GIRONDE, a maritime department in the S.W. of France, formed from four divisions of the old province of Guyenne, viz., Bordelais, Bazadais, and parts of Périgord and Agénois. It is bounded on the N. by the department of Charente-Inférieure, E. by those of Dordogne and Lot-et-Garonne, S. by that of Landes, and W. by the Bay of Biscay. It lies between 44° 12′ and 45° 35′ N. lat. and between 0° 18′ E. and 1° 16′ W. long., being 106 miles in length from N.W. to S.E., and 80 in breadth from N.E. to S.W. It takes its name from the river or estuary of the Gironde formed by the union of the Garonne and Dordogne. The department divides itself naturally into a western and an eastern portion. The former, which is termed *Les Landes*, occupies more than a third of the department, and consists chiefly of morasses, or of sandy and unfruitful downs. The downs stretching along the sea-coast have, however, been now planted with pines, which, binding the sand together by means of their roots, afford an efficacious protection against the encroachments of the sea. Near the coast are two extensive lakes, Carcans and Lacanau, communicating with each other, and with the bay of Arcachon, near the southern extremity of the department. The Bay of Arcachon contains numerous islands, and on the land side forms a vast shallow lagoon, a considerable portion of which, however, has been drained and converted into arable land. The eastern portion of the department consists chiefly of a succession of hill and dale, and, especially in the valley of the Gironde, is very fertile. The estuary of the Gironde is about 45 miles in length, and varies in breadth from 2 to 6 miles. The principal affluent of the Dordogne in this department is the Isle. The feeders of the Garonne are, with the exception of the Dropt, all small. West of the Garonne the only river of importance is the Leyre, which flows into the bay of Arcachon. The climate is humid and temperate. Wheat, rye, maize, millet, and hemp are grown to a considerable extent. The corn produced, however, does not more than half meet the wants of the inhabitants. The culture of the vine is by far the most important branch of industry carried on, the vineyards occupying about one-seventh of the surface of the department. The wine-growing districts are the Médoc, Graves, Côtes, Palus, and Entre-deux-Mers. The Médoc country grows the three *grands crùs*. The Graves country forms a zone 30 miles in extent, and is situated in the vicinity of the Garonne and Dordogne, extending from Châtillon-sur-Gironde to Langon. This is the Sauterne country. The wines of the Côtes district are St Émilion, Pommerol, St Laurent, St Hippolyte, St Christophe, and St George. The Palus and Entre-deux-Mers produce is inferior. Fruits and vegetables are increasingly cultivated, strawberries, cherries, apricots, prunes, artichokes, and peas being largely exported. Tobacco is also cultivated to a considerable extent. Large supplies of resin, pitch, and turpentine are obtained from the pine wood. There are stone quarries and smelting works, but few mines. The manufactures are various, and, with the general trade, are chiefly carried on at Bordeaux. Gironde is divided into the arrondissements of Bordeaux, Blaye, Lesparre, Libourne, Bazas, and La Réole, with 48 cantons, and 547 communes. The chief town is Bordeaux. The total area is 3761 square miles; and the population in 1866 was 701,855, and in 1876 735,242. For a graphic description of the scenery of *Les Landes* in Gironde see the novel *Maître Pierre* of Edmund About.

GIRONDISTS. See FRANCE.

GIRVAN, a burgh of barony and market-town, in the county of Ayr, Scotland, is situated at the mouth of the river Girvan, 21 miles S.W. of Ayr, and nearly opposite Ailsa Craig, a rocky island 10 miles distant. The principal industry was formerly hand-loom weaving, but the number of persons so employed has decreased from 3000 to 300. Of late years the herring-fishing has been greatly developed; in the spring of 1879 304 boats were engaged in it, the "take" exceeding 20,000 crans. The harbour is a tidal one, with a depth at high water of only 9 feet. The public buildings are very superior; and of late many handsome villas have been erected. The situation of the town is one of the finest in the west of Scotland, and the shore affords excellent facilities for sea-bathing. The population, which was 7319 in 1851, had fallen to 4776 in 1871, but it is now increasing.

GISORS, a town of France, department of Eure, is situated in a pleasant valley on the Epte, 45 miles E.N.E. of Paris. Of its ancient castle, which dates from the 12th century, and was at one time one of the principal strongholds in the kingdom, the octagonal keep, built by Henry II. of England, remains entire, and the rest of the ruins still present an imposing appearance. Its ancient ramparts have been converted into promenades. There is a fine old church, the choir of which was built in 1240, and contains windows with portraits of Blanche of Castile and Louis VIII. The north portal is a good specimen of the florid style of the Renaissance. The church contains some fine sculptures and paintings. The principal other buildings are the communal college, the convent, and the hospital. The industries include tanning, brewing, cotton-spinning, and bleaching. The population in 1876 was 3590.

GITSCHIN, the chief town of a circle in Bohemia, is situated on the Cydlina and on the North-West Austrian railway, 50 miles N.E. of Prague. The principal buildings are the parish church, erected after the model of the pilgrim's church of Santiago de Compostella in Spain; the prison, formerly a Jesuit college; the castle, built by Wallenstein in 1630; the gymnasium, the normal school, and the real school. There is a considerable trade in corn. Gitschin was made the capital of the duchy of Friedland by Wallenstein in 1627, at which time it contained only 200 houses. Wallenstein was interred at the neighbouring Carthusian monastery, but in 1639 the head and right hand were taken by General Banér to Sweden, and in 1702 the other remains were removed by Count Vincent of Waldstein to his hereditary burying ground at Münchengrätz. At Gitschin the Prussians gained a great victory over the Austrians, June 29, 1866. The population in 1869 was 6750.

GIULIO ROMANO. See PIPPI.

GIUNTA PISANO, the earliest Italian painter whose name is found inscribed on an extant work, exercised his art from 1202 to 1236; he may perhaps have been born towards 1180 in Pisa, and died in or soon after 1236. There is some ground for thinking that his family-name was Capiteno. In recent times some efforts have been made to uphold his deservings as an artist, thereby detracting so far from the credit due to the initiative of Cimabue; but it cannot be said that these efforts rest on a very solid basis. To most eyes the performances of Giunta merely represent a continuing stage of the long period of pictorial inaptitude. The inscribed work above referred to, one of his earliest, is a Crucifix now or lately in the kitchen of the convent of St Anne in Pisa. Other Pisan works of like date are very barbarous, and some of them may be also from the hand of Giunta. It is said that he painted in the upper church of Assisi,—in especial a Crucifixion dated 1236, with a figure of Father Elias, the general of the Franciscans, embracing the foot of the cross. In the sacristy is a portrait of St Francis, also ascribed to Giunta; but it more probably belongs to the close of the 13th century. This artist was in the practice of painting upon cloth stretched on wood, and prepared with plaster.

GIURGEVO, in Roumanian *Giurgiu* or *Shursha*, a town of Roumania (formerly of Lower Wallachia), at the head of the district of Vlashka, lies on the left or northern bank of

the Danube, over against Rustchuk in Bulgaria, and is distant about 40 miles from Bucharest, with which it has been connected by railway since 1869. It presents on the whole rather a mean appearance, rising out of the mud embankments of the river, but its population is increasing, its commerical advantages as the port of Bucharest are becoming more generally recognized, and improvements are consequently being effected in the town itself. It is the seat of a court of primary instance, and has a normal school and a gymnasium. The fortifications to which it was formerly indebted for no small part of its importance were destroyed in 1829, and its only defence is a castle on the island of Slobosia, with which it communicates by a bridge. Giurgevo, or, as it was called by its founders, San Zorzo, that is, San Giorgio, or St George's, owes its origin to the Genoese of the 14th century. It has frequently figured in the wars whereby the lower Danube has so often been laid waste. The population in 1875 was about 15,000.

GIUSTI, GIUSEPPE (1809–1850), Tuscan satirical poet, was born at Monsummano, a small village of the Valdinievole, on May 12, 1809. His father, a cultivated and rich man, accustomed his son from childhood to study, and himself taught him, among other subjects, the first rudiments of music. Afterwards, in order to curb his too vivacious disposition, he placed the boy under the charge of a priest near the village, whose severity did perhaps more evil than good. At twelve Giusti was sent to school at Florence, and afterwards to Pistoia and to Lucca; and during those years he wrote his first verses. In 1826 he went to study law at Pisa; but, disliking the study, he spent eight years in the course, instead of the customary four. He lived gaily, however, though his father kept him short of money, and learned to know the world, seeing the vices of society, and the folly of certain laws and customs from which his country was suffering. The experience thus gained he turned to good account in the use he made of it in his satire.

His father had in the meantime changed his place of abode to Pescia; but Giuseppe did worse there, and in November 1832, his father having paid his debts, he returned to study at Pisa, seriously enamoured of a woman whom he could not marry, but now commencing to write in real earnest in behalf of his country. With the poem called *La Ghigliottina* (the guillotine), Giusti began to strike out a path for himself, and thus revealed his great genius. From this time he showed himself the Italian Béranger, and even surpassed the Frenchman in richness of language, refinement of humour, and depth of satirical conception. In Béranger there is more feeling for what is needed for popular poetry. His poetry is less studied, its vivacity perhaps more boisterous, more spontaneous; but Giusti, in both manner and conception, is perhaps more elegant, more refined, more penetrating. In 1834 Giusti, having at last entered the legal profession, left Pisa to go to Florence, nominally to practice with the advocate Capoquadri, but really to enjoy life in the capital of Tuscany. He fell seriously in love a second time, and as before was abandoned by his love. It was then he wrote his finest verses, by means of which, although his poetry was not yet collected in a volume, but for some years passed from hand to hand, his name gradually became famous. The greater part of his poems were published clandestinely at Lugano, at no little risk, as the work was destined to undermine the Austrian rule in Italy. After the publication of a volume of verses at Bastia, Giusti thoroughly established his fame by his *Gingillino*, the best in moral tone as well as the most vigorous and effective of his poems. The poet sets himself to represent the vileness of the treasury officials, and the base means they used to conceal the necessities of the state. The *Gingillino* has all the character of a classic satire. When first issued in Tuscany, it struck all as too impassioned and personal. Giusti entered heart and soul into the political movements of 1847 and 1848, served in the national guard, sat in the parliament for Tuscany; but finding that there was more talk than action, that to the tyranny of princes had succeeded the tyranny of demagogues, he began to fear, and to express the fear, that for Italy evil rather than good had resulted. He fell, in consequence, from the high position he had held in public estimation, and in 1848 was regarded as a reactionary. His friendship for the marquis Gino Capponi, who had taken him into his house during the last years of his life, and who published after Giusti's death a volume of illustrated proverbs, was enough to compromise him in the eyes of such men as Guerrazzi, Montanelli, and Niccolini. On May 31, 1850, he died at Florence in the palace of his friend.

The poetry of Giusti, under a light trivial aspect, has a lofty civilizing significance. The type of his satire is entirely original, and it had also the great merit of appearing at the right moment, of wounding judiciously, of sustaining the part of the comedy that "castigat ridendo mores." Hence his verse, apparently jovial, was received by the scholars and politicians of Italy in all seriousness. Alexander Manzoni in some of his letters showed a hearty admiration of the genius of Giusti; and the weak Austrian and Bourbon Governments regarded them as of the gravest importance.

His poems have been often reprinted, the best editions being those of Le Monnier of Florence, and also that published in Verona, with valuable annotations, by Professor Giovanni Fioretti in 1876. Besides the poems, and the proverbs already mentioned, we have a volume of select letters, full of vigour and written in the best Tuscan language, and a fine critical discourse on Giuseppe Parini, the satirical poet of the last century, whose poetical works are published in a volume by Le Monnier. In some of his compositions the elegiac rather than the satirical poet is seen. Many of his verses have been excellently translated into German by Paul Heyse. Good English translations were published in the *Athenæum* by the late Mrs T. A. Trollope.

GIUSTINIANI, the name of a prominent Italian family which originally belonged to Venice, but established itself subsequently in Genoa also, and at various times had representatives in Naples, Corsica, and several of the islands of the Archipelago.

In the Venetian line the following are most worthy of mention. I. LORENZO (1380–1465), the Laurentius Justinianus of the Roman calendar, at an early age entered the congregation of the canons of Saint George in Alga, and in 1433 became general of that order. About the same time he was made by Eugenius IV. bishop of Venice; and his episcopate was marked by considerable activity in church extension and reform. On the removal of the patriarchate from Grado to Venice by Nicholas V. in 1451, Giustiniani was promoted to that dignity, which he held for fourteen years. He died on January 8, 1465, was canonized by Pope Alexander VIII., his festival (semi-duplex) being fixed by Innocent XII. for September 5th, the anniversary of his elevation to the bishopric. His works, consisting of sermons, letters, and ascetic treatises, have been frequently reprinted,—the best edition being that of the Benedictine P. N. A. Giustiniani, published at Venice in 2 vols. folio, 1751. They are wholly devoid of literary merit. His life has been written by Bernard Giustiniani, by Maffei, and also by the Bollandists. (2.) LEONARDO (1388–1446), brother of the preceding, was for some years a senator of Venice, and in 1443 was chosen procurator of St Mark. He translated into Italian Plutarch's *Lives of Cinna and Lucullus*, and was the author of some poetical pieces, amatory and religious, as well as of rhetorical prose compositions. (3.) BERNARDO (1408–1489), son of Leonardo, was a pupil of Guarino and of George of Trebizond, and entered the Venetian senate at an early age. He served on several important diplomatic missions both to France and Rome, and about 1485 became one of the council of ten. His orations and letters were published in 1492; but his title to any measure of fame he possesses rests upon his history of Venice, *De Origine Urbis Venetiarum rebusque ab ipsa gestis historia* (1492), which was translated into Italian by Domenichi in 1545, and which at the time of its appearance was undoubtedly the best work upon the subject of which it treated. It is to be found in vol. i. of the *Thesaurus* of Grævius. (4.) Pietro, also a senator, lived in the 16th century, and wrote an *Historia rerum Venetarum* in continuation of that of Bernardo. He was also the author of chronicles *De Gestis Petri Mocenigi* and *De Bello Venetorum cum Carolo VIII.* The latter has been reprinted in the *Script. Rer. Ital.*, vol. xxi.

Of the Genoese branch of the family the most prominent members were the following. (1.) Paolo, di Moniglia (1444–1502), a member of the order of Dominicans, was, from a comparatively early age, prior of their convent at Genoa. As a preacher he was very successful, and his talents were fully recognized by successive popes, by whom he was made master of the sacred palace, inquisitor-general for all the Genoese dominions, and ultimately bishop of Scio and Hungarian legate. He was the author of a number of Biblical commentaries (no longer extant), which are said to have been characterized by great erudition. (2.) Agostino (1470–1536), was born at Genoa, and spent some wild years in Valencia, Spain. Having in 1487 joined the Dominican order, he gave himself with great energy to the study of Greek, Hebrew, Chaldee, and Arabic, and in 1514 commenced the preparation of a polyglot edition of the Bible. As bishop of Nebbio in Corsica, he took part in some of the earlier sittings of the Lateran council (1516–17), but, in consequence of party complications, withdrew to his diocese, and ultimately to France, where he became a pensioner of Francis I., and was the first to occupy a chair of Hebrew and Arabic in the university of Paris. After an absence from Corsica for a period of five years, during which he visited England and the Low Countries, and became acquainted with Erasmus and More, he returned to Nebbio about 1522, and there remained, with comparatively little intermission, till in 1536, when, while returning from a visit to Genoa, he perished in a storm at sea. He was the possessor of a very fine library, which he bequeathed to the republic of Genoa. Of his projected polyglot only the Psalter was published (*Psalterium Hebræum, Græcum, Arabicum, et Chaldaicum*, Genoa, 1616). Besides the Hebrew text, the LXX. translation, the Chaldee paraphrase, and an Arabic version, it contains the Vulgate translation, a new Latin translation by the editor, a Latin translation of the Chaldee, and a collection of scholia. Giustiniani printed 2000 copies at his own expense, including fifty in vellum for presentation to the sovereigns of Europe and Asia; but the sale of the work did not encourage him to proceed with the New Testament, which he had also prepared for the press. Besides an edition of the book of Job, containing the original text, the Vulgate, and a new translation, he published a Latin version of the *Moreh Nevochim* of Maimonides (*Director Dubitantium aut Perplexorum*, 1520), and also edited in Latin the *Aureus Libellus* of Æneas Platonicus, and the *Timæus* of Chalcidius. His annals of Genoa (*Castigatissimi annali di Genova*) were published posthumously in 1537.

The name Giustiniani has also been borne by the following:—(1.) Pompeio (1569–1616), a native of Corsica, who served under Alessandro Farnese and the marquis of Spinola in the Low Countries, where he lost an arm, and, from the artificial substitute which he wore, came to be known by the soubriquet Bras de Fer. He also defended Crete against the Turks; and subsequently was killed in a reconnaissance at Friuli. He left in Italian a personal narrative of the war in Flanders, which has been repeatedly published in a Latin translation (*Bellum Belgicum*, Antwerp, 1609). (2.) Giovanni (1513–1556), born in Candia, translator of Terence's *Andria* and *Eunuchus*, of Cicero's *In Verrem*, and of Virgil's *Æneid*, l. viii. (3.) Orsatto (1538–1603), Venetian senator, translator of the *Œdipus Tyrannus* of Sophocles, and author of a collection of *Rime*, in imitation of Petrarch. He is regarded as one of the latest representatives of the classic Italian school. (4.) Geronimo, a Genoese, flourished during the latter half of the 16th century. He translated the *Alcestis* of Euripides and three of the plays of Sophocles; and wrote two original tragedies, *Jephte* and *Christo in Passione*. (5.) Vincenzo, who in the beginning of the 17th century built the Roman palace and made the art-collection which are still associated with his name (see *Galleria Giustiniana*, Rome, 1631). The collection was removed in 1807 to Paris, where it was to some extent broken up. In 1815 all that remained of it, about 170 pictures, was purchased by the king of Prussia and removed to Berlin, where it forms a portion of the royal museum.

GIVET, one of the strongest fortified towns of France, on the Belgian frontier, situated in the department of Ardennes, on the river Meuse, 40 miles N.N.E. of Mezières. The Eastern French railway connects it with Rheims, and the Belgian railways connect it with Namur and Charleroi. It is divided into three portions—the citadel called Charlemont, and Grand Givet on the left bank of the river, and on the opposite bank Petit Givet, connected with Grand Givet by a stone bridge of five arches. The citadel of Charlemont, built by the emperor Charles V. in 1555, is situated at the top of a precipitous rock 705 feet high, and on the east side, by which alone it is accessible, is fortified by six bastions and several other works. Grand Givet has four bastions and three ravelins, and Petit Givet 3 bastions. The fortress has accommodation for 25,000 men, but can be held by 3000 or 4000. The town is famed for its clay tobacco-pipes. There are also manufactures of nails, lead pencils, sealing wax, white lead, glue, earthenware, and leather, and the town has some trade. The population in 1876 was 5275.

GIVORS, a town of France, department of Rhône, is situated on the Rhone and the canal of Rive-de-Gier, near the railway between Lyons and St Étienne, 14 miles south of Lyons. It has glass and tile works, potteries, tanneries, foundries, silk factories, and dyeworks, and is the principal entrepôt for the coal and coke of the Gier valley. Near it are the ruins of the château of St Gerald and of the convent of St Ferréol. Population (1876), 10,856.

GLACIER,[1] a name given to a mass of ice, having its origin in the hollows of mountains where perpetual snow accumulates, but which makes its way down towards the lower valleys, where it gradually melts, until it terminates exactly where the melting, due to the contact of the warmer air, earth, and rain of the valley, compensates for the bodily descent of the ice from the snow reservoirs of the higher mountains.

The diminution of temperature as we ascend the slopes of mountains, is indicated by successive zones of vegetation, and finally by the occurrence of perpetual snow (see Geology, p. 280). It was first shown by Baron Humboldt and Von Buch that the limit of perpetual snow depends principally on the temperature of the summer, and not upon that of the whole year.

[1] The following are synonyms in different languages and dialects:—French, *glacier*; German, *gletscher*; Italian, *ghiacciaja*; Tyrolese, *fern*; in Carinthia, *käss*; in the Valais, *biegno*; in part of Italy, *vedretto*; in Piedmont, *ruize*; in the Pyrenees, *serneille*; in Norway, *iisbræ* or *iisbrede*; in Lapland, *geikna* or *jegna*; in Iceland, *jökull* or *fall-jökull*.

A glacier usually protrudes into a valley far below the limit of perpetual snow, and terminates amidst a wilderness of stones borne down upon its surface and deposited by its fusion. This earthy and rocky rubbish is termed moraine matter, and has already been described (Geology, p. 281). Lying in front of the lower end of a glacier, it marks in a characteristic and certain manner the greatest limit of extension which the glacier has at any one time attained. Sometimes a glacier is seen to have withdrawn very far within its old limits, leaving a prodigious barren waste of stones in advance of it, which, being devoid of soil, nourishes not one blade of grass. At other times the glacier pushes forward its margin beyond the limit which it has ever reached (at least within the memory of man), tears up the ground with its icy ploughshare, and shoves forward the yielding turf in wrinkled folds, uprooting trees, moving vast rocks, and scattering the walls of dwelling-houses in fragments before its irresistible onward march.[1]

The lower end of a glacier is usually steep,—sometimes with a dome-shaped unbroken outline, more frequently broken up by intersecting cracks into prismatic masses which the continued action of the sun and rain sharpen into pyramids, often assuming (as in the glacier of Bossons at Chamouni) grotesque or beautiful forms. From a vault in the green-blue ice, more or less perfectly formed each summer, the torrent issues which represents the natural drainage of the valley, derived partly from land springs, partly from the fusion of the ice. The united or crevassed condition of the glacier generally depends almost entirely on the slope of its bed. If it incline rapidly, numerous transverse fissures are formed from the imperfect yielding of the ice during its forced descent along its uneven channel. These cracks often extend for hundreds of yards, and may be hundreds of feet in depth; but their greatest depth is not accurately known, since they are rarely quite vertical. In many cases, however, the crevasses are comparatively few in number, and the glacier may be readily traversed in all directions. This is especially the case if a glacier of considerable dimensions meets with any contraction in its course. The ice is embayed and compressed, and its slope lessens, just as in the case of a river when it nears a similar contraction preceding a fall. Such level and generally traversable spaces may be found about the middle regions of the Mer de Glace, the lower glacier of Grindelwald, the lower glacier of the Aar, and in many other cases. The last-named glacier is perhaps the most remarkably even and accessible of any in Switzerland. The slope of its surface is in many places only 3°. The Pasterzen glacier in Carinthia is even less inclined. It is in such portions of a glacier that we commonly find internal cascades, or "moulins." These arise from the surface water being collected into a considerable mass by a long course over its unbroken surface, and then precipitated with violence into the first fissure it meets with. The descending cascade keeps open its channel, which finally loses the form of a fissure, presenting that of an open shaft, often of immense depth.

Nearly connected in their origin with the internal cascades are the "gravel cones," occasionally seen on the surface of glaciers, which appear to be formed in this way. A considerable amount of earthy matter derived by the superficial water-runs from the moraine accumulates in heaps in the inequalities of the ice, or at the bottom of the "moulins." As the glacier surface wastes by the action of the sun and rain, these heaps are brought to the surface, or rather the general surface is depressed to their level. If the earthy mass be considerable, the ice beneath is protected from the radiation of the sun and from the violent washing of the rain; it at length protrudes above the general level of the glacier, and finally forms a cone which appears to be entirely composed of gravel, but is in fact ice at the heart, with merely a protecting cover of earthy matter. These singular cones are very well seen on the glacier of the Aar, but on most others they are comparatively rare. The similar protective action of large stones detached from the moraines and lying on the surface of the ice often produces the striking phenomenon of "glacier tables." Stones of any considerable size almost invariably stand upon a slightly elevated pillar of ice; but when they are broad and flat they occasionally attain a height of 6 and even of 12 feet above the general level.

The superficial waste of a glacier is thus a very important phenomenon. Owing to it the body of the ice has its vertical thickness rapidly diminished during the heats of summer, and, as we have already intimated, the lower end of a glacier has its position determined by the amount of this waste. Suppose a glacier to move along its bed at the rate of 300 feet per annum, and imagine (merely for the sake of illustration) its yearly superficial waste to be 20 feet; then the thickness of the glacier will diminish by 20 feet for every 300 feet of its length, or at the rate of 360 feet per mile, so that the longitudinal section of a glacier has the form of a wedge; and however enormous its original thickness, after a certain course we must at length come to the thin end of the wedge, and that the more rapidly as the causes of melting increase towards the lower extremity. These causes are indeed so various that it is difficult to estimate them with accuracy. We have (1) the direct solar heat, (2) the contact of warm air, and (3) the washing of rain. All these causes act on the surface and produce the "ablation" of the surface. Besides these, the ice of the glacier wastes somewhat beneath by the contact of the soil and the washing of the inferior streams. This may be called its "subsidence." Further, the natural slope of the rocky bed of the glacier causes any point of the surface to stand absolutely lower each day in consequence of the progressive motion. These three causes united produce the "geometrical depression" of the surface. Principal J. D. Forbes showed how the several effects may usually be distinguished by observation. During the height of summer, near the Montanvert, he found the daily average ablation to be 3·62 inches, the daily subsidence to be 1·63 inches. Seventh-tenths of the geometrical depression are due therefore to the former cause, and three-tenths to the latter. This is a very large amount, and it is certain that during the colder period of the year, and whilst the glacier is covered with snow, the subsidence is not only suspended, but the glacier recruits in thickness a portion of its waste during the seasons of summer and autumn. To this subject we shall again return.

The middle region of the great glaciers of the Alps extends from the level of about 6000 to 8000 feet above the sea. The inclination is usually there most moderate—say from $2\frac{1}{2}°$ to 6°. But this is not invariably the case. Beyond 8000 feet we reach the snow-line. The snow-line is a fact as definite on the surface of a glacier as on that of a mountain, only in the former case it occurs at a somewhat lower level. It cannot be too distinctly understood that the fresh snow annually disappears from the glacier proper. Where it ceases entirely to melt, it of course becomes incorporated with the glacier. We have therefore arrived at the region where the glacier *forms*; everywhere below it only *wastes*. This snowy region of the glacier is called in French *névé*, in German *firn*. As we ascend the glacier it passes gradually from the state of ice to the state of snow. The

[1] Such a sudden and disastrous increase took place in many of the glaciers of Switzerland and Savoy in 1818 (occasioning the catastrophe of the Val de Bagnes), and in those of the Bergenstift in Norway about 1740. The retreat of a glacier far within its old moraines is well exemplified in most of the glaciers of the latter country, and especially in that of Nygaard.

superficial layers are more snowy and white, in fact nearly pure snow; the deeper ones have more colour and consistence, and break on the large scale into vast fragments, which at Chamouni are called *seracs*. The *névé* moves, as the glacier proper does, and it is fissured by the inequalities of the ground over which it passes. These fissures are less regular than those of the lower glacier. They are often much wider, in fact of stupendous dimensions, and, being often covered with treacherous snowy roofs, constitute one of the chief dangers of glacier travelling. The constitution of the *névé* may be well studied on the Glacier du Géant, a tributary of the Mer de Glace. The mountain-clefts in which large glaciers lie usually expand in their higher portions (in conformity with the ordinary structure of valleys) into extensive basins in which snow is perpetual, and which therefore contain the *névé*, the true origin and material of the glacier, which is literally the overflow of these snowy reservoirs. The amount of overflow, or the discharge of the glacier—upon which depends the extent of its prolongation into the lower valleys—depends in its turn on the extent of the *névé* or collecting reservoir. Glaciers with small reservoirs of necessity perish soon. Their thickness being small, the wedge of the glacier soon thins out. They are common in confined *cirques* of the higher mountains. Such are the glaciers of the second order described by De Saussure. Their slope is often very great—from 20° to 40°.

The ice of the glacier proper has a very peculiar structure, quite distinct from the stratification of the snow on the *névé* (the relics of its mode of deposit), and one which requires special notice. When we examine the appearance of the ice in the wall of an ordinary crevasse (especially if it be tolerably near the side of the glacier) we are struck with the beautiful vertically laminated structure (first observed by Principal Forbes) which it commonly presents, resembling delicately veined marble (especially the variety called in Italy *cipollino*), in shades varying from bluish-green, through green, to white. When we trace the direction of the planes constituting the laminated structure, by observing them on the surface of the glacier (where they are usually well seen after rain, or in the channels of superficial water-runs), we find that where best developed (or not very far from the sides of the glacier) these laminæ are nearly parallel to the sides, but rather incline from the shore to the centre of the ice stream as we follow the declivity of the glacier.

Forbes found that certain superficial discolorations in the form of excessively elongated hyperbolas are due to the recurrence (at intervals of some hundred feet along the course of the glacier) of portions of ice in which the veined structure is more energetically developed than elsewhere, and where, by the decomposition of the softer laminæ, portions of sand and dirt become entangled in the superficial ice, and give rise to the phenomena of "dirt bands," which thus at a distance display (though in a manner requiring some attention to discover) the exact course of this singular structure on the surface of the glacier. Fig. 1 displays

Fig. 1.

Fig. 2.

Fig. 3

the superficial form of the dirt bands, and the course of the structural laminæ projected horizontally. Fig. 2 shows an ideal transverse section of the glacier, and fig. 3 another vertical section parallel to its length. These three sections in rectangular planes will serve to give a correct idea of the course of this remarkable structure within the ice, but a more popular conception will be formed of it from the imaginary sections of a canal-shaped glacier in fig. 4. The structure of the compound glacier, originally double, becomes gradually single; and the "frontal dip" of the laminæ at the loop of the horizontal curves, which in the upper region is nearly vertical, gradually

Fig. 4.

slopes forwards until at the lower termination it has a very slight dip inwards, or indeed may be reversed and fall outwards and forwards. The general form of a structural lamina of a glacier rudely resembles that of a spoon.

This structure and the accompanying dirt bands have been recognized by different observers in almost all glaciers, including those of Norway and of India. The interval between the dirt bands has been shown in the case of the Mer de Glace (and therefore probably in other cases) to coincide with annual rate of progression, and in the higher parts of the glacier (towards the *névé*) to be accompanied by wrinkles or inequalities of the surface which are well marked by the snow lying in them during the period of its partial disappearance.

The Motion of Glaciers and its Causes.—There is something about a glacier which almost inevitably conveys to the mind the idea of a stream. This may be traced in the descriptions of unscientific tourists, of poets, and of some of those who have addressed themselves more seriously to the question of the real nature of these bodies. To the latter class of observers belong Captain Basil Hall and Monseigneur Rendu, bishop of Annecy, who had much more than hinted at the possibility of a true mechanical connexion between the descent of a glacier and that of a mountain torrent, or of a stream of lava. But until the actual conditions of motion were reduced to rule, it was impossible to know how far the analogy was real.

The most characteristic and remarkable feature of glaciers is their motion downwards from the *névé* towards the lower valley. The explanation of it is by far the most important application of mechanical physics connected with the subject. The principal theories to account for the progressive motion of glaciers which were prevalent previous to 1842 may be briefly characterized as De Saussure's and De Charpentier's, though each had been maintained long before by the earlier Swiss writers. The first may be called the *gravitation* theory, the latter the *dilatation* theory. Both suppose that the motion of the ice takes place by its sliding bodily over its rocky bed, but they differ as to the force which urges it over the obstacles opposed by friction and the irregularities of the surface on which it moves.

The following quotation from De Saussure explains his views with his usual precision:—"These frozen masses, carried along by the slope of the bed on which they rest, disengaged by the water (arising from their fusion owing to the natural heat of the earth) from the adhesion which they might otherwise contract to the bottom—sometimes even elevated by the water—must gradually slide and descend along the declivity of the valleys or mountain slopes (*croupes*) which they cover. It is this slow but continual sliding of the icy masses (*des glaces*) on their inclined bases which carries them down into the lower valleys, and which replenishes continually the stock of ice in valleys warm enough to produce large trees and rich harvests." Very sufficient objections have been urged against this theory. It is evident that De Saussure considered a glacier as an accumulation of icy fragments, instead of a great and continuous mass, throughout which the fissures and "crevasses" bear a small proportion to the solid portion; and that he has attributed to the subglacial water a kind and amount of action for which there exists no sufficient or even probable evidence. The main objection, however, is this, that a sliding motion of the kind supposed, if it commence, must be accelerated by gravity, and the glacier must slide from its bed in an avalanche. The small slope of most glacier-valleys, and the extreme irregularity of their bounding walls, are also great objections to this hypothesis.

The dilatation theory ingeniously meets the difficulty of the want of a sufficient moving power to drag or shove a glacier over its bed, by calling in the well-known force with which water expands on its conversion into ice. The glacier being traversed by innumerable capillary fissures, and being in summer saturated with water in all its parts, it was natural to invoke the freezing action of the night to convert this water into ice, and by the amount of its expansion to urge the glacier onwards in the direction of its greatest slope. In answer to this, it is sufficient to observe, in the first place, that during the height of summer the portions of those glaciers which move fastest are never reduced below the freezing point, and that, even in the most favourable cases of nocturnal radiation producing congelation at the surface, it cannot (by well-known laws of conduction) penetrate above a few inches into the interior of the glacier. Again, the ascertained laws of glacier-motion are (as will be immediately seen) entirely adverse to this theory, as it is always accelerated by hot weather and retarded by cold, yet does not cease even in the depths of winter.

It is singular how slow observers were to perceive the importance to the solution of the problem of glacier-motion of ascertaining with geometrical precision the amount of motion of the ice, not only from year to year, but from day to day, in summer and winter, whether constant or variable at the same point, whether continuous or by starts; if variable, on what circumstances it depended, and in what manner it was affected at different points of the length and breadth of a glacier.

This method of studying the question was taken up by Forbes. His observations were commenced on the Mer de Glace of Chamouni, in June 1842. Between the 26th and 27th of that month the motion of the ice opposite a point called the "Angle" was found, by means of a theodolite, to be 16·5 inches in 26 hours; between the 27th and 28th, 17·4 inches in 25½ hours; and from about 6 A.M. to 6 P.M. on the 28th the motion was 9·5 inches, or 17·5 inches in 24 hours; whilst the proportional motion during even an hour and a half was observed. No doubt could therefore remain that the motion of the ice is continuous and tolerably uniform—in short, that it does not move by jerks. He also ascertained about the same time that the motion of the ice is greatest towards the centre of a glacier and slower at the sides, contrary to an opinion then maintained on high authority. He next found that the rate of motion varied at different points of the length of the same glacier, being on the whole greatest where the inclination of its surface is greatest. As the season advanced, he observed notable changes in the rate of motion of the same part of the ice, and connected it by a very striking direct relation with the temperature of the air. These facts were established during the summer of 1842, and promptly published. By means of occasional observations during the following winter and spring by his guide, Auguste Balmat of Chamouni, and by a more full comparison of the entire motion of a glacier for twelve months with its motion during the hot season of the year, another generally received error was rectified: the motion of the glacier continues even in winter, and it has a very perceptible ratio to the summer motion. Last of all, it was found that the surface of a glacier moves faster than the ice nearer the bottom or bed.

These and some minor laws of motion, being undoubted expressions of the way in which glaciers move, were formulated by Forbes in an approximate theory: "A glacier is an imperfect fluid or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts." The analogy subsisting between the motion of a glacier and that of a river (which is a viscous fluid,—were it not so, its motion would be widely different) will be best perceived by stating more precisely its laws of motion.

1. Each portion of a glacier moves, not indeed with a constant velocity, but in a continuous manner, and not by sudden subsidences with intervals of repose. This, of course, is characteristic also of a river.

2. The ice in the middle part of the glacier moves much faster than that near the sides or banks; also the surface moves faster than the bottom. Both these facts obtain in the motion of a river in consequence of the friction of the fluid on its banks, and in consequence also of that internal friction of the fluid which constitutes its viscosity.

Thus, at four stations of the Mer de Glace, distant respectively from the west shore of the glacier......100 230 405 365 yds., the relative velocities were........... 1·000 1·332 1·356 1·367.

3. The variation of velocity (as in a river) is most rapid near the sides, whilst the middle parts move nearly uniformly. This and the preceding laws are also fully brought out by the subsequent experiments of M. Agassiz on the glacier of the Aar, and of MM. Schlagintweit on the Pasterzen glacier.

4. The variation of velocity of a glacier from the sides to the middle is nearly in proportion to the absolute velocity of the glacier,—whether that absolute velocity change in the same place in consequence of change of season, or between one point and another of the length of the same glacier, depending on its declivity. See (5) and (6) below.

5. The glacier, like a stream, has its pools and its rapids. Where it is embayed by rocks it accumulates, its declivity increases, and its velocity at the same time. When it passes down a steep, issuing by a narrow outlet, its velocity increases. Thus the approximate declivities of the inferior, middle, and superior regions of the Mer de Glace (taken in the direction of its length) are...15° 4½° 8° and the relative velocities are as the numbers .. 1·398 ·574 ·925.

6. A fact not less important than any of the preceding is that increased temperature of the air favours the motion of the ice, and generally whatever tends to increase the proportion of the watery to the solid constituents of a glacier, as mild rains, and especially the thawing of the superficial snow in spring. The velocity does not, however, descend to zero even in the depth of winter. Indeed, in the lower and most accessible portions of the Mer de Glace (or Glacier des Bois) and the Glacier des Bossons, the ratio of the winter to the summer motion is almost exactly 1 : 2. On endeavouring to establish a relation between the velocity of the glacier and the temperature of the ambient air, we find that these diminish together almost regularly down to the freezing-point, below which the velocity seems to remain constant.

Any mechanical theory of glaciers must be more or less imperfect which does not explain the remarkable veined or ribboned structure of the ice, with its peculiar course through the interior of the glacier, as above described. According to Forbes the fundamental idea is that the veined or ribboned structure of the ice is the result of internal forces, by which one portion of ice is dragged past another in a manner so gradual as not necessarily to produce large fissures in the ice, and the consequent sliding of one detached part over another, but rather the effect of a general bruise over a considerable space of the yielding body. According to this view, the delicate veins seen in the glacier, often less than a quarter of an inch wide, have their course parallel to the direction of the sliding effort of one portion of the ice over another. Amongst other proofs of this fundamental conception that the veined structure is the external symbol of this forced internal motion of a body comparatively solid, Forbes cited a striking instance from the glacier of La Brenva, on the south side of Mount Blanc. In this case the ice of the glacier, forcibly pressed against the naked rocky face of an opposing hill is turned into a new direction; and in thus shoving and squeezing past a prominence of rock, he observed developed in the ice a "veined structure" so beautiful that "it was impossible to resist the wish to carry off slabs, and to perpetuate it by hand specimens." This perfectly developed structure was visible opposite the promontory which held the glacier in check, and past which it struggled, leaving a portion of its ice completely embayed in a recess of the shore behind it. Starting from this point as an origin, the veined laminæ extended backwards and upwards into the glacier, but did not spread laterally into the embayed ice. They could, however, be traced from the shore to some distance from the promontory into the icy mass. The direction of lamination exactly coincided with that in which the ice must have moved if it was shoved past the promontory at all. That it did so move was made the subject of direct proof, by fixing two marks on the ice opposite the promontory, one on the nearer, the other on the farther side of the belt of ice which had the lamination best developed. The first mark was 50 feet from the shore, and moved at the rate of 4·9 inches daily; the other mark was 170 feet further off, and moved almost three times faster, or 14·2 inches daily. Throughout this breadth of 170 feet there was not a single longitudinal crevasse which might have facilitated the differential motion. A parallelogram of compact ice, only 170 feet wide, was therefore moving in such a manner that, whilst one of its sides advanced only a foot, the other advanced a yard. No solid body, at least no rigid solid body, can advance in such a manner; Forbes therefore concluded that glacier-ice is plastic, that the veined structure is unquestionably the result of the struggle between the rigidity of the ice and the quasi-fluid character of the motion impressed upon it, and that this follows, not only from the direction of the laminæ, but from their becoming distinct exactly in proportion to their nearness to the point where the bruise is necessarily strongest. The subsequent experiments of Sorby on the cleavage structure of rocks proved that it has arisen as the result of intense lateral compression, and could be imitated in many artificial substances. Tyndall obtained it even in beeswax, the analogy between which and the veined structure of ice is very close.

Though Forbes termed his expression of the laws of glacier motion the "viscous" or "plastic theory," it was rather a statement of fact than an explanation of the physical processes concerned in the descent of glaciers. Against his views it was of course objected that ice is by its nature a brittle solid, and not sensibly possessed of any viscous or plastic quality. But he cogently replied that the qualities of solid bodies of vast size, and acted on by stupendous and long-continued forces, cannot be estimated from experiments on a small scale, especially if short and violent; that sealing-wax, pitch, and other similar bodies mould themselves, with time, to the surfaces on which they lie, even at atmospheric temperatures, and whilst they maintain, at the same time, the quality of excessive brittleness under a blow or a rapid change of form; that even ice does not pass at once, and *per saltum*, from the solid to the liquid state, but absorbs its latent heat throughout a certain small range of temperature (between 28°·4 and 32° of Fahrenheit), which is precisely that to which the ice of glaciers is actually exposed; that, after all, a glacier is not a crystalline solid, like ice, tranquilly frozen in a mould, but possesses a peculiar fissured and laminated structure, through which water enters (at least for a great part of the year) into its intrinsic composition. He insisted that the quasi-fluid or viscous motion of the ice of glaciers is not a theory but a fact. A substance which is seen to pour itself out of a large basin through a narrow outlet without losing its continuity; the different parts of which, from top to bottom, and from side to centre, possess distinct though related velocities; which moves over slopes inconsistent with the friction between its surface and the ground on which it rests; which surmounts obstacles, and even if cleft into two streams by a projecting rock, instead of being thereby anchored as a solid would necessarily be, reunites its streams below, and retains no trace of the fissure, leaving the rock an islet in the icy flood,—a substance which moves in such a fashion cannot, Forbes maintained, in any true sense of the word, be termed a rigid solid, but must be granted to be ductile, viscous, plastic, or semifluid, or to possess qualities represented by any of these terms which we may choose to adopt as least shocking to our ordinary conception of the brittleness of ice.

The problem of the cause of glacier-motion cannot yet be considered to be satisfactorily solved. One of the most important contributions to the solution of this question was made by Professor James Thomson when he predicted that the freezing point of ice must be lowered by pressure, and when he sought by means of this property to explain the plastic or viscous behaviour of glaciers contended for by Forbes. This prediction was experimentally verified by his brother, Sir W. Thomson. Tyndall subsequently to Forbes's work brought forward an explanation termed the "pressure or fracture and regelation theory." Some experiments of Faraday in 1850 had shown that two pieces of ice with moistened surfaces would if in contact adhere, owing to the freezing of the thin film of water between them, while at a lower temperature than 32°, and with consequently dry surfaces, no adhesion took place. The freezing was obtained even under warm water. Starting from those observations Tyndall was led to make experiments on the effects of compression upon ice, and found that a quantity of pounded ice could be moulded into a compact homogeneous mass. This property possessed by ice of reuniting by pressure after fracture was termed regelation, and was applied by Tyndall in explanation of the motion of glaciers. He maintained that the ice of a glacier is a solid brittle substance, and that its descent down a valley is due to constant rupture produced by the effects of gravitation and to the consequent sliding forward of the mass in which the surfaces of fracture speedily reunite. He pointed more particularly to the ice-falls of glaciers where the ice in passing over a steep descent and undergoing great tension does not yield as a viscous body, but is fractured as a solid. More recently Canon Mosely investigated the physics of glaciers, especially by determining the shearing force of the ice. He found that in a glacier of such a uniform section and slope, moving at such a uniform rate, as the Mer de Glace at Les Ponts, the aggregate resistance offered by the ice to its descent is about 34 times greater than the force of gravitation. He therefore concluded it to be physically impossible that a glacier could slide down its valley by its own weight, and consequently that the gravitation or fracture and regelation theory could not be maintained. The slow descent of sheet lead on a roof of moderate inclination, and its ability even to draw out from the rafters the nails with which it had been fastened, led him to propound another theory of glacier-motion, viz., that it is due to expansion

and contraction caused by changes of solar heat. He contended that the ice, like the lead, is expanded by heat, and that, as it cannot on expansion move up the valley without overcoming the resistance of gravitation as well as of friction, it necessarily moves chiefly downward, in which direction gravitation co-operates. Contraction on the other hand must also tend to send the ice downward, for a larger part will move with the force of gravitation than against it. Dr Croll, objecting to Canon Mosely's views that no observed alternations of glacier temperature warrant the conclusion that the ice can be impelled downward by that cause, has proposed yet another explanation. He regards the motion of the ice of a glacier as molecular, resulting from the very conduction of heat through the mass of the glacier. He conteuds that from the thermal conditions of glacier-ice its molecules will melt before their temperature can be raised. Any given molecule on melting will transmit its extra heat or part of it to the next molecule, which in turn may melt, and thus a wave of thaw will travel through the ice. But as each molecule loses its heat again it freezes, and in the act of solidification exerts an enormous pressure on the walls of the interstice into which while fluid it entered. Hence in proportion to the amount of heat received by it the ice is subjected to great molecular pressure. As the glacier cannot expand laterally on account of the walls of its channel, and as gravitation opposes its expansion up the valley, it necessarily finds relief by a downward movement—the direction in which gravitation co-operates.

See De Saussure's *Voyages dans les Alpes*, § 535; De Charpentier, *Essai sur les Glaciers*, 1841; Agassiz, *Études sur les Glaciers*, 1840, *Système Glaciaire*, 1847; L'Abbé Rendu, "Théorie des Glaciers de la Savoie," in *Mem. Acad. Savoie*, x., 1841, translated by G. Forbes and published 1875; J. D. Forbes, *Travels in the Alps*, 1843, *Norway and its Glaciers*, 1853, and *Occasional Papers on Glaciers*, 1859; Tyndall's *Glaciers of the Alps*, 1857; Mousson's *Gletscher der Jetztzeit*, 1854; Mosely, *Proc. Roy. Soc.*, 1869; Croll, *Climate and Time*, 1875; J. Thomson, *Proc. Roy. Soc.*, 1856–7.

GLADBACH, usually called BERGISCH-GLADBACH, a town of Prussia, circle of Mülheim, government district of Cologne, is situated 8 miles N.E. of the latter town. It possesses an iron foundry, and manufactories of paper, pasteboard, powder, percussion caps, nets, and machinery. Ironstone, peat, and lime are found in the vicinity. The population in 1875 was 7030.

GLADBACH, or MÖNCHEN-GLADBACH, a flourishing and rapidly increasing manufacturing town of Rhenish Prussia, capital of a circle in the government district of Düsseldorf, is situated 16 miles W.S.W. of the town of that name. It is one of the chief manufacturing seats of Rhenish Prussia, its principal industries being the spinning and weaving of cotton, the manufacture of silks, velvet, ribbons, and damasks, and dyeing and bleaching. There are also tanneries, tobacco manufactories, machine works, and foundries. The town possesses a chamber of commerce, a gymnasium, and a female school of the higher grade. There are an Evangelical and three Catholic churches, one of which posssesses a choir of 1250, a nave dating from the beginning of the 12th century, and a crypt of the 8th century. Gladbach existed before the time of Charlemagne, and a Benedictine monastery was founded near it in 972 by Archbishop Gero of Cologne. The population in 1855 was only 4398; but it had increased in 1858 to 13,965, in 1861 to 17,074, in 1871 to 26,354, and in 1875 to 31,962.

GLADIATORS, professional combatants with men or beasts in the Roman arena. That this form of spectacle, which is almost peculiar to Rome and the Roman provinces, was originally borrowed from Etruria is shown by various indications. On an Etruscan tomb discovered at Tarquinii there is a representation of gladiatorial games; the slaves employed to carry off the dead bodies from the arena wore masks representing the Etruscan Charon; and we learn from Isidore of Seville that the name for a trainer of gladiators, *lanista*, is an Etruscan word meaning butcher or executioner. These games are evidently a survival of the practice of immolating slaves and prisoners on the tomb of illustrious chieftains, a practice recorded in Greek, Roman, and Scandinavian legends, and traceable even as late as this century in the Indian suttee. Even at Rome they were for a long time confined to funerals, and hence the older name for gladiators was *bustuarii*; but in the later days of the republic their original significance was forgotten, and they formed as indispensable a part of the public amusements as the theatre or the circus.

The first gladiators are said, on the authority of Valerius Maximus, to have been exhibited at Rome in the Forum Boarium 264 B.C., by Marcus and Decimus Brutus at the funeral of their father. On this occasion only three pairs fought, but the taste for these games spread rapidly, and the number of combatants grew apace. In 174 B.C. Titus Flamininus celebrated his father's obsequies by a three days' fight, in which 74 gladiators took part. Julius Cæsar engaged such extravagant numbers for his ædileship, that his political opponents took fright, and carried a decree of the senate imposing a certain limit of numbers; but notwithstanding this restriction he was able to exhibit no less than 300 couples. During the later days of the republic the gladiators were a constant element of danger to the public peace. The more turbulent spirits among the nobility had each his band of gladiators to act as a body guard, and the armed troops of Clodius, Milo, and Catiline played the same part in Roman history as the armed retainers of the feudal barons or the condottieri of the Italian republics.

Under the empire, notwithstanding sumptuary enactments, the passion for the arena steadily increased. Augustus, indeed, limited the shows to two a year, and forbade a prætor to exhibit more than 120 gladiators, yet allusions in Horace and Persius show that 100 pairs was the fashionable number for private entertainments; and in the Marmor Ancyranum the emperor states that more than 10,000 men had fought during his reign. The imbecile Claudius was devoted to this pastime, and would sit from morning till night in his chair of state, descending now and then to the arena to coax or force the reluctant gladiators to resume their bloody work. Under Nero senators and even well-born women appeared as combatants; and Juvenal has handed down to eternal infamy the descendant of the Gracchi that appeared without disguise as a *retiarius*, and begged his life from the *secutor*, who blushed to conquer one so noble and so vile. Titus, whom his countrymen surnamed the Clement, ordered a show which lasted 100 days; and Trajan, in celebration of his triumph over Decebalus, exhibited 5000 pairs of gladiators. Domitian instituted *venationes* by torchlight, and at the Saturnalia of 90 A.D. arranged a battle between dwarfs and women. Even as late as 200 A.D. an edict was passed forbidding women to fight. How widely the taste for these sanguinary spectacles extended throughout the Roman provinces is attested by monuments, inscriptions, and the remains of vast amphitheatres. From Britain to Syria there was not a town of any size that could not boast its arena and annual games. The following inscription copied from the pedestal of a statue shows the important part they played in provincial life:—"In four days, at Minturnæ, he showed eleven pairs of gladiators, who did not cease fighting till one half, all the most valiant men in Campania, had fallen. You remember it well, noble fellow citizens." After Italy, Gaul, North Africa, and Spain were most famous for their amphitheatres; and Greece was the only Roman province where the institution never took root.

Gladiators were commonly drawn either from prisoners of war, or slaves, or criminals condemned to death. Thus