLORIA.

of from 1 in 40 to 1 in 100; the average rate of ascent, however, is 1 in 82. At its greatest elevation, the line pierces the Semmering in a tunnel 4,633 ft. long. Quick trains take 1 hour and 42 minutes to traverse these 25 m.; slow trains 2 hours 33 minutes. The *Semmeringbahn* was constructed for the Austrian govt. 1848-53 by Carlo Chega, eminent engineer.

GLOME, n. *glōm* [L. *glōmus*, a ball of thread or yarn]: in *bot.*, a roundish head of flowers.

GLOMERATE, a. *glōm'ēr-āt* [L. *glōmērātus*, gathered into a round heap—from *glōmus*, a ball or clew of thread]: gathered into a round heap or head: V. to gather or wind into a ball. **GLOMERATING**, imp. **GLOMERATED**, pp. **GLOMERATION**, n. *-ā'shūn*, act of gathering into a ball; a mass formed into a ball. **GLOMERULE**, n. *-ēr-ūl*, in *bot.*, a head or dense cluster of flowers; a powdery mass on the surface of some lichens. **GLOMERULOSE**, a. *-lōs*, minutely clustered. **GLOMERULUS**, n. *glōm-ēr'ū-lūs*, in *med.*, one of the small red bodies in the kidneys, consisting of tufts of minute vessels covered in by the dilate ends of the secreting tubes of the organ; in *bot.*, a rounded cymose inflorescence.

GLOMMEN, *glōm'en*, or **STOR-ELV** (i.e., *great river*): largest river in Norway; flowing from Lake Aursund, at the town of Røros, lat. about 62° 40' n, and long. 11° 16' e. Its source is 2,419 ft. above sea-level, and its course is interrupted by frequent water-falls, the last of which with a descent of 60 ft., is called the Sarpenfos or Sarpfos, and is about 10 m. from the mouth of the river. Large boats can ascend to the Sarpenfos. The G. flows first s.w. for about 50 m., then bends s.e., and after passing the fortress of Kongsvinger, turns s.w., and empties into the Skager Rack at Frederickstadt, after a course of about 320 m. Its most important affluents are the Rena on the left, and the Vormen on the right.

GLONONIN, n. *glō'noyn* [unascertained]: nitro-glycerine concentrated, or Nobel's blasting oil.

GLOOM, n. *glōm* [Ger. *glumm*, gloomy: prov. Dan. *glomme*; Swiss, *glumsen*, to glow in a covert way, as coals beneath the ashes: Scot. *glum*, a sour, cross look: prov. Sw. *glomma*, to stare fixedly]: a sour, surly look; partial darkness; thick shade; obscurity; cloudiness or heaviness of the mind; melancholy; sullenness: V. to be sullen; to shine dimly; to be dark; to make dark. **GLOOMING**, imp. **GLOOMED**, pp. *glōmd.* **GLOOMY**, a. *-ī*, dark; dismal; clouded: heavy of heart. **GLOOMINESS**, n. *-ī-nēs*, obscurity; heaviness of mind; sullenness; moroseness. **GLOOMILY**, ad. *-lī*, darkly; dismally.—**SYN.** of 'gloomy': obscure; dim; opaque; dusky; cloudy; dejected; downcast; disheartened; depressed; sad; melancholy; morose; sullen; moody; heavy; dull.

GLORIA, *glō'ri-a*: hymn of doxology. The chief G. (or Great Doxology, or Angelic Hymn) begins with the words. '*Gloria in excelsis Deo*' (Glory be to God on high), and is founded on Luke ii. 14: John i. 29. Its place in the

GLORIED—GLORY.

Roman mass is after the 'Introitus,' except on the penitential days in Advent and during Lent, when it is omitted. It is at the close of the communion service of the Anglican Prot. Epis., and Meth. Epis. churches, and is in use in many other denominations. Its use in the Eastern Church has extended through 1,500 years, and in the church in England 1,200 years. It was a compilation (perhaps by Tellesphorus, Bp. of Rome, abt. 139) from a morning hymn of the early church near the time of the apostles; traceable in the first half of the 2d c.; and in its present form supposed to date from the middle of the 4th c. The *repetition* in the Anglican Book of Common prayer, 'Thou that takest away' etc., is no part of the ancient hymn—not being found in any ancient Latin or Greek liturgy, nor even in the earliest Prayer-Book in English, 1549. Its appearance in the book of 1552, was possibly due to a printer's error.—*Gloria Patri*, (or the Less Doxology—Glory be to the Father, etc.), is traceable in the 2d c.: it is of very frequent use.—*Gloria Tibi* (Glory be to Thee, O God) is a still shorter doxology used at the end of sentences, etc.

GLORIED, GLORIFY, GLORIOUS, etc.: see under GLORY.

GLORIOSA, *glō-rī-ō'za*: genus of plants of nat. ord. *Liliaceæ*, having a perianth of 6 elongated and reflexed segments, a 3-lobed stigma, a 3-celled superior germen, and globose seeds. The best known species, *G. superba*, native of India, is a herbaceous perennial with a weak stem, 6-10 inches high, alternate leaves terminating in tendrils, and very beautiful flowers, finely colored with red and yellow.

GLO'RIOUS VIR'GIN, or ST. MARY THE GLORIOUS: order of knighthood in Venice, founded by Bartholomew of Vicenza, and approved by Pope Urban IV. 1262. This institution was ecclesiastical as well as military, and its objects were the protection of widows and orphans, and the furtherance of the peace of Italy. The badge was a purple cross between certain stars, and the costume a white surcoat on a russet cloak.—An order of knighthood of St. Mary the Glorious also existed in Rome in the 17th c., whose purpose was the suppression of the Barbary corsairs who infested the Mediterranean.

GLORY, n. *glō'rī* [OF. *glorie*—from L. *glō'ria*, fame, renown: It. *gloria*; F. *gloire*, glory: Icel. *glora*, to glitter: comp. Gael. *glòir*, praise, honor—from *glòr*, speech, talk]. splendor; brightness; magnificence; praise ascribed in adoration and honor, as to God; heaven; Divine perfection, as glory of God; the circle of rays surrounding the head of a saint; honor; praise; fame: V. to exult with joy; to boast; to be proud of. GLO'RYING, imp. *-rī-ìng*, boasting; exulting with joy: N. exultation; display of pride. GLO'RIED, pp. *-rīd*: ADJ. honorable; dignified; illustrious. GLO'RIFY, v. *-rī-fī* [L. *faciō*, I make]: to praise in honor or in worship; to exalt to glory; to extol. GLO'RIFYING, imp. GLO'RIFIED, pp. *-fīd*: ADJ. made illustrious; exalted to glory. GLO'RIFIER, n. *-er*, one who. GLO'RIFICA'TION, n. *-kā'shūn* [F.—L.]: the act of giving glory or of ascribing

GLOSS.

honors to; state of being glorified. **GLO'RIOUS**, a. *-iūs*, of exalted excellence and splendor; noble; illustrious; very successful or renowned, as a battle. **GLO'RIOUSLY**, ad. *-lī*. **GLO'RIOUSNESS**, n. *-nēs*.—**SYN.** of 'glorious': eminent; excellent; renowned; magnificent; splendid; grand; praiseworthy; boastful; ostentatious;—of 'glory, v.': to boast; vaunt: rejoice, exult; be proud of.

GLOSS, n. *glōs* [Icel. *glossi*, flame, brightness: *glossa*, to blaze, to sparkle]: the lustre of a body proceeding from a smooth pressed surface; specious appearance; external show: **V.** to give a superficial lustre to. **GLOSS'ING**, imp. **GLOSSED**, pp. *glōst*. **GLOSS'Y**, a. *-ī*, having a smooth and shining surface. **GLOSS'INESS**, n. *-nēs*, the lustre and brightness of a smooth polished surface. **GLOSS'ER**, n. *-ēr*, a polisher. **GLOSS'ILY**, ad. *-ī-lī*, in a glossy manner. *Note.*—Under the present and succeeding titles it is difficult to group the words and separate the definitions, their origin in most cases being ambiguous—for example, *gloss*, in the sense of *specious representation*, may apply to glosses of both kinds.

GLOSS, n. *glōs* [OF. *glose*, or *glosse*—from L. *glossa*, a hard word needing explanation—from Gr. *glossa*, a tongue—see *note* below]: a comment—usually understood of comments, etc., on the margins of anc. mss.; a remark intended to illustrate; interpretation artfully specious: **V.** to explain by comment (see **GLOSS**, in *Biblical Criticism*). **GLOSS'ING**, imp.: **ADJ.** dealing in glosses or comments. **GLOSSED**, pp. *glōst*. **GLOSSARY**, n. *glōs'ā-rī* [L. *glossārīum*, a glossary]: a small dictionary appended to a book containing the difficult and unusual words to be found in it; the peculiar terms of any science or art arranged and explained as in a dictionary. **GLOSSA'RIAL**, a. *-ā'rī-āī*, relating to or connected with a glossary. **GLOSS'ARIST**, n. *-ā-rīst*, one who writes a gloss or commentary; a writer of a glossary. **GLOSS'ER**, n. *-ēr*, or **GLOSS'IST**, n. a writer of glosses; a commentator. **GLOSSOG'RAPHER**, n. *-ōg'rā-fēr* [Gr. *graphō*, I write]: a commentator; one who defines and explains terms. **GLOSSOG'RAPHY**, n. *-rā-fī*, the definition and explanation of terms used in a science. **GLOSS'OLA'LIA**, n. *-o lā'li-ā* [Gr. *lalīā*, speech]: the gift of tongues. **GLOSSOL'OGY**, n. *-ōl'ō-jī* [Gr. *logos*, a word, discourse]: the science which investigates the number, connection, relations, and condition of the languages of the earth; the explanation of the special terms used in any science. *Note.*—**Gloss** formerly meant a word from a foreign language, or an obsolete or poetical word, or whatever required explanation. It was afterwards used for the interpretation itself, and subsequently extended from a single word, interlined or placed in the margin, to an entire expository sentence, and in many instances to a sort of running commentary on an entire book.

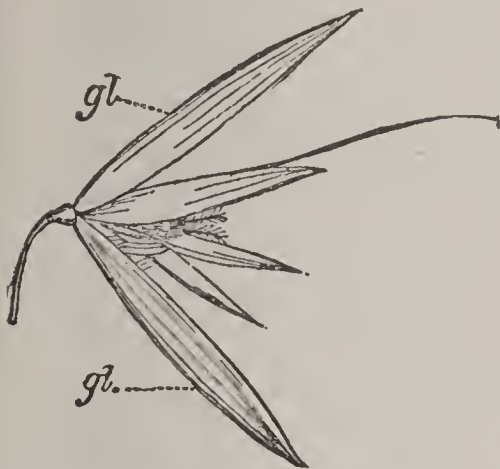
GLOSS, in *Biblical Criticism*: properly an explanation of purely verbal difficulties of the text, to the exclusion of those which arise from doctrinal, historical, ritual, or ceremonial sources; there are however some theological glosses.



Globe-flower (*Trollius Europæus*).



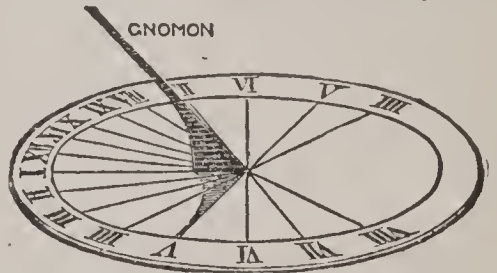
Gloxinias.



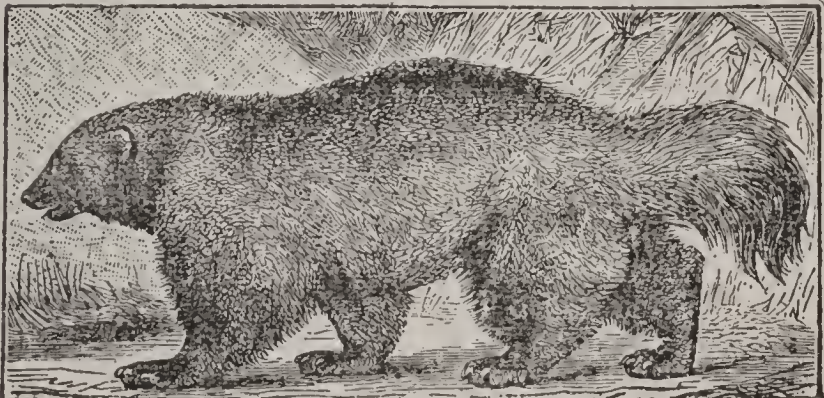
Glume.—Locusta of Oat (*Avena sativa*): *gl.*, *gl.*, Glumes.



Glyptodon (*Glyptodon clavipes*).



Dial-plate, with Gnomon.



The Glutton (*Gulo luscus*).

GLOSSANTHRAX—GLOSSO.

The words which are commonly the subject of these glossarial explanations are reducible to five classes: (1) foreign words; (2) provincialisms or dialects; (3) obsolete words; (4) technical words; (5) words used by the author in some abnormal or exceptional signification. From an early period, these verbal difficulties were the object of attention, and the writers who applied themselves to the elucidation were called *glossatores*, and their works *glossaria*. The principal Greek glossatores; are Hesychius, Zonaras, Suidas, Phavorinus. Most of the Rabbinical writers have done the same work for the Hebrew text; so that it would be difficult to name any in particular as Hebrew glossatores. The chief glossatores of the Latin Vulgate are the celebrated Walafried Strabo in the 9th c., and Anselm of Laon, who continued Walafried's work in the 12th c.

In Roman and canon law, the practice of introducing glosses was of early origin, and probably was an imitation of the biblical glosses. Among jurists, the gloss was not purely verbal, but regarded the true interpretation of the law, and in some cases it was held of equal authority with the text itself. From the position which it occupied in the ms., being generally written between the lines of the text and on the margin, it was called *glossa interlinearis*. The gloss of the Roman law is written in very poor Latinity, that of the canon law in the Latinity of the mediæval schools.

GLOSSANTHRAX, n. *glōs'sän-thrāks* [Gr. *glossa*, the tongue; *anthrax*, burning coal]: among *cattle*, a disease characterized by a development of malignant carbuncle in the mouth, especially on the tongue.

GLOSSITIS, or **GLOTTITIS** [fr. Gr. *glossa*, the tongue]: inflammation of the tongue. The disease in its most acute form is rare; it is sometimes due to injury, or to scald; in other cases, to the action of mercury on the system. The tongue becomes enormously swollen, and one of the chief dangers of the attack is suffocation from swelling of the parts about the hyoid bone, and closure thereby of the glottis (see **LARYNX**). The only effective treatment is to make quite deep incisions into the inflamed part, keeping in view that the resulting wound is likely to be much less than appears at the time; for the enlargement of the organ has stretched the mucous membrane, and infiltrated all the textures with fluid, while the vessels also are distended with blood. A straight bistoury should be boldly plunged into the upper surface, and several incisions made lengthways sufficiently deep to evacuate the confined fluids. A good deal of blood will usually follow, but if care has been taken not to injure the lingual artery or its branches (see **TONGUE**), there is no real danger from this cause. In places at a distance from medical advice, this operation might require to be performed by unskilled hands, and with a penknife or any other cutting instrument at hand; care should be taken in this case to make the incisions on the upper surface, and not too far from the middle line.

GLOSSO. *glōs'sō* [Gr. *glossa*, the tongue]. in *anat.*, a

GLOSSOP—GLOUCESTER.

prefix signifying connection with the tongue. **GLOSSA'GRA**, n. -sā'gra [Gr. *agra*, a catching]: a rheumatic pain in the tongue. **GLOS'SOCELE**, n. -sō-sēl [Gr. *kīle*, a tumor]: protrusion of the tongue, arising from its tumefaction. **GLOSSOCO'MIUM**, n. -kō'mī-ŭm [Gr. *komeō*, I guard]: in *surg.*, originally a small case for holding the tongues of wind instruments, afterwards extended to a case or apparatus in which fractured limbs are kept. **GLOSSOHY'AL**, a. -hī'al, lingual. **GLOSSOID**, a. glōs'soyd [Gr. *eidōs*, resemblance]: of or resembling the tongue. **GLOSSITIS**, n. glōs-sī'tis, inflammation of the tongue.

GLOSSOP, glōs'sop: town of Derbyshire, in the beautiful scenery of the Peak, 19 m. w.n.w. of Sheffield. The suburb of Howard's Town is larger than G. G. is the chief seat of the cotton manufacture in Derbyshire. There are also woolen and paper-mills, dye-works, print-fields, bleach-fields, and iron-foundries. Pop. (1871) 17,046; (1881) 19,574; (1891) 22,414.

GLOSSOPTERIS, n. glōs-sōp'tēr-īs [Gr. *glōssa*, the tongue; *pteris*, a fern]: in *geol.*, a genus of oolitic fern—so named from their tongue-shaped leaves; also called *sagenopteris*.

GLOTTALITE, n. glōt'tā-līt [L. *Glotta*, the Clyde; Gr. *lithos*, a stone]: a mineral occurring in small aggregated and irregular white or colorless crystals near Port Glasgow, on the Clyde; a silicate of alumina and lime.

GLOTTIS, n. glōt'tis [Gr. *glōttis*, the mouth of the wind-pipe—from *glōtta*, the tongue]: the narrow opening at the upper part of the windpipe (see **LARYNX**). **GLOT'TAL**, a. -tāl, pertaining to the glottis. **GLOTTITIS**, n. glōt-tī'tis, inflammation of the glottis: see **GLOSSITIS**.

GLOUCESTER, glōs'tēr: city and port of entry of Essex co., Mass.; on the peninsula of Cape Ann, and on a branch of the Eastern railroad; 30 m. n.n.e. of Boston. It is beautifully situated, handsomely laid out, and includes, beside the original village of G., East G., West G., Annisquam, Bay View, and Lanesville. Its harbor, opening into Mass. Bay, is one of the best on the n.e. coast, is accessible for large vessels at all seasons, and is defended by a fort. The city formerly extended over the whole of Cape Ann, but the town of Rockport was set off from the n.e. portion 1840. G. is lighted with gas and electricity, has macel sewage and water systems, contains an imposing city hall; 30 public schools, high, grammar, primary, and ungraded; the Sawyer Free Library, 4 national banks (cap. \$800,000), and 1 savings bank (cap. \$91,000). There are 2 weekly newspapers, and 19 churches, divided denominationally as follows: Meth. Epis. 5; Universalist 4; Congl. and Bapt. each 2; Unit., Evang. Cong., Ind. Christian, Prot. Epis., Rom. Cath., New Church, each 1. Its chief industries are connecte with the fishery trade and include the building of schooners for fishing and coasting purposes. Next to its fisheries the granite trade is the most important. Extensive quarries exist on the n. side of the cape from which the choicest paving and building stone is obtained. These quarries furnished the granite for the

GLOUCESTER.

new post-office in Boston and the base of the Scott monument in Washington, D.C., a solid block weighing nearly 100 tons. Since 1624 G. has been noted as a fishing station. It was the first place settled by the English on the n. side of Mass. Bay, the fishing business was permanently established 1639, and the settlement was incorporated as a plantation under the jurisdiction of the Plymouth Colony 1642. The fisheries then began to fall off, but in 1700 there was a sudden development of the ship-building industry, owing to the excellent growth of timber on the Cape Ann hills, and about the same time the fisheries were revived with much vigor. In 1720 schooners were built suitable for voyages to the Grand Banks off Newfoundland, and even to foreign cruises; and in 1741 G. owned 70 of these schooners, or 'bankers' as they are called. From 1663, when a given quantity of cod and mackerel formed a part of the minister's salary, till to-day, these fish have constituted the chief kind of catch. In 1770-75 beside the 70 or 80 'bankers' engaged in cod-fishing, about 70 other schooners fished along the Cape Ann shore for cod, hake, and pollock. The revolutionary war stopped the business, and it did not revive till 1804. Now about 400 vessels and 3,500 men are employed in the industry, which has an annual value of \$4,000,000. G. is connected with Boston by a line of daily steamboats, and its extent of beautiful rocky and wooded shore has become popular for summer residence. G. was chartered 1874. Pop. (1870) 15,389; (1880) 19,329; (1890) 24,651; (1900) 26,121.

GLOUCESTER, *glōs'ter*: English city and county in itself, chief town of the county of the same name, an inland port, cathedral town, watering-place, and the seat of important manufactures, on the left bank of the river Severn, w.n.w. from London 107 m. by road, and 114 by rail, and 36 m. n.n.e. from Bristol. G. is clean and well built, with four principal streets, of convenient width, meeting at right angles in the centre of the city. The docks are spacious, and communicate with the open part of the Severn, below Sharpness Point, through a ship canal 17 m. in length, while the wharfs, about 1,000 ft. in length, are directly connected with the several railways. The foreign trade is principally with the Black and Baltic seas, Canada, W. Indies and France. In 1880, there entered the port 4,616 vessels, of 427,796 tons, cleared 4,563 vessels, of 428,704 tons. G. is noted for its salmon and lampreys; it has ship-building yards, iron and brass foundries, and marble and slate-works. The railways of Gloucestershire belong almost entirely to the Great Western and Midland systems; the latter connecting G. with the n., s., and w; the former, with London and the e., and with Wales. Besides affording a market for the produce of the surrounding districts, G. imports corn, timber, wines, and spirits, has large export trade in iron and steel goods, coal, soap, malt, and potter-ware, railway-fittings, agricultural implements, bells, pins, chemicals, and hempen goods.

The principal building in G. is the cathedral, lately com-

GLOUCESTER—GLOUCESTERSHIRE.

pletely restored at a cost of £65,000 to £70,000. It is 427 ft. in length, 154 in width; the height of the central tower, its greatest external ornament, is 223 ft.; the cloisters also, of great beauty, form a large square. Formerly the church of a Benedictine abbey, it was converted into a cathedral 1541. Near it is the new Bishop's Palace. There are more than a dozen Established churches; Wesleyan, Congl., Rom. Cath., and other chapels. The town possesses a grammar-school, theatre, assembly-rooms, shire-hall, town-hall, jail, and lunatic asylum. G. returns one member to parliament. It is noted as one of the three cities (Worcester and Hereford being the other two) at which the musical festivals of the three choirs are alternately held. The history of G. is traceable to a very remote antiquity; it was the *Caer Glow* of the Britons, *Colonia Glevum* of the Romans, and an important town in Mercia under the Saxons, by whom it was called *Glean-Ceaster*—whence its present name. Here the celebrated single combat between Edmund Ironsides and Canute is said to have taken place. G. was repeatedly visited by William I., afforded a refuge and support to Queen Matilda in her contest with Stephen, saw Henry III. crowned, and parliaments held under Richard II. and Henry IV., and sided successfully with the parliament in the civil war against Charles I. Robert of Gloucester, metrical historian; Miles Smith, biblical translator; the poet Taylor; and Robert Raikes, promoter of Sunday schools. were natives of Gloucester. Pop. (1871) parl. bor. 31,844; (1901) parl. bor. 47,943.

GLOUCES'TER, ROBERT OF: see ROBERT OF GLOUCESTER.

GLOUCESTERSHIRE, *glōs'tēr-shēr*: county of England, around the lower course of the Severn and the estuary of that river; bounded w. by Monmouth and Hereford, n. by Worcester and Warwickshire, e. by Oxford and Berks, s. by Somerset and Wilts. 804,977 acres. Pop. (1881) 572,480; (1901) 331,516. The shape of the country resembles a parallelogram; and its outline, still irregular, especially in the n. is much less so than formerly. There are three distinct districts in this county, the natural features of each being different: These are the Hill, the Vale, and the Forest districts; the first formed by the Cotswold or Cotswold (q.v.) Hills, the second, comprising the vales of G. and Berkeley, by the rich and low meadow-lands along the banks of the Severn; the third, the land w. of the Severn, occupied chiefly by the Forest of Dean. The county is watered principally by the Severn, the Wye, the Upper and Lower Avon, and the Thames or Isis, which receives all the streams on the e. of the Cotswold Hills. The soil is thin on the hills, but produces good pasturage for sheep, while the lower tracts abound in excellent grass and arable lands. G. is famous as a dairy county, and raises large numbers of cattle. The famous double and single Glo'ster cheese is produced in the vale of Berkeley. The Forest of Dean, 20,000 acres of which are still crown prop-

GLOUT—GLOVE.

erty, is highly picturesque. From the orchards of G. enormous quantities of cider are obtained. In 1881, there were in G. 655,358 acres under cultivation, 164,493 acres under corn crops. G. is also a great coal and iron producing county. There are about 100 collieries; in 1880 the Forest of Dean iron mines raised 83,198 tons of iron ore. The manufactures are numerous and important. The chief is the manufacture of woolen cloth of finer qualities; hats, felt, stockings, pins, cheese-cloths, and other linens are produced in considerable quantities. The county sends five member to the house of commons.

G., previous to the Roman invasion, was inhabited by a tribe called the Dobuni; and after that event, the county, or the greater part of it, was included in the province named *Flavia Cæsariensis*. From the earliest Danish invasion till the battle of Tewkesbury 1471, and the civil wars between the crown and parliament, G. has been the scene of many and disastrous encounters. It contains numerous Roman relics in camps, roads, coins, fragments of statuary and pottery, tessellated pavements, etc. There are also very numerous traces of British works.

GLOUT, v. *glout* [Ger. *glotzen*, to look fixedly, to stare (see GLOAT)]: in *OE.*, to look sullen; to view attentively: N. a sullen angry glance.

GLOVE, n. *glǫv* [Icel. *glofi*; AS. *glof*, a glove—from Icel. *lófi*, the palm of the hand: Scot. *loof*, the flat or palm: comp. Gael. *lamh*, the hand; *ceil-lamh*, the covering of the hand]: a covering for the hand, or for the hand and arm, usually with sheaths for the fingers: V. to cover, as with a glove. GLOV'ING, imp. GLOVED, pp. *glǫvd*: ADJ. covered, as with a glove. GLOV'ER, n. *-ér*, one who makes or sells gloves.—*Gloves* are made of various materials, silk, wool, linen, cotton, fur, and various kinds of leather. Leather is most used, and the mode of making gloves from it is the most characteristic branch of this manufacture. The term 'kid' is a mere technicality, as the annual consumption of leather bearing this name is largely in excess of the possible supply from the skins of all the young goats annually slaughtered: it is made chiefly from lamb's skin. A few of the finest gloves are made from real kid skins, obtained from countries where goats' milk and flesh are articles of food. Dogskin, buckskin, and doeskin gloves are chiefly of sheepskin; some of the thickest leather gloves are of calfskin. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes. Worcester is the chief seat of the English leather glove-manufacture; and at Woodstock, a peculiar and superior doeskin glove is made bearing the name of the town. Limerick, Ireland, and its neighborhood has long been celebrated for gloves. Gloversville, N. Y., is the chief seat of the manufacture in the United States. The French excel in glove-making. Till 1825, the importation of French gloves into England was prohibited, and the competition produced rapid improvement in the English manufactures. Very cheap and good gloves are made at Naples. For the history of gloves

GLOVE.

and glovemaking, see Beck's *Gloves: their Annals and Associations* (1883).

After the leather has been properly prepared, it is cut into pieces of the required size, then folded over somewhat unequally, as the back should be larger than the front. Three cuts are then made through the doubled piece to produce the four fingers; an oblong hole is cut at the bending of the fold for the insertion of the thumb-piece: the cutting of this of the exact shape and size requires skill. The first and fourth fingers are completed by gussets or strips sewed only on their inner sides, while the second and third fingers require gussets on each side. Small pieces of diamond shape are sewed in at the base of the fingers toward the palm of the hand. The stitching together of these pieces requires much care, as the junction must be made as closely as possible to the edge of each piece, and yet with sufficient hold to keep the stitches from cutting through the material. A kind of vice or clamp, with minute teeth to regulate the stitches, is sometimes used; and sewing-machines are applied as far as practicable, especially for the ornamental or embroidery stitching on the backs. The putting in of the thumb-piece requires special skill and management: badly made gloves commonly give way at this part. The superiority of the best gloves depends chiefly on the adaptation of their shape to the structure of the hand by giving additional size where the flexure of the hand requires it. The best woolen, thread, and silk gloves are made as above by cutting and sewing together, but inferior gloves are made to a great extent by knitting and weaving like stockings.

Glove-dyeing.—The dye is lightly washed over the stretched glove, a second and third coat being given after the first is dry. When this is thoroughly dried, the superfluous color is rubbed off, and the surface smoothed by rubbing with a polished stick or piece of ivory. The surface is then sponged over with white of egg.

Glove-cleaning.—Oil of turpentine or camphine, formerly most used for cleaning kid gloves, has been superseded by benzole (q.v.), or benzine, obtained in sufficient purity for this purpose by careful rectification of coal-naphtha. The chief advantages of benzine are, that it is more volatile, and its odor less persistent, than ordinary turpentine, or even the best rectified camphine after much exposure to the atmosphere. The mode of using either of these is to stretch the gloves over a wooden hand of suitable size, and then sponge them with the fluid, removing the first or dirty portion with a second wash of clean fluid. By collecting the washings separately, and allowing them to stand till the dirt settles, the same turpentine or benzole may be used again and again. An inodorous composition may be made by dissolving one part of soap-shavings in two parts of rain or distilled water, using heat to aid the solution. This is improved by adding a little liquor ammonia and any ordinary perfume. It should be applied to the glove stretched on the stock by rubbing with a piece of flannel always in one direction. Doeskin and wash-leather gloves, when not

GLOVER—GLOWWORM.

much soiled, may be cleaned dry by rubbing them when stretched on a stock with a mixture of finely powdered fuller's-earth and alum, then sweeping off this powder with a brush, and dusting with dry bran and whiting. If the gloves are much soiled, they should be washed with the soap solution, then rubbed with pipe-clay mixed with yellow ochre or amber (according to the shade required) made into a paste with ale or beer, then carefully dried and dusted to remove the superfluous powder.

Glove powder, for cleaning gloves, is made by carefully drying Castile soap, and then pounding it in a mortar; or is made of pipe-clay colored with yellow ochre or Irish slate, or of a mixture of pipe-clay and powdered soap.

It is an old custom in England on a maiden assize—i.e., an assize on which there is no offender to be tried—for the sheriff to present the judge with a pair of white gloves: the clerk of assize and the judges' officers have money given to them on the same occasion, which is called *glove silver*. The custom of presenting white gloves to the judges on a maiden circuit is observed also in Scotland.

GLOVER, *glŭv'er*, RICHARD: 1712–85; b. London. He was educated at Cheam, in Surrey; was a merchant in London, and 1760 became a member of parliament for Weymouth. His first poem, to the memory of Sir Isaac Newton, was written in his 16th year. His chief poem, entitled *Leonidas*, was published 1737, and passed through several editions: a continuation, the *Atheniad*, was published 1787. These poems are in blank verse, and of prodigious extent, and though not without elevation of tone, they are in the main heavy, and are now almost forgotten.

GLOVERSVILLE, *glŭv'érz-víl*: city of Fulton co., N. Y.; on Cayadutta Creek, and the Fonda Johnstown and G. railroad; 44 m. n.w. of Albany. It contains 7 churches, graded and primary schools, 1 national bank (cap. \$150,000) and 1 state bank (cap. \$50,000), a public library, 3 weekly newspapers, and nearly 200 establishments which manufacture two-thirds of the kid and buckskin gloves made in the United States. This industry, from which the town derives its name, was begun 1803. Besides gloves and mittens, there are manufactories of machine and glove patterns, kid and other leather, organs, carriages, and railroad lamps. Pop. (1880) 7,033; (1890) 13,864; (1900) 18,349.

GLOVER TOWER: see SULPHURIC ACID.

GLOW, n. *glō* [Icel. *gloa*, to glow; *glod*, live coal: Ger. *glŭhen*, to be red-hot: Dut. *gloed*, hot coals]: brightness of color; redness; shining heat; passion: V. to shine with heat; to be red or flushed, as with heat or animation; to feel heat. GLOW'ING, imp.: ADJ. burning with vehement heat and shining; ardent; animated; inflamed: N. act or condition of that which glows. GLOWED, pp. *glōd*. GLOW'INGLY, ad. *-lŭ*.

GLOW'WORM: popular name for the wingless females of certain coleopterous insects of the family *Lampyridæ*, remarkable for the luminosity of some of the last segments of the abdomen. The insects of the family *Lampyr-*

GLOXINIA—GLOZE.

idæ have five joints in all the *tarsi*, the antennæ toothed, the elytra (wing-covers)—at least of the males—covering the whole abdomen, the whole body soft and the elytra flexible, the females often destitute both of wings and elytra, the thorax projecting over and almost concealing the head. When seized, they place their feet and antennæ close to the body, many of them also curving the abdomen downward, and simulate death. The COMMON G. (*Lampyris noctiluca*) is abundant in parts of England. The antennæ are short. The male has very large eyes. The female, which is larger than the male, is fully half an inch in length, of a blackish color, the legs dusky red, and the thorax and abdomen margined with that color. The female is destitute of wings and elytra.



Glowworm (*Lampyris noctiluca*):
1, male; 2, female.

The habits of the insect are nocturnal. The male emits a faint light, the female a soft but strong light, of which the use is supposed to be to attract and guide the male. The female G. is generally to be found, during the summer months, among grass or on mossy banks. There is reason to think that the G. has the power of displaying and extinguishing its light at pleasure, so that it may not be unnecessarily exposed to enemies; but if the luminous portion of the abdomen be removed, it retains its luminosity for some time. If placed in hydrogen gas, it sometimes detonates. The luminous matter is capable of being mixed with water, and warm water increases its brilliancy. Two spots on the last segment of the abdomen are more luminous than any other part, and a constant motion of this segment seems to be connected with the emission of the light. The two segments next to this are each surrounded by a band brighter than the rest of the segment. The larva of the G. is very similar to the perfect female insect, but is very faintly luminous. It is very voracious, attacking and devouring snails, whereas the perfect insect eats little, and is supposed to prefer the tender leaves of plants.—Several species of G. are found in the warmer parts of Europe, and in other parts of the world. The luminosity of the males of the genus *Lampyris*, and of other winged insects of the family *Lampyridæ*, has obtained for them the name of fireflies (q.v.): see also COLEOPTERA.

GLOXINIA. n. *glöks-ĭn'ĭ-ă* [after the botanist *Gloxin* of Colmar]: a splendid genus of plants, ord. *Gesneriæcæ*.

GLOZE, v. *glöz* [AS. *glesan*, to explain, to flatter: a

GLUCHOV—GLUCINA.

corruption of GLOSS 2, which see]: to flatter; to wheedle; to talk smoothly: N. flattery; insinuation. GLO'ZING, imp. GLOZED, pp. *glōzd*. GLO'ZER, n. *-zér*, one who.

GLUCHOV, *gló-kǒv'*, or GLUCHOW, or GLUCHOFF: town in s.w. Russia, govt. of Tchernigov, 112 m. in direct line e.n.e. of the town of Tchernigov. It is surrounded by earthen walls, contains eight churches, has manufactures of cloth, and some trade in grain and brandy. In the vicinity porcelain clay is obtained and sent to the imperial manufactory at St. Petersburg. Pop. (1860) 10,008, of which Jews numbered 2,517; (1890) 17,625.

GLUCINA, n. *gló-sǐ'nǎ*, or GLUCIN, n. *glǒ šǐn*, also GLYCINA [Gr. *glukus*, sweet; F. *glucine*: named from its salts having a sweetish taste]: the oxide of the metal glucinum, a white powder without taste or odor, and insoluble in water. It was discovered by Vauquelin 1797, in the emerald, and has since been found in cymophane, chrysoberyl, phenakite, the gadolinites, leucophane, and belvine; but in consequence of the great difficulty of preparing it, its properties and combinations have not been much studied. Berzelius regarded it as the sesquioxide of Glucinum (q.v.), in which case its formula would be Gl_2O_3 , but it is now generally believed to be a protoxide, GlO . For the mode of extracting it from the emerald or other mineral containing it, see Debray's *Memoir on Glucinum and its Compounds* (a translation of which is given in *Quarterly Journal of the Chemical Soc.* VIII.), or to any of the larger works on chemistry. Glucina is a white, loosely coherent powder, without taste or smell. It is infusible, but volatilizes at a very high temperature.

Among the salts of glucina studied by Debray and others, are the sulphates of glucina, and of glucina and potash; the carbonates of glucina, and of glucina and potash; and the oxalates of glucina, of glucina and potash, and of glucina and ammonia. They are colorless, and much resemble those of alumina.

The mineral *phenakite* is a pure silicate of glucina. The *beryl* (q.v.), of which the *emerald* is a variety, is a double silicate of glucina and alumina. The mineral *euclase* also is a double silicate of the same earths; while the *chrysoberyl* is an aluminate of glucina, colored with peroxide of iron.

GLUCINUM, n. *-nǐm* (symbol, Gl or Be), also GLYCIUM, or GLYCIUM, now generally BERYLLIUM: the metallic base of glucina, closely resembling magnesium (see also BERYL). Its atomic weight is 4.65 according to the system formerly in use, and 9.4 according to that now adopted; its specific gravity is 2.1. It is white, malleable, and fusible below the melting-point of silver. It does not burn in air, oxygen, or sulphur, but in the first two substances it becomes covered with a thin coat of oxide. It combines readily with chlorine, iodine, and silicon. Even when heated to redness, it does not decompose water. It dissolves readily in hydrochloric and sulphuric acids, and in a solution of potash, but is insoluble in ammonia, and only slightly acted on by nitric acid. It forms one oxide,

GLUCK.

From the researches of Debray, it follows that glucinum should be placed side by side with aluminium. These bodies are intermediate between the precious and the ordinary metals, and both of them are characterized by the following properties: They are permanent in the air at high as well as at low temperatures; do not decompose water, even when they are at white heat; are not attacked by sulphur, sulphuretted hydrogen, or the alkaline sulphides; are not attacked by strong nitric acid at ordinary temperatures, and only slowly, even with the aid of heat; but dissolve readily in dilute sulphuric and hydrochloric acids.

Glucinum was obtained first from glucina by Wöhler 1827, who procured it by decomposing the chloride of G., which is obtained by evaporating a solution of glucina in hydrochloric acid. Debray has since (1854) obtained it much more abundantly by a process similar to that employed by Sainte Claire Deville for the reduction of aluminium. **GLUCOSE**, n. *gló'kōs* [Gr. *glukus*, sweet]: the peculiar form of sugar which exists in grapes and in other fruits; grape-sugar (see below). **GLUCOSIDES**, n. plu. *gló'kō'sīdz* [Gr. *eidōs*, resemblance]: large number of bodies occurring in plants which are bitter in taste, yielding glucose or a similar sugar, nearly allied to glucose: see **GLUCOSE** (below).

GLUCK, *glúk*, **CHRISTOPH WILLIBALD VON**: 1714, July 2—1787, Nov. 25; b. Weissenwangen, in the Upper Palatinate: German musical composer, who may be considered the father of the modern opera. (The name is often improperly spelt Glück.) He learned the rudiments of music in one of the common schools of Prague, and as a wandering musician went to Vienna, where he found opportunity to master the rules of counterpoint and harmony. In 1738, he went to Italy, and found a worthy master in San-Martini. After four years of study he wrote his first opera, *Artaxerxes*, performed at Milan, 1741. This was followed by *Ipermnestra* and *Demetrio*, given at Venice, 1742, and several others in the next two years, produced at Milan and Turin, having achieved high reputation, G. was invited to London, where his *Fall of the Giants* was represented 1745. He found a formidable rival in Handel, whose genius he honored, and he derived advantage from the friendship of Dr. Arne, English composer. Here he began to develop the full force of that lyric genius destined soon to create a new order of musical composition; but the outbreak of the Rebellion in Scotland closed the opera, the singers and musicians being mostly Rom. Catholics, and G. returned to Vienna. In 1754, he was called to Rome, where he wrote *La Clemenza di Tito*, *Antigono*, and several others. But he did not rise to that style of art which distinguished his later works until he found at Florence, in Ranieri di Calzabiga, a poet whose dramas were worthy of his music. He then composed the three operas, *Alceste*, *Paride e Elena*, and *Orfeo*, which became the foundation of an imperishable fame. He made music the interpreter of poetry, giving it the fullest expression. His simple, noble, and grand style filled Europe with admiration. He changed no less the action of the stage than the music. Before his time all

GLÜCKSTADT.

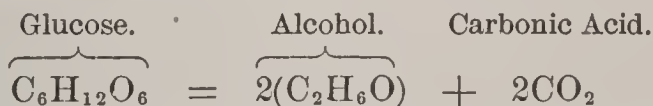
had been artificial and insipid: he made everything natural and effective. At Paris, 1777, he became the rival of the great Italian composer Picini, and the city was divided into two rival factions of the Gluckists and the Picinists. He conquered with his *Iphigénie en Tauride*, 1779. Picini, who had composed an opera on the same subject, would not allow his to be performed after listening to that of his rival. His great triumph was followed by several successful works, and he enjoyed the highest patronage and prosperity. Burney characterized him in a single phrase, 'the Michael Angelo of music.'

GLÜCKSTADT, *glük'stát*: town in Prussian province of Slesvig-Holstein, on the right bank of the Elbe, on the Kremper Marsh, 32 m. below Hamburg. It is a pretty town, regularly built, and intersected by canals. The chief buildings are the high school, the school of navigation, the house of correction, the workhouse for Slesvig-Holstein, and the theatre. It has a safe port capable of containing 200 ships, and furnished with wharfs. The water with which the town is supplied requires to be gathered into cisterns and artificially purified. Weaving is carried on; but trade, navigation, and whale-fishing employ the inhabitants chiefly. G. was founded 1620 by Christian IV. of Denmark, fortified, and endowed with various commercial privileges. During the thirty years' war, it successfully withstood three sieges; its fortifications were demolished 1815. Pop. (1890) 5,958.

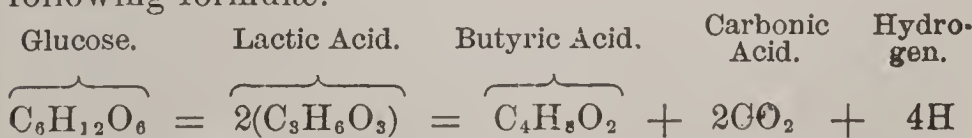
GLUCOSE.

GLUCOSE, also GLYCOSE, known also as GRAPE SUGAR, STARCH SUGAR, and DIABETIC SUGAR ($C_6H_{12}O_6 + 1aq$): species of sugar. It seldom occurs in distinct, well-formed crystals, but may be obtained in warty concretions, which, examined under the microscope, are found to consist of minute rhombic tablets. It never, however, crystallizes readily. It is less sweet than ordinary (cane) sugar, and is soluble in water and in dilute alcohol. The two chief varieties are distinguished by their action on polarized light—*dextroglucose*, which turns the plane of polarization to the right, and *levoglucose*, which turns it to the left. At 212° it fuses, and loses its water of crystallization, and at a higher temperature (about 400°) it undergoes change, loses the elements of water, and becomes converted into *Caramel*, a brown substance of varying composition, neither sweet nor capable of undergoing fermentation, but which is readily soluble in water, and is much used by cooks and confectioners as a coloring matter. At a still higher temperature, it becomes entirely decomposed into carbonic oxide, carbonic acid, light carburetted hydrogen (CH_4), acetic acid, aldehyde, furfural, and a very bitter substance, to which the name *Assamar* has been applied.—With bases, G. forms various definite but unstable compounds, termed *saccharates*, a term which ought to have been restricted to the salts of saccharic acid. On heating an alkaline solution of G., decomposition ensues, and a dark-brown uncrystallizable substance is formed, which possesses acid properties, and is known as *melassic acid*. This reaction is sometimes employed for the detection of G., and is known as Moore's test.—G. has a strong reducing power, and upon this property several of its tests are based. Even without the aid of heat it reduces the oxide of copper in alkaline solutions to the state of the red suboxide, and this reaction is apparent when only 0.0001 of G. is present in the fluid. This is known as Trommer's test, and Fehling's mode of determining G. quantitatively is based on the same reaction. In consequence of this reducing power, sugar is sometimes employed in the solution of the silver salts used for the silvering of mirrors.

G. readily undergoes fermentation. On mixing a solution of it, kept at a moderate temperature, with yeast, each equivalent of it breaks up into two equivalents of alcohol, and four equivalents of carbonic acid or—



Under the influence of other excitors of fermentation, e.g., putrid animal membranes, or other nitrogenous substances, G. becomes converted first into lactic acid, subsequently into butyric acid. These reactions are exhibited in the two following formulæ:



Under certain conditions, which are not accurately known,

GLUCOSE

solutions of G. undergo a change termed *viscous* fermentation: see FERMENTATION. The sugar becomes converted into a viscous or ropy substance, while lactic acid and mannite ($C_6H_{14}O_6$) are formed. This kind of fermentation sometimes occurs in lightbodied white wines. Water is probably decomposed, and its hydrogen unites with a portion of the G. to form mannite.—G. is a constituent of the juice of grapes, plums, cherries, figs, and many other sweet fruits, and may often be observed in a crystalline form on raisins, dried figs, etc. It occurs in honey also. In the animal kingdom, it is found sometimes as a normal and sometimes a pathological constituent of various fluids and tissues. Thus, it occurs normally in the contents of the small intestine, and in the chyle after the use of amylaceous and saccharine food, in the blood of the hepatic veins (see LIVER), in the tissue of the liver, in both the yelk and white of birds' eggs, in the urinary secretion in minute quantity (according to Brücke, Bence Jones, and others), etc.; while in the disease known as diabetes, it exists in large quantity in the urinary secretion, and may be detected in nearly all the fluids of the body. By injuring a certain part of the medulla oblongata (the part of the spinal cord contained within the cavity of the cranium), an artificial diabetes can be produced.

G. can be obtained chemically from starch and from dextrine (q.v.) by broiling them with dilute sulphuric acid, or by the action of Diastase (q.v.), and from cellulose and gum, and from most of the varieties of sugar, by treatment with dilute acids. In the liver, it is formed from the Glycogen (q.v.) which occurs in that organ, under the influence of a ferment which has been chemically separated from the hepatic tissue, but with the nature of which we are not acquainted; while in the rest of the organism it is formed from the starch which is taken with the food, the starch undergoing this transformation under the influence of ptyaline (a ferment occurring in the saliva), pancreatine (a ferment occurring in the pancreatic juice), and an unknown but corresponding ferment existing in the intestinal fluid.—The simplest method of preparing pure G. is by treating honey with cold rectified spirit, which extracts the uncrystallizable sugar; the residue is dissolved in water, and the solution is decolorized with animal charcoal, and allowed to crystallize.

It is manufactured on a large scale, in Europe and the United States, from starch. A mixture of starch and water at a temperature of about 130° is made to flow gradually into a vat containing water acidulated with 1 per cent. of sulphuric acid, and kept at boiling-point. In about half an hour, the starch is converted into sugar. The liquid is drawn off, and the sulphuric acid is neutralized by the gradual addition of chalk, till there is no longer any effervescence. The sulphate of lime is deposited, and the clear aqueous solution, after being concentrated by evaporation, is set aside to crystallize. The molasses is drained off, and the sugar is dried at a gentle heat in a current of air. 'The chief use,' says Dr. Muspratt, in his *Chemistry Applied to Arts*

GLUCOSURIA—GLUE.

and Manufactures, 'to which glucose is applied on the continent (of Europe) is for the manufacture of beer and a coarse kind of alcohol, which is said to be extensively converted into French brandy by the addition of oil of raisins, coloring matter, etc.'

As all alcoholic drinks (ales, wines, and spirits) are obtained from fluids containing this variety of sugar as the essential constituent, and as their quality depends mainly on the amount of sugar present, it is very important to have some ready means of determining its amount. A similar determination is of great value in reference also to the urinary secretion in diabetes (q.v.) as it is mainly by ascertaining whether the daily amount of excreted G. is diminishing or increasing that we can trace the favorable or unfavorable progress of the case.

Without entering into details, we may mention that there are three different modes of determining the amount of G. in a fluid: the first is by determining the specific gravity; the second is the optical test, based upon the fact (above noticed), that solutions of sugar (grape, cane, or milk sugar) exert right-handed rotation upon a ray of polarized light, the angle of rotation being proportional to the percentage of sugar. For Soleil's apparatus for determining sugar in this way, see POLARIZING APPARATUS. The third is by chemical means, of which the most important are Barreswil's method and the fermentation test. Barreswil's method is based upon the property which G. possesses of throwing down suboxide of copper from alkaline solutions of oxide of copper. For the fermentation test, we take a given quantity of the saccharine fluid, add a little well-washed yeast, and collect the carbonic acid that is evolved over mercury. Roughly speaking, a cubic inch of carbonic acid corresponds to a grain of sugar.

Other glucoses than dextroglucose (or dextrose) and lævoglucose (lævulose) are galactose, sorbin, eucalin, inosite, and arabinose. *Glucosides* are compounds found in vegetables, which, by means of natural ferments or reagents, may be converted into glucose and another compound. Amygdalin, glycyrrhizin, salicin, quercitrin, are examples.

GLUCOSURIA, *glū-ko-sū'ri-a*: modern name for Diabetes Mellitus (see DIABETES), and indicative of its characteristic symptom, the presence of sugar in the urine.

GLUE, n. *glō* [F. *glu*, bird-lime—from L. *gluten*, glue or paste: W. *glud*, tenacious paste]: a tenacious jelly made from the parings of the skins, hoofs, etc., of animals, and used as a cement (see GELATIN): V. to join or unite by means of glue; to stick or hold fast; to join. GLU'ING, imp. GLUED, pp. *glōd*. GLU'ER, n. one who. GLUEY, a. *glō'ī*, tenacious like glue. GLU'YNES-, n. *-ī-nēs*.

GLUE, MARINE: cementing composition used in shipbuilding, and for other purposes, where the materials are exposed to the influence of wet. It consists of india-rubber cut very small—one part digested at a gentle heat in a closed vessel with 12 parts of mineral naphtha until it is dissolved, then 20 parts of powdered shellac are added,

GLUKHOFF—GLUTEN.

and the digestion continued until it also is dissolved. During both stages of the process, the mixture must be stirred or shaken occasionally. It requires to be liquefied by heat before using, and must be quickly applied, as it very soon hardens. It is valued particularly for its power to cement not only wood, but glass and metals, and to resist the action of moisture. Its employment, however, requires care and skill.

GLUKHOFF': see GLUCHOV.

GLUM, a. *glüm* [Ger. *glumm*, gloomy: Scot. *glum*, a sour, cross look: prov. Sw. *glomma*, to stare (see GLOOM)]: sullen; stubbornly grave. GLUM'MISH, a. *-mish*, somewhat glum; gloomy. GLUMP, v. *glümp*, in familiar language, to show sullenness by manner; to be sullen. GLUM'PY, a. *-pi*, sullen.

GLUME, n. *glóm* [L. *gluma*, the husk of corn: F. *glume*], in Botany: small bract or scale, in the axil of which there grows either a single flower destitute of perianth, as in the *Cyperaceæ*, and in some of the grasses; or, as in others of the grasses, a *spikelet* composed of a number of flowers (*florets*): it is the husk formed of flaps or valves embracing the seed. The Grasses (*Gramineæ*) and *Cyperaceæ* are sometimes conjoined under the appellation *Glumaceous Plants*.

GLUMOUS, a. *glómüs*, having a glume. GLUMA'CEOUS, a. *-mä'shüs*, resembling the dry scale-like glumes of grasses. GLUMIF'EROUS, a. *-mif'er-üs* [L. *fero*, I bear]: bearing or producing glumes. GLUMELLE, n. *glómël*, also GLUMEL'LULE, n. *-mël'ül* [dim. of *glume*]: the inner husk of the flowers of grasses—also GLUMELLA, n. *glómël'lä*, GLUMELLÆ, n. plu. *-lë*, the paleæ or fertile glumes of grasses.

GLUT, v. *glüt* [a word imitative of the sound, and represented by such syllables as *glut*, *glop*, *glup*, *gulp*, etc.: *glüt glut*, the noise of a liquid escaping from a narrow-necked opening: L. *glütio*, I swallow: comp. Gael. *glut*, voracity (see GLUTTON)]: to swallow greedily; to gorge; to fill or to be filled beyond sufficiency: N. superabundance; more than enough—as, there is a *glut* in the market; anything which obstructs a passage. GLUT'TING, imp. GLUT'TED, pp.

GLUTEN, n. *glótën* [F. *gluten*—from L. *gluten*, paste or glue: It. *glutine*]: a tough substance obtained from wheat and other grains containing fibrin and gliadin; in *wax-painting*, a compound made of wax and copal, with an essential oil with which the pigments are mixed. GLUTENOID, a. *-oyd* [Gr. *eidos*, resemblance]: resembling gluten or allied to it. GLUTIN, n. *glót'in*, the part of crude gluten which is soluble in alcohol—preferably known as gliadin. GLUTINATE, v. *-tì-nät* [L. *glutinatus*, glued together]: to unite with glue; to cement. GLUTINATING, imp. GLUTINATED, pp. GLUTINA'TION, n. *-nä'shün*, the act of uniting with glue. GLUTINATIVE, a. *-nä-tiv*, having the quality of gluing or cementing. GLUTINOUS, a. *-tì-nüs*, [L. *glutinösus*, gluey]: tenacious; covered with slimy moisture. GLUTINOUSNESS, n., or GLUTINOS'ITY, n. *-nös-ì-tì*, the quality of being glutinous; tenacity.

GLUTEN—GLUTEUS.

GLUTEN: one of the most important constituents of the varieties of corn used as food. It is obtained by mixing flour with water, and thus forming a paste or dough. This paste is placed in a bag of fire linen, and kneaded in water, which must be repeatedly changed, till it ceases to assume a milky appearance. A gray, tenacious, viscous, tasteless albuminous substance, having the appearance of birdlime, is left in the bag. This substance consists mainly of G., mixed with traces of bran starch and of oily matter. The G. thus obtained from wheat and from rye is far more tenacious than that from the other cereals, and it is the great tenacity of this constituent that especially fits these flours of conversion into bread. It is found by analysis, that the proportion of G. in wheat grown in Algeria and other hot countries is considerably higher than in wheat grown in England, or still colder countries; and the hard, thin-skinned wheats contain more of this ingredient than the softer varieties of the grain. It forms about 16 per cent. of Algerian wheat; abt. 15 per cent. of wheat from the Black Sea; and nearly 14 per cent. of S. Carolina wheat; about 10·7 per cent. of English wheat; 9·8 per cent. of Canadian wheat; and less than 9 per cent. of Danzig wheat.

G. in a moist state rapidly putrefies, the mass acquiring the smell of decaying cheese; but when dry, it forms a hard, brownish, horny-looking mass, that does not readily decompose. G., treated with hot alcohol, resolves itself into at least two distinct substances, one soluble, the other insoluble in that fluid. The insoluble portion is regarded by Liebig as vegetable fibrine. It is a gray, tough, elastic substance, insoluble in water or in ether, but readily soluble in dilute alkalies, from which it is precipitated by neutralization with acetic acid. It is soluble also in very dilute hydrochloric acid, from which it is thrown down by the neutral salts. The soluble portion is in part precipitated from the alcohol on cooling, in the form of flakes, which have the composition and properties of caseine; while a third substance remains in solution, giving to the alcohol a syrupy consistence. It separates, on the addition of water, as a white substance resembling albumen. It is usually known as *gliadin*, but some chemists—Dumas and Cahours and others—have termed it *glutin*, a name objectionable on the ground that it is already engaged for the chief form of gelatine. All these constituents of G. contain carbon, hydrogen, nitrogen, oxygen, and sulphur, in much the same proportion as the animal albuminates or proteine bodies, and they all doubtless belong to the flesh-forming group of foods.

The action of G. in the manufacture of bread is probably double; it induces, by constant action, an alteration of the starch, and subsequent fermentation, while by its tenacity it prevents the escape of carbonic acid gas.

GLUTEUS, n. *glô-tē'ūs* [Gr. *gloutos*, the buttock or hip]: one of the three large thick muscles on which the human form rests in sitting. **GLUTE'AL**, a. *-tē'āl*, pertaining to the buttocks.

GLUTTON.

GLUTTON, n. *glüt'n* [OF. *gloton* and *glout*, a *glutto*: F. *glouton*, ravenous—from mid. L. *glütōnem*: W. *gloth*, gluttonous: Norw. *glupa*, to swallow: L. *glütio*, I swallow (see GLUT)]: one who eats to excess; one who gorges or stuffs himself with food; a carnivorous mammal about the size of a large badger. GLUTTONOUS, a. *glüt'n ūs*, given to excessive eating. GLUT'TONOUSLY, ad. *-lī*. GLUTTONY, n. *glüt'n-ī*, excess in eating; voracity of appetite. GLUT'TONIZE, v. *-īz*, to eat to excess. GLUT'TONIZING, imp. *-ī'zīng*. GLUT'TONIZED, pp. *-īzd*.

GLUT'TON (*Gulo*): genus of quadrupeds usually referred to the bear family (*Ursidæ*), but which constitutes an interesting connecting-link between that and the weasel family (*Mustelidæ*), agreeing more nearly with the latter in dentition, though approaching the former in the plantigrade character. There are three false molars in the upper, and four in the lower jaw, anterior to the carnivorous tooth, which is large and sharp. The body is long, the legs are short, the feet have each five deeply divided toes, terminated by long curved claws. The tail is rather short, a fold beneath the tail supplies the place of the glandular pouch of the badgers; but when hard pressed by enemies, the gluttons emit a peculiar fluid of a strong musky odor.



Glutton (*Gulo arcticus*).

Their habits are nocturnal. The species commonly called GLUTTON, also WOLVERENE (*G. arcticus*), is a native of the n. parts of Europe, Asia, and America. It is more common in the arctic regions than toward the s. limits of its distribution, which in Europe are about the forests of Courland, and in America the mountainous parts of Massachusetts. It is about two ft. six inches or two ft. nine inches in length, from the tip of the nose to the root of the tail; the tail about seven or eight inches long, both body and tail covered with long hair, under which the body is covered with a rich thick fur. The general color of the long hair is brown, sometimes approaching to black, lighter bands passing from the neck along the flanks, and meeting at the tail. The short fur is chestnut brown. The muzzle

GLYCERIA—GLYCERINE.

is black. A light-brown band runs across the forehead from ear to ear. The fur of the G. is sometimes of considerable value, and is used for muffs, cloaks, etc., but varies not a little in glossiness and other qualities. Extraordinary stories were formerly credited concerning the ferocity, voracity, and cunning of this animal, and have not altogether disappeared from books of natural history. It is very capable of domestication, and even in a wild state shows no remarkable ferocity; nor is there any reason to believe that it leaps from trees on deer, or pursues any of those artful methods of procuring food which have been ascribed to it. It often preys on animals which it has not itself killed. The smaller quadrupeds are its principal food, and it devours young foxes in great numbers. Its speed is not great, but it excels in strength and perseverance. The traps set for the smaller kinds of animals in the fur countries of N. America are often robbed by the wolverene, and it has been known to remove a great pile of wood, to obtain provisions hidden under it.—Closely allied to the G. are the Grison and the Ratel. Bone-caverns and some of newest deposits exhibit remains of more than one species of Glutton.

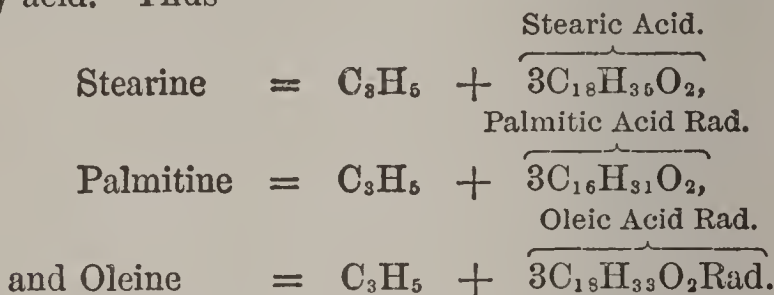
GLYCERIA: see MANNA GRASS.

GLYCERIDES, n. plu. *glīs-ēr'ī-dēz* [Gr. *glukus*, sweet; *eidos*, resemblance]: a general term for compound fatty substances which, when acted on by water, are resolved into the sweet substance *glycerine*, and the fatty acids, *stearic*, *palmitic*, *oleic*, etc.

GLYCERINE, or GLYCERIN, or GLYCEROL, n. *glīs'ēr-īn* [F. *glycérine*—from Gr. *glukus*, sweet]; ($C_3H_8O_3$), known also as hydrated oxide of lipyl, or hydrated oxide of glyceryl (and in pharmacy as Glycerinum): sweet substance obtained from oils and fats by the removal of the fatty acids. It was discovered by Scheele 1779, who obtained it in the preparation of lead-plaster, and named it 'the sweet principle of oils.' It is a colorless, viscid, neutral, uncrystallizable, inodorous fluid, of sweet taste, is soluble in water and alcohol in all proportions, but nearly insoluble in ether. Its specific gravity at 59° is, according to Miller and most authorities, 1.28, but Gorup-Besanaz makes it as high as 1.97. At 40°, it becomes gummy and almost solid; at 212°, it is slightly volatile; but if distilled alone, the greater part of it becomes decomposed; it may, however, be distilled without alteration in a current of superheated steam which has been raised to a temperature between 500° and 600°. By this means, Wilson succeeded 1854 in separating heated fats into hydrated glycerine, and the acids with which it was previously in combination; the glycerine is thus obtained in high concentration as a colorless, syrupy liquid, which can be thus prepared in unlimited quantity. Glycerine forms soluble compounds with baryta, strontia, and lime; and it dissolves oxide of lead and numerous salts. Berthollet has found that glycerine, like Mannite (q.v.), is convertible into a true fermentable sugar, when digested with certain animal tissues.

GLYCERINE.

Glycerine occurs ready formed in a few fats (e.g. old palm-oil); and, according to Pasteur, is contained in all fermented liquors, and especially in wine, its quantity amounting to three per cent. of the fermented sugar. It is a product of the saponification of the various fats, though it does not exist as glycerine, but rather as a substance having the composition represented by the formula $C_6H_{10}O_3$. According to Berthollet's view, glycerine is a triatomic alcohol, and may be represented by the formula $C_3H_5O_3$; and in the animal and in many vegetable fats, the three atoms of water are replaced by three atoms of the anhydrous fatty acid. Thus—



In the saponification of these fats—that is to say, when they are treated with potash, soda, or oxide of lead, or under the influence of heated steam—the fatty radical separates from C_3H_5 , which assimilates the hydroxyl from three molecules of water, and becomes glycerine

A good mode of obtaining glycerine on a large scale, is Wilson's process (above); the usual method of obtaining it on a small scale is from olive oil, which is saponified by treating it with an equal weight of oxide of lead (litharge), which is mixed with water, and added to the oil, with which it is boiled till the saponification is complete. The glycerine is dissolved by the water, and is easily separated from the insoluble lead-plaster (a mixture of oleate and palmitate of lead). Any traces of lead are removed by sulphuretted hydrogen, and the water is then expelled *in vacuo*, or over the water-bath: the former is preferable, as in the open air the glycerine becomes brown.

The uses of glycerine are numerous. In medicine, it is a local application in diseases of the skin and of the ear; and it is used as a solvent for many drugs taken internally. It is a valuable preservative fluid for small and delicate anatomical preparations, and it has been applied to the preservation of meat. It is used in perfumery, in the manufacture of beer, in calico printing, and in the preparation of leather. Large quantities of G. are required for the production of nitro-glycerine (q.v.), dynamite, and other explosives. It has been added to the water in gas-meters, to prevent it from freezing. It is used in the manufacture of copying-ink, and is of frequent application wherever a lubricating agent is required.

Many interesting researches have been carried on during the last few years regarding the true chemical nature and the artificial production of glycerine; they are, however, for the most part too purely chemical to be intelligible to the general reader. Like the alcohols in general, to which class

GLYCINE—GLYCOGEN.

glycerine is now assigned, it forms several classes or series of derivatives, the most important of which are its combinations with acids, forming *glycerides*, or compound ethers of glycerine, which are analogous in composition to the various fats and oils. Berthollet has succeeded in forming these bodies synthetically, and has thus not only reproduced several of the natural fats, but has obtained a large class of similar bodies not previously known.

Treated with sulphuric acid, glycerine yields *sulphoglyceric acid* ($C_3H_5O_3, SO_3$); treated with phosphoric acid, it yields *phosphoglyceric acid* ($2C_3H_5O_3, P_2O_5, H_2O$), a substance which occurs normally, in combination with soda and ammonia, in the brain and in the yolk of egg. GLYCERIC ACID, *glis'ér-ik*, an acid produced by the action of nitric acid on glycerine. NITRO-GLYCERINE, *nī'trō-*, a powerful blasting oil, and highly dangerous explosive agent, prepared by the action of nitric and sulphuric acids on glycerine: see NITRO-GLYCERINE.

GLYCINE, *glī'sin*, or GLYCOCINE, *glī'ko-sin*, or GLYCOLL, *glī'ko-kol*, or SUGAR OF GELATINE [Gr. *glukus*, sweet] ($C_2H_5NO_2$): hard crystals, colorless, transparent rhombic prisms, which have a sweet taste, and are devoid of odor. It is obtained from the action of acids on certain animal substances, as glue; also on glycocholic acid. It is very soluble in water, the solution having no effect on vegetable colors; but is insoluble in alcohol and ether. G. combines both with acids (as hydrochloric, nitric, sulphuric, and oxalic acid) and with metallic oxides, and the compounds in both cases are soluble and crystallizable; they are, however, of no great importance.

It is usually described as an animal base, but some chemists regard it as belonging to the class of bodies termed amido-acids, and as being amido-acetic acid; that is to say, acetic acid ($C_2H_4O_2$) in which one of the atoms of hydrogen is replaced by one atom of amidogen (NH_2). According to this view, its formula should be written $C_2H_3(NH_2)O_2$. G. is a product of various processes of decomposition of animal matters.

GLYCOCHOLIC ACID, n. *glī'kō-kōl'ik* [Gr. *glukus*, sweet; *cholē*, bile]: one of the constituents of bile.

GLYCOGEN, n. *glī'kō-jěn* [Gr. *glukus*, sweet; *gennāō*, I produce], ($nC_6H_{10}O_5$), according to the analysis of Pelouze): starch-like substance, tasteless, inodorous, obtainable from the livers of animals. In its properties it seems intermediate between starch and dextrine. In contact with saliva, pancreatic juice, diastase, or with the blood or parenchyma of the liver, it is converted into glucose, and hence its name of glycogen. It occurs only in the cells of the liver, where it exists as an amorphous matter; but in the early stage of fetal life, before the liver begins to discharge its functions, instead of being found in that organ it exists in special cells in the fetal structures known as the placenta and the amnion, and in the muscles, horny tissues, etc. In severe forms of disease, especially in febrile affections, it seems temporarily absent from the liver. For its uses in the

GLYCOL—GLYPTIC.

animal economy, see LIVER. GLYCOGENIC, n. *glī'kō-jěn'ik*, producing or elaborating grape-sugar.

GLYCOL, n. *glī'kōl* [compounded of first syllable of *glycerine*, and the last one of *alcohol*]: type of a new class of artificial compounds, whose existence was inferred and afterward discovered, a few years ago, by Wurtz. In their chemical relation and properties, they form an intermediate series between the monobasic or monatomic alcohols, of which common alcohol is the type on the one hand, and the class of bodies of which ordinary glycerine is the type on the other. The composite name glycol expresses this relation. According to the Theory of Types now commonly accepted (see TYPES, THEORY OF CHEMICAL), the glycols are termed diatomic alcohols, ordinary alcohol being a monatomic, and glycerine being a triatomic alcohol.

Ordinary glycol is formed from ethylene (C_2H_4); hence it may be called ethyl-glycol, to distinguish it from propyl-glycol, formed from propylene (C_3H_6); from butyl-glycol, formed from butylene (C_4H_8); or from amyl-glycol, formed from amylene (C_5H_{10}). It is a colorless, slightly viscid fluid, with sweet taste; formula $C_2H_6O_2$. For further information on this class of bodies, see any recent work on organic chemistry, or a lecture on the *Histoire générale des Glycols*, by Wurtz before the Chemical Soc. of Paris, published in the *Leçons de Chimie professées en 1860*, par MM. Pasteur, Cahours, Wurtz, etc., 1861. GLYCOLIC ACID, *-ik*, a syrupy liquid obtained from one of the glycols by treatment with nitric acid.

GLYCONIAN, a. *glī-kō'nī-ān*, or GLYCON'IC, a. *-kōn'ik* [Gr. *glukonei'os*, a kind of verse, said to be named from its inventor, *Glykon*]: denoting a kind of verse in Greek or Latin poetry, consisting of three feet, a spondee, a choriamb, and a pyrrhic or iambus.

GLYCOSMIS, *glī-kōs'mīs*: genus of plants of nat. ord. *Aurantiaceæ* trees, natives of E. Indies and the Mascarene Islands. The fruit of *G. citrifolia*, an E. Indian species, is delicious.

GLYCYRRHIZA, n. *glīs'er-rī'zā* [Gr. *glukus*, sweet; *rhiza*, a root]: herbaceous plants having the small flowers in bunches or cones, commonly known by the name of *liquorice plants*, ord. *Leguminōsæ*. GLYCYRRHIZIN, n. *glīs'er-rī'zīn*, the saccharine matter of liquorice-root.

GLYPH, n. *glīf* [Gr. *gluphō*, I hollow out, I carve]: in *sculp.*, a notch, channel, or cavity intended as an ornament. GLYPHÆA, n. *glī-fē'ā*, in *geol.*, a genus of small lobster-like crustaceans. GLYPHOGRAPHY, n. *glī-fōg'rā-fī* [Gr. *graphō*, I write]: a particular kind of raised engraved drawing produced by an electrotype process.

GLYPTIC, a. *glīp'tik* [Gr. *gluptikōs*, carving; *gluptos*, carved, sculptured]: of or relating to the art of carving on stone. GLYP'TICS, n. plu. *-tiks*, the art of engraving figures, as on precious stones. GLYPTOG'RAPHY, n. *-tōg'rā-fī* [Gr. *graphō*, I write]: a treatise on the art of engraving on precious stones. GLYP'TOGRAPH'IC, a. *-tō-grāf'ik*, describing the methods of engraving figures on precious stones.

GLYPTODON—GMÜND.

GLYPTODON, n. *glĭp'tō-dŏn* [Gr. *gluptos*, carved, sculptured; *odonta*, a tooth]: gigantic fossil animal belonging, like the *Megatherium* (q.v.), and the *Myloodon* (q.v.), to the *Edentata*, but of the family of the *Dasypidae* or *Armadillos*. It is found in the post tertiary deposits of the pampas of S. America, and four species have been described. The back and sides of the creature were covered with a carapace of thick polygonal bony plates, which in some cases was nearly six ft. long. The G. must, from the shape of the carapace, have looked more like a huge tortoise than an armadillo; and in some other respects it resembled the chelonians. Its teeth, eight in each jaw, had each two lateral sculptured grooves, whence its name: see **ARMADILLO: ANT-EATER**.

GLYPTOTHECA, n. *glĭp'tō-thĕ'kă* [Gr. *gluptos*, carved; *thĕkĕ*, a repository]: building or apartment for the preservation or exhibition of works of sculpture. The *Glyptothek* in Munich, built 1816–30. has 12 halls, each assigned to an epoch in art. The building contains the famous collection made by King Louis I.

GMELIN, *gmĕ'lin*, LEOPOLD: 1788, Aug.—1853, Apr.; b. Göttingen: chemist. His father, Johann Friedrich G., was prof. of nat. history and botany at Tübingen, afterward of chemistry at Göttingen; and for at least four generations members of the G. family have distinguished themselves in chemistry and nat. history. After taking his degree in medicine, he spent several years in study; and was appointed, 1814, extraordinary prof. of chemistry at Heidelberg. In 1850. in consequence of an attack of paralysis, he resigned his professorship, and died three years later, at Heidelberg. He published numerous scientific papers and, 1826, with Tiedemann, the celebrated work on digestion, *Die Verdauung nach Versuchen*, 2 vols. But his chief service to science, was his chemical dictionary, *Handbuch der Chemie*. The first ed. of this great work appeared 1817–19, and included, in two vols. of moderate size, the whole extent of chemical knowledge as it then existed. The fourth and last ed. appeared 1843–55, six vols., the last vol. edited after G.'s death. An English translation of this edition, with additions by Mr. Watts, the translator, was published 1861

GMELINA, *mĕ-lĭ'na*: genus of trees of nat. ord. *Verbenaceae*, having a small 4–5-toothed calyx, and a large, obliquely bell-shaped corolla. *G. arborea*, called **GOOMBAR** or **KOOMBAR**, in India, is the most valuable for its timber, which resembles teak, but is closer in grain, and lighter.

GMELINITE, n. *mĕl'in-ĭt* [from Prof. Charles *Gmelin* of Tübingen]: colorless, yellowish-white, greenish-white or reddish-white, fresh, transparent to translucent brittle mineral, crystallizing in rhombohedrons. It is found in the Harz, Cyprus, Nova Scotia, and Great Britain.

GMÜND, *gmünt*: town of Würtemberg, in the circle of Jaxt, in a beautiful and highly cultivated district on the Rems, 29 m. e n.e from Stuttgart. G. has important manufactures of *bijouterie* and hardware, and carries on spinning

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and stocking-weaving. Hops are produced in the neighborhood in great quantity. G. was formerly an imperial free city, and in the middle ages had a population of 18,000. It was added to the kingdom of Württemberg in 1803. Pop. (1880) 13,774; (1885) 15,321; (1890) 16,817; (1900) 18,699.

GMÜNDEŃ, *gmün'dén*: town of Upper Austria, at the lower end of the Lake of Traun or Gmünden, in the midst of extremely grand scenery. Salt mines employ many of the inhabitants. Pop. 7,000.

GNAPHA'LIIUM: see CUDWEED.

GNAR, v. *nâr* [Sw. *gnorla*, to twist, to curl: Dan. *kurre*, a knot or tangle in thread (see GNARL)]: in *OE.*, the same as *gnarl*; to growl; to snarl: N. a hard knot in a tree. GNAR'RING, imp. GNARRED, pp. *nârd*: see GNAUR.

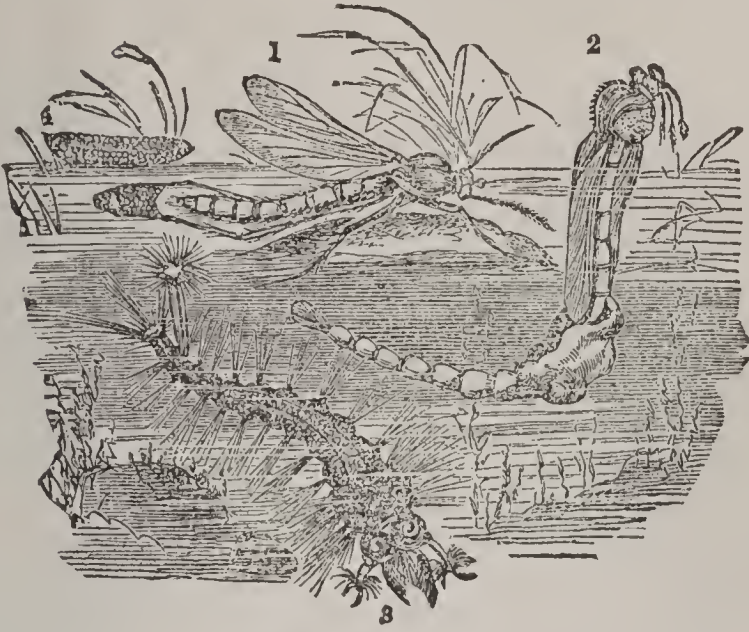
GNARL, v. *nârl* [Dut. *knarren*, to growl, to snarl: Sw. *knarra*, to creak: Dan. *knurre*, to growl: Icel. *gnerr*, a knot, a knob]: to growl; to murmur; to snarl. GNAR-LING, imp. *nâr'ling*. GNARLED, pp. *nârl'd*: ADJ. distorted in large woody knots; knotted; twisted and knotty. GNAR'LY, a. -*li*, knotted or knotty.

GNASH, v. *nâsh* [Dan. *gnaske*; Sw. *gnissla*, to crunch, to gnash: Icel. *gnastan*, a gnashing: Dut. *knasschen*, to gnash]: to strike the teeth together as in pain or rage; to grind the teeth; to growl. GNASH'ING, imp.: N. a striking together or grinding of the teeth in rage or pain. GNASHED, pp. *nâsht*. GNASH'INGLY, ad. -*li*.

GNAT, n. *nât* [imitative of its humming sound before attack: Sw. *gnadd*, a midge: Norw. *gnette*; Icel. *gnata*, to crackle, to rustle]: very small stinging fly of the mosquito kind; anything proverbially small. TO STRAIN AT A GNAT (*at* for *out*) AND SWALLOW THE CAMEL, to guard ostentatiously against a trivial offense while overlooking a very great one.

GNAT (*Culex*): a genus of dipterous insects, having the wings laid flat on the back when at rest; the antennæ thread-like, 14-jointed. feathery in the male and hairy in the female; the mouth furnished with a long projecting proboscis, adapted for piercing the skin of animals and sucking their blood. They are said to feed also on vegetable juices. The species are numerous, and abound in almost all parts of the world, particularly in marshy regions; and some of them, under the name of mosquitoes (q.v.), are known in many countries as most annoying pests. An irritating fluid, injected through the proboscis, makes their punctures painful, and causes swelling. The proboscis of a gnat is an extremely interesting microscopical object. It is a membranous cylindrical tube, clothed with minute, feather-like scales, and terminated by two lips, which, when closed, form a kind of knob, and by six sharp bristles or very small lancets. The female gnats have the most powerful proboscis, and are the principal blood-suckers. Some persons are much more liable to the assaults of gnats than others. The flight of gnats is very swift, and the extremely rapid vibration of their wings causes the loud

and sharp buzzing sound, which so often prevents sleep when even one of these insects has found its way into a bedroom on a summer night. The eggs of gnats are deposited on the surface of shallow stagnant water, placed



Gnat, magnified:

- 1, insect depositing eggs; 2, insect escaping from pupa case;
3, larva of gnat; 4, floating raft of eggs.

side by side, united by an unctuous matter, and fastened to the bottom by a thread, which prevents their floating away. They are soon hatched; indeed, a single summer sees several generations of gnats. The larvæ are seen in immense numbers in stagnant waters; they are of elongated worm-like form; are destitute of feet, but swim and dive by means of fin-like organs; they feed on insects, also on vegetable substances; and often suspend themselves at the surface of the water, head downward, for the purpose of respiration, by means of radiating bristles attached to a long spiracle or tube at the caudal extremity of the body, by which air is admitted to the *tracheæ* or air-tubes. The pupæ also inhabit water, and are active; they remain almost constantly at the surface of the water, with the body recurved; and the respiratory openings of the air-tubes are now in the thorax.—The COMMON G. (*C. pipiens*) is of very wide geographic distribution. It is about three lines in length, brown, with whitish rings on the abdomen, the wings unspotted. It so abounds in some of the fenny parts of England that beds are occasionally surrounded with gauze curtains, as in India on account of mosquitoes.—A number of genera, allied to *Culex*, are united by many entomologists into a family called *Culicidæ*.

GNATHIC, a. *năth'îk* [Gr. *gnathos*, the cheek or jaw-bone]: belonging to the cheek or superior maxilla. GNATHITES, n. plu. *năth'îtz*, in *zool.*, the masticatory organs of the Crustacea. GNATHITIS, n. *năth-î'tis*, inflammation of the jaw. GNATHO, *năth'ô*, a prefix in compounds indicating connection with the jaw.

GNATHODON: see *DIDUNCULUS*.

GNAUR—GNEISS.

GNAUR, n. *nawr*, or **KNAUR**, n. *nawr*, and **GNAR**, or **GNARR**, n. *nâr*, the last the proper spelling [Dut. *knarren*, to growl: Sw. *knorla*, to twist, to curl: connected with **GNARL**]: a hard knot in wood.

GNAW, v. *naw* [Icel. *gnaga*; Dan. *gnave*; Ger. *nagen*, to gnaw: comp. Gael. *enamh*, to wear away; *cnaimh*, a bone]: to eat away or bite off by degrees; to bite in agony or rage; to corrode; to fret. **GNAWING**, imp.: **ADJ.** eating by slow degrees; corroding. **GNAWED**, pp. *nawd*: **ADJ.** bit; corroded. **GNAWER**, n. *-ér*, one who or that which.

GNEISENAU, *gnî'zêh-now*, **AUGUST**, Graf **NEIDHARDT VON**: 1760–1831; b. Schilda, Prussian Saxony: Prussian general. After serving in the Austrian army, he accompanied the German auxiliaries of England to America. On his return he joined the Prussian army, and showed his military genius in his defense of Colberg. But his most distinguished service was his share in the Waterloo campaign, in which he was Blücher's chief of staff, and principally directed the strategy of the Prussian army. He was made field-marshal in the year in which he died.

GNEISS, n. *nîs* [Ger. *gneisz*, a kind of granite]: hard, tough, crystalline, and slaty rock, composed mostly of quartz, felspar, and mica, differing from granite in presenting a foliated appearance. **GNEISSIC**, a. *nîs'sîk*, also **GNEISSOSE**, a. *-sôs*, having the aspect of gneiss; exhibiting the crystalline texture, and the foliated and flexured structure, of gneiss. **GNEISSOID**, a. *-söyd* [Gr. *eidós*, form]: resembling gneiss; applied to rocks intermediate between granite and gneiss, or between mica-slate and gneiss.—*Gneiss* is a variety of metamorphic rock, which has the same component materials as granite, and differs from it only in these materials being arranged in layers, rather than in an apparently confused aggregated mass. The minerals of which it is composed are quartz, felspar, and mica. The mica is sometimes replaced by hornblende, producing a gneiss corresponding to the variety of granite called Syenite. The different ingredients occur in various proportions, altering the character and appearance of the gneiss accordingly. It is often difficult to determine hand specimens of gneiss; for, on the one hand, they are sometimes so crystalline that they resemble granite, while, on the other, the schistose varieties approach so near to mica-schist, that even in the field, under the most favorable circumstances, it is not easy positively to separate them.

Gneiss was originally deposited as sand or mud, and has been converted into a hard tough crystalline rock by long and continuous subjection to metamorphic action, induced, perhaps, chiefly by heat. It has generally been considered as an azoic rock, i.e. deposited before the existence of life on the globe. The older strata, classified by Logan under the title Laurentian, the equivalents of which have been recently observed by Murchison in Scotland, have as yet proved destitute of fossils, but this may be owing to the extreme metamorphism that they have undergone. The Cambrian and Silurian strata of n. Scotland also have been

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to a large extent converted into gneissose rocks, which contain intercalated with them fossiliferous limestones. It seems indeed, that gneiss and its allied stratified rocks are not necessarily 'primary rocks,' but may occur wherever an agency sufficiently powerful has acted upon ordinary sandstone and shale.

GNESEN, *gnã'zen* (Polish, *Gniezno*): small town of Prussia, in a district abounding in hills and lakes, in the province of Posen, 30 m. e. n. e. of the town of Posen. It was the earliest capital, and is said to be the oldest town of Poland. Abt. half the inhabitants are Poles. Pop. (1880) 13,826; (1885) 15,760; (1890) 18,088.

GNETA'CEÆ: see SEA GRAPE.

GNOME, n. *nōm* [Gr. *gnōmē*, an opinion]: pithy and sententious saying, commonly in verse, embodying some moral sentiment or wise precept. The gnome belongs to the same generic class with the proverb; but it differs from a proverb in lacking that common and popular acceptance which stamps the proverb as with public authority. The use of gnomes prevailed among all the early nations, especially the Orientals; and the literatures, both sacred and profane, of most countries abound with them. In the Bible, the book of Proverbs, part of the book of Ecclesiastes, and still more the apocryphal book of Ecclesiasticus, present, so far as regards language and structure, numberless illustrations of the highest form of this composition. The other books of the Old Testament contain many specimens; and in the New Testament the familiar lessons of the Lord Jesus are frequently presented in this striking form, which was peculiarly adapted to impress and move the classes whom he addressed. The Indian, the Arabian, and the Persian literatures also are rich in gnomes, as are those of the northern nations. But the most interesting form which they have taken is in Greek literature, in which the writers who have cultivated this form of composition are known as a distinct class—the Gnostic Poets (*gnomikoî*). The Greek gnome is commonly couched in elegiac distich; and the most celebrated gnostic poets were Solon, Theognis, Phocylides, Simonides, Tyrtaeus, and Xenophanes of Colophon. The most remarkable of these is Theognis, whose gnomes extend to above 1,200 lines. The remains of gnostic writers have been repeatedly edited under the title of *Gnostic Poetæ Græci*, since the days of Melancthon. The standard editions are those of Bekker (1815) and Welcker (1826). There is, moreover, a popular edition by Brunck, reprinted in the Tauchnitz Classics; and the gnostic poets are commonly included in the collections of minor Greek poets.—In Latin literature, the *Disticha* of Dionysius Cato, the authorship of which has proved so fertile a source of controversy, belongs to the class of gnomes. **GNOMIC**, a. *-mīk*, having the character of a gnome; sententious; also **GNOMICAL**, a. *-mī-kāl*. **GNOMOLOGY**, n. *nō-mōl'o-jī* [Gr. *gnōmē*, a maxim; *logos*, a word, a discourse; *legō*, I collect, I speak]: treatise or collection of maxims or sententious reflections or sayings; the

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knowledge of or literature relating to such maxims or sayings.

GNOME, n. *nōm* [Gr. *gnōmōn*, one that knows; F. *gnome*]: in the cabalistic and mediæval mythology, one of the classes of imaginary beings, said to inhabit the inner parts of the earth, and to be the guardian of mines, quarries, etc. They were supposed to be the presiding spirits in the mysterious operations of nature in the mineral and vegetable world. They have their dwelling within the earth, where they preside specially over its treasures, and are of both sexes, male and female. The former are often represented in the form of misshapen dwarfs, of whom the well-known 'Rübezahl,' or 'Number-nip,' of German legend is a fair example. Pope, in the *Rape of the Lock*, and Darwin, in the *Loves of the Plants*, have drawn upon the more pleasing associations of this curious branch of mythology. See ELEMENTAL SPIRITS.

GNOMON, n. *nō'mōn* [L. and Gr. *gnōmōn*, one that knows, the index of a dial]: in a *sun-dial*, the pin which by its shadow shows the hour of the day; in *geometry*, that which remains of a parallelogram after taking away one of the two parallelograms formed about the diagonal; the sum of any three of the four parts into which a rectangle is divided by cross lines parallel to its sides: see Euclid, ii. prop. 5, et seq.; GNOMON'IC, a. *-ik*, or GNOMON'ICAL, a. *-ikāl*, pertaining to dials or dialling. GNOMON'ICALLY, ad. *-lī*. GNOMON'ICS, n. plu. *-iks*, the principles or art of dialling (see DIAL). GNOMONIC PROJECTION: see PROJECTIONS.

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GNOSTICS, n. *nŏs'tiks* [Gr. *gnōstikōs*, possessing the power of knowing, intelligent—from *ginōskō*, I know; *gnōsis*, knowledge]: sects in the first ages of Christianity who taught that they alone had a true knowledge of the Christian religion, and who attempted to incorporate the tenets of the pagan philosophy with some doctrines of Christianity. GNOSTIC, *-tik*, pertaining to a Gnostic. GNOSTICISM, *-tī-sizm*, the doctrines or tenets of the Gnostics. The various sects of Gnosticism were known—with one insignificant exception—by special names derived from their respective founders. The word *gnosis*, when first applied to revealed religion, in many passages both of the Septuagint (for the Hebr. *Déah*) and the New Testament, expressed a full and comprehensive acquaintance with, and insight into, the received laws and tenets, ritual and ethical, and was consequently praised as a desirable acquirement; by St. Paul even called a special gift (*Charisma*) (I Cor. xii. 8, etc.). Gradually, however, there was—first by the Judæo-Alexandrine schools—ingrafted upon it a meaning more akin to that in which it was occasionally used by Pythagoras and Plato; it designated a knowledge of certain mysteries, which lay hidden beneath the letter of the religious records, and could be received only by a few superior minds, while the multitude had to be satisfied with the merely outward apparent meaning. The remarkable form of so-called Christianity—but really of pagan philosophy—to which the word in this sense was applied, is a religious phenomenon as extraordinary as were the times and causes that gave it birth. Rome had conquered nearly the whole of the then known civilized world, and within her vast dominions the barriers, which had hitherto separated the multifarious nations of east and west, were broken down. From the remotest corners of the empire philosophers and priests, scholars and teachers, flocked to Rome, to Athens, to Alexandria, and communicated to each other, discussed, and frequently amalgamated their widely differing creeds and systems, to such a degree that the former national or personal individuality of opinion was almost effaced, making room either for a vacillating indecision, or at the best a shadowy and passive eclecticism. And while, on the one hand, Greek philosophy, which formed a principal part of the education of the higher classes, had become almost exclusively a Platonism, sliding into overt skepticism; on the other hand, the naturalization in the Roman empire of a promiscuous Pantheon, whose gods were gathered from Egypt, Greece, Persia, India, and countries still more remote, had at length produced, out of an unparalleled mixture of religious notions and fancies, a superstition so abject and unnatural, that it too, at last, was ready to give place to despairing unbelief. Judaism, meanwhile, had outlived its political existence, and began to assert itself as a faith independent of any state or dominion of its own, divided, however, into different schools, according to the more or less strict adherence to the letter of its written and oral laws. Indeed, the influence of Hellenism had, among the Alexandrines, produced such effect that, of the living body of

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Judaism, little remained but a skeleton framework, round which allegory and symbol had woven their fantastic fabric. Christianity, as yet not clearly defined in its dogmatic system, swept all the more irresistibly over the regions from the Euphrates to the Ganges, the Nile to the Tiber, as it offered a code of morals sublime and yet simple, a faith human and withal divine, superior to any of the abstruse and exploded Polytheisms, to a world agitated to its lowest depths, and yearning for some new and more satisfying doctrine; while it denounced the stringent and severe ritual tenets of its mother-religion, Judaism, as inconsistent with the liberty of the human mind and the free grace of God in Christ. Yet it was not to be expected that the old pagan creeds and the old philosophies would expire without a struggle. They made a last stand, and produced in their and the ancient world's dying hour, Gnosticism. It sprang suddenly out of a monstrous chaos, a consummate religious eclecticism, bold, consistent, to a certain degree even sublime. The wildly opposite ideas of Polytheism, Pantheism, Monotheism, the most recondite philosophical systems of Aristotle, Plato, Pythagoras, Heraclitus, Empedocles, etc., together with the awe-striking Mysticism and Demonology which after the Babylonian captivity had created, in the very heart of Judaism, that stupendous and pre-eminently anti-Jewish science of Cabbala (q.v.)—all, it seems, had waited to add something of their own to the new faith, which could not hold its own under all these strange influences. An open attack was no longer of any use; so, assuming the garb of the enemy, they sought to carry destruction into the centre of the hostile camp. Moreover, an aristocracy of mind, powerful and numerous as none had ever been before, could not but, even when it had outwardly assumed the new religion, loathe the thought of sharing it completely and unreservedly with the herd of freed and unfreed slaves around them, with the low and the poor in spirit; and the intellectual exclusiveness of Gnosticism was undoubtedly, next to the philosophic fascination of its dogmas, one of the chief reasons of its extraordinarily rapid propagation.

We have stated at the outset, that Gnosticism was but a general name for a great number of diverging nominally Christian but really heathen schools. But all these had some fundamental points in common, which we will attempt to specify briefly, as far as the fragmentary and adulterated evidence will permit; for unluckily, all that we know of the G., we know from their Jewish and Christian adversaries, who confessedly took pride in representing them and their belief in their darkest hues.

There is a Divine Being, whose essence is love, grace, and mercy. He is enthroned in the highest height, enclosed in an abyss (*Buthos*). He is the sum of being, He is silence, abstraction, incomprehensible, for human minds almost non-existing (*Ouk On*). The Mosaic Cosmogony has not seemingly, they said, brought us one step nearer to the solution of the problem of the creation. Out of nothing, nothing can come notwithstanding a Divine

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Fiat; for God can, through his spiritual nature, have no connection whatever with corporeal things, and he could not have originally *made* them. Gnostics, therefore, assumed a pre-existing *matter* (*Hyle*), out of which the universe was merely *formed*. A corroboration for this opinion was found—according to the peculiar Gnostic mode of interpretation—in the two adjectives *Tohu vabohu* (without form and void) (Gen. i. 2), applied to the earth, and which were by them interpreted as substantives (*Kenoma, Kenon*) intended to express the original substance of the universe (Cf. Gen. Rab. i.). Between this *Hyle*, or visible world, however—which was either represented as the darkness or shadow over against the divine light, as a sluggish, stagnant mass, or as a turbulent, active kingdom of evil—and that supreme, incomprehensible Being, whose goodness could have nothing to do with the evils of the world, no more than his perfection with its defects and misery, there existed a *Plerōma*, or fulness of Light. In this fulness dwelt embodied attributes of Divinity the abstract ideas of Wisdom, Justice, Right, Power, Truth, Peace, and many more which had emanated or flowed out (in pairs, as some held, male and female) from the supreme central point, as rays innumerable flow out of the sun, as countless numbers from one unit, as echoes from a sound, or as, primarily, all the founts and rivers arise from the waters below. At the head of these emanations or *Æons* (Everlasting ones—like their source) which, descending lower and lower, form a link between heaven and earth, stands the *Nous*; and one of the lowest *Æons* is the *Demiurgos*. He is the real framer and master of the visible world, and partakes to a certain degree of its nature. On the nature of this *Demiurgos* (*Jaldabaoth, Archon*), however, the two principal divisions of Gnosticism, which might be termed Judæo-Alexandrine and Syrian respectively, widely differed. The former took him as the representative and organ of the highest God. It was he who had been put by the divine will over Israel, especially under the name of *Jehovah*. As other, though inferior, angels presided over the destinies of other nations, so this higher *Æon* had to protect the peculiar people of God. It was he, therefore, who revealed himself—he who gave the laws—he who sent the prophets. But in all this he acted rather as an unconscious medium; he was no more able to comprehend the full meaning of the ideas revealed through him in the Old Testament, than he understood the scope and significance of the creation. His principal attributes are justice and severity, which, carried out with stern consistency, become cruelty. These Gnostics distinguished also among the Jews themselves, those ‘after the flesh’ who, confounding the likeness with the original, the symbol with the idea, took the *Demiurgos* to be the supreme God, and those ‘after the Spirit,’ or Israelites indeed—the privileged few who, divining at least the veiled ideas of the supreme God, needed no such education by fear or hope, punishment or reward, at the hands of the *Demiurgos*, but rose

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above him in understanding and conception of things human and divine. The other principal party of the G., however, the Syrian, under the influence of the Parsic (Zoroastrian) Dualism, so far from considering the Demiurgos as an instrument of divinity, willing, but poor in intellect, looked upon him rather as a rival and consequently conflicting power. He is the primary evil opposed to the primary good. The divine germs which, according to parties, had been communicated through the lowest emanations in their downward course to matter and to mankind, the Demiurgos of the Alexandrians had not known how to develop in a proper manner, but had weakened, sometimes neutralized, them from want of knowledge, thus engendering all earthly sin and misery *against* his will, while the Syrian Demiurge spitefully and maliciously stifled these germs in order to wrest the power over the world from the Divine Being altogether. His base, revengeful, and withal limited nature, they said, is fully and clearly stamped upon the Old Testament—exclusively his work.

Man—in this all the schools were agreed—was divided into three classes, corresponding more or less to these predominant powers of the world: Divinity, Matter, and Demiurgos. There were first the spiritual men or *Pneumatikoi*, inspired by the highest God, striving toward him, with him; initiated into his counsels, understanding his essence. They were free from the yoke of law, for terrestrial nature had no power over them; they were the prophets, guiding, but not guided; the possessors of the true Gnosis. Diametrically opposed to these, as was Hyle to divinity, are the terrestrial men, *Sarkikoi* or *Choiks*—of the earth earthy—who are tied and bound by matter; they can neither aspire to the height of spiritual men, nor are they to be ruled by the precepts of law. Between these stand the *Psychikoi*, the blind servants of the lawgiving Demiurgos, who are, through the restraints put upon them by his either stupid or spiteful precepts, free to a certain degree from the terrestrial powers, but they can never reach the height in which the pneumatics habitually dwell. And again, corresponding to these three classes of men, there were three principal religions—Christianity above, Heathenism below, and Judaism in the intermediate space.

The two leading tendencies of Gnosticism, of which we have spoken, also manifested themselves accordingly, in the view that they each took of the person of Christ himself. According to both, he was the highest Æon, suddenly sent down by the Supreme Being, to rescue and reclaim certain higher natures—for the lowest stratum of men, the carnal or terrestrial, was irredeemably lost—which had either been led astray by the Demiurgos, or had become entangled in the net of matter. At the same time the harmonious, lovely, and not unnatural combination of the human and divine in Christ, which the New Testament assumed, stood in direct opposition to the very basis of Gnosticism. The Visible and the Invisible, the Finite and

the Infinite, God and Man, cannot combine: in this they all agreed. But while the Judaizing schools divided Christ into two distinct persons, one of heaven and one of earth, who had only become one at the baptism in the Jordan, and who had separated at the crucifixion, the other oriental section of Gnostics held that Christ's earthly manifestation in the flesh, that his whole humanity, was a mere shadow or delusion.

It might well be asked how, with this extraordinary conglomeration of Monotheism, Pantheism, Spiritualism, and Materialism, the Gnostics could possibly take their stand on the Bible, which from first to last denounces, in the strongest manner, doctrines such as the foregoing. The only answer to this is, that they, and they only, were the Pneumatikoi—the Initiated. It was well for the other portions of mankind, the natural men, to take everything, including Scripture, and its historical as well as its dogmatical parts, literally. As in creation, so in the book; the Gnostics, guided by their inner lights, saw beneath the surface, and saw everywhere, the most complete affirmation of their peculiar ideas. As the Midrash (q. v.) gave the most fanciful and allegorical interpretations of the Old Testament, for the sake of inculcating moral principles, for edifying, elevating, comforting the congregation, but without the faintest pretense that any but the fixed traditional interpretation was binding and authoritative—Gnosticism, with a proud contempt of the laws of language and thought, did the same for its own purposes, but made its wildly symbolical and erratic interpretations of the religious records binding. We are far from saying that they were in all cases guilty of intentional deception, in the ordinary sense of the word; though they must frequently have known the real meaning to be totally opposed to their explanations, as most of their teachers were learned Jews; but they, like other enthusiasts, gradually lost the power of discriminating between that which was and that which might be. Some, however, more consistent, assumed that Christ and his apostles had still been partially under the influence of the Demiurgos, and also that what they had taught, they had expressed in accordance with the blindness of those whom they addressed. Proceeding consistently, they by degrees excluded from the code most of the books of the New Testament, especially those in which there were distinct attacks against themselves; and substituted a number of other epistles and religious documents of their own in Greek and Syriac, such as the *Prophecies of Cain*, *Writings of Pachur*, *Psalms* by Valentinus and Bardesanes, *Gnostic Hymns* by Marcos, *Books of Adam, Enoch, Moseh, Eliah, Isajah*, etc., not to mention a host of writings by newly invented prophets of such peculiar names as Pachor, Barkor, Armagil, Barbelon, Balsamum, Lënsiboras, etc. (Hier. ad Theod. iii. 6, etc.).

Practically, Gnosticism influenced the lives of its adherents in two totally distinct ways: according to the view they took of the nature and office of the Hyle and Demiurgos. The Hellenizing Gnostics, striving to free themselves

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as much as in them lay from what they deemed stupid and degrading bonds, became ascetics, austere, rigid, and uncompromising. The oriental view, however, of the dualistic and antagonistic powers of light and darkness, good and evil, which was adopted by the other portion of the Gnostics, led them, on the other hand, to the practice of the grossest sensuality, in token, they said, of their utter contempt for matter, and still more for the Demiurgos—Body—and its enjoyments; everything terrestrial, in short, had as little to do with their mind, which was one with the Supreme Deity, as had matter with God. Transgression there was none, because there was no law; there could be no law for them who were better even than the angels—who were subject to none: a distortion of a dictum in the *Midrash*, that ‘the law was given not to angels, but to mortal men,’ and was therefore to be administered leniently. They, indeed, knew not how to express to the full their utter contempt for this Jewish Jehovah, or Demiurgos. There were others among them who called themselves after the serpent (*Ophites*), which by tempting Eve brought into the world the blessing of knowledge, and had thus become its greatest benefactor. Others took the name of *Cainites* (*Balamites*), contending that Cain had been the primeval representative of Gnosis, as opposed to the *Pistis*, or blind unreasoning faith of Abel, the representative of the *Psychikoi* (the Jews)—Seth being the type of the *Pneumatikoi*. Another class of similar tendencies styled themselves simply *Antitacts* (opponents to the Law), a name indicative of their readiness to take under their special protection, not only all those persons condemned in the Biblical records, but all the offenses prohibited in them.

It is as hopeless a task to follow the development of this metaphysical and unique abnormality called Gnosticism, above faintly outlined, through the bewildering maze of its ramifications from its beginning in history to its final disappearance, as it would be to fully trace its component parts to their original sources. It sprang up in the 1st c., it had spread over the whole civilized world in the 2d, and it was fiercely and unremittingly combated from the 2d to the 6th c. by Judaism, Platonism, Neo-Platonism, and, above all, by Christianity. With respect to the relation of the Gnostics to the orthodox church, however, we must observe that they all the while feigned a naive surprise at not being fully recognized as most faithful followers of Christianity, and members of the large Christian body. All they aspired to, they said, was to be allowed to form a small central cricle within the large outer circle, to be a kind of theosophic community, consisting of the more advanced members of the church; indeed, they not only adhered, for the most part, to the outward forms of Christian worship, but occasionally even surpassed it in pomp and splendor. And such was the fascination which Gnosticism exercised over the popular mind that, had it not been for the innumerable schisms in its own camp, which prevented its alliance with the political power of the day, it would have stood its ground much longer. On its influence

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on the Judaism of its time, as it is recognizable in many passages of contemporaneous Jewish literature; on its lasting influence on Christianity; and on its frequent revivals in the middle and modern centuries, we can as little dwell here as on its embodiment in many philosophical systems, ancient and recent.

We take, in conclusion, a cursory glance over some of its principal schools, in giving a brief list of their founders (for whom and their chief doctrines, see the respective titles), and the places where they flourished; without attempting to divide them minutely, as has been done in different way, by Neander, Gieseler, Matter, Baur, Schaff, into Judaizing and Christianizing; speculative, practical and antinomian; dualistic and emanationistic; or to classify them strictly by origin and locality. Suffice it to mention, that among the precursors of Gnosticism are recorded some half mythical personages, such as Euphrates, mentioned cursorily by Origen; Simon Magus, whose history, as given in the Acts, has been made the groundwork of innumerable legends; Menander, his successor; Cerinthus, apostle of the Millennium; and Nicolaus, father of the pre-eminently immoral sect of the Nicolaitans. Founders of special schools were, in Syria, Saturninus of Antioch, about A.D. 125 under Hadrian; Bardesanes of Edessa, 161, author of many hymns, and who deemed the Holy Spirit at once wife and sister of Christ; Harmodius and Marinus, his disciples; Tatian of Rome, founder of the *Encratites*, who wrote a still extant *Oration to the Greeks*; of Egyptian founders of Gnostic schools, were Basilides of Alexandria (125–140), who assumed 365 æons or circles of creation, two Demiurgi, and a threefold Christ, and whose mystic use of numbers and names reminds us most strikingly of the Cabalistic *Geometria*; his no less famous son and follower, Isidorus, author of a system of ethics; and Valentinus of Rome (died 160 at Cyprus), a Jew—as indeed was Markos his disciple, and, very likely, Basilides and Jaherminus; of Valentin's successors who founded schools of their own, besides Markos are mentioned Secundus, Ptolemy, Colarbasus, Heracleon, Theodorus, and Alexander. To the Syrians may be reckoned also the Ophites, Cainites, and Sethites (see above). In Asia Minor, was Marcion about the middle of the 2d c., remarkable for his consistency in scornfully rejecting the whole of the Old Testament and all apostolic authority save Paul. His school flourished to a very late period. Among non-localized G. may be enumerated the schools of Carpocrates and Epiphanes, the Bortonians, Antitacts (see above), Phibionites, Archontics, and a great many others.

Irenæus, *Adv. Hæret.*; Tertullian, *De Præscript. Hæret.* and *Contra Gn. Scorpianum*; Epiphanius, *Adv. Hæres.*; Theodoret, *Hæret. Fabb.*; Plotinus (*Ennead.* ii. 9); Mosheim, *De Rebus Christ. ante, Const. comm.*; Münter, *Vers. über die Kirchl. Alterth. d. Gn*; Lewald, *De Doctrina Gnostica* (Heidelb. 1818); Neander, *Genet. Entw. d. Gnost. Syst.* (Berl. 1818); Möhler, *Urspr. d. Gn.* (Tübingen 1831); Matter, *Hist. Crit. du G.* (Par. 1843-4, 2d edit. 3 vols);

GNU—GO.

Baur, *Die Chr. G.*, (Tübingen 1835). See also Neander's and Gieseler's *Histories of the Church*; Dorner's *Christology*; Bunsen's *Hippolytus and his Age*, and Grätz, *Gnosticismus und Judenthum*, besides many of the histories of Philosophy and of Christian dogma.

GNU, n. *nū* [Hottentot, *gnu* or *nju*], (*Catoblepas*): genus of ruminant quadrupeds, which naturalists generally rank with the antelope family (*Antilopidæ*), but which some place in the ox family (*Bovidæ*), and of which the best-known species has been often described as apparently made



Gnu (*Catoblepas Gnu*).

up of parts of different animals, not only of the antelope and the ox or buffalo, but even of the horse. This species (*C. Gnu* or *Antilope Gnu*) is a native of s. Africa; it has disappeared from the more settled parts of Cape Colony, but is seen in herds on the arid plains beyond these boundaries in company with the zebra or the quagga, and with flocks of ostriches. The form and action of gnus so much resemble those of zebras and quaggas, that at a distance they may be readily mistaken for them. The size of the gnu is that of a large ass; the general color is yellowish tawny. Both sexes have horns. The limbs are slender, like those of deer and antelopes. The gnu gallops with great speed. It has been usually represented as a very fierce animal, and certainly shows much ability to defend itself with its horns, when unable to escape from danger by flight; but when taken young, it is easily tamed, and readily associates with oxen, accompanying them to and from the field. There are two or three species, all s. African, nearly resembling the common gnu, and one of them at least is considerably larger. Their flesh is said to be palatable.

GO, v. *gō* [AS. *gangan*; Ger. *gehen*; Dut. *gaen*, to go; Icel. *ganga*, to go on foot]: to move from one place to another; to pass; to proceed; to depart; to walk; to be pregnant; to run; to take a direction; to move or work, as a watch or a mill; to contribute, as, the different ingredients which *go* to make up the compound; to conduce; to fall out or terminate; to reach or be extended; to fare. WENT, pt. *wēnt*, did proceed or go, etc. GO'ING, imp. about to do,

GOA.

I was going to say, etc.: ADJ. moving; travelling; walking; rolling; sailing. GOINGS, n. plu. movements. GONE, pp. *gōn*, declined; departed; ruined; undone; past; deceased. TO GO AGAINST HIM, to be unfavorable; to lose his case. TO GO AGAINST A TOWN, to besiege or attack it with troops. TO GO ABOUT, to attempt; to engage in. TO GO ABOUT YOUR BUSINESS, to depart and mind your own affairs. TO GO BETWEEN, to interpose; to mediate. TO GO BEYOND, to overreach. A GO-BETWEEN, an intermediate agent; in *China*, an agent or middle person employed in the transaction of important business. A GO-DOWN, in *China*, a one-storied building where goods are kept. THE GO-BY, an evasion; a shifting off; giving the cut; escape by artifice. Go TO! an exclamation meaning, 'come, come, say the right thing, or take the right course;' move; begin. TO GO ABROAD, to go out of the country; to walk outside the house; to be disclosed or published. TO GO ASIDE, to retire to a private place; to err. TO GO ASTRAY, to wander from the right course. TO GO AWAY, to depart. TO GO DOWN, to come to nothing; to disappear; to be swallowed or accepted. TO GO FOR NOTHING, to have no meaning or effect. TO GO FORTH, to issue; to become public. TO GO HARD WITH, to have small chance of escape; to cause serious trouble or danger to. TO GO IN, to enter. TO GO IN AND OUT, to go freely; to be at liberty. TO GO OFF, to depart to a distance; to die; to explode; to run away. TO GO ON, to proceed; to make an appearance, as on the stage. TO GO OUT, to issue forth; to go upon any expedition; to be extinguished. TO GO OVER, to change sides; to read; to examine. TO GO SHARES, to divide. TO GO THROUGH, to suffer; to undergo; to perform thoroughly. TO GO UNDER, to be known by, as, to *go under* a certain name; to be ruined. TO GO ILL WITH, not to prosper. TO GO WELL WITH, to prosper. TO GO IN UNTO, in *Scrip.*, to have sexual intercourse with. TO LET GO, to allow to depart; to release. GO-CART, a framework moving on wheels for training children to walk. GET ALONG WITH YOU, a familiar expression of disbelief in the words of the speaker, 'talk not so, for I don't believe it.' LITTLE GO, the first examination of an undergraduate in an English university. GREAT GO, the last examination before taking a degree.

GOA, *gō'á*: city, Portuguese settlement of Hindustan, on the Malabar coast, lat. 15° 30' n. and long. 74° e. G. was formerly cap. of the Portuguese dominions in India, but is now in hopeless decay. It was valuable chiefly for its harbor, one of the best on the w. coast of Hindustan, from which it was about 5 m. distant; but having the misfortune to be ravaged by the cholera in the beginning of the 18th c., most of the Portuguese left it, and settled nearer the sea, at Panjim or New Goa, which is the present seat of govt., with pop. about 14,000. The inhabitants of the old city are almost entirely ecclesiastics, the place being the see of a Rom. Cath. abp., primate of the Portuguese Indies. G. was conquered by Albuquerque 1502, at which time it was inhabited by an Arabic people.

The dependent territory of GOA stretches in n. lat. from

GOAD—GOAR.

14° 53' to 15° 48'. and in e. long. from 73° 43' to 74° 24'; 1.062 sq.m. Pop. about 600,000.

GOAD, n. *gōd* [Norw. *gadd*, a sharp point: prov Dan. *gadd*, a prickle: Icel. *gadda*, to goad: *gaddr*, a goad: Gael. *gad*, a strong stick]: a pointed stick used in driving oxen. V. to drive as with a goad; to urge forward; to rouse by anything severe or irritating; to stimulate. **GOAD'ING**, imp. **GOAD'ED**, pp. **GOADS'MAN**, n. a driver with a goad.

GOAD'LOUP: see **GANTLET**.

GOAF, n. *gōf*, or **GOB**, n. *gōb* [see **GOBBING**]: in *mining*, the waste or empty space left by the extraction of a seam of coal.

GOAL, n. *gōl* [Gael. *geal*, anything white, a mark to shoot at; *gobhal*, a post, a pillar: F. *gal*, the goal at football; *gaule*, a long pole set up to mark the bounds of the race]: the winning-post at football or on a race-course; final purpose or aim.

GOALPARA, *gō-âl-pâ'râ*: district of British India, most westerly dist. in the chief-commissionership of Assam (though not recognized as part of Assam till 1874); n. lat. 25° 40' to 26° 31', and in e. long. 89° 42' to 91° 8'; 3,897 sq. m. On the n. it is bounded by the native state of Bhotan. Its cap., of the same name, stands on the river Brahmaputra, lat. 26° 8' n., and long. 90° 40' e.; pop. (1872) 4,678. Pop. of dist. about 450,000.

GOA POWDER, *gō-â*: drug obtained from the trunk of a tree first found in the Portuguese colony of Goa, since cultivated in Portugal and its African and Asiatic colonies. It is prepared in the form of a yellowish-brown powder which grows darker on exposure to the air, and when made into a paste or mixed with vinegar or lime-juice is used locally for the cure of ringworm and various other skin diseases. When given internally it acts as an emetic and purgative. The powder when used by itself leaves a stain difficult to efface, and is very irritating to the eyes; hence it is found best to apply it in the form of ointment. In Bombay the powder sells for \$15–\$20 per pound.

GOAR, or **GORE**, n. *gōr* [see **GORE** 3]: a triangular piece put into the skirt of a garment in order to widen a part; a *gusset* is a triangular piece inserted into the body of a garment to widen and strengthen a part, particularly in the armpit and shoulder, to permit the arm to have unrestrained movements.

GOAT.

GOAT, n. *gôt* [AS. *gat*; Dan. *ged*, a goat: Icel. *geit*, a female goat]: a well-known animal used for its milk and flesh. GOAT'ISH, a. resembling a goat; of a rank smell; lascivious. GOAT'ISHNESS, n. GOATCHAFER, n. a kind of beetle. GOATHERD, n. one whose occupation is to tend goats.

GOAT (*Capra*): genus of mammiferous quadrupeds, ruminant, with cloven feet, and hollow horns which turn upward and backward. The G. has 12 molars and no incisors on the upper jaw, while the lower jaw has 12 molars and 8 incisors. The male has a long beard under the chin. The real G. is not found wild in this country, but has been domesticated in almost all parts of the habitable world. The wild G. (*C. ægagrus*) is found in large herds throughout the mountainous regions of central Asia and is regarded by many naturalists as the parent race of the various domestic varieties, though others claim that the parent stock is now extinct. The ibex (*C. ibex*) is an agile species with large, square horns, which frequents high mountain ranges in Europe and Asia.

In many respects the G. has close resemblance to the sheep, while in other directions it approaches the antelope. The horns are longer than those of the sheep and turn upward and backward instead of downward and spirally as in sheep. The G. has a shorter tail and the face is more nearly straight than that of the sheep, while the beard, a prominent characteristic of the G., is wanting in the sheep. The male G. also has a strong odor which is not emitted by the sheep. The G. is stronger, more agile and hardy than the sheep, and when tamed is much less timid. In its wild state it frequents rocky places, is very wary and difficult of approach by man, leaping from ledges and cliffs, and seldom losing its footing. It feeds on the leaves and twigs of shrubs and herds as well as on grass. It was regarded as an enemy of the vine by the ancient Romans, who, on this account, sacrificed it to Bacchus. In the Old Testament the G. is often mentioned as an emblem of strength and also of licentiousness.

The Angora G., native to Asia Minor, is remarkable for its long, soft and lustrous hair from which the celebrated mohair goods are manufactured (see ANGORA). The Cashmere G., of n. India and Tibet, yields the material of which the famous Cashmere shawls are made (see CASHMERE).

The common G. (*C. hircus*) has been domesticated from the earliest ages. The patriarchs kept large flocks of goats; they were offered as sacrifices for sin under the Mosaic dispensation; they are figured in Assyrian inscriptions, and were generally distributed throughout the ancient world. In modern times the G., though kept in nearly all countries, has never been as popular as its rival the sheep, which is far more profitable in localities to which it is adapted. The G. will thrive in rocky situations and in scanty pastures where sheep will not thrive. In the cultivated lands of Great Britain the number of goats has gradually declined, but in the mountainous districts of Scotland and Wales

GOAT.

are many large herds in a semi-wild state. In the United States the G. is seldom kept in large numbers. Its habit of breaking through or leaping fences and roaming at will is a great objection, as is also its tendency to browse on young trees. Where the pastures are good, sheep are to be preferred. The G. is capable of enduring confinement and is kept to quite an extent in cities and towns. In



Common Goat (*Capra hircus*).

former times the skins of goats were largely used for clothing. At present some of the finest morocco leather is derived from this source, and from the skins of the young the genuine kid gloves are made. The flesh of the G. is not highly esteemed, though it has been used for food from early times. The ancient Israelites used both the flesh and the milk, but were not allowed to eat the fat. The flesh of the kid is said to be delicate and nutritious, but that of the mature G. is somewhat indigestible. The milk of the G. is considered more nutritive and healthful than that of the cow. The quantity yielded by an ordinary G. is small, but where special care has been taken in breeding to develop the milking qualities there has been marked increase. From two to three quarts per day for several successive months is sometimes given. Owing to its habit of eating briars and bushes the G. has sometimes been found useful in destroying such growths in neglected pastures though its dislike of confinement makes it difficult to fence sufficiently to keep it from trespassing. The G. is sometimes employed also to protect sheep from dogs and wolves. Two or three goats will defend 50 to 100 sheep.

The G. reaches maturity very early, and is quite prolific. It breeds once, and in many cases twice, a year, producing from one to three at a birth. Early and frequent breeding is injurious, reducing the size and vigor of the animals and impairing the milking qualities. It should not be kept after reaching seven years of age. It is subject to few diseases. The G. can be kept in winter on rather coarse hay, straw, and roots. In s. Europe the G. is largely used for drawing light loads, and in this country it is often seen in public parks harnessed to small carriages in which children ride.

GOAT—GOAT MOTH.

GOAT, ROCKY MOUNTAIN (*Aplocerus montanus*): ruminant mammal with hollow and permanent horns; resembling both the goat and the deer, but belonging to the antelope family. It is found on the Rocky Mountains. It is about the size of a sheep, and has a large quantity of long, straight hair, resembling wool, which would be valuable for manufacturing purposes if a supply could be obtained. It is sometimes called the Sheep-antelope. The flesh is of little value. Domestication has been proposed but, on account of the natural disposition of the animal, would be extremely difficult, and is not known to have been successfully attempted.

GOAT ISLAND: islet of abt. 70 acres, on the very brink of Niagara Falls. It is connected with the United States shore by a bridge 900 ft. long; and is about 2,000 ft. from the Canadian shore.

GOAT MOTH (*Cossus ligniperda*): lepidopterous insect of the same family with the Ghost-moth, *Hepialidæ*. The genus *Cossus* has long antennæ, a large body, a very small head; the upper wings larger and longer than the lower. The larvæ feed on the wood of trees, and the pupæ are inclosed in cocoons, made chiefly of the sawdust which the mandibles of the larvæ have produced. The G. is a large moth, measuring 3 to 3½ inches from tip to top of expanded wings. It is of gray color, the upper wings mottled with white, and marked with many irregular black lines, the lower wings of almost uniform brownish ash-color.

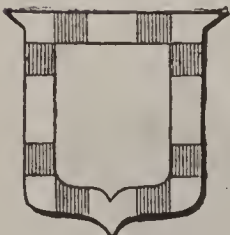


Caterpillar, Chrysalis, and Imago of the Goat-Moth (*Cossus ligniperda*).

The larvæ is about 3 inches long when full grown, yellowish, the upper parts pink, the head black. The larva inhabits and feeds on the wood of willows, poplars, and elms, making holes large enough to admit the finger, and often



The Bezoar Goat (*Capra aegagrus*).



Gobony.



Gobony. Another specimen.



Go-cart.



A Female affected with Goitre.

GOAT'S-BEARD—GOATSUCKER.

causing the destruction of trees. It emits, when alarmed or handled, a peculiar and disagreeable goat-like odor, which cannot be removed from the hands even by frequent washings. The larva takes three years to come to maturity.

GOAT'S'-BEARD: see SALSIFY.

GOAT'S'-RUE (*Galega*): genus of plants of nat. ord. *Leguminosæ*, sub-ord. *Papilionacæ*, of which one species (*G. officinalis*), a perennial herbaceous plant, about three ft. in height, with pinnate leaves, long pointed leaflets, racemes of generally purplish or pink-colored flowers, and upright, nearly cylindrical pods, has been recommended for cultivation as a forage plant, for its great bulk of produce: it has, however, a peculiar smell, and is not relished by cattle unaccustomed to it. It is a native of s. Europe.

GOATSUCKER (*Caprimulgus*): genus of birds of the family *Caprimulgidæ* (q.v.), having the upper mandible curved at the point, and furnished along each margin with a row of strong hairs or bristles (*vibrissæ*) directed forward; the hind toe capable of being directed forward; the claws short, except that of the middle toe, which is remarkably long, and serrated on its inner edge, so as to form a kind of comb attached to the toe. Although the bill is very short and weak, the gape is extremely wide, as if the head itself were divided. The goatsuckers feed on insects, perhaps chiefly on moths, whence they are called *Moth-hunters*, and pursue their prey either in the evening twilight or during the night, in a manner similar to bats and swal-



Common Goatsucker (*Caprimulgus Europæus*).

lows. Like them, they seem to confine themselves to a limited space, in which they often pass and re-pass at no great height above the ground. They have great rapidity and power of flight. Their great width of gape is favorable for capture of insects. Goatsuckers are birds of light, soft plumage, in general minutely mottled with gray and brown. The COMMON G. or EUROPEAN G. (*C. Europæus*), is called also the Night-Churr, or NIGHT-JAR, from the sound which it produces; and frequently, from the resemblance of its plumage to that of owls, the CHURN OWL or FERN OWL. Its migrations ex-

Send from Britain n. to Scandinavia, Siberia, and Kamtchatka. In winter, it retires from Europe altogether, passing to the south of the Mediterranean. It often haunts bushy places and grounds covered with brake. It scarcely makes a nest, but deposits two eggs in a depression of the ground, under shelter of a bush. Its whole length is about ten inches and a half. This bird is the *Caprimulgus* of Pliny, the *Aigothelas* of Aristotle, both these names being exactly equivalent to the English G., and expressive of the ancient popular notion, that this bird sucks the teats of goats, a notion probably founded on the habit—observed in some of this family—of hunting insects under the bellies of grazing cattle. In perching, the G. sits *lengthwise* on the branch. Species are widely distributed over the world. An American genus nearly allied, is *Chordiles* (see NIGHT-HAWK); also a group *Antrostonus* (see CHUCK-WILL'S WIDOW: WHIP-POOR-WILL).

GOB, n. *göb* [F. *gober*, to swallow greedily; *gobet*, a mouthful: Gael. *gob*, the mouth: It. *gobbo*, a hump or hunch]: a hump. GOBBET, n. *göb'bët*, a mouthful; a morsel: V. to swallow as a mouthful. GOB'BETING, imp. GOBBETED, pp. *göb'bët-éd*.

GO-BANG, n. *gō-bāng'*: a game of Japanese origin played with thin counters of bone or ivory on a board marked with 324 small squares.

GOBAT, *go-bâ'*, SAMUEL, D.D.: 1799, Jan. 26—1879, May 12; b. Cremine, Berne, Switzerland: Anglican bp. of Jerusalem. Little is known of his early history, except that he was a presbyter of the Lutheran Church in Prussia, under which he served as a missionary in Abyssinia, 1830–2. Subsequently, he was vice-principal of the Malta Protestant College; and 1846 was consecrated first Anglo-Prussian bp. of Jerusalem on the nomination of the king of Prussia. The creation of this see caused much controversy and difficulty at the time the Oxford 'Tractarian' movement was at its height. His *Journal of a Sojourn in Abyssinia* (1834) was for a long time the most authentic account of that country.

GOBBE, *göb*, or VOANDZOU (*Voandzeia subterranea*): annual plant, allied to the kidney-bean, but of which the pod is thrust into the ground in the same manner as that of the ground-nut (*Arachis hypogæa*, see ARACHIS), to ripen the seeds there. It is a native of the s.e. of S. America, and of some parts of w. Africa. Its seeds are used as food, being wholesome and agreeable when boiled.

GOBBING, n. *göb'bīng*, or GOBBIN, n. *göb'bīn*, and GOFFIN, n. *göf'fīn* [W. *gob*, a heap, a mound: F. *gobbe*, a poisoned morsel (see GOB)]: the refuse thrown back into the mine, after the removal of the coal, to help to support the roof.

GOBBLE, v. *göb'bl* [a word imitative of the sound: Dut. *gobelen*; Icel. *gubba*, to vomit: F. *gober*, to swallow: Gael. *gob*, the mouth]: to swallow in large pieces; to swallow greedily and with noise; to make a noise like a turkey-cock.

GOBBO—GOBLET.

GOB'BLING, imp. *-blīng*. GOBBLED, pp. *gōb'blēd*. GOB'BLER. n. *-blēr*, one who swallows in haste; a greedy eater; a turkey-cock—so called from the character of the noise which it makes.

GOB'BO, or GOB'BIO, or GOM'BO: see HIBISCUS.

GOBELINS, n. plu. *gōb'līnz* [named from *Gobelin*. Fr. dyer in the reign of Francis I.]: the royal manufactory of tapestry near Paris; the fabrics there made: see TAPESTRY.

GOBEMOUCHE, n. *gōb-mōsh* [F. a fly-swallower]: silly, simple, credulous person, who will believe anything; usually listening open-mouthed to any extravagant story.

GOBI, *gō'bē*, or SHAMO: vast desert in eastern central Asia. G. is the Chinese, Shamo the Mongol name for the wide region of steppe and desert which extends from the Thian-Shan Mountains to the Kuen-Lun and Nan-Shan Mountains, bordering on e. Turkestan to the west, and occupying great part of the area 40°—45° n. lat., and 90°—118° e. long. The 'desert' is not sterile throughout. On the n. and on the s. is a wide belt of firm steppe, consisting mostly of vast green levels covered with abundance of pasture, but broken by numerous ridges of hills. Between these two belts, each at a height of 4,500 to 5,500 ft. above the sea, lies a depressed tract, not more than 2,500 to 3,000 ft. above sea-level, varying in breadth from 230 to 460 m. This alone—especially its eastern part—is properly called G., or 'sea of sand;' it is an utter wilderness of sand and stones, and is probably the bed of an ancient sea. The salt sand of which its soil is mainly composed produces nothing but a few scrubby plants. The fauna of the G., even in the wider sense, is limited, including little save hamsters, dziggetais, a few wild sheep and antelopes. There are no fixed habitations even in the steppe country; the inhabitants, chiefly Mongols, all are nomads. Yet in various places there are traces of ancient cities buried in the shifting sand (see *Ocean Highways* for 1873). The winter here is intensely cold and stormy, and the summer excessively hot. Yet the wandering hordes of Mongols have no difficulty in keeping large herds, which find plenty of rich pasturage on the steppes, and even in winter contrive to pick sufficient food from beneath the snow. From want of wood the nomadic tribes have to use dried dung as fuel. Little is known of the G., save in the neighborhood of the main tracks across it, of which the chief is from Maimatchin to Peking.

GOBLET, n. *gōb'lēt* [F. *gobelet*, a wide-mouthed vessel to drink from—from mid L. *cupellum*, a goblet: F. *gobelotter*, to guzzle, to tipple: Gael. *gob*, the beak, the mouth (see GOBLIN)]: a cup or drinking-vessel without a handle; a bowl.

GOBLET. *go-blā'*, RENÉ: French statesman: b. Aire-sur-la-Lys, 1828, Nov. 26. He was educated for the law, practiced with notable success in Amiens, was appointed attor.gen. to the court of appeals by the provisional govt. 1870, elected member of the national assembly 1871, of the chamber of deputies 1876, became under sec. of state for

GOBLIN.

justice and mayor of Amiens 1879, minister of the interior 1882, education and public worship 1885,6, pres. of the council and minister of the interior 1886, and minister of foreign affairs 1888. He founded 1869 and still conducts *Le Progrès de la Somme* a liberal journal, interdicted the production of Zola's *Germinal* 1885, and is considered an accomplished orator.

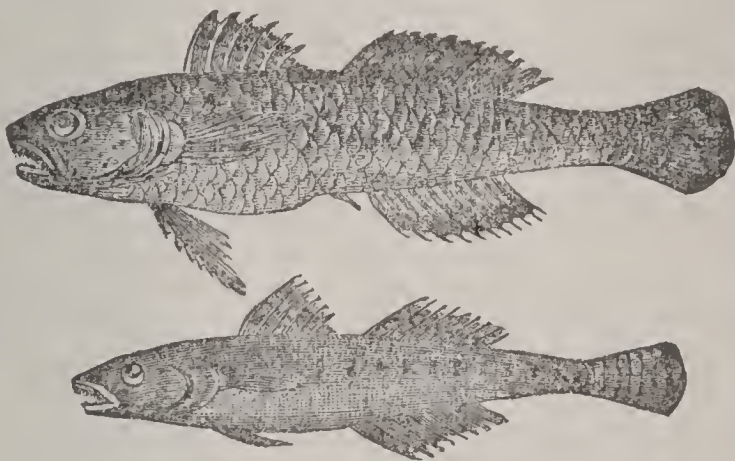
GOBLIN, n. *göblin* [OF. *gobelin*, hobgoblin: Ger. *kobold*, the goblin or spirit of the mines: W. *coblyn*, a knocker, a goblin]: familiar demon of popular superstition—known also as *Bogle* or *Bogie*; supposed supernatural being of small size but of great strength, lurking about houses, or dwelling underground in mines, in mounds, and in desert places, not necessarily ill-disposed toward men: an evil spirit: a fairy. HOBGOBLIN, a spirit.—Some have derived the word Goblin from Fr. *gober*, to swallow, to devour; and others the words elf and goblin from the Guelphs and Ghibellines, each name being used by the other party as a name of terror. Goblin is used in a serious sense by Shakespeare in *Hamlet*, where the ghost is supposed to be either a 'spirit of health or goblin damned.' *Gobelet*, in French, is applied to juggler's tricks and instruments, and the English word goblet is said to come from the juggler's cup.

Bogle, bogle-boe, or bugaboo, may be from the Welsh *brogwly*, to terrify; and *boe* or *boo*, a sound. Bugaboo was the popular name of wide-mouthed, ugly pictures, formerly carried in May-games in England. Warton says Boh was the designation of a fierce Gothic chieftain, whose name was used in after-times to frighten children. The belief in benevolent and malevolent spirits belongs to all countries, and appears to be as old as the world.

GOBONY—GOBY.

GOBONY, *gō'bō-nŏ*, in Heraldry: same as *Componé* (q. v.). A gobonated bordure is frequently carried in place of the baton sinister, not only by the lawful issue of bastards, who, after the third lawful generation, are considered entitled to make the change, but by bastards themselves: see **BASTARD BAR**.

GOBY, n. *gōbŏ* [F. *gobie*; L. *gōbŏŭs*], (*Gobius*): genus of acanthopterous fishes, type of the family *Gobiidæ*. This family is distinguished by thinness and flexibility of the rays of the dorsal fin; by union—in most of the genera—of the ventral fins, which are thoracic, into a disk more or



The Black Goby and the One-spotted Goby
(*Gobius niger* and *Gobius unipunctatus*).

less capable of being used as a sucker; by lack of an air-bladder; and by a long intestinal canal without cœca. The Blenny (q. v.) family (*Bleniidæ*) have by some ichthyologists been united with the Goby family, while others unite with them the *Discoboli* (q. v.). The true gobies (*Gobius*) are generally small, some inhabiting the shallow water of the coasts, others found in deeper water; the species very numerous in the seas both of the n. and s. hemispheres. They are very interesting on account of their habits; and are of the number of nest-building fishes, employing *algæ* and grass-wrack (*Zostera marina*), in the spring season, for making their nests. When the female has deposited her eggs in the nest, the male watches over them till they are hatched. The **BLACK GOBY** (*G. niger*), is a large British species, about five or six inches long. Some species are often found in rock-pools on the coast; many live in such fresh waters as are near the sea. The disk formed by the ventral fins is often used for adhesion to stones. Most of the gobies prefer seas of clayey or muddy bottom, in which they excavate canals to pass the winter in. The species are numerous in the Mediterranean.—The goby family includes the Dragonets (q. v.), and several other interesting genera, among which are the *Boleophthalmi* of the Chinese seas, remarkable for their power of thrusting out their eyes to look around them.

GOD.

GOD, n. *gōd* [AS. *God*; Icel. *gud*; Dut. *God*; Ger. *Gott*; Pers. *khoda*; Hind. *khooda*; Lat. *Deus*; Gr. *Theos*]: the Supreme Being; the Deity; the Almighty: an idol or worthless object of worship. **GOD**, v. in *O.E.*, to treat as a divinity; to deify. **GOD'DING**, imp. **GOD'DED**, pp. **GOD'DESS**, n. fem. *gōd'ēs*, a female heathen deity or idol. **GOD-FATHER**, n. one who becomes sponsor for a child at baptism—a woman who does so is called a **GODMOTHER** (see below). **GODCHILD**, n. a child for whom one becomes sponsor. **GODSON**, n. a male child—**GODDAUGHTER**, n. a female child—for whom one becomes sponsor at baptism. **GODHEAD**, n. *gōd'hēd* [*God*, and AS. *head*, person, quality, state]: the Divine essence or nature; the Deity. **GODLESS**, a. *gōd'lēś*, impious; regardless of God. **GOD'LESSLY**, ad. *-lī*. **GOD'LESSNESS**, n. state of being godless or irreligious. **GOD'LIKE**, a. *-līk*, resembling God; of superior excellence; divine. **GOD'LY**, a. *-lī*, devout; pious. **GOD'LINESS**, n. a religious life; piety; the revelation of God in Christ, as, 'great is the mystery of godliness.' **GOD'SEND**, n. an unexpected acquisition or piece of good fortune. **GOD'SHIP**, n. rank or character of a God. **GOD FORBID**, a strong exclamation, indicating the desire that a stronger power than man may intervene. **GOD-BOTE**, ancient ecclesiastical fine, for crimes and offenses against God. The word *bote*, same as *boot*, is the old Saxon *bot* or *bote*, a reparation or satisfaction—e.g., man-bote was the compensation due for the life of a man. **GOD-SPEED**, God be with you; may God prosper you. **GOD'WARD**, ad. *-wērd*, toward God. **AMONG THE GODS**, in *familiar language*, the audience in the upper gallery of a theatre—so named in allusion to their elevated position, and the ceiling being generally painted to resemble the sky. **GOD'S ACRE**, a churchyard or burial-ground. **OFFENSES AGAINST GOD**: see **SACRILEGE**. *Note*—In written or printed compositions, the word **GOD**, designating the Supreme Being, begins with a capital letter, thus, *God*; but when an idol or false god is meant the word is wholly in small letters, thus, *god*. *God* is not derived from *good*, as is often supposed.

GOD: the Self-existent, Supreme, Almighty, All-wise, Infinite, Eternal, Holy, and Blessed Spirit; the Living One, who is the source of all life; the creator, preserver, and ruler of all things; the Father of men. The name is of Saxon origin. The idea is more or less definitely expressed in every language, as it may be said to be in one form or another a universal element of the human consciousness. There have been many nations, indeed, in every age of the world, that have been far from attaining any such conception of God as is expressed above. The Supreme has been to them the conception not of a single Being, but of many beings of greater power than man, and claiming his worship. In the general history of nations after the loss of that original monotheism whose record appears in Genesis, a tangled, shifting, capricious polytheism prevails, from which there is an ascent by slow gradations to the primeval belief in One living God, infinite and self-existent.

The general character of polytheism is everywhere the

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same. A dualistic conception of nature and life is traceable as underlying it, and shows itself in varied expressions. In looking forth on nature—in looking within himself—man seems to see two principles striving for the mastery—an active and passive, a creative and recipient principle—a good and evil, a productive and destructive, a joyous and gloomy agent. On one side, there seems a power rich, benignant, and gracious, giving light to the day, verdure to the spring, abundance in autumn, scattering fecundity and blessing around; on the other side, there seems a power cruel and malevolent, quenching the light in darkness, consuming the verdure and fertility with scorching heat, or destroying them with cold. These contrasts seem eternal—they take possession of the imagination, and clothe themselves in diverse shapes. In every polytheistic religion, they will be found in the recognition of male and female, of good and evil divinities—Baal and Baaltis, Baal-Adonis and Baal-Moloch, in the old Phœnician religion; Osiris and Isis and the evil principle, Typhon, in Egypt; and the more familiar opposites of Ahriman and Ormuzd, Jupiter and Juno, etc. The dualism assumes various shapes, now male and female, productive and passive; and now good and evil, conservative and destructive. It is true indeed that this dualism is modified by other elements, such as the conception of fate or destiny, and chance.

Whether this dualistic mode of conception, and the polytheistic view of nature that springs from it, be a later or an earlier type of thought than the monotheistic, has been much disputed. Some see in it the corruption of monotheism—the worship of the Supreme gradually falling to a worship of the great forms of nature which most strikingly represent Him—the sun and storm, the light and darkness, etc. Others, again, regard the polytheistic as the primitive view of nature, above which man gradually rises, by the growth and exercise of his reason, under the inspiration and impulse of God's continual revelations of Himself. As concerns nations originating since man's earliest loss of the idea of one God, there is truth in this latter view, even to those who most firmly hold that man originally received a Divine Revelation, which he has gradually corrupted. Polytheism is the natural religion of savage tribes throughout the world; and correspondent to man's advance in civilization are purer and more comprehensive conceptions of Deity. His reason, set free for its unbiased exercise, tends to recognize the One in the many everywhere, to carry up all his conceptions into a unity. Polytheism, consequently, everywhere disappears with steps equal to those of advancing knowledge, light, reasonableness, and a true manhood. It is incompatible with even the lowest stage of speculative development.

But while the growth of reason and the rise of speculation everywhere destroy polytheism, they do not necessarily in every case substitute a genuine monotheism—the doctrine, that is to say, of one living and true God, infinite and eternal in power, wisdom, goodness, and truth, a free personal Being exalted above the world, and apart from

it, yet intimately related to all its creatures, who 'suffereth not a sparrow to fall to the ground without his permission.' This is the doctrine of Christian theism, as opposed alike to polytheism (doctrine of many gods); and to pantheism (doctrine that all things are God—making God a unity, yet only an abstract unity consisting in the comprehension of an infinite number of particular existences, not a self-subsistent and independent unity), and to atheism (assertion that there is no God).

The course of argument on which the theistic conclusion supports itself may be sketched as follows: There are everywhere in the world the traces of order; a unity of plan or design, shown in innumerable beautiful effects, pervades creation. Science is always unfolding it more and more. Of *the fact* of this order or unity of plan, there is no question. The progress of science, if nothing else, has effectually exploded the old dualistic or polytheistic conception of nature. What appeared to be the result of opposing principles, is really found to be the issue of general laws working on some great though unexplored scheme of harmony. There is no disturbance, no *disorder*; amid the infinite diversity of nature and even through all its visible antagonisms—*order* reigns universally.

But this 'order,' what is it? The mere recognition of order, it is said, does not necessarily imply the recognition of God—of a 'Being all-powerful, wise, and good, by whom everything exists.' The materialist and pantheist also equally admit the fact of order, but equally deny the theistic conclusion founded on it (which, we may suggest, is a belief in *order* while denying any *ordering*), and the argument, accordingly, is carried up from nature and its facts to a higher region of discussion. It might better be said that the argument is carried up, not 'from' nature and its facts, but *to include with* nature and its facts a higher range of discussion. But merely noting this in passing, and continuing the theistic argument as it is now usually presented—whence arises the conception of order—of design? Nature illustrates it, but nature, it is said, does not itself give it. Yet it is undeniable that nature does give it *to the mind of man*, which is the very tribunal before which the question is being presented. The general laws of which science speaks so much pervade all phenomena of creation, but they are not a part of these phenomena: thus it is asserted. But these laws of nature are a part of nature even though not a part of the phenomena. Is nature merely appearance and not reality? 'Order' and law are ideas which *we* indeed attribute to nature as facts, but it is because nature shows us those facts as existing; otherwise our attributing of them would be a fallacy and nothing worth. They come from within, not from without, it is said; but it is plain that they come from both, and must come from both unless they are baseless. We start with both mind and matter. The latter in itself presents a mere series of endless movements: in the presence of mind it necessarily assumes meaning and *order*. Mind is the true image of the Deity. We discern *causation* in nature for

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two reasons: first, because causation is there to be discerned; secondly, because we ourselves are *agents*, conscious of exerting power. We discern *order* in nature, because nature is an ordered or arranged whole; also, because we everywhere bring our conceptions into a unity, and apprehend our several modes of consciousness with reference to the indivisible self which they all involve. 'In our life alone does nature live,' is more poetic than scientific. Nature exists, whether we live or die or never are born. But the following may be accepted as beautifully setting forth one great side of the truth, and that the deepest and most impressive: 'It is from the little world of our own consciousness, with its many objects marshalled in their array under the rule of the one conscious mind, that we are led to the thought of the great universe beyond—that we conceive this also as a world of order, and as being such by virtue of its relation to an ordering and presiding mind.'

The existence of Deity, therefore, according to both lines of the argument indicated above, is a postulate of the human consciousness. Recognize in man a living mind independent of matter—a *rational will*, as constituting the essential and distinguishing element of his being—and the inference is inevitable of an infinite mind—a supreme will governing the world. A true natural theology is based on a true psychology. A philosophy which denies to man a higher existence than mere physical nature, which would make his rational consciousness the mere growth of material conditions, leaves no ground of argument for the existence of Deity; since practically it involves an exclusion from the argument of the mind which is to argue, and by which the facts of the whole case are to be discerned. Reducing the human reason to this point, it makes true *to such a mind* the eloquent utterance of Jacobi, though with an application modified from his: 'Nature reveals only fate, only an indissoluble chain of causes (sequences), without beginning and without end, excluding with equal necessity both providence and chance. Working without will, she takes counsel neither of the good nor of the beautiful; creating nothing, she casts up from her dark abyss only eternal transformations of herself, unconsciously and without end. But man *reveals* God—for man, by his intelligence, rises above nature, and in virtue of this intelligence, is conscious of himself, as a power not only independent of, but opposed to, nature, and capable of resisting, conquering, and controlling her. As man has a living faith in this power superior to nature, which dwells in him, so has he belief in God—a feeling, an experience of his existence. As he does not believe in this power, so does he not believe in God; he sees, he experiences naught in existence but nature, and necessity, and fate.'

The argument for the existence of God rests, accordingly, on certain fundamental principles of our mental and moral being, such principles as causation and design, or final cause; and on the observed facts of the physical universe 'the things that are seen.' It implies a spiritual as against a materialistic philosophy of human nature.

GODAVERY.

Some philosophers have sought not merely to rest the argument for the existence of God upon man's consciousness and experience, but to evolve it in all its completeness from them alone. From a single datum of consciousness—sometimes from a single datum of experience—they have tried to construct, by processes of mere abstract reasoning, a 'demonstration of the being and attributes of God.' This has been styled the *a priori* method of argument, though to all the arguments to which this name has been given the term does not strictly apply. The mode of argument, on the other hand, which reasons only from special effects in nature to a First Cause, has been styled, in contradistinction, *a posteriori*. The argument from design, e.g., as conducted by Paley and others, is *a posteriori*. The arguments of Descartes, and the 'demonstration' of Dr. Samuel Clarke, are what have been termed *a priori*. Either of these modes of proof, taken by itself, has been rightly considered inconclusive, or at least dangerously incomplete, by recent writers on natural theology. Mere *a priori* trains of reasoning fail to carry up the mind to any real and living conception of Deity; they yield merely a theoretical or abstract idea. Arguments such as Paley's and the Bridgewater treatises on the other hand, though of great excellence and strength as illustrations, are illustrations rather than real arguments. They derive all their logical force from certain principles which are implied in their details, principles without which these details fail as convincing evidence of the existence of God. The very idea of Design itself is such a principle. It is in nature indeed; but the mind itself is so constituted that it cannot on any large scope conceive of nature as without design: thus the mind takes design into nature and finding the outward facts fitting to its natural conception, necessarily accepts each as corroborating the other, and by both the outward and the inward witness establishes the truth. Any complete argument for the Being of God, therefore, involves equally *a priori* and *a posteriori* elements. The former are necessary as the rational foundation of the argument; the latter are necessary to illustrate, to give life and body to the general principles which lie at the foundation.

For the Christian doctrine of the Godhead, see TRINITY: SON OF GOD: HOLY SPIRIT. See also ATHEISM: PANTHEISM: MATERIALISM.

GODAVERY, or GODAVARI, *gō-dāv'ēr-ī*: one of the principal rivers of the peninsula of Hindustan, and the largest of the Deccan, rising within 50 m. of the Arabian Sea, and flowing s.e. across the peninsula into the Bay of Bengal. Its source is in the e. face of the Western Ghauts, lat. 9° 58' n., and long. 73° 30' e.; and its two mouths, diverging in lat. 16° 57' n., and long. 81° 49' e., enter the sea respectively in lat. 16° 48' and long. 82° 23', and in lat. 16° 18' and long. 81° 46'. About 23 m. above the head of the delta, the G. emerges at Polaveram from the Eastern Ghauts, through which it has passed with so moderate a descent as to be navigable in either direction. The s. arm

GODEFROI—GODFATHER.

of the G. admits vessels drawing eight or nine ft.; and the n. one has a depth of two or three ft. more. Like tropical streams in general, the river varies greatly; according to the season in breadth and depth. But a dam or annicut (see CAUVERY) has been constructed, to mitigate the evil for purposes of navigation and of irrigation. The length of the G. is about 900 m.—For the *district* of G., see RAJA-MAHENDRI.

GODEFROI': see GOTHOFRED.

GODERICH, *gōd'rich*: town, port of entry, and cap. of Huron co., Ont., Canada; on Lake Huron; w. terminus of the Buffalo and G. division of the Grand Trunk railway: 78 m. n.n.w of London, 160 m. n.w. of Buffalo. It has a valuable harbor, protected by a pier, with a lighthouse at the mouth of Maitland river, and is connected by steamboat lines with Sarnia and Buffalo and ports on Lake Huron. It manufactures woollens, iron castings, machinery, leather, boots and shoes, and wooden-ware, and has 8 salt-wells and extensive lake-fisheries. Pop. (1870) 3,954; (1881) 3,444; (1891) 4,564; (1900) 4,158.

GODESBERG, *gō'dès-bèrch*: village of Rhenish Prussia, with a fine ruin; on a conical hill in a plain on the left bank of the Rhine, four m. s. of Bonn. It has a mineral spring, and is a favorite summer residence. It derives its name, not from Woden, who is said to have been worshipped here, but probably from the Gau-ding, or Goding, the district court which may have held its sittings at this place. The castle was erected by Dietrich, Abp. of Cologne (1208-13), with materials from the ancient chapel of St. Michael, the ruins of which are still standing near the castle. In 1582, Gebhard, the deposed archbishop, took refuge here, and intrusted the castle to a Dutch garrison. It was, however, soon taken by his successor, on which occasion it sustained much injury. During the Thirty Years' War, it was alternately in possession of the Swedes and the Imperialists, and was finally almost demolished by the French. Only one fine tower, 90 ft. in height, is still standing. It commands a magnificent prospect of the Siebengebirge and great part of the valley of the Rhine, and is, on this account, much visited by strangers. Pop. of G. 3,000.

GODFATHER and GODMOTHER: in prelatical churches, persons who, by solemnly presenting to the minister the candidate for baptism, which is regarded as a new spiritual birth, is reputed to contract toward the newly baptized the relation of spiritual paternity or maternity. The effects of the usage are differently estimated in the different communions.—In the Rom. Cath. Church, the parties presenting a child for baptism are called, from the spiritual *parental* relations which they contract, 'godfather' (*patrinus*) and 'godmother' (*matrina*); and from the *engagement* into which they enter on behalf of the baptized, 'sponsors' (*sponsores*). The spiritual bond resulting from this relation is regarded as a species of kindred (whence the name *gossip*, or God-sib, *spiritually akin*), and

GODFREY OF BOUILLON.

constitutes, by the canon law, an impediment of marriage between the sponsors upon the one hand, and the baptized and the parents of the baptized on the other. Anciently, this impediment arose also between the sponsors themselves, who were often very numerous, and extended besides to the other members of the kindred; but the Council of Trent limited the number of sponsors to 'one or two,' and restricted the matrimonial impediment within the limits above described. The parents of the baptized are not permitted to act as sponsors in the Rom. Cath. Church, one of the objects of the institution being to provide instructors in case of the death of parents; nor are members of religious orders, because their inclusion within their convent is supposed to render it impossible for them to discharge permanently and regularly the duties of instructors to the newly baptized. In the Rom. Cath. sacrament of confirmation also, the candidate is commonly presented by one sponsor, usually, though not necessarily, of the same sex with the candidate for confirmation. It is difficult to assign the precise date of the origin of the institution of godparents: no trace of it occurs in the New Testament, but it is believed to have been in use in the 2d c., and it was an established practice in the fourth.—In the Church of England, two godfathers and a godmother are required at the baptism of a male, and two godmothers and a godfather at that of a female. In order to be admitted as such, the person must be baptized, must be of full age, acquainted with the Lord's prayer, creed, and ten commandments, and familiar with the fundamental truths of Christianity. No impediment of marriage arises in the English church from the relation of the sponsors to the baptized. Practically, the usage in the Church of England has, for the most part degenerated into a mere form; godfathers and godmothers usually giving themselves little concern in the future fate of the infant whose spiritual condition they bind themselves to watch over. They are regarded as fulfilling a graceful office of friendship.—In the Church of Scotland, and other non-Episcopal churches, there are no godparents; the parents of an infant are the sponsors, expressly taking the vows on the occasion.

GODFREY OF BOUILLON, *gōd'frī ōv bō-yōng*, Duke of Lower Lorraine: abt. 1061–1100; b. Baisy, village of Belgian Brabant: eldest son of Count Eustace II. of Boulogne, and of Ida, sister to Gottfried or Godfrey, the Hunchback, Duke of Lower Lorraine and Bouillon, whom he succeeded in the govt. of the latter duchy 1076. He served with great gallantry in the armies of Emperor Henry IV., in Germany and Italy; and it was from his hand that the competitor for the imperial crown, Rudolf of Swabia, received his death-blow at the battle of Merseburg. When the first Crusade was set on foot, the fame of his exploits caused him to be elected one of the principal commanders. To defray the expenses of the crusade of 1095, he mortgaged Bouillon to the Bp. of Liège, and set out, accompanied by his brothers Eustace and Baldwin, in the spring of 1096. For a detailed account of his career till the taking

of Jerusalem, see CRUSADES. Eight days after the taking of Jerusalem, G. was proclaimed king by the unanimous voice of the crusading army; but the piety and humility of the conqueror forbade him to 'wear a crown of gold where his Savior had worn one of thorns.' He declined the title, contenting himself with that of Defender and Guardian of the Holy Sepulchre. The Sultan of Egypt, learning that the army of ~300,000 crusaders who had taken Antioch had dwindled away to 20,000, advanced against them with an army said to have amounted to 400,000 men: but G. gave him battle in the plain of Ascalon, and gained a victory which put him in possession of the whole of Palestine, a few fortified towns only excepted. He now directed his endeavors to the organization of the new state; he installed a patriarch, founded two cathedral chapters, built a monastery in the valley of Jehoshaphat, and drew up laws. At his death his body was interred on Mount Calvary, near the Holy Sepulchre. History represents this prince as a model of piety, valor, and all kingly virtues; and his praises have been worthily sung by Tasso in his *Jerusalem Delivered*.

GODIVA, *gō-dī'va*, LADY: patroness of Coventry, England. About 1040, Leofric, Earl of Mercia, and Lord of Coventry, then an important market-town, imposed certain onerous services and heavy exactions upon the inhabitants, of which they loudly complained. His wife, the Lady G., having the welfare of the town at heart, besought her husband to give them relief, and was so earnest in her entreaties, that at length, to escape her importunities, the earl said he would grant her the favor, on condition that she would ride naked through the town, supposing himself to be requiring an impossible condition; but he was surprised with the answer: 'But will you give me leave to do so?' As he could not in justice refuse, she ordered that proclamation be made that on a certain day no one should be away from home and that none should even look from their houses, when, clothed only with her long hair, she rode through the town; and her husband, in admiration of her intrepid devotion, performed his promise. This event was commemorated by a stained-glass window, mentioned in 1690, in St. Michael's Church, Coventry; and the legend that an unfortunate tailor, the only man who looked out of a window, was struck blind, also has found commemoration in an ancient effigy of 'Peeping Tom of Coventry,' still seen in a niche of one of the buildings. By a charter of Henry III., 1218, a fair is held at Coventry, beginning on Friday of Trinity-week, and lasting eight days. The fair was opened with a grand civic procession, a part of which was, in 1678, the representation of the ride of Lady Godiva. These processions were continued at intervals of three to seven years, until 1826. Some beautiful woman, who represented Lady G., was the principal figure, but many other historical and emblematic personages were introduced. In 1848, the procession was revived with great splendor, and attracted 15,000 strangers. The ceremony has, how-

ever, now fallen into disrepute, and the procession, when celebrated, is a vulgar and tawdry affair.

GODKIN, *göd'kîn*, EDWIN LAWRENCE: journalist; 1831, Oct. 2—1902, May 20; b. in Ireland. Graduated at Queen's College, Belfast, 1851, was war correspondent for the London *News* during the Crimean war, came to the United States as correspondent for the same paper 1856, studied law and was admitted to the bar in New York 1859, practiced a few years, visited Europe, returned to the United States 1862, and was correspondent for the London *News* and New York *Times* during the remainder of the civil war. In 1865, July, he established *The Nation*, and became its editor. In 1881 it was made the weekly edition of the New York *Evening Post*, G. becoming one of the editors and proprietors of both publications.

GÖDÖLLÖ, *gö-döl-lö'*: market-town in Hungary, with a noble castle and park, bought by the Hungarians 1867 and presented to their king, the emperor of Austria-Hungary. It was on the woody heights of G. and Isaszeg that the combined armies of Austria, under Prince Windischgrätz and Count Jellachich, were defeated in two bloody battles by the Hungarians under Görgei. On the eve of victory, Gov. Kossuth held a conference with the Generals Görgei, Klapka, and Damjanich, for laying down the principles of the famous Declaration of Independence, issued 1849, Apr. 14, by the diet at Debreczin. It was this declaration which served the czar of Russia as a pretext for the invasion of Hungary.—Pop. 4,000.

GODOLPHIN, *go-döl'fin*, SYDNEY, Earl of Godolphin: abt. 1640—1712, Sep. 15; of an old Cornish family: English statesman. After the Restoration he became one of the grooms of the bed-chamber to Charles II., was appointed one of the secretaries of state 1664, and soon afterward first commissioner of the treasury; was twice despatched to Holland 1678 on business of importance; and argued and voted for the exclusion of the Duke of York from the succession, 1680. Nevertheless, when the latter mounted the throne, G. (now Baron Godolphin of Rialton, in Cornwall) was made lord-chamberlain to the queen; and on the landing of the Prince of Orange, he was one of the commissioners sent by King James to treat with the invader—a difficult business, which he is considered to have managed with much tact and prudence. William was not slow to perceive the admirable abilities of G., and 1690 appointed him first lord of the treasury. In 1695 he was one of the seven lords justices for the administration of the govt. during the king's absence. In 1702, on the accession of Anne, he accepted the office of lord high treasurer, mainly at the solicitation of Marlborough, who paid him a splendid compliment by declaring that otherwise he could not venture to assume the command of the British armies, as he could depend on him alone for punctual remittances. G. fully realized the expectations of the great Captain. He raised the public credit, induced the queen to contribute £100,000 to-

GODON—GOD SAVE THE KING.

ward the war, firmly opposed the selling of offices and places, and increased the stipends of the inferior clergy. In 1706, G. was raised to the dignity of Earl of Godolphin and Viscount Rialton; after this period he took part with the Whigs, as being more patriotic and English than the Tories. The contest between him and Harley for the premiership, resulted finally in the defeat of G., who was dismissed from office 1710. He died at St. Albans, and was interred in Westminster Abbey. The title became extinct in his son Francis, second Earl of Godolphin. G. was the best business-man on record in his age. He had the clearest and quickest understanding, and liked to do his work in such a way that it would not require to be done again. In an age of corruption, he was believed incapable of bribery, and he never employed as his agents any except men of integrity. His 'talent for silence' equalled William's own.

GODON, SYLVANUS WILLIAM, U.S.N.: 1809, June 18—1879, May 10; b. Philadelphia. He was appointed a midshipman in the U. S. navy 1819, Mar. 1, promoted passed midshipman 1827, commissioned lieut. 1836, promoted commander 1855, capt. 1861, commodore 1863, rear-admiral 1866, and retired 1871. He served through the Mexican war, most of the time in command of the bomb-vessel *Vesuvius*, commanded the *Powhatan* in the successful attack on Port Royal, and commanded the 4th division of the fleet (on the *Susquehanna*) in the two bombardments of Fort Fisher 1864, Dec., and 1865, Jan. After the war he commanded the Brazilian squadron 1866-7, and the Brooklyn navy-yard 1868-70. He died in Blois, France.

GODOY: see ALCUDIA.

GOD SAVE THE KING (or QUEEN): noble national anthem of Great Britain, and by adoption that of several of the German states; played and sung in every part of the British empire alike on solemn and festive occasions. Its origin has been a subject of controversy. Its words are apparently imitated from the Domine Salvum of the Rom. Cath. church service. In England, the authorship has been generally attributed though with no proof, to Dr. John Bull (q.v.; 1563-1628). About the period of the discovery of the gunpowder plot, he composed and played on a small organ before the king an ode beginning with the words, 'God save great James our king.' It does not appear, however, that this, or any other old composition of a similar title, had any connection with the present anthem. Chappell, in his *Popular Music of the Olden Time*, and Dr. Fink, German musical antiquary, are considered to have settled the question; the honor of this great work, both words and melody, must be given to Dr. Henry Carey, English poet and musician, (b. London about 1696, died 1743). The words and music were composed in honor of a birthday of George II., and performed for the first time at a dinner given on that occasion in 1740 by the Mercers' Company of London. The words and music were published first in the *Harmonia Anglicana*, 1742, and appeared in the *Gentleman's Magazine*,

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1745. The air, according to Dr. Arne, has preserved its original form, but its harmonies have been modified by various artists; and the words were changed on the accession of William IV., and on that of Queen Victoria.

GOD'S TRUCE [Lat. *Treuga Dei*, or *Treua Dei*, from the Ger. *treu*, true]: one of the most singular among the institutions of the middle ages, which prevailed specially in France and the Germanic empire but was received for a time also in the other countries of Europe. It consisted in the suspension for a stated time, and at stated seasons and festivals, of that right of private feud for the redress of wrongs, which, under certain conditions, was recognized by mediæval law or usage. Private feuds, it is true, could, by the mediæval law, called *Faustrecht* and *Fehderecht*, be undertaken only when judicial redress had failed or could not be enforced, and after formal notice had been served upon the party against whom they were levied. But even with this limitation, private feuds multiplied exceedingly. The public peace was subject to constant interruption; the weak were without resource; the strong bore down all by the terror of their arms; and the whole social framework was so utterly disorganized, that men, by one of those religious impulses of which that age offers so many instances, fell back on the aid of the church, and invoked her influence, as the only effectual stay of the evil. In this crisis the 'God's Truce' originated. In the end of the 10th c., a council assembled at Limoges, at which the princes and nobles bound themselves, by solemn vow, not only to abstain from all unlawful feuds, but also to keep the peace mutually toward each other, and to protect from violence all defenseless persons, clerics, monks, nuns, women, merchants, pilgrims, and tillers of the soil. A similar engagement was entered into in a council at Orleans 1016; and the whole body of the bishops of Burgundy enforced it upon their flocks everywhere throughout that duchy. A plague which visited a great part of Europe soon afterward gave a fresh impulse to the movement; and in 1033, the 'Holy Peace' was almost universally received, and for a time was religiously observed. But as the old abuse began to revive by degrees, it was felt that the observance would carry with it more of religious authority, if, instead of being, as it had originally been instituted, universal, it was limited to particular times and days, which themselves had certain religious associations connected with them. Accordingly, 1041, the bishops of Aquitaine limited the God's Truce to the week-days specially consecrated by the memory of the Passion and Resurrection of Christ—that is, from the sunset of Wednesday to sunrise of Monday. The same decree was renewed at Narbonne 1054, and at Troyes 1093. At Clermont, 1095, it was extended to the whole interval from the beginning of Advent to the Epiphany, and from the beginning of Lent to Pentecost, to which seasons were afterward added several other festivals. These enactments were adopted or renewed at several later councils; and though they were often disregarded, they doubtless had a wide and lasting influence in mitigating the frightful evil against

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which they were directed. This singular institution fell gradually into disuse, and at last disappeared altogether, when the right of private redress was restricted, and at last entirely abolished, by the law of the empire.

GODWIN, *gödwin*, MARY WOLLSTONECRAFT: 1759, Apr. 27—1797, Sep. 10; b. Beverly, Yorkshire, England: author. She received a meagre education, by her own exertions fitted herself to be a teacher, opened an improved day-school in Islington 1183, and afterward became governess to Lord Kingsborough's daughters. After the last engagement she turned her attention to literary work and made many translations from the French. She went to Paris 1792 to witness the revolution, and while living there entered into marital relations with Gilbert Imlay, an American author, who cast her off after a child was born. She twice attempted suicide. In 1797 she married in London William Godwin, a novelist and political writer, and the same year died after giving birth to the future wife of Percy Bysshe Shelley. Her writings include *Thoughts on the Education of Daughters* (1787); *Original Stories from Real Life* (1791); *An Historical and Moral View of the Origin and Progress of the French Revolution, and the Effects it has produced in Europe* (1790); *Vindication of the Rights of Woman* (1792); *Vindication of the Rights of Man* (1793); *Mary; a Fiction* (1796); *Letters written during a Short Residence in Sweden, Norway, and Denmark* (1796); and *Posthumous Works*, 4 vols. (1798).

GODWIN, PARKE: author: b. Paterson, N. J., 1816, Feb. 25. He graduated at Princeton College 1834, studied law and was admitted to the bar in Ky., returned to New York and married the eldest daughter of William Cullen Bryant, and was editor of the *Evening Post* 1837-53. He contributed to the *Democratic Review*, edited *Putnam's Monthly*, was deputy-collector of the port of New York under Pres. Polk, was an early member of the republican party, but has always advocated free trade. His writings include *Popular View of the Doctrines of Charles Fourier* (1844); *Constructive Democracy* (1851); *Vala*, a Mythological Tale (1851); *Handbook of Universal Biography* (1851); *Political Essays* (1856); *History of France*, 1st vol. (1861); *Out of the Past* (1870); *Cyclopaedia of Biography* (1871); translation of a portion of Goethe's *Autobiography*; and a complete edition of William Cullen Bryant's writings in prose and poetry, 6 vols. (1883-4).

GODWIN, WILLIAM: 1756, Mar. 3—1836, Apr. 7; b. Wisbeach, in Cambridgeshire: English author. His father and grandfather were Presb. ministers, and he was educated to the same profession, first at a school at Norwich, to which place his father had removed 1767, and later at a Presb. college at Hoxton, he pursued his theological studies. 1778-83 he was minister to a congregation in the neighborhood of London; but his zeal declined, his theological views changed, and he resigned his charge. His only resource was to remove to the metropolis and engage in literature. His first work, a series of *Historical*

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Sketches, in the form of sermons, was unsuccessful, and he was reduced to penury and almost to despair; but his sketches made him acquainted with Fox, Sheridan, and other Whig leaders, and he turned to politics. The American revolution, closely followed by that of France, excited the public mind, and G. wrote *Inquiry Concerning Political Justice*, 1793. This was followed by *The Adventures of Caleb Williams*, a remarkable novel, intended to illustrate the political views advanced in *Political Justice*. An able defense of Horne Tooke and others, published in the *Morning Chronicle*, advanced his reputation; and in 1797, he published *The Inquirer*, collection of essays on morals and politics. About this time, he formed an alliance with Mary Wollstonecraft, the celebrated author of the *Rights of Woman*, and adopted and defended her extreme social views. He became, in the strict sense, a calm philosophic radical. After some months, however, the twain yielded so far to custom as to be married. His wife died a short time afterward in giving birth to a daughter, who afterward became the second wife of the poet Shelley. In 1799, he published *St. Leon*, a romance; and the next year visited Ireland, where he associated with Curran, Grattan, and other eminent Irish political leaders. He also wrote his wife's memoirs. In 1801, he married again; and for more certain support, G. and his wife opened a bookstore and circulating library, but he also worked indefatigably with his pen to the end of his life. He wrote many school-books, an admirable *Life of Chaucer* (1801); *Fleetwood*, a novel, 3 vols. (1805); *Mandeville* (1817); *Treatise on Population*, a refutation of Malthus (1820); *History of the Republic of England*, 4 vols. (1824-28); *Cloudesley* (1830); *Thoughts on Man* (1833). As he grew old, he modified his opinions on politics and society, and especially on marriage, which he warmly commends in some later works. Being now 77 years old, he was appointed to a place under government which removed him from the apprehension of want. Many of his work were translated into foreign languages. Shelley put himself under G.'s guidance, and Edward Lytton Bulwer, afterward Lord Lytton, formed his earliest romances on the style of those of Godwin.—See *William Godwin*, by C. Kegan Paul (1876).

GODWINE, *gōd'win*, Earl of Wessex: famous Saxon noble, b. near the end of the 10th c.; d. 1054, Apr. 7; prob. son of Wulfnoth, a south Saxon. G. became the leading Englishman in the first half of the 11th c., and was father of the last king of the English native stock. He ingratiated himself with Ulfr, brother-in-law of King Canute, the latter gave him his daughter in marriage, and he soon became one of the most powerful of the English nobles. More than any other person, he contributed to the elevation of Edward to the English throne (1044); and the principal reward of his services was the marriage of his beautiful and accomplished daughter Editha with the English king. This union, however, was not happy. Editha was cruelly neglected by Edward, and her father, by his dislike of the Normans, incurred the royal enmity. His estates were

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seized, and then given to favorites, and he and his family fled. Queen Editha was made to feel even more bitterly the misfortunes of her family. Her husband seized her dower; he took from her her jewels and her money, 'even to the uttermost farthing;' and allowing her only the attendance of one maiden, he closely confined her in the monastery of Wherwell, of which one of his sisters was lady-abbess. Meanwhile, throngs of Normans visited England to make or rather get fortunes. Among Edward's most favored guests for a time was Duke William of Normandy, later known as William the Conqueror. The banished earl, however, had not been idle; through frequent correspondence with his countrymen at home, he kept alive the antipathy of the English to the Norman favorites of Edward, and in the summer of 1052 he landed on the southern coast of England. The royal troops, the navy, and vast numbers of the burghers and peasants went over to him; and finally the king was forced to grant his demands. The Normans were for the most part expelled from the country, the G. family was restored to all its possessions and dignities; and at a meeting of the Witenagemôte, 'the earls and all the best men of the land' declared that the foreigners alone were to be held guilty of the late dissensions that had distracted the country. His son Harold was for a few months Edward's successor on the throne.

GODWIT, n. *gōd'wīt* [word of unknown origin], (*Limosa*): genus of birds of the family *Scolopacidæ*, with very long bill, slightly curved upwards, and long slender legs, great parts of the tibia bare. All the species frequent marshes and shallow waters, chiefly those of the sea-coast, where they seek their food by wading and by plunging the long bill into the water of mud like snipes. They sometimes



Bar-Tailed Godwit (*Limosa rufa*).

run after small crustaceans or other animals, and catch them on the sands, from which the tide has retired. The BLACK-TAILED G. (*L. melanura*) and the BAR-TAILED G. (*L. rufa*) both birds of passage, are species very widely distributed over Europe, Asia, and Africa. They breed in

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Lapland and the far north. The females are rather larger than the males, and the whole length of the female black-tailed G., the largest species, is about 17 inches, the bill alone being four inches long. They are much esteemed for the table, and are sent from Holland to the London market, which receives some also from the fens of Lincolnshire.—There are two American species; the Marbled G., or Marlin; and the smaller Hudsonian G., whose range seems to extend over the whole continent, though it is not found in great numbers.

GOEBEN, *gó'bèn*, AUGUST VON: Prussian gen. of inf.: b. Stade, Hanover, 1816, Dec. 10. He entered the army as lieut. 1833, but soon resigned for want of more active employment, and took service with the Carlists in Spain, where he was several times wounded, taken prisoner, confined in jail in Cadiz and Saragossa, and at the close of the war liberated. He then returned to Germany, published a book on the Carlist war; re-entered the army, and received an appointment on the staff. From 1849, when he served in the Baden campaign, till 1855 he was on the staff of the crown prince (William I.), and in the latter year became chief of the staff of the 6th corps. In 1860 he was Prussian reporter of the Morocco campaign and attached to the staff of the Spanish gen. O'Donnell; 1863 was appointed commander of the 26th brigade of inf.; 1864 was commander of the 10th division in the war against Denmark; and 1865 promoted lieut.gen. and commander of the 13th division. He was active in the Franco-German war 1870-71, as commander of the 8th corps at Saarbrücken and Metz, and of the army of the north, which defeated the French under Gen. Faidherbe at St. Quentin 1871, Jan. 19. He d. 1880. Nov. 13.

GOES, *chós*, or TER-GOES, *tér-chós'*: town and fortified seaport of Holland, province of Zeeland, in a fruitful district in the island of s. Beveland, about $3\frac{1}{2}$ m. from its n. coast, 17 m. w. of Bergen-op-Zoom. The town received municipal rights 1406. It is well built; has a harbor formed by a canal communicating with the E. Scheldt, ship-building docks, besides an active trade in hops, salt, and agricultural produce. Pop. (1880) 6,394

GOES, *chós*, HUGO VAN DER: about 1420-82; b. Bruges: painter. He was a pupil of Van Eyck, attained considerable celebrity while living in Ghent, and spent the closing years of his life in a monastery near that city. His best known works are an altar-piece in the chapel of the hospital of Santa Maria Nuova in Florence, and the *Crucifixion* in the church of St. James in Bruges. He excelled in delineating female beauty.

GOETHE.

GOETHE, *gö'tèh*, JOHANN WOLFGANG VON: acknowledged prince of German poets, one of the most highly gifted and variously accomplished men of the 18th c.: 1749, Aug. 28—1832, Mar. 22; b. Frankfurt-on-the-Maine, where his youthful years were spent. His father, Johann Kaspar G., was an imperial councilor in good circumstances, and in a respectable position. In 1765, G. went to the Univ. of Leipsic, of which Ernest and Gellert were then notable ornaments. As a student, he pointed, by external profession, toward the law; but his real studies were in the wide domain of literature, philosophy, and above all, life and living character. In 1770, he went to Strasburg, to finish his juridical studies; but here also anatomy and chemistry, Shakespeare, Rousseau, and architecture—anything rather than the statute-book—occupied his time and exercised his soul. Here the most famous of his youthful love-adventures took place.

He had already written poems, and was gradually to become the most universal genius of the time—poet, biographer, physicist, archæologist, critic, and king of literature. We here give summarily the name of the chief of his works, reserving some of them for brief criticism below. (1) The first period of his literary life has been called the sentimental, or storm and stress period, 1770–76. To it belong *Götz*, *Werther*, *Prometheus*; the dramas, *Clavigo*, *Stella*, *Die Geschwister*; the dramatic farces, *Gods*, *Heroes*, and *Wieland*, with many shorter pieces, and some of the songs. (2) The ideal period (1776–1808) comprises *Egmont*, *Iphigenia*, *Tasso*; *Wilhelm Meister's Apprenticeship*; two operettas, one or two political comedies; the first part of *Faust*; the *Roman Elegies*; Ballads, the *Xenien*; the novels *The Natural Daughter*, and *Elective Affinities*. (3) The didactic period, into which fall the autobiographical *Truth and Fiction*; *Westöstlicher Divan*; *W. Meister's Journeyman'ship*; the second part of *Faust*; also *Letters from Switzerland*; *The Campaign in France*; the *Italian Journey*; a work on *Winckelmann*; the famous works on *The Metamorphosis of Plants*, *On the Theory of Colors*, and *On Optics*; the magazine, *Science and Antiquity*; besides his version of *Reineke Fuchs*, *Benvenuto Cellini*, and translations.

In 1771, the young poet, 22 years of age, took his degree as doctor of laws, and went for a while to Wetzlar on the Lahn, seat of the imperial chamber of the then German empire. But for him Wetzlar was mainly the scene of the famous *Sorrows of Werther*, a glowing leaf from the life of the human soul, full of interest and beauty at all times, but which, in the then state of European thought and feeling, stirred the whole literary mind of Europe like a breeze sweeping over a forest. The book was not published till 1774. G. spent some years in his native city, engaged chiefly in literary productions. His first great work was *Götz von Berlichingen*, translated into English by Sir Walter Scott, published Frankfurt, 1773, which at once set the Germans free from the painful constraint of French and classical models, and opened to them that career of bold originality, which they have

since prosecuted in so many departments of literature, learning, and speculation. In 1775, G., who had had the good-fortune to gain the good opinion of Karl August, Grand Duke of Saxe-Weimar, accepted an invitation from that prince to settle in his little capital, since become so famous as the Athens of the great legislative age of German literature. Here the poet became a little statesman; and occupying himself in various ways in the service of his benefactor, passed quickly through stages of court preferment, till, 1779, he became 'actual privy-councilor,' at the age of 30, holding the highest dignity that a German subject could then attain; a great, a rich, and an influential man. In 1782, he received a patent of nobility; and in the following years, till 1788, travelled much in Switzerland and Italy, of which last journey we have the beautiful fruits in *Iphigenia*, *Egmont*, *Tasso*, and the *Venetian and Roman Elegies*. Of this last work, thoroughly German both in form and feeling, the heroine was Christiana Vulpius, a highly attractive though not highly gifted woman, who bore him a child—his eldest son—in 1789; but whom, though he always treated her as his wife, he did not formally marry till 1806. In 1792, he took part in the German campaign against France, of which he has left a memoir. In 1815, he was made minister of state. After the death of the grand duke, 1828, he lived much in retirement, occupied occasionally with poetry, but much more intensely and constantly with the study of nature and the fine arts, which from his earliest years had possessed the strongest attractions for him. He died in his 84th year.

For the literary and scientific productions of G.'s pen, the best source of reference to the English reader is the biography of the poet, by G. H. Lewes; with which may be taken G.'s interesting conversations with Eckermann, translated by Oxenford. We turn to his general character and literary position. It is as a poet that this remarkable man is generally known and recognized by English readers; but it is not as a poet only that a just measure can be taken of his intellectual calibre or of his European and wider significance. It is as poet, thinker, critic, and original observer of nature, all in one admirable harmony, that his rare excellence consists. We do not find in literary history any intellect that can fitly be placed on the same platform with G.; that presents, in such grand and graceful completeness, so much severe thought, combined with so much luxuriant imagination; so much accurate science with so much playful fancy; so much simplicity with so much art; so much freshness and originality of productive power, with so much justness and comprehensiveness of critical judgment. As a dramatist, G. will not compare for a moment with the great English masters of that art. His English biographer detects in the constitution of his mind, most justly, 'a singular absence of historic feeling and dramatic power.' Not less correct is the judgment of the same writer when he says: 'Goethe was attached to character and picture, indifferent to action and event.' In this respect, the poet was a true type of his nation. As con-

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trasted with the French and English, the Germans are deficient in nothing so remarkably as in stirring passion and progressive energy; the relation of G. to Shakespeare and the English dramatists, is exactly the same. Nevertheless, *Faust* is a great poem, even a great dramatic poem, for it is full of dramatic scenes, though they are not sufficiently moved by the living current of dramatic action. *Faust* is essentially a German poem, yet a poem which all foreigners can read and enjoy. It is the great drama of that moral and metaphysical questioning which thoughtful minds must go through in all times and places, but which has received the fullest and most fruitful development in modern Germany. Of the other poetical works of G., *Iphigenia*, *Hermann and Dorothea*, and *Tasso*, are those which most strongly bear the type of the ripe manhood of the author. The form and style of these classical works are characteristically Greek; by which we mean they are remarkable chiefly for profundity of thought and truth of feeling, expressed in the most simple, graceful, and unpretending manner. In soul, however, they are essentially German; and the most deep-thinking of the Germans are always the first to claim G. as the most German of all German poets in spirit, though very few great German writers have so carefully avoided the most characteristic German defects of style. In the extraordinary value which he attaches to 'the form,' G. authenticates himself everywhere as at once a great modern Greek and a great artist.

G. is a poet thoroughly relished only by those who understand thoroughly the German language, and whose minds are not so typically English or American or French as to exclude a ready sympathy with German thoughts and feelings. With general English readers, for various reasons, Schiller will always be the favorite poet. Nevertheless, there has been a considerable amount of literary power in other countries spent in the translation of G.'s works, specially of his great work, the *Faust*; of this, about 40 English translations exist, the most notable being by Bayard Taylor, Anster, Blackie, and Hayward. Some of the most beautiful of the lyric poems have been aptly rendered in a conjunct volume by Prof. Aytoun and Theodore Martin.

GOETHITE, n. *gāth'it* [named in honor of *Goethe*, the great German poet]: an ore of iron found in crystals of a reddish and blackish bronze color; hydrous peroxide of iron.

GOFF, NATHAN, Jr.: lawyer: b. Clarksburg, W. Va., 1843, Oct. 9. He was educated at the Northwestern Virginia Acad. and graduated at the law school of Columbia College. He served through the civil war in the Union army, was captured and confined in Libby prison six months, and became brig.gen. of volunteers. In 1865 he was admitted to the bar and elected a member of the W. Va. legislature, 1868-81 was dist.attor.; 1881 was appointed sec. of the navy to fill a vacancy, and the same year reappointed dist.attor.; and 1884, 86 was elected a member of congress as a republican. He was defeated for congress 1874 and for gov. 1876. In the state election 1888 he was the re-

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publican candidate for gov. and claimed the election. The claim was disputed, owing to the failure of the speaker of the house of delegates to declare the person elected who had received the highest number of votes. Both G. and the pres. of the senate were sworn in as gov., but Gov. Wilson declined to surrender the office 1889, Mar. 4, and the matter was taken to court, which awarded the office to G.'s opponent, Judge A. B. Fleming. G. was appointed a U. S. circuit court judge 1891.

GOFFE, *gof*, WILLIAM: about 1605-79; b. England: regicide. He was educated for commercial pursuits, but joined Cromwell's parliamentary army 1647, and became maj.gen. 1655. In 1649 he was made master of arts by Oxford College, 1654 elected member of parliament from Yarmouth, and 1656 from Southampton; was appointed to a seat in the house of lords by Cromwell, and was so popular that he was spoken of as the successor to the protectorship. Having been one of the regicide judges, with Edward Whalley, his father-in-law, both fled to America on the news of Charles's return, and settled in Cambridge 1660, July 27. They were excluded by name in the parliamentary act of amnesty, and 1661-64, lived in concealment near New Haven, part of the time hiding in a cave in West Rock, and several times narrowly escaping arrest by crown officers. In 1664 they went to Hadley, Mass., where with John Dixwell (q.v.), a third regicide, they were protected by the Rev. Mr. Russell. A pleasant and long-current narrative of G.'s saving Hadley from destruction by Indians is now regarded as fiction.

GOFFER, v. *gǒf'fēr* [OF. *gauffrer*, to adorn a garment with puffs: Scot. *goupher*, to puff]: to pucker; to plait; to flute, as linen, lace, and the like. GOF'FERING, imp.: N. the operation of puckering or plaiting. GOF'FERED, pp. *gǒf'fērd*. See GAUFFERING.

GO'GARĪ: river rising in Nepaul, about lat. 27° 20' n., and long. 86° 46' e., and joining the Coosy, affluent of the Ganges, in lat. 25° 24' n., and long. 87° 16' e., after a course of 235 miles.

GOGGLE, v. *gǒg'l* [Gael. *gogach*, nodding, wavering, *gog*, a nod; allied to *cog*, *jog*, and *shog*, expressive of motion brought to a sudden stop]: to strain or roll the eyes: N. a strained or affected rolling of the eyes: . ADJ. having full eyes; staring with rolling eyes. GOGGLING, imp. *gǒg'l'ing*. GOGGLED, pp. *gǒg'ld*. GOGGLES, n. plu. *gǒg'lz*, spectacles to cure squinting or keep off dust. GOGGLE-EYED, having large prominent eyes, which are constantly in motion.

GOG, *gǒg*, AND MAGOG, *mā'gǒg*: names several times used in the Bible: also the names given to the famous figures of giants in Guildhall, London.—Magog is spoken of, Gen. x. 2, as a son of Japhet; Ezekiel (xxxviii., xxxix.) speaks of Gog, prince of Magog; Gog and Magog are spoken of in Rev. xx. Magog is considered by many modern writers as a geographical designation; and Gog as the father of the Scythians and Tartars. Under the name Scythians it was customary to group several rude and barbarous

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nations supposed to dwell in a vast region n. of the Caucasus, whose savage inroads were the terror of civilized lands in the ancient world. Thence the word came to be used irrespectively of land or nationality, as the type of dark, gigantic, obstructive, and injurious power, of which the giant leader or father of the Scythians may, it is thought, have been taken as the personification. If this view be adopted, then in the vivid style of prophecy, 'Gog and Magog' may denote the leader of the world's evil, with all his hosts mustered for the final conflict. The Caucasus is suppose by Bochart to derive its name from Gog Chasan—fortress of Gog.

The Guildhall giants boast of almost as high an antiquity as the Gog and Magog of the Scriptures, as they, or their living prototypes, are in legend said to have been found in Britain by Brute, younger son of Anthenor of Troy, who invaded Albion, and founded the city of London, at first called Troy-novant, 3,000 years ago. Albion, at this period, was inhabited by a race of tremendous giants, descendants of the 33 infamous daughters of the Emperor Diocletian, who, having murdered all their husbands, were sent to sea in a ship, and were happy enough to reach Albion, where, cohabiting with wicked demons, they gave birth to the giants, whom the Trojans finally conquered, leading the last two survivors prisoners to London, where they were chained to the gates of a palace on the site of Guildhall, and there kept as porters. When they died, their effigies were set up in their place. This is Caxton's account; but there is another, which represents one of the giants as Gog-magog, and the other as a British giant who killed him, named Corineus. However the fact may have been, the two giants have been the pride of London from time immemorial. On London Bridge, they welcomed Henry V. 1415; they welcomed Henry VI. to London 1432; and 1554, Philip and Mary. In 1558, they stood by Temple Bar, when Elizabeth passed through the city gate. The old giants were burned in the great fire, and the new ones were constructed 1708. They are 14 ft. high, and occupy suitable pedestals in Guildhall. The ancient effigies, made of wicker-work and paste board, were carried through the streets in the Lord Mayor's Shows, and copies of the present giants were in the show of 1837. Formerly, other towns in England had their giants, and there are famous and some very large ones in several continental cities. The Antigonus of Antwerp is 40 ft. high, and was formerly carried in the most solemn religious as well as civic processions. Gayant, the giant of Douai, is 22 ft high. There are also giants, and families of giants, at Lille, Malines. Brussels, etc., each connected with some popular tradition of their respective cities. The arms of Antwerp, a castle with severed hands, are connected with the legend of the giant who lived in the castle, and cut off the hands of those who failed to pay his exactions. Though it is now impossible to ascertain the facts, there can be little doubt that all these civic giants are exaggerated representatives of real persons and connected events.

GOGÓ—GOGRA.

GOGO, *gō'gō*, or **GHOGHÁ**: large town and seaport of British India, presidency of Bombay, on the w. shore of the Gulf of Cambay. It has safe anchorage during the s.w. monsoon, with smooth water and a muddy bottom. It is in lat. 21° 39' n., and long. 72° 15' e. Pop. (1881) 7,063.

GOGOL, *go'gol*, **NIKOLAI VASILIEVICH**: Russian author of great and original genius: 1809-52; b. at the village of Wassiljewka, govt. of Poltova. On finishing his studies he went to St. Petersburg, and solicited government employment, which was refused, on the ground, that 'he did not know Russian.' Shortly afterward he proved that the officials were in the wrong by publishing a collection of novels and sketches, entitled *Vechera na Khutorie* (Evenings at a Farmhouse). The first and most important of these tales contains a vivid picture of Cossack manners, enabling us, according to Saint-Beuve, to comprehend the profound antipathies that have for ages characterized the relations of certain branches of the Slavic family to each other. Then come the *King of the Gnomes*; the *History of a Fool*, more a satire than a psychological study; and *The House-keeping of Former Times*, a little masterpiece of its kind. The success of *Evenings at a Farmhouse* was immense, and Russian critics compared G.'s style to that of Washington Irving. It was followed by *Mirgorod*, of the same character, containing stories full of poetry, showing grasp in the delineation of character, with skill in plot. G. then produced the *Revisor*, a brilliant comedy, whose purpose was to expose the rooted abuses of the internal administration of Russian affairs. Emperor Nicholas applauded its morality, and showed his approbation by appointing the author prof. of history in the Univ. of St. Petersburg. In 1842, G. published *Pokhozhdeniya Chichagova ili Mertvuiya Dushi* (Adventures of Chichagov, or Dead Souls, of which a poor translation appeared in English 1854, under the title of *Home-life in Russia*). The aim of this novel was to extinguish serfdom by ridicule. G. afterward went to reside in Italy, where his opinions appear to have undergone a change: he became an apologist of despotism, an apostasy which he lived to regret. After the commotions of 1848, he returned to Russia, and died at Moscow.

GOG'RA: see **GHOGRA**.

GOHANUH—GOITRE.

GOHANUH, *gō-hān'ūh*: town of British India in the Punjab, 45 m. n.w. of Delhi. Pop. 8,000.

GOHILWAR', or **GOHELWAD'**: region of Gujerat in India, comprising several tributary states: on the e. coast of the peninsula of Cattywar. The native states in the 'G. division' cover an area of about 3,000 sq. m. The soil is fertile. Most of the rivers are dry in the hot season; the Setroonjee is the largest river. The chief mountains are Wulluk, Palitayna, and the Servi ranges. The capital of G., Bhaonagar, is within the British dist. of Ahmed abad. Pop. of G. about 120,000.

GOIL, *goyl*, **Loch**: small, highly picturesque loch in Argyleshire, Scotland; branch of Loch Long (q.v.); six m. in length, and about one m. in breadth. Its shores are mostly wild and rugged, but with extensive natural woods of hazel. The mountains in the neighborhood rise to about 2,500 ft. Lochgoilhead is a favorite summer watering-place: it may be visited by steamers from Glasgow.

GOITO, *gō-ē-to*: small town in Italy, province of Mantua, dist. of Volta; abt. 15 m. n.w. from Mantua, in a beautiful though somewhat marshy position on the Mineio. This town, owing to its vicinity to the stronghold of Mantua, has been the field of various military operations. In 1630, it was carried by assault by the imperialists, who entered Mantua on the same night, and took it by surprise; during the war of the Spanish Succession 1701, it was alternately captured by the allies and the imperialists; and in 1796 the French took it, but were expelled, after a brief tenure, by the Austrians. In 1814, a severe engagement took place at G. between the Austrian and French troops; and during the war of independence 1848, it became the theater of two further battles between the same powers, to which it owes its modern celebrity. Pop. 3,600.

GOITRE, or **GOITER**, n. *goy'tr* [F. *goître*—from L. *gutter*, another form of *guttur*, a throat, the meaning in mid. L. is 'goitre']: enlargement of the thyroid gland (q.v.) occupying the front of the neck. The swelling is sometimes of such a size as to project downward over the breast, and even to admit of being thrown over the shoulder. Goitre is mostly an endemic or local disease, being found in the mountainous regions of the Alps, Andes, and Himalaya, especially, it is said, where lime prevails largely as a geological formation. The proofs of goitre being connected with a calcareous impregnation of the drinking-water are rather strong, but perhaps not quite sufficient, especially as regards England, though the chief seat of goitre in England, Derbyshire, is subject to this alleged cause. In Switzerland, Goitre is a very important deformity, especially when connected with Cretinism (q.v.). Goitre is of two kinds: the one due to increased development of the vessels of the gland, the other to the growth of Cysts (q.v.) in its substance. To these might perhaps be added a third, Exophthalmic Goitre, found in connection with functional disease of the heart, but which is

GOLCONDA—GOLD.

perhaps only a variety of the vascular goitre. When with enlargement of the thyroid gland, there is also palpitation of the heart and protrusion of the eyeballs, the disease is that sometimes known as Graves's disease, or Von Basedow's disease. The usual treatment of goitre is by the administration of very minute doses of Iodine (q.v.) for a long time together: iodine is applied externally also, often with good result. The use of this remedy is due to Coindet of Geneva, who recognized it as the principal source of the virtues of burned sponge, long of high repute in the treatment of goitre. GOITRED or GOITERED, a. *goy'trd*, affected with goitre. GOI'TROUS, a. *-trūs*, affected or inclined to goitre.

GOLCO'NDA, *göl-kön'da*: fortress and ruined city in the Nizam's dominions, seven m. n.w. of his cap., Hyderabad; in lat. 17° 22' n., and in long. 78° 25' e. Near the fortress are the ruins of an ancient city, former metropolis of the kingdom of Golconda. The place itself is still strong; but its strength is seriously impaired through its being overtopped, within breaching-range, by the yet solid mausolea of its former sovereigns, which form a vast group at a distance of 600 yards. These tombs are dome-crowned structures of gray granite, each having its own mosque, and occupying the centre of its own elevated terrace. G. is proverbially famous for its diamonds; but, in truth, they are merely cut and polished here, being generally found at Parteall, near the s. frontier of the Nizam's dominions.

GOLD, n. *göld* [Icel. *gull*, gold—from *gulr*, yellow: Dut. *goud*; Scot. *gowd*; Dan. *guld*, gold]: an elementary body; one of the precious metals, of a bright yellow color; money; riches; wealth: ADJ. made or consisting of gold. GOLDEN, a. *göldn*, consisting of gold; bright; shining; of a gold color; excellent; happy or innocent, as the *golden age*; pre-eminently favorable. GOLDBEATER, n. *-bät-ër*, one whose trade it is to make gold-leaf (see GOLD-BEATING: GOLDBEATER'S SKIN). GOLD COAST (see GUINEA). GOLDFINCH, n. *fīnsh*, song-bird—so called from the color of its plumage (see below). GOLD-LEAF, gold beaten extremely thin (see GOLD-BEATING). GOLD'SMITH, n. a worker in the precious metals. GOLD-DUST, gold as found in fine particles. GOLDEN-HAIRED, having yellow hair. GOLDEN RULE, Christ's rule, Matt. vii. 12: 'All things whatsoever ye would that men should do unto you, even so do ye also unto them': also, in *arith.*, a process so called from the universality of its application (see PROPORTION). GOLD-FIELD, the district of a country where gold is found. GOLD-STICK, higher officers in the English body-guard, and captains in the corps of gentlemen-at-arms—named from the gilded baton which they carry on state occasions. GOLDEN HORN, the inlet or harbor of the Bosphorus on which Constantinople is situated—so named from its curved shape, and the glittering cupolas of the mosques around it. GOLDSMITH'S NOTES, earliest form of bank-notes; so called because goldsmiths were the first bankers: see BANK-NOTES.

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GOLD (symbol Au, atomic weight 196.7): from earliest ages known and regarded as the most precious of the metals, and almost universally employed as a medium of exchange. Although the quantity of G. which is found, when compared with that of many other metals, is small, yet there are few parts of the globe in which it does not occur more or less abundantly.

In the native state, it occurs crystallized, the primary form being the cube, or in plates, ramifications, or nodules—popularly known as *nuggets*—which sometimes are of considerable size. It is almost always alloyed with silver, and sometimes with tellurium, bismuth, lead, etc. It sometimes occurs in small quantity in metallic sulphides, as in galena, iron and copper pyrites.

The extraction of G. from the substances with which it is associated is effected more by mechanical than by chemical means. (See below.)

The following are its most important properties. In its compact state, it has a characteristic yellow color and high metallic lustre, is nearly as soft as lead, and is the most malleable of all metals. It can be beaten into leaves of a thinness not exceeding $\frac{1}{280000}$, or, according to some authors, $\frac{1}{28000}$ of an inch, through which light passes with a green tint; one grain may thus be distributed over 56 sq. inches of surface; and the ductility of the metal is so great, that the same quantity may be drawn into 500 ft. of wire. In its tenacity, it is inferior to iron, platinum, copper, and silver; but a wire whose diameter is 0.787 (or rather more than one-third) of a line (which is one-twelfth of an inch), will support a weight of about 150 lbs. It fuses at about 2016°, according to Daniell's pyrometer, and when in fusion is of a bluish-green color. It is scarcely at all volatile in the heat of the furnace, but by a powerful electric discharge, by the concentration of the sun's rays by a powerful burning-glass, or by the oxy-hydrogen jet, it is dispersed in purple vapors. G. has very little affinity for oxygen; it undergoes no change on exposure to the atmosphere, and is unaffected by hydrochloric, sulphuric, or nitric acid, or, in short, by any simple acid except selenic acid; nor do the alkalis affect it. It is, however, dissolved by any mixture which liberates chlorine, its usual solvent being *aqua regia*, which is generally prepared by mixing 1 part of nitric acid with 4 parts of hydrochloric acid. Hydrochloric acid to which binoxide of manganese has been added, acts with equal power, the G. in these cases being converted into a chloride. G. is one of the most perfect conductors both of heat and of electricity. When precipitated in a finely comminuted state, it is of brown color; but when suspended in water, and viewed by transmitted light, it appears purple. The specific gravity of this metal is less than that of platinum and iridium, ranging from 19.2 to 19.4, according as it is fused or hammered.

The alloys of G., or its combinations with other metals, are very numerous, those with copper and mercury being the most important. Copper and G. combine in all proportions without materially affecting the color of the latter,

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except that it is somewhat redder. The density of the compound is less than that of G., but the hardness is greater, and it is more fusible. It is this alloy which is employed in gold coinage—in Britain, 11 parts of G. being combined with 1 of copper; in the United States 9 parts of G. with 1 of copper—without which the coin would not be sufficiently hard to stand the wear to which it is exposed. Hence British standard G. contains 8·33 per cent. of copper; while in France, and in the United States, standard G. contains 10 per cent. of copper: see ALLOY. Jewellers alloy their G. with other metals, partly on economical grounds, partly for the purpose of evolving special tints. Thus, red G. is obtained by combining 75 parts of fine G. with 25 of copper; green G., by combining 75 parts of fine G. with 25 of silver; dead-leaf G., by combining 70 parts of fine G. with 30 of silver; water-green G., by combining 60 parts of fine G. with 40 of silver; blue G., by combining 75 parts of fine G. with 25 of iron.

Mercury and G. combine very readily, and yield a white alloy, termed an *amalgam*, used in gilding. In consequence of the readiness with which these metals unite even at ordinary temperatures, mercury is used for the extraction of gold.

As a general rule, the ductility of G. is much impaired by alloying other metals with it while its hardness and sonorousness are increased.

Two oxides of G. are known—a protoxide, Au_2O , and a sesquioxide, Au_2O_3 . Neither of these oxides can be formed by the direct union of the elements, and both are reduced by heat. The protoxide is a dark-green or bluish-violet powder. It forms no definite salts. It is obtained by the decomposition of protochloride of G. with a solution of potash. The teroxide is a brown powder, which is reduced, not only by heat and light, but by many other reducing agents. It combines more readily with bases than with acids, and hence has been termed *auric acid*. It is obtained by mixing a solution of terchloride of G. with magnesia or carbonate of soda, and boiling.—Two chlorides of G. are known, corresponding to the oxides, viz., a protochloride, AuCl , and a terchloride AuCl_3 . Of these, the latter is the most important: it is obtained by dissolving G. in aqua regia, and evaporating the solution to dryness at a temperature not exceeding 300° , when this compound obtained as a deliquescent yellowish brown or reddish mass, soluble in water, alcohol, and ether, with which it forms orange-colored solutions. The chlorides of many of the organic bases form crystallizable double salts with the terchloride of G.; and these compounds are often employed to determine the combining power of the organic alkali. Metallic G. in the form of a brown powder is thrown down from the solution of the terchloride by most reducing agents. This reducing power of protosulphate of iron is employed in the preparation of chemically pure gold.—A sesquisulphide of G. is obtained in the form of a black powder by passing a current of sulphuretted hydrogen through a cold solution of terchloride of gold. 'If finely divided gold be heated with sulphur in contact with

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carbonate of potash, a double sulphide of gold and potassium is formed; it resists a red heat, and is very soluble in water; this sulphur salt is used for gilding china, and produces the color known as *Burgos lustre*.—Miller's *Elements of Chemistry*, 2d edit. II., 74.

Fulminating G., a compound known to the alchemists, who (e.g., Basil Valentine) formed solutions of terchloride of G., occurs as a green powder, when prepared by immersing teroxide of G. (or auric acid) in caustic ammonia. By modifying the mode of preparation, it is obtained of brownish-yellow color. From Dumas's analysis of the green powder, it seems to be presented by the formula $2\text{NH}_3, \text{Au}_2\text{O}_3$, the brownish-yellow powder having a more complicated formula. These powders detonate with a loud sharp report and a faint light when rubbed, struck, or beaten, or when an electric spark is passed through them, and yielding nitrogen gas, ammonia, and water. None but professed chemists should attempt to prepare them, in consequence of their dangerous explosive character. On one occasion, a drachm of fulminating G. introduced into a bottle burst it as the stopper was being turned round, in consequence of small particles of it having adhered about the mouth, and both the operator's eyes were destroyed by the projected fragments of glass.

The *Purple of Cassius* is an important gold compound. It derives its name from its having been described first by Andreas Cassius 1685: see CASSIUS, PURPLE OF.

None of the salts of the oxides of G. are of much importance.

For the description of *Mosaic Gold*, see TIN.

GOLD was, in all probability, one of the earliest discovered of the metals. The fact of its being found very generally distributed over the surface of the earth, and that, too, in its simple metallic state, combined with its beautiful color, and many valuable properties, would cause it very early to attract the attention of man. According, we learn that Gold was used by the Hebrews, the Egyptians and other ancient nations, for much the same purposes as at the present day.

Previous to the great Californian discovery 1847, Europe was to a great extent supplied with G. from Mexico, Brazil, New Granada, Chili, and Peru in N. and S. America; a large quantity was obtained also from Asiatic Russia and the islands of the Indian Archipelago; the e. and w. coast of Africa furnished a less but still considerable quantity. All these countries still produce G., but their total yield, including Europe, is only about one-fourth that of California and Australia. The most famous mines in Europe are those of Hungary and Transylvania, which produce annually about \$1,000,000 worth of this metal. Piedmont and Spain are almost the only other European countries where G. is worked; though it is occasionally found in all districts where the rivers flow over primary rocks. G. has been found in several parts of the British Islands. The most productive district yet discovered was that of Wicklow, in Ireland, where, toward the close of the last century, the

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stream-works were prosecuted for some time with considerable success. In Scotland, the Leadhills, on the borders of Dumfriesshire, as well as the Highlands of Perthshire, and recently Helmsdale, in Sutherlandshire, have produced G.; so have Cornwall and Devonshire in England, and in recent years a considerable quantity has been obtained from N. Wales.

First among the celebrated gold discoveries of this century, in date, though not in importance, are those of e. and w. Siberia, where extensive auriferous tracts were discovered 1829-38. The quantity obtained in these eastern regions raised the annual produce of the Russian Empire to 15, and ultimately to 20 million dollars—more than triple its former yield. An examination of the auriferous deposits of the Ural Mountains led Sir Roderick Murchison, 1844, on comparing their rocks with those brought to England by Count Strzelecki from Australia, to predict the presence of G. on the latter continent. Subsequent discoveries have proved the accuracy of this conclusion.

The rich gold region of California was discovered 1847, Sep. Mr. Marshall, the contractor for a saw-mill on the estate of Captain Sutter—a Swiss emigrant who settled on the banks of the Sacramento River—detected particles of G. in the sand of the mill-race, and on further examination, it was found that valuable deposits existed throughout the bed of the stream. Intelligence of the discovery soon reached the town of San Francisco, whose scanty population at once abandoned their usual occupations to join in the exciting search for gold. The supply was soon found to be abundant over a large area, and emigrants quickly poured in from all parts of the American continent, and ere'long from Britain, Germany, and other European countries, till the population of San Francisco alone rose from under 200 in 1845 to 40,000 in 1858, and in 1880 it was 234,000 (see SAN FRANCISCO). At first, it was thought that the supply of G. from this region would soon fail, but though the supply, which continued for several years at more than \$65,000,000 per annum, had in 1881 fallen to little over \$15,000,000 from California, the total production of G. in the United States in that year was \$34,500,000—almost wholly from the states near to or w. of the Rocky Mountains.

In 1851, before the excitement of the Californian discovery had time to subside, the world was startled by the announcement of another, or rather by a series of other discoveries, of not less importance, in Australia. It is a curious fact that not only Sir. R. Murchison, as stated above, but also the Rev. W. B. Clarke, a native geologist, had pointed out the likelihood of G. being found in the eastern chain of the Australian mountains, several years before the value of the gold-fields near Bathurst was discovered by Mr. Hargraves 1851, April. This discovery was no sooner made, however, than several other places in Bathurst and the adjoining counties were found to contain rich deposits; so that, before many months had passed, 6,000 persons were employed at these *diggings*. In Aug.

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of the same year, further discoveries of G. were made at Ballarat, in Victoria, which excelled in richness those of the Sidney district; and these, in turn, were soon surpassed by fresh discoveries in the Mount Alexander range. During the climax of the excitement created by the Victoria gold-fields, the number of diggers rose to such a pitch as to withdraw for a time the great mass of the population from Melbourne and Geelong.

The modes of working adopted at the start of the diggings in California and Australia were necessarily rude and wasteful; the fortunes of the gold-seekers, too, were of course very variable under such a system, many of them having made large profits—as much, in a few instances, as \$5,000 or more in a single week—but many more met with nothing but disappointment. A more systematic, economical, and productive plan of mining has now been introduced; but notwithstanding the improved methods of working, the world's supply of new G. had greatly fallen off. Before 1848, the average supply was abt. \$40,000,000 per annum from all sources; in 1852, \$182,500,000; in 1870, abt. \$107,000,000. It dropped to abt. \$90,000,000 in 1874 and ranged from that sum up to \$110,000,000 until 1888. The world's production (1889) was \$123,500,000, (1890) \$118,800,000, (1891) \$130,700,000, (1892) \$146,300,000, (1893) \$157,200,000, (1894) \$180,600,000, (1895) \$199,500,000. The production for the world and for several of the leading countries (1901) was as follows:

WORLD'S PRODUCTION OF GOLD 1901.

Countries.	Ounces.	Value.
United States.....	3,805,500	\$78,666,700
Australia.....	3,719,080	76,880,200
Russia.....	1,105,412	22,853,900
Canada.....	1,167,216	24,128,500
Other countries.....	2,917,018	61,269,100
Total.....	12,614,236	\$263,893,400

From 1492 to 1600 the total production of gold in the world is estimated at 24,266,820 fine ounces, valued at \$501,640,000; from 1600 to 1700 it was 29,330,445 fine ounces, valued at \$606,315,000; from 1700 to 1800 it was 61,088,215 ounces, valued at \$1,262,805,000; from 1800 to 1848 it was 34,572,643 ounces, valued at \$714,679,000; from 1848 to 1873 it was 128,949,609 ounces, valued at \$2,665,625,000; from 1873 to 1896 it was 141,675,000 ounces, valued at \$2,922,000,000. The entire production of the world from the discovery of America down to the discovery of gold in California in 1848 was 149,000,000 ounces, valued at \$2,085,000,000. From 1848 to 1896 the world's aggregate production was 270,000,000 ounces, valued at \$5,588,000,000. The production of the past 48 years has been nearly double that of the entire 356 years preceding.

The United States holds the first place among the nations of the world in production of gold. In 1848 it was \$10,000,000; (1849) \$40,000,000; (1850) \$50,000,000. From 1851 to 1871 it ranged from \$39,200,000 to \$65,000,000. Since that date it has been as follows:

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1872.....\$36,000,000	1880.....\$36,000,000	1888.....\$33,200,000
1873..... 36,000,000	1881..... 34,700,000	1889..... 32,800,000
1874..... 33,500,000	1882..... 32,500,000	1890..... 32,800,000
1875..... 33,400,000	1883..... 30,000,000	1891..... 33,200,000
1876..... 39,900,000	1884..... 30,800,000	1892..... 33,000,000
1877..... 46,900,000	1885..... 31,800,000	1893..... 35,900,000
1878..... 51,200,000	1886..... 35,000,000	1894..... 39,500,000
1879..... 38,900,000	1887..... 33,000,000	1902..... 80,853,070

Production by leading states (1895, 1896) is here given:

GOLD PRODUCTION IN THE UNITED STATES, 1895, 1896.

States.	1895.		1896.	
	Ounces.	Value.	Ounces.	Value.
California.....	722,171	\$14,928,600	798,253	\$16,500,000
Colorado.....	643,634	13,305,100	628,931	13,000,000
Montana.....	198,405	4,101,400	214,804	4,440,000
South Dakota.....	187,187	3,869,500	224,964	4,650,000
Idaho.....	86,088	1,779,600	119,699	2,474,000
Arizona.....	95,072	1,965,300	116,999	2,418,000
Oregon.....	42,972	888,300	62,893	1,300,000
Nevada.....	75,088	1,552,200	142,961	2,955,000
Alaska.....	78,140	1,615,300	157,185	3,249,000
Utah.....	66,419	1,373,000	92,888	1,920,000
New Mexico.....	23,810	492,200	25,400	525,000
Washington.....	16,980	351,000	18,481	382,000
Michigan.....	2,075	42,900	}	14,781 306,000
Southern States.....	15,026	310,600		
Other States.....	1,693	35,000		
Total.....	2,254,760	\$46,610,000	2,618,239	\$54,119,000

California led all the states in gold production in 1848-96, but since 1897 Colorado has stood first. The yield of the former, 1902, was valued at \$17,124,793; and the latter at \$27,502,429.

There is a valuable source in the gold-fields of the Transvaal. It was recently estimated that from \$60,000,000 to \$75,000,000 worth of G. were annually required for ornament and employment in the arts and manufactures (including gilding, electro-plating, etc.); leaving, with the reduced production of G., but a small margin for coinage. One cubic inch of pure G. weighs 10.12883 ounces troy, and is worth \$209.38, and a single ounce is worth \$20.67. In 1873, the wages earned by all those connected with gold-mining in Victoria, where mining is carefully and economically done, averaged only \$490 a year, lower than the usual rate for other kinds of labor.

Wherever G. is found, its origin can generally be traced to quartz veins in the primary or volcanic rocks, such as granite, gneiss, porphyry, clay-slate, or green-stone. As these rocks became decomposed by the action of the weather, portions of the auriferous veins were carried down by streams and floods, and so found their way into the deposits of sand, clay, and shingle in river-beds, and in the gullies and flats of hills. Many auriferous drifts are of great thickness, formed by long-continued wasting of the rocks of neighboring hills, and therefore require mining to a considerable depth. G. for the most part is found in small grains, or scales, called gold-dust; some of it,

GOLD.

however, in pieces, or *nuggets* of considerable size. One found at Ballarat 1858, called "Welcome," weighed 2,280 oz., and it was sold for \$52,500. Much of the Mexican and European G. is obtained from auriferous pyrites. See METALLURGY: MINING: AMALGAM: ASSAYING: ALLOY. Nearly all the metals except G. are most usually found as ores chemically combined with oxygen, sulphur, or other substances; and they therefore require to be separated by chemical processes. Gold ores, if we may use the term, require to be mechanically treated by the process of crushing, stamping, and washing; the amalgamation process being resorted to when the G. occurs in a state of fine division. One kind of crushing-mill consists of two large cast-iron rollers, which break the auriferous quartz into small pieces as it passes through between them. More usually now, a stamping-mill is used with iron-shod piles of wood, wrought by an axle with projecting cams, after the fashion of flint-mills and beetling-machines. The ore pounded by the stamps is next washed, and for doing this there is an almost endless number of contrivances. In one of the richest quartz districts of California, it is carried by a current of water over coarse woollen blankets laid on sloping boards. By this plan the lighter particles of quartz are carried away, and the particles of G. become entangled in the fibres of the wool. The blankets are washed at intervals in a tank, where the G. and other matters caught on their surface accumulates. It is then ready for the amalgamation process. The G. of auriferous drift is partly extracted by washing, but there still remain minute particles invisible to the naked eye mixed with the *gangue*; indeed, some auriferous soils contain all their G. in a state of extreme division. To recover the G. either from this or stamped quartz, an amalgam is made; that is, it is mixed with mercury, which has the power of seizing on and dissolving the gold particles, however minute. The mercury is afterward distilled off in a retort, leaving the G. nearly pure. Plattner's process converts the G. into a liquid chloride.

In 1873 the United States discontinued the coinage of the silver dollar. In 1874 the Latin Union, comprising France, Italy, Belgium, Switzerland, and Greece, demonetized silver. Germany, Holland, Finland, Russia, and other countries followed in rapid succession. The result was an increased demand for gold to replace the silver as coin and for reserves. For nearly 200 years prior to 1873 there was little variation in the commercial ratio of silver to gold from the average value of $15\frac{1}{2}$ to 1. But with the various changes in the production and use of the two metals the relative value of silver has rapidly fallen until it touched the low point of 35 to 1 in 1894 and 41 to 1 in 1897. The increased production of gold has been met by an increased demand through the closing of the Indian mints to silver in 1893, and the establishment on a gold basis of Chili in 1895 and of Japan in 1897. See BIMETALLISM: CURRENCY: MONEY.

GOLDAU.

EXTRACTION BY SODIUM AMALGAMS.—Certain difficulties which attend the separation of gold by amalgamation—caused by the presence of other metals which frequently cover the gold with a film of tarnish, and prevent the complete action of the mercury upon it—have led to the employment of sodium amalgamated with mercury in various proportions. This amalgam also restores the usefulness of mercury which has become *floured* or *sickened*. The compositions have been made the subjects of two patents, one by Dr. Wurtz of New York 1864, the other by Mr. Crookes of London 1865. The use of these considerably increases the yield of the precious metal. Mr. Crookes has three preparations, A, B and C, all of which contain 3 per cent. of sodium. A consists of mercury and sodium only; B of 20 per cent. of zinc in addition; and C has 10 per cent. both of zinc and tin added. Wurtz recommends two kinds, one containing 2 and the other 4 per cent. of sodium. Although the quantity of sodium amalgam added to the mercury employed in the amalgamation process, differs according to the nature of the gold ores, yet one per cent. at a time is a very common proportion; but this charge requires to be repeated as the sodium becomes expended. At first the proportion of sodium used in these amalgams was sometimes as high as 15 per cent.; but it has been found by experience that those with less sodium give better results. When it happens that the 'flouring' of the mercury is caused by the presence of sulphide of antimony in the gold ores, the sodium amalgam is found to do harm rather than good.

GOLDAU, *gōl'dow*: formerly a small town of Switzerland, in the canton of Schwyz, which lay in a valley between Mount Rossberg on the n. and Mount Rigi on the s., five m. n.w. of the town of Schwyz: memorable for its destruction by one of the most stupendous and fatal landslips on record. The upper portion of the slope of the Rossberg, consisting of a layer of stone resting on light soil, had been loosened by continuous rains, which percolated under the rock, and in a measure washed the soil from beneath it. 1806, Sep. 2, toward evening, the outer layer of rock became completely detached, and rushed down the mountain in a s.w. direction into the valley. In a few minutes not only G. but the neighboring villages of Busingen and Rothen were overwhelmed in destruction, a part of the Lake of Lauwerz was filled up, and by the sudden overflowing of the water the land w. of Seewen was devastated. Two churches, 111 dwelling-houses, 220 outhouses containing many cattle, and 400 men were buried in one moment. Only a few of the inhabitants who, at the moment of the landslip, were at some distance from the scene, were saved. A numerous company of travellers, commencing the ascent of Mount Rigi, were overtaken on the bridge of G. by the landslip, and perished. The valley is now a wild rocky waste, but grass and moss are gradually creeping over and veiling its more rugged features. On a height in this valley through which the highway leads from Arth

GOLDBEATER'S SKIN—GOLD-BEATING.

to Schwyz, a chapel has been erected. The village of *Neu-Goldau*, on the line of the Rigi railway, consists of but a few houses.

GOLDBEATER'S SKIN: delicate membrane prepared from the large intestine of the ox, and used as a dressing for slight wounds, as the fabric for court-plaster, etc., but chiefly by gold-beaters (see GOLD-BEATING, below). The outer or peritoneal membrane is used for this purpose. The intestine is first subjected to partial putrefaction, by which the adhesion of the membranes is sufficiently diminished to enable them to be separated; the separated membrane is then further cleaned from the adhering muscular fibres, dried, beaten, and pressed between paper, besides being treated with alum, isinglass, and white of egg, the object of which is to obtain the pure continuous membrane free from grease and impurities, without allowing the putrefactive processes to weaken it. A packet of 900 pieces of skin, each four inches square, is worth about \$40. They may be beaten continuously for several months with a 12-lb. hammer without material injury. The intestines of 500 oxen are required to furnish the 900 leaves that form one packet, or *mold*, as it is technically called. The manufacture is extremely offensive. Chlorine has been introduced both as a disinfectant and to assist in the separation of the membrane.

GOLD'-BEATING: process by which gold is extended to thin leaves used for gilding. The gold used for this purpose is usually alloyed with silver or copper, according to the color required: see GOLD. For *deep gold*, an alloy containing about 1 part of copper to 20 of pure gold is used. As gold-leaf is sold not by weight, but by superficial measure, and as increasing the quantity of alloy diminishes the malleability, there is little temptation to use the baser metals as adulteration.—The gold is first cast into oblong ingots about $\frac{3}{4}$ of an inch wide, weighing two ounces. The ingot is flattened out into a ribbon of about $\frac{1}{800}$ of an inch in thickness by passing it between polished steel rollers. This is annealed or softened by heat, and then cut into pieces of one inch square; 150 of these are placed between leaves of vellum, each piece of gold in the centre of a square vellum leaf, another placed above, and so on till the pile of 150 is formed. This pile is enclosed in a double parchment case, and beaten with a 16-lb. hammer. The elasticity of the packet considerably lightens the labor of beating, by causing the hammer to rebound with each blow. The beating is continued until the inch-pieces are spread out to four-inch squares; they are then taken out, and cut into four pieces, and squares thus produced are now placed between *gold-beater's skin* instead of vellum, made into piles, and enclosed in a parchment case, and beaten as before, but with a lighter hammer. Another quartering and beating produces 2,400 leaves, having an area of about 190 times that of the ribbon, or a thickness of about $\frac{1}{20000}$ of an inch. An ounce of gold is thus extended to a surface of about 100 sq. ft.

GOLDBERG—GOLDEN BETTLE.

GOLDBERG, *gôlt'bêrch*: manufacturing town, of great antiquity, in Prussia prov. of Silesia, 10 m. s.w. of Leignitz. It owes its origin and name to gold-mines worked here from the earliest times. G. suffered much from the Mongol hordes and during the thirty years' war. Pop. 6,736.

GOLD COAST COLONY: a British colony on the coast of West Africa: area 40,000 sq. m.; pop. (1901) 1,486,433, of whom 646 were Europeans; coast line, 350 m. Ashanti, a native state, lies e. of the colony. In 1894 the king of Kumassi declared himself king of Ashanti and much trouble resulted. In 1895 an English expedition was sent against the usurper, who was taken to the coast. The kings of Bekwai and Abodom also submitted, and the country was placed under British protection. In 1898 the Anglo-French Commission arranged the boundaries of the *hinterland* to the w. and n. France evacuated Wa and other points e. of the Volta, and received Bona and Dokta.

GOLD-CURE, n. *gôld' kûr*: a treatment for the cure of drunkenness, the morphine and opium habits, etc., based largely on a hypodermic injection of a secret fluid popularly believed to contain gold. This system of treatment was invented by Leslie E. Keeley, a physician of St. Lawrence co., N. Y. Thence the system is known also as the 'Keeley treatment,' and there are various proprietary institutions known as Keeley Institutes. The fact that Dr. Keeley's formulas were not made known to the medical profession placed him in the position of violating professional ethics. His system has had some use in the U. S. army.

GOLD'EN AGE: fabled age of primitive simplicity and happiness. In the mythologies of most peoples and religions, there exists a tradition of a better time, when the earth was the common property of man, and produced spontaneously all things necessary for an enjoyable existence. The land flowed with milk and honey, beasts of prey lived peaceably with other animals, and man had not yet by selfishness, pride, and other vices and passions, fallen from a state of innocence. At the foundation of this legend lies the deep-rooted opinion, that the world has degenerated with the progress of civilization, and that mankind, while leading a simple, patriarchal life, were happier than at present. The Greeks and Romans placed this golden age under the rule of Saturn; and many of their poets—e.g., Hesiod, in his *Works and Days*, Aratus, Ovid, and, above all, Virgil, in the first books of the *Georgics*—have turned this poetic *matériel* to admirable account, and defined the gradual decadence of the world, as the silver, the brass, and the iron ages, holding out the hope that the age of gold will one day return.

GOLD'EN BEE'TLE: popular name for many of a genus of coleopterous insects, *Chrysomela*, and of a tribe or family, *Chrysomelinae* or *Chrysomelidae*, belonging to the tetramerous section of the order. The body is generally short and convex, the antennæ are simple and wide apart at the base: some of the species are destitute of wings. Many are distinguished by great splendor of color. None

GOLDEN BULL—GOLDEN-CRESTED WREN.

are large. The finest species are tropical, but some are found in temperate regions. Some of them, in the larva state, commit ravages in the field and garden.

GOLD'EN BULL [Lat. *Bulla Aurea*, Ger. *Goldene Bullé*; named from the gold case in which the seal attached to it was inclosed]: imperial edict in German history issued by Emperor Charles IV., mainly for the purpose of settling the law of imperial elections. Till that time much uncertainty had prevailed as to the rights of the electoral body, claims having frequently been made by several members of the lay electoral families, and divisions having repeatedly arisen from this uncertainty; the effect of such divisions being to throw the decision for the most part into the hands of the pope. To obviate these inconveniences, the G. B. defines that one member only of each electoral house shall have a vote—viz., the representative of that house in right of primogeniture, and in case of his being a minor, the eldest of his uncles paternal. On the great question as to the dependence of the imperial office on the pope, and as to the right of the pope to examine and approve the imperial election, the G. B. is silent, though it declares the emperor competent to exercise jurisdiction in Germany from the moment of election. It invests the vicariate together with the government of the empire during the interregnum, in the Elector Palatine, and the Elector of Saxony; but it is remarkable that this applies to Germany only. On the vicariate of Italy, which was claimed by the popes, nothing is said. The G. B. contains also some provisions restraining the so-called *Faustrecht* (literally, 'fist-law'), or right of private redress. It was solemnly enacted in two successive diets at Nürnberg and Metz, 1356, and original copies were furnished to each of the electors, and to the city of Frankfurt. The electoral constitution, as settled by this bull, was maintained almost unaltered till the extinction of the empire.

In Hungarian history, the G. B. is a constitutional edict, issued by Andrew II. in the early part of the 13th c. It changed the government of Hungary from an absolutism to an aristocratic monarchy, and it contained till recent times the charter of the liberties of Hungary, or perhaps of the noble class. See Schmidt's *Geschichte der Deutschen*, III. 638.

GOLD'EN-CRESTED WREN (*Regulus aurocapillus*): very beautiful bird of the family *Sylviadæ*, smallest of British birds: some species are found in N. America and Asia. Its entire length is scarcely three inches and a half. Notwithstanding its name, it is not really a wren, but this name continues in popular use rather than *Regulus* and *Kinglet*, which have been proposed instead. The golden-crested wren is greenish-yellow on the upper parts, cheeks and throat grayish-white; crown feathers elongated, and forming a bright yellow crest. In its habits, it is intermediate between the warblers and the tits. It particularly affects fir-woods. In 1822, Oct., thousands were driven on the British coast of Northumberland and Durham by a

GOLDEN-EYE—GOLDEN FLEECE.

severe n.e. gale. The nest of this bird is suspended from the outermost twigs of a branch of fir, some of them being interwoven with it.

GOLD'EN-EYE: species of Duck: see GARROT.

GOLD'EN-EYE FLY (*Hemerobius perla*, or *Chrysopa perla*): neuropterous insect; pale green, with long thread-like antennæ, long gauze-like wings, and brilliant golden eyes. Its flight is feeble. The length, from the tip of the antennæ to the tip of the wings, is almost an inch and a half, but the insect without wings and antennæ is not above one-third of this length. The female attaches her eggs, in groups of 12 or 16, by long hair-like stalks, to



Golden-eye Fly (*Chrysopa perla*)

(Copied from Morton's *Encyclopædia of Agriculture*):

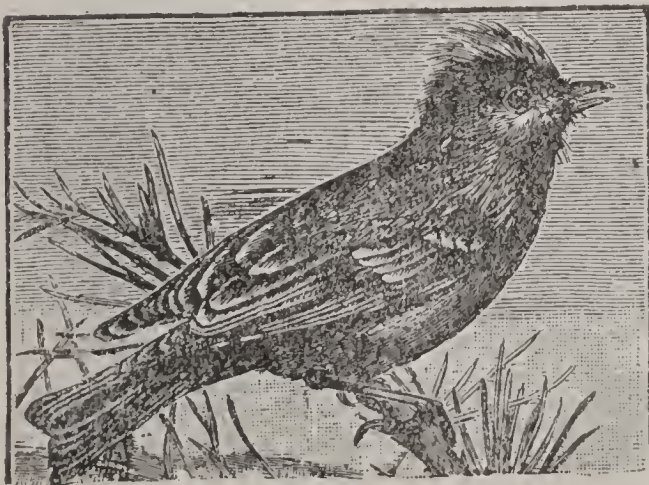
a, cocoon; *b*, the same magnified; *c*, larvæ; *d*, the same magnified, and freed from adhering substances; *e*, perfect insect, on a branch to which its eggs are attached.

leaves or twigs: the eggs have been mistaken for fungi. The larvæ are ferocious-looking little creatures, rough with long hairs, to which particles of lichen or bark become attached; they are called *aphis-lions*, and are very useful by the destruction of aphides, on which they feed. The pupa is inclosed in a white silken cocoon, from which the fly is liberated by a lid.

GOLD'EN FLEECE: in Greek tradition, fleece of the ram Chrysomallus, the recovery of which was the object of the Argonautic expedition: see ARGONAUTS. The G. F. has given its name to a celebrated order of knighthood in Austria and Spain, founded by Philip III., Duke of Burgundy and the Netherlands, at Bruges, 1429, Jan. 10, on the occasion of his marriage with Isabella, daughter of King John I of Portugal. This order was instituted for the protection of the church, and the fleece was probably assumed for its emblem, as much from being the material of the staple manufacture of the Low Countries, as from its connection with heroic times. The founder made himself grand-master of the order, a dignity appointed to descend to his successors; and the number of knights, as first limited to 24, was subsequently increased. After the death of Charles V., the Burgundo-Spanish line of the



Gold.—Hydraulic Mining, Devil's Creek, Reefton, New Zealand.



Golden-crested Wren (*Regulus cristatus*).



Jewel of the Golden
Fleece.

GOLDEN HORDE—GOLDEN LEGEND.

House of Austria remained in possession of the order; but at the close of the Spanish war of succession, the emperor, Charles VI., laid claim to it in virtue of his possession of the Netherlands, and taking with him the archives of the order, celebrated its inauguration with great magnificence at Vienna 1713. Philip V. of Spain contested the claim of Charles; and the dispute, several times renewed, was at last tacitly adjusted by the introduction of the order in both countries. The insignia are a G. F. hanging from a gold and blue enamelled flintstone emitting flames, and borne in its turn by a ray of fire. On the enamelled obverse is inscribed *Pretium laborum non vile*. The decoration was originally suspended from a chain of alternate firestones and rays for which Charles V. allowed a red ribbon to be substituted, and the chain is now worn only by the grand-master. The Spanish decoration differs slightly from the Austrian. The costume consists of a long robe of deep red velvet, lined with white taffetas, and a long mantle of purple velvet lined with white satin, and richly trimmed with embroidery containing firestones and steels emitting flames and sparks. On the hem of white satin is embroidered in gold, *Je l'ay empris*. There is also a cap of purple velvet embroidered in gold, with a hood, and the shoes and stockings are red. In Austria, the emperor may now create any number of knights of the G. F. from the old nobility; if Protestants, the pope's consent is required. In Spain, none but princes and grandees, and personages of peculiar merit are eligible.

GOLD'EN HORDE: Tartar force, led first by the grandson of Ghengis Khan, which invaded Russia, captured Moscow and Kiev, and destroyed other cities. A Magyar army which met them 1241 was defeated and massacred.

GOLD'EN LEG'END (Lat. *Aurea Legenda*): celebrated collection of hagiology, which for a time had almost unequalled popularity, having passed through more than a hundred editions, and translations into almost all European languages. It is the work of James de Voragine, also written 'Vragine' and 'Varagine,' b. abt. 1230. He entered the Dominican order, and was elected, at a comparatively early age, provincial of the order in Lombardy 1267. Toward the end of that century, he was elected Abp. of Genoa; and by his ability, moderation, and exemplary life, he had great influence in the public affairs of his time, being called more than once into the councils of the popes themselves, in affairs of difficulty. The *Legenda* consists of 177 sections, each devoted to a particular saint or festival, selected according to the order of the calendar. In its execution, the work, as may be supposed from its age, is far from critical, but is deserving of study as a literary monument and as illustrating the religious habits and views of the Christians of that time. It presents a very different phase of the mediæval mind from that exhibited in the acute and severely philosophical lucubrations of the schools. A translation of the G. L. was made by William Caxton, for the Earl of Arundel, published 1483.

GOLDEN NUMBER—GOLD-EYE.

GOLD'EN NUMBER for Any Year: the number of that year in the Metonic Cycle (q.v.), and as this cycle embraces 19 years, the golden numbers range from 1 to 19. The cycle of Meton came into general use soon after its discovery, and the number of each year in the Metonic cycle was ordered to be engraved in letters of gold on pillars of marble, hence the origin of the name. Since the introduction of the Gregorian calendar, the point from which the golden numbers are reckoned is B.C.1, as in that year the new moon fell on Jan. 1; and as by Meton's law the new moon falls on the same date (Jan. 1) every 19th year from that time, we obtain the following rule for finding the G. N. for any particular year, 'Add 1 to the number of years, and divide by 19; the quotient gives the number of cycles and the remainder gives the golden number for that year; and if there be no remainder, then 19 is the golden number, and that year is the last of the cycle.' The golden number is used for determining the Epact (q.v.) and the time for observing Easter (q.v.).

GOLD'EN-ROD (*Solidago*): genus of plants of nat. ord. *Compositæ*, sub.-ord. *Corymbifera*, closely allied to *Aster*, but distinguished by the single-rowed pappus and tapering—not compressed—fruit. The species are natives chiefly of temperate climates, and are most numerous in N. America: a few are European. These plants have erect paniced crowded racemes of small yellow flowers, and are a charming ornament of fields and pastures in the later summer. They are of favorite use in decoration, and were they not so abundant, would be grown in gardens. Some species of G. R. had formerly great reputation as a vulnerary, whence the name *Solidago*, it is said, from Lat. *solidare*, to unite. The leaves of a fragrant N. America species, *S. odora*, have been used as a substitute for tea. They are mildly astringent and tonic.

GOLD'EN ROSE: rose formed of wrought gold, set with gems, blessed with much solemnity by the pope in person on Mid-lent Sunday (4th Sunday in Lent, or 'Lætare Sunday'). The prayer of blessing contains a mystic allusion to our Lord as 'the flower of the field and the lily of the valleys.' The G. R. is anointed with balsam, fumigated with incense, sprinkled with musk, and is then left on the altar until the conclusion of the mass. Formerly, in the solemn papal procession of the day, the pope carried it in his hand. It is usually presented, with an appropriate form of words, to some Rom. Cath. prince, whom the pope desires especially to honor. The origin of the ceremony is uncertain, but the probable opinion as to its date is that of Martène and Du Cange, who fix it in the pontificate of Innocent IV. See Wetser's *Kirchen Lexicon*, IX. 397.

GOLD-EYE (*Hyodon*): genus of malacopterosus fishes, inhabiting the lakes and rivers of N. America; the type of a family *Hyodontidæ*: of which other members are found in tropical America and in Borneo. They are small fishes, much compressed like herrings, feed like trout on insects,

GOLDFINCH—GOLDFISH.

and like trout are often taken by anglers with artificial flies. They have the mouth abundantly armed with teeth, having teeth far back on the palate as well as on the tongue and jaws.

GOLD'FINCH (*Fringilla carduelis* of Linnæus, or *Carduelis elegans*): pretty little bird of the family *Fringillidæ*, favorite cage-bird for its soft and pleasing song, its intelligence, its liveliness, and the attachment which it forms for those who feed and caress it. The genus *Carduelis* is distinguished by a thick conical bill, without any bulging, attenuated and very sharp at the tip. Some writers distinguish two groups; one the G., whose British and American species are very similar; the other, with darker plumage and shorter bill, represented by the Aberdevine (q.v.), or Siskin; but other writers do not consider the latter group in such close alliance to the former. The G. is about five inches in entire length; black, blood-red, yellow, and white are beautifully mingled in its plumage. The colors of the female are duller than those of the male. It is widely diffused throughout Europe, and is found in parts of Asia. It is a common bird in Britain and America, but somewhat local. It is seen in small flocks on open grounds, feeding on the seeds of thistles and other plants, and in the earlier parts of the season frequents gardens and orchards. Its nest is made in a tree, bush, or hedge, is remarkable for extreme neatness, and is always lined with the finest downy material that can be procured. The eggs are four or five in number, bluish-white, with a few spots and lines of pale purple and brown. The G. is much employed by bird-catchers as a call-bird. It can be trained to the performance of many little tricks, of which the trainers seem to prefer the raising of water for itself as from a well in a bucket the size of a thimble. The AMERICAN G. (*F.* or *C. tristis*) has very similar habits and song, and the same interesting liveliness and affectionateness in domestication: the nest is of the same elegant structure. It is a common bird in most parts of North America.

GOLD'FISH, or **GOL'DEN CARP** (*Cyprinus auratus*): fish of the same genus with the carp, native of China, now domesticated and naturalized in many parts of the world. It is said to have been originally confined to a lake near the mountain Tsien-king, in the province of The-kiang, in China; but this is questionable. It has been long common in many of the fresh waters of China, and was introduced into England about the end of the 17th or beginning of the 18th c. On account of the brilliancy of its colors and the ease with which it is kept in glass globes or other vessels, in apartments, it soon became, and has continued to be, a general favorite. Its ordinary length is five or six inches, but it has been known to reach 12 inches. When young, it is of blackish color, but acquires its characteristic golden red as it advances to maturity, some individuals (*Silver-fish*) becoming rather of a silvery hue. Monstrosities of various kinds are frequent, particularly in the fins and eyes. The G. is now plentiful in some streams of s. Europe from

GOLD HILL.

which it is exported into countries northward, where also it breeds in ponds, particularly in those into which hot water is poured from steam-engines, which sometimes swarm with its fry. In confinement, it may be fed with worms, insects, crumbs of bread, yolks of eggs dried and powdered, etc. Frequent changing of the water is advantageous, not only because of its being more fresh and better aerated, but because of the animalcules thus supplied for food.

GOLD HILL: a former town of Nev.; on the Va. and Truckee railroad; at the head of Gold Cañon; on the Washoe range of the Sierra Nevada Mts.; 7,000 ft. above the sea; now a part of Virginia City. It received its name from its location on a part of the famous Comstock Lode, and beneath it are some of the richest gold and silver mines in the world. These have been worked to a depth of 2,000 ft., and yield in bullion of both metals about \$2,000,000 per month. The chief mines are the renowned Belcher and Crown Point, with the Gould and Curry ranking second in importance. The part contains 12 quartz mills, 4 churches, a bank, and a daily newspaper, and receives its water supply from the summit of the Sierra Nevada. Pop. (1870) 4,311; (1880) 4,531.

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