

heights should not be made when clouds are forming or rain is falling.

Dalton has shown¹ that air charged with vapour is specifically lighter than when it wants the vapour; in other words, the more vapour any given quantity of air has in it the less is its specific gravity; and Sir William Thomson has shown² that the condensation of vapour in ascending currents of air is the chief cause of the cooling effect being so much less than that which would be experienced by dry air. From these ascertained effects of aqueous vapour in modifying the pressure and temperature of the atmosphere, the importance in the barometric measurement of heights of full and accurate observations of the hygrometry of the atmosphere and of the weather will be apparent.

Since the equilibrium of the vapour atmosphere is being constantly disturbed by every instance of condensation, by the ceaseless process of evaporation, and by every change of temperature, and since the presence of oxygen and nitrogen greatly obstructs the free diffusion of the aqueous vapours, it follows that Dalton's law of the independent pressure of the vapour and the dry air does not absolutely hold good. From the constant effort of the vapour to attain to a state of equilibrium there is, however, a continual tendency to approach this state. Since the equal diffusion of the dry air and the vapour is never reached, observations can only indicate local humidity, and therefore as regards any considerable stratum of air can only be regarded as approximate. Though particular observations may often indicate a humidity wide of the mark, yet in long averages a close approximation is reached, except in confined localities which are exceptionally damp or dry. Hence in observations for the determination of heights, the results of a long-continued series of observations should be employed, and those hours should be chosen whose mean is near the daily mean.

The most recent results arrived at by Regnault are the best, but it is to be regretted that the whole subject of the hygrometry, both as regards the methods of observation and the methods of discussing the observations, is still in an unsatisfactory state. This consideration, taken in connection with our defective knowledge of the relation of aqueous vapour to radiant heat, of the mode of its diffusion both vertically and horizontally, and of the influence exerted by its condensation into cloud and rain, and with our ignorance of the merely mechanical effects of ascending, descending, and horizontal currents of air in increasing or diminishing barometric pressure, renders it evident that heights deduced from barometric observations can only be regarded as approximate. It is much to be desired, in stating results, that the limit of error were taken into account, and the nearest round number in accordance therewith should alone be given as the calculated result. Thus, it is a mistake to give as the height of a place 1999 feet when the calculation is based wholly on barometric observations, and the limit of error amounts to 30 feet or more. The height 2000 should be given as the result.

The correction for decrease of gravity at the higher station, or at sea-level, must also be taken into account. Its amount is small, being, roughly speaking, only about 0.001 inch per 400 feet. Since the force of gravity is diminished in proportion to the square of the distance from the centre of gravity, the rate of its decrease with the height varies in different latitudes. * Places at the equator being farther from the earth's centre than places at the poles, it follows that the force of gravity diminishes at a less rapid rate as we ascend at the equator than it does at the poles. Now,

¹ *Meteorological Observations and Essays*, 2d ed., p. 100.
² *Mem. Lit. and Phil. Soc. Manchester*, vol. ii. 3d series, p. 131.

since at the equator gravity diminishes less rapidly with the height, the air at any given height will exert a higher pressure there than anywhere else on the globe at the same height as compared with what it does at the sea-level of the latitude. Hence a subtraction requires to be made at the equator, and the amount to be subtracted diminishes as we proceed into higher latitudes, till it falls to zero at latitude 45°, where the force of gravity is assumed to be the mean. For higher latitudes an addition is required which constantly increases till it reaches the maximum at the poles. This correction is also small, being for 1000 feet less than 0.001 inch in Great Britain, and less than 0.003 at the equator and the poles.

Various formulæ for the barometrical measurement of heights, based on these principles, have been given by Laplace and others, not a few of them being unnecessarily refined and intricate when the real character of the data is taken into consideration. The following formula by Rühlmann³ is given as the simplest and best, being based on the most recent results which have been arrived at:—

$$h = 18400 \cdot 2 \left(1.00157 + 0.003675 \frac{t' + t''}{2} \right) \left(1 + 0.378 \frac{\sigma' + \sigma''}{2} \right) (1 + 0.002623 \cos. 2\phi) \left(1 + \frac{2z + h}{6378150} \right) \log. \frac{b'}{b''} \dots (1)$$

in which *h* is the difference in mètres of level between the two stations; *t'* and *t''* the temperature centigrade of the air at the two stations; *b'* and *b''* the heights of the barometer in millimètres, corrected for temperature and for all instrumental errors; *σ'* and *σ''* the elastic force of vapour; *φ* the mean of the latitudes of the two stations; and *z* the height of the lower station above the sea. Making—

$$A = \log. \left\{ 18400, 2 \left(1.00157 + 0.003675 \frac{t' + t''}{2} \right) \right\},$$

$$C = \log. \left\{ 1 + \frac{0.378}{2} \left(\frac{\sigma'}{b'} + \frac{\sigma''}{b''} \right) \right\},$$

$$D = \log. \left\{ 1 + 0.002623 \cos. 2\phi \right\},$$

$$E = \log. \left\{ 1 + \frac{2z + h}{6378150} \right\}.$$

Rühlmann has calculated the values A, C, D, and E for the different values of the respective arguments, which are given in the tables appended to the work.

From formula (1) we obtain—
 $\log. h = \log. \{ \log. b' - \log. b'' \} + (A + C + D + E) \dots (2)$

It is assumed that the whole stratum of air between the two heights is in a state of rest, and that the means of the temperature and humidity observed at the two stations are the means respectively of the stratum of air between them.

If great accuracy is desired, both barometers must be read from the zeros of their scales, and the observations must be corrected for all merely instrumental errors, and must be made strictly at the same time or times, seeing that a very small error, arising either from imperfect observations, or from their not being comparable, produces a comparatively large error in the calculated results.

In deducing heights from long-continued observations it should be ascertained that the barometers and observations are good, and observations should if possible be used which have been made at the same hours of the day and during the same years. Observations at different hours of the day are not comparable, since, owing to our imperfect knowledge of the differences of daily barometric range, the

³ *Die Barometrischen Höhenmessungen und ihre Bedeutung für die Physik der Atmosphäre*, von Dr. Richard Rühlmann, Leipzig, 1870.

necessity for the application of any so-called corrections for daily range must necessarily lead to error. The comparison should also only be between observations made during the same years, since the means of different years often differ widely from each other. Thus the difference of height between two places at which barometrical observations were made, from 1830 to 1859 and from 1850 to 1869 respectively, could be more accurately ascertained from the ten years' averages from 1850 to 1859 during which observations were made at both places, than from the longer averages of thirty and twenty years. Inattention to this point has often led to error, especially in cases where at one of the places only a few years were available. To secure greater accuracy, the calculations should be made on the mean for the year, the two extreme months, January and July, and that month during which the distribution of pressure is most uniform over the region where the places are situated. Owing to the great differences in the distribution of atmospheric pressure in different parts of the globe (see ATMOSPHERE), comparison of the observations at the higher station with those at more than one lower station is in some cases indispensable. Thus, if it were desired to compute the height of Dovre, in Norway, barometrically, it should be compared both with Christiania and with Christiansund on the west coast; for if compared with Christiania alone the calculated height would be too high, and if with Christiansund too low, the reason being that the mean annual pressure diminishes from Christiania to Christiansund. The same remark applies to a large portion of Hindustan and to many other regions of the globe.

The more special precautions to be taken in deducing heights from one or a few observations, that is, from such data as travellers observe, are these:—that the observations be made in as settled weather as possible, at those hours of the day, at least, at which observations are made at the nearest meteorological stations, and be repeated as long as possible from day to day; that the barometer hang perpendicularly and in shade; and that the observations be not made till the whole instrument has acquired the temperature of the surrounding air. For, for every degree which the temperature indicated by the attached thermometer differs from the temperature of the whole instrument, there is an error of about 0.003 inch.

From their portability and handiness the aneroid barometer, and the thermometer for ascertaining the point at which water boils, are of great use in determining heights,—the thermometer, if properly managed, being the more accurate of the two. Since, owing to the sluggishness with which the aneroid often follows the changes of pressure, especially low pressures, its readings should not be recorded till it has hung for some hours at the place of observation, and if this be not possible, the time which elapsed from arriving at the place and making the observations should be stated. It may not be unnecessary to add that every opportunity which presents itself should be taken of comparing it with a standard mercurial barometer, owing to the variations, irregular or permanent, to which aneroids are subject, and that the instrument should always be read in one position, since the difference between the reading in a horizontal position and the reading in a vertical position is often considerable.

At a pressure of 29.905 inches distilled water boils at 212°. The temperature of the boiling point varies with the nature of the vessel. Thus, if the interior of the glass vessel be varnished with shell-lac, the temperature may rise to 221°; and if iron filings be dropped into the water, the temperature is lowered. But in all these cases the temperature of the vapour arising from the water is as nearly as possible the same. Hence in making observations with the thermometer for hypsometrical purposes, the

instrument is not plunged into the water, but the whole instrument, bulb and stem, are by an apparatus used for the purpose plunged into the vapour arising from the boiling water. The degrees on the thermometer used are greatly enlarged, thus admitting of a minute subdivision of the scale and, consequently, of very precise readings. The following are a few of the barometric heights corresponding to different temperatures at which distilled water boils, taken from Regnault's tables revised by Moritz:—

Boiling Point.	Barometer, Inches.	Boiling Point.	Barometer, Inches.
211	29.331	205	25.990
210	28.751	204	25.465
209	28.180	203	24.949
208	27.618	202	24.442
207	27.066	201	23.943
206	26.523	200	23.453

The temperature of the vapour of the boiling water being observed, the pressure is ascertained from the table, whence the height may be calculated, just as in the case of pressures obtained by means of a mercurial barometer.

The remark made by Sir John Leslie many years ago still holds good, that it is preposterous, in the actual state of physical science, to effect any high refinement in the formula for computing barometrical heights. What is required on the part of the computer of heights from barometrical observations is carefully to weigh the *limits of error* due to the instrument and methods of observations, to the hour of the day and the month of the year (see ATMOSPHERE, p. 28), and to the degree of unsettledness of the weather at the time the observations were made, and to give effect to these in the calculated results. From inattention to these simple considerations a large proportion of important heights given in works of travel and of physical geography are very erroneously stated, and consequently require careful revision.

For very rough approximations to the real height from observations of pressure and temperature, Sir G. B. Airy has prepared a table showing the differences of level corresponding to differences of pressure. It is from this table that the heights corresponding to pressures engraved on many aneroids are usually taken. The heights read off from the pressures should be corrected for observations of temperature carefully taken at the upper and lower stations, the mean of these two observations being assumed as the mean of the stratum of air occupying the interval between the two heights. (A. B.)

BARON. The origin and primary import of this term have been much contested. Menage derives it from the Latin *baro*, a word which we find used in classical Latin to signify "a simple" or "foolish man" (*Cic. Fin.*, ii. 23). Another form of the same word appears to be *varo*, to which Lucilius gives the meaning "a stupid man," "a blockhead," Forcellini observing that its primary sense is "a block of tough, hard wood." But with greater probability Graff derives the word baron from the old German *Bar = Mann, freier Mann*. The word seems related to the Spanish *varon*, which means "a male," "a noble person," and its root may be found in the Sanskrit *vēra*. Like the Greek *ἀνὴρ* and the Latin *vir*, the word *baron* signifies man in general and also a husband—the old legal expression *baron and feme* being equivalent to our ordinary phrase "man and wife."

In modern English usage the term is particularly applied to a member of the lowest order of the peerage, but in ancient records (as Lord Coke observes) the barony included all the (titular) nobility of England, because all noblemen were barons though they might possess a higher dignity also; and the great council of peers, in which were included dukes, marquesses, and earls, as well as barons, was styled simply the "Council de Baronage." In like manner w

speak of the "barons wars," and "the barons" who signed Magna Charta, although nobles of higher rank joined in both, and it is usual in summoning to the Upper House a peer's son in the lifetime of the father to give, for the occasion, a separate existence to the latter's barony.¹ Thus Earl Fortescue sat in the House of Lords during his father's lifetime as baron of Castle Hill, county Devon—the barony held with his father's earldom. The fiction is still maintained when a commoner is raised directly to one of the higher grades of the peerage, as in the case of Admiral Jervis, who was created at the same time Baron Jervis and Earl St Vincent.

The origin and comparative antiquity of barons have been the subject of much research amongst antiquaries. The most probable opinion is that they were the same as our present lords of manors; and to this the appellation of *court-baron*, given to the lord's court, and incident to every manor, seems to lend countenance. The term baron had, therefore, originally a very extensive meaning, being applicable to all tenants-in-chief of the Crown, whether holding by knight service or by grand serjeantry. But the latter only were in the narrower sense the king's barons, and as such possessed both a civil and criminal jurisdiction, each in his *curia baronis*, and were entitled to seats in the great council of the nation. "For," says Sir H. Nicolas, "it was the principle of the feudal system that every tenant should attend the court of his immediate superior; and hence it was that he who held *per baroniam*, having no superior but the Crown, was bound to attend his sovereign in his great council or parliament, which was, in fact, the great court baron of the realm" (*Historic Peerage of England*, ed. Courthope, p. 18). The lesser barons—those, namely, who held by knight service—were also occasionally summoned to parliament, but upon no fixed principles, and "the irregularity of passing over many of them when councils were held for the purpose of levying money, led to the provision in the Great Charter of John, by which the king promises that they shall be summoned through the sheriff on such occasions" (Hallam, *Middle Ages*, iii. 213). Both these classes, but the former especially, might be entitled to the appellation of *Barons by Tenure*; but it is evident that the mere possession of a barony (*i.e.*, thirteen knights' fees and a quarter) did not give its possessor an absolute right to a seat in parliament, and, of course, all such baronies must have been swept away by the Act of 12 Car. II. c. 24, abolishing feudal tenures and whatever depended thereupon. But from the reign of Henry III. (49th year) the barons were summoned to attend the king in council or parliament *by writ*, and thus the dignity ceased to be territorial and became altogether personal. And although the writ, whether addressed to ancient barons or to those who had not before been peers of parliament, contained no words of limitation to the heirs of the person summoned, yet it was laid down by Coke, and has always been accepted, that it ennobles the blood of the person summoned, and that thus the barony becomes heritable by heirs, male or female. A further change by King Richard II. in the 11th year of his reign, when he created John Beauchamp de Holt baron of Kidderminster *by letters patent*, and since that date this mode of conferring the dignity of a baron has been pursued. Dugdale states that the solemn investiture of barons created by patent was performed by the king himself, by enrobing the peer in scarlet, and this form continued till 13 Jac. I., when the lawyers declared that the delivery of the letters patent without ceremony was sufficient. The letters

¹ The practice commenced, as Dugdale states, the 22 Edw. IV., but came into more general use in the latter part of the 17th century. It will be understood that it was designed to "accelerate the possession" of a dignity and not to create a second.

patent express the limits of inheritance of the barony. The usual limit is to the grantee and heirs male of his body; occasionally (as in the case of Lord Brougham) in default of male issue, to a collateral male relative; and occasionally (as in the case of Lord Nelson) to the heirs of a sister. The coronation robes of a baron are the same as those of an earl, except that he has only two rows of spots on each shoulder; and, in like manner, his parliamentary robes have but two guards of white fur, with rows of gold lace; but in other respects they are the same as those of other peers. King Charles II. granted to the barons a coronet, having six large pearls set at equal distances on the chaplet. A baron's cap is the same as a viscount's. His style is *Right Honourable*; and he is addressed by the king or queen, *Right Trusty and Well Beloved*.

Barons of the Exchequer, six judges (a chief baron and five puisne barons) to whom the administration of justice is committed in causes betwixt the king and his subjects relative to matters of revenue. Selden, in his *Titles of Honour*, conjectures that they were originally chosen from among the barons of the kingdom, and hence their name.

Barons of the Cinque Ports (originally Hastings, Dover, Hythe, Romney, and Sandwich) were (prior to 1831) members of the House of Commons, elected by the Cinque Ports, two for each port. Their right to the title is recognized in many old statutes, but in 1606 the use of the term in a message from the Lower House drew forth a protest from the peers, that "they would never acknowledge any man that sitteth in the Lower House to the right or title of a baron of parliament" (*Lords' Journals*). These ports are now under the jurisdiction of a warden.

Baron and Feme, in the *English Law*, a term used for husband and wife, in relation to each other, who are accounted as one person. Hence, by the old law of evidence the one party was excluded from being evidence for or against the other in civil questions, and a relic of it is still preserved in the criminal law.

Baron and Feme, in *Heraldry*, is when the coats-of-arms of a man and his wife are borne per pale in the same escutcheon,—the man's being always on the dexter side, and the woman's on the sinister. But in this case the woman is supposed not to be an heiress, for then her coat must be borne by the husband on an escutcheon of pretence. (C. J. R.)

BARONET, a name originally given to the *lesser barons* mentioned in the preceding article, but now confined to the lowest grade of our hereditary nobility. The order was instituted by King James I. in 1611, at the suggestion of Sir Robert Cotton, to whom the plan had been submitted by Sir Thomas Sherley of Wiston, its actual inventor. Originally, the creation of this order was merely an expedient to raise money, and the cost of a baronetcy in each case amounted to £1095, exclusive of the fees. The money thus raised was professedly destined for the defence and maintenance of the new plantation in the province of Ulster, but it actually passed at once into the king's exhausted exchequer. According to the instructions given to the commissioners appointed for admitting to the new dignity, none were eligible but "men of quality, state of living, and good reputation, worthy of the same, and, at the least, descended of a grandfather (by the father's side) that bore arms, and who have also of certain yearly revenue"—£1000 per annum. The number created at first was 200, and the king engaged for himself, his heirs, and successors, that this should not be exceeded; and for himself also promised that no vacancies in the original number should be filled up. Charles I. disregarded the stipulated limitation, and the original terms have never since been carried out. The first twenty patents issued

were dated 22d May 1611, and begin with that given to Sir Nicholas Bacon (son of the lord keeper) whose descendant still retains the position of premier baronet of England.

Baronets take precedence according to the dates of their patents, conformably to the terms of which no intermediate honour between baron and baronets can be established, and they rank above all knights except those of the Garter. The title or prefix of *Sir* is granted them by a peculiar clause in their patents, and until 1827 they could claim for themselves and the heirs male of their bodies the honour of knighthood. All baronets are entitled to bear in their coats-of-arms, either in a canton or an escutcheon at their choice, the arms of Ulster, *viz.*, a bloody hand.

Baronets of Scotland, called also *Baronets of Nova Scotia*.—This order of knights-baronets was instituted by Charles I. in the year 1625, when the first person dignified with the title was Sir Robert Gordon of Gordonstone, a younger son of the earl of Sutherland. The professed object of the institution was to encourage the plantation and settlement of Nova Scotia in North America; hence the king granted to each of them a certain portion of land in that province, which they were to hold of Sir William Alexander, afterwards earl of Stirling, with precedence to them and their heirs-male for ever, before all knights called *equites aurati*, all lesser barons called *lairds*, and all other gentlemen, except Sir William Alexander, his Majesty's lieutenant in Nova Scotia, his heirs, their wives and children. It was further provided that the title of *Sir* should be prefixed to their Christian name, and *Baronet* added to their surname, and that their own and their eldest sons' wives should enjoy the title of *Lady, Madam, or Dame*. The baronets of Scotland had assigned to them as an addition to their armorial bearings the ensign of Nova Scotia, *viz.*, argent, a cross of St Andrew, azure, to be borne in a canton or in escutcheon; but in 1629, after Nova Scotia was sold to the French, this privilege was changed into permission to wear a badge about their necks pendent from an orange-tawny silk ribbon.

Malone has given the following curious note upon this subject, in his learned *Life of Dryden*, prefixed to his edition of the prose works of that writer:—

"When the order of baronets was first established in 1611, King James engaged that they should not exceed two hundred. However, towards the close of his reign, that number being completed, and the creation of baronets being found a useful engine of Government (the courtier by whose influence the title was obtained receiving usually £1000 for the grant), it was not lightly to be parted with. A scheme, therefore, of creating *Baronets of Scotland* was devised, which, it was conceived, would be no infraction of the original compact to confine the grants to a limited number; and as the English baronets were created under the great seal of England, for the reduction of Ulster in Ireland, so the Scottish baronets were created under the great seal of Scotland, for the reduction of Acadia, or Nova Scotia. The scheme, however, was not carried into execution by King James; but early in the reign of his successor several Scottish baronets were made. From this statement it appears that there is no more necessity for calling a baronet created under the great seal of Scotland (whether he be an Englishman or Scotchman), a *Baronet of Nova Scotia*, than there is to denominate one created under the great seal of England a *Baronet of Ulster*."—(Malone's *Dryden*, vol. i. pp. 28, 29.)

After the Union with England in 1707 the baronets of Scotland charged their arms with the Ulster badge, being created as baronets of the United Kingdom.

Baronets of Ireland.—This order was likewise instituted by King James I. in the 18th year of his reign, for the same purpose and with the same privileges within the kingdom of Ireland as had been conferred on the analogous order in England; for which also the Irish baronets paid the same fees into the treasury of Ireland. (C. J. R.)

BARONIUS, CESAR, the great church historian, was born on the 31st October 1538 in the district of Naples. His parents, Camillo de Barono or Baronio and Porcia

Trebonia, were of noble birth. He was educated at Veroli and Naples, where his favourite studies were theology and jurisprudence. In 1557 he accompanied his father to Rome, and found himself in the midst of the reactionary enthusiasm which did much to restore Italy, in spite of the efforts of her reformers, to the papal authority. There he was brought in contact with Philip Neri, a man who then and since has done much to reconcile the speculative student with the Church of Rome, and to provide for him work in her service to which he can give his whole heart. Neri had just founded the Italian Oratory, the model of many another, and he and his monks had vowed to devote themselves to student lives, and to dedicate their whole power of study to the Roman Catholic Church. Among the theological studies pursued in the oratory, church history and ecclesiastical biography held a prominent place, the greater part of every forenoon being set apart for these subjects. In this small congregation Baronius found a congenial home, and his superior, Philip Neri, soon saw that he had secured a coadjutor who would make his oratory all he had hoped it would become. The alarm caused by the first Protestant church history, the *Magdeburg Centuries*, gave his studies a special direction, and, as he told Pope Sixtus V., he was urged by his own desires, and the encouragement of Neri, to attempt to answer the *Annales Ecclesiastici*, his great work, which occupied thirty laborious years. These *Annales*, the first and in many respects the most important historical work which the Roman Catholic Church has produced, begin with the birth of Christ and end with the year 1198. The book is not properly history; it is annals rather, as everything is subordinated to chronology. The year is first given, then the reigning Pope and the year of his reign, then the emperors of the East and West, and, after its institution, the name and year of the emperor of the Holy Roman empire. This chronological form had one advantage—theology was kept as much as possible in the background, and the facts of history were the most important part. The *Annales* have thus become very important to every student of church history whether Protestant or Roman Catholic. While Baronius was engaged in his great work he was encouraged by several marks of papal favour. He was named pronotarius of the papal chair; in 1596 he was elected a cardinal; and he was afterwards chosen to fill the much-coveted post of librarian of the Vatican. He died on the 30th of June 1607. The best and most useful edition of his works is that of Mansi, in 38 vols. fol.; it gives Pagi's *critica historico-theologica*, or corrections of Baronius, at the foot of each page. The best text is the Antwerp edition of 1610.

BARQUISIMETO, a city of Venezuela, and since 1830 the capital of the province of Nueva Segovia, is situated on a confluent of the Portuguesa, which belongs to the northern part of the Orinoco system. The surrounding district is fertile, and produces excellent coffee, cocoa, and sugar; and the climate is healthy and pleasant. Barquisimeto was founded in 1522 by Juan de Villegas, principally for the exploration and working of gold-mines supposed to exist in the neighbourhood; and at first it received the name of Nueva Segovia in honour of his native city. The commercial advantages of its situation soon raised it to considerable prosperity. In 1807 it had about 15,000 inhabitants; but on the 26th of March 1812, it was totally destroyed by an earthquake. It has since been regularly rebuilt, and, in spite of the disastrous effects of the revolutionary wars, has recovered its position. Among its public buildings may be mentioned a college and several schools. The inhabitants are partly engaged in the rearing of horses and mules. Population in 1873, 25,664.

BARR, a town in Alsace, 18 miles S.W. of Strasburg, situated on the eastern slope of the Vosges, at the mouth of the Ulrichthal. Wool and cotton spinning, and the manufacture of pottery, crystal, and soap, are its principal industries; and an active trade is carried on in wine, brandy, vinegar, cattle, and wood. The town is mentioned as early as the 8th century. It was burned by the troops of the Cardinal of Lorraine in 1592; in 1678 it suffered from a severe conflagration; and in 1794 it was greatly damaged by the explosion of the arsenal. There is a tepid mineral spring in the neighbourhood, and, on the Odilienberg, which rises above the town, are the ruins of the convent of St Odilia, which was founded in the 7th century. Population, 5651.

BARRA, or **BARRAY** (from the Scandinavian *Baraey*, isle of the ocean), one of the Hebrides or Western Isles of Scotland, forming part of Inverness-shire. It lies about 5 miles S.W. of South Uist, and is 8 miles in length by from 2 to 4 miles in breadth. The parish comprehends a number of smaller islands and islets,—Berney, Flodday, Fluda, Hellisay, Mingalay, Watersay, &c.,—and is estimated to contain 4000 acres of arable land, and 18,000 of meadow and hill pasture. The cod, ling, and herring fisheries are considerable; and the coasts abound with shell-fish, especially cockles, which have sometimes afforded food to the inhabitants in times of famine. On Barra Head, the highest point of Berney, is a lighthouse with an intermitting light 680 feet above high water, in lat. 56° 48' N., long. 7° 38' W. There are several remains of interest in the island of Barra, as the churches at Kilbar, the castle of the M'Neils at Kishmul, "Danish" forts and "Druidical" circles. Population of island (chiefly Gaelic-speaking Roman Catholics) in 1871, 1563; of the parish, 1753.

BARRACKPUR, a magisterial subdivision and town of British India, in the district of 24 Parganas, under the Lieutenant-Governor of Bengal. Barrackpur subdivision was formed in 1858. It consists of the single police circle of Nawabganj, and contains an area of 42 square miles, with 51 villages, 16,057 houses, and a total population of 68,629, of whom 47,709, or 69.5 per cent., are Hindus; 19,600, or 28.6 per cent., are Mahometans; 1281, or 1.9 per cent., are Christians; and 39 are of other religions. Proportion of males to total population, 52.2 per cent.; persons per square mile, 1626; villages per square mile, 1.21; persons per village, 1346; houses per square mile, 380; persons per house, 4.3. In 1870-71 the subdivision contained one magistrate's court, with a regular police of 195, and a village watch of 38 men. The separate cost of administration amounted to £2101.

BARRACKPUR TOWN and **CANTONMENT**, situated on the Húglí, 15 miles above Calcutta, in 22° 45' 40" N. lat., and 88° 23' 52" E. long.; area, 889 acres, or 1.39 square miles. Population, according to the experimental census of 1869—males, 5730; females, 2914; total, 8644. Population, as ascertained by the general census of 1872:—Hindus—males, 3207; females, 1745; total, 4952; Mahometans—males, 1987; females, 1561; total, 3548; Christians—males, 766; females, 297; total, 1063; others—males, 21; females, 7; total, 28. Total of all denominations—males, 5981; females, 3610; total in 1872, 9591. Municipal income in 1872, £235, 9s. 6d.; expenditure, the same; taxation, 5½d. per head. Major Smyth says in his *Survey Report of the 24 Parganas District* (1857):—"The natives call it 'Chának,' from the circumstance of Job Charnock, the founder of Calcutta, having erected a bungalow and established a small bazaar there [in 1689]. Troops were first stationed there in 1772, from which time it has acquired the name of Barrackpur. The cantonment is situated on the left bank of the Húglí; it has also a large bazaar and several large tanks, and also a parade ground.

There are usually four regiments of Native infantry cantoned in the lines. To the south of the cantonment is situated the park, created by the taste and public spirit of Lord Wellesley. Within the park is situated the Government House, a noble-looking building, commenced by Lord Minto, and enlarged into its present state by the Marquis of Hastings. The park is beautifully laid out, and contains a small menagerie." Its most interesting feature is now Lady Canning's tomb. Within the last few years commodious two-storied brick barracks have been constructed for the British troops, and have materially added to the health and comfort of the soldiers. The military bazaar is situated a short distance from the Sepoy lines, and is carefully supervised by the authorities. The military force stationed in the cantonment, on the 1st March 1873, was as follows:—English troops, 18 officers, and 395 non-commissioned officers and rank and file; Native, 12 English and 21 Native officers, with 877 non-commissioned officers and men; total of all ranks, European and Native, 1323.

Barrackpur played an important part in the two Sepoy mutinies of 1824 and 1857, but the details of these belong to the general history of British rule in India.

BARRACKS are groups of buildings constructed for the accommodation of soldiers. The word, which was formerly spelt "baracks" or "baragues," is derived from the Spanish "barracas," meaning the little huts or cabins used by the fishermen on the sea-shore, or for soldiers in the field. The French call them "casernes," meaning lodgings for soldiers. Barracks of a temporary character, commonly called "huts," have ordinarily been constructed by troops on a campaign as winter quarters, or when for any length of time in "standing camp,"—they being accommodated when in the field under other circumstances in tents, or else, if not provided with tents, bivouacking without cover.

In time of peace barracks were formerly only provided for troops in fortified places termed "garrisons," soldiers elsewhere being provided with quarters by being billeted on public-houses. The apprehension of disturbances, and risk of the troops being too much mixed up with the populations of the localities in which they might be stationed, mainly led to the construction of barracks in or near towns in England about the year 1792. In the first instance the Deputy-adjutant-general was charged with the building and fitting up of barracks. In 1793 the same officer was appointed "Superintendent-general of barracks," and subsequently "Barrack-master-general." In 1806 the barrack establishment was placed under the direction of a board of four commissioners, of whom one was generally a military man. About the year 1825 the duke of Wellington arranged for the construction and maintenance of barracks to be given over to the corps of Royal Engineers. The custody and equipment of barracks, with the supply of fuel and light to the troops quartered in them, were then made and remained, until recently, the duty of the "barrack department," which consisted of barrack-masters and barrack-sergeants.

The duties connected with barracks in the British service are now arranged as follows:—

Construction, maintenance, and supply of fixtures; also custody if dismantled.....	} Royal Engineer Department.
Equipment with supplies of all kinds, giving and taking over; also custody when furnished but unoccupied.....	
Distribution of troops to barracks	Q. M. General's Department, under the orders at headquarters of the Field-Marshal Commanding-in-Chief, and in districts or at foreign stations of the General Officer Commanding.

The duties connected with the construction of barracks are under the supervision of the Inspector-general of Fortifications, who is also Director of Works to the War Department. He is assisted in these duties by a Deputy and two Assistant-directors of Works, and a professional staff.

The arrangement and composition of barracks vary according to the arm of the service to be accommodated in them; thus for the cavalry, horse and field artillery, Royal Engineer train, and transport branch of the army service corps, stables are required; and it is usual to provide for the unmarried non-commissioned officers and men over their horses, a troop of cavalry or a division of field artillery being placed in a separate block of two stories in height. Horse and field artillery also require gunsheds and workshops for artificers, such as collarmakers, wheelers, &c. All mounted troops require forge and shoeing accommodation as well as saddlers' shops. Garrison artillery and companies of Royal Engineers can be accommodated in similar barracks to those for infantry, but the latter require an ample provision of workshops for artificers, with store accommodation for materials, &c.

Not fifty years since, in the West Indies, men slept in barracks in hammocks touching each other, only 23 inches of lateral space being allowed for each man. At the same time in England the men slept in wooden beds, with two tiers, like the berths of a ship, and not unfrequently each bed held four men. Now, each soldier has an iron bedstead which turns up in the middle, forming a seat for the day-time, and only two rows of beds are allowed in barrack-rooms, and the principle of providing one window for every two beds is carried out in all new barracks.

The best size for a barrack-room is now considered to be 60 or 62 feet long, by 20 feet wide, and about 12 feet high. The number of men each room is to contain is painted on the door; and in barracks of modern construction each barrack-room has attached to it—

- (1.) A small (single) sergeant's room, with fire-place, cupboard, and small window looking into the men's room.
- (2.) An ablution room, with basins, water-taps, and a fixed pan in which the feet can be washed.
- (3.) A night urinal, with water for flushing laid on.

Barracks are washed once a week, and on intermediate days the rooms are dry-scrubbed. The walls and ceilings are limewashed by the troops twice a year. The general periodical painting of all barrack buildings is performed twice externally and once internally in every eight years. Formerly, barrack buildings were placed on very limited areas, and even a whole regiment was lodged in one house built in the form of a square, with the quarters of the officers on one side for the better supervision of the men; but the Barrack and Hospital Improvement Commission recommended that the men should be divided in numerous detached buildings, so placed as to impede as little as possible the movement of air and the action of the sun's rays.

For barracks, as a general rule, buildings of two stories in height are preferred to those of three stories, but three-story buildings may be adopted where space is limited and land very costly. Buildings of two stories are less expensive than those of only one story in height, and the general arrangement, when the former mode of construction is adopted, is more compact. The selection of a site for a barrack requires great care and circumspection. This duty is performed in the first instance by the Commanding Royal Engineer of the district, or an officer appointed by him; but the ground proposed is also reported on by an Army medical officer as well as subsequently by the General Officer commanding the district, the final approval resting with the Secretary of State for War.

The following important points have to be considered in the selection of a site, viz.—(1.) That the ground is suitably situated; (2.) That it is sufficient for the number and nature of troops to be placed in the barracks; (3.) That it is not commanded by higher ground within range of rifle fire; (4.) That the subsoil is good and healthy; (5.) That water can be easily obtained for drinking, washing, and cooking; (6.) That drainage and sewerage can be carried out; (7.) That gas can be laid on.

A barrack should not as a rule be placed in the midst of a populous town, nor should it be too far distant from one. If in the midst of a town it would not be likely to be healthy or well placed in respect to keeping up discipline; if too far off the men quartered in it may become dissatisfied with the service. A barrack should be surrounded with a defensible wall; there should be as few entrances as possible, and these should be provided with strong, well-barred gates.

In the new barracks now under construction for brigade depôts, the armouries are generally placed in defensible "keeps," the outer or boundary walls being flanked by *caponnières*. In arranging the position of buildings on a design for a barrack, the axis of each of those intended for occupation by troops should be north and south, so as to allow the sun's rays to fall on both sides. One building should in no case obstruct the light from another. The distance of buildings should not be less than their own height from each other. The position selected for any new building or buildings in an existing or a proposed barrack is reported on by a board of officers, consisting of the head of the department, officer commanding a regiment, or other responsible officer who is to occupy the building when erected, an officer not under the rank of captain, and the commanding Royal Engineer or other engineer officer, a medical officer attending to advise the board. On the completion of a new building or barrack, it is also reported on by a board of officers before being taken over for occupation.

In 1854-55 public attention was called to the necessity for sanitary improvement in the barracks belonging to Great Britain, and an inquiry was instituted by the Barrack and Hospital Improvement Commission, which was succeeded by the Army Sanitary Committee. The result of the inquiries so made has been a great improvement of the quarters of the troops, which has tended largely to decrease the sickness previously prevalent among them.

The principal improvements have been as follows, viz.—At least 600 cubic feet, and from 56 to 60 superficial feet, are now allotted to every single non-commissioned officer and man in permanent barracks, it being considered as important that a soldier should have his full ration of air as of food. In wooden huts 400 cubic feet are reckoned sufficient. At least 1000 cubic feet are allotted to every single non-commissioned officer and man in hot climates. About 1600 cubic feet are allotted to every horse, and since the introduction of ventilation, as well as proper sanitary arrangements in stables, glanders have almost entirely disappeared from the army. Married non-commissioned officers and men have special accommodation, with one or two rooms each, according to the size of the rooms or rank of the occupant. In the latest buildings small washing-rooms have been provided, in addition to two rooms for each family. A laundry and infant school are provided for every compound of married soldiers' quarters. The principal medical officer is now charged with seeing that the regulations for protecting the health of troops in barracks are carried out. Each regimental medical officer has also to see to this matter, as well as that every soldier has a separate bed; that the beds are placed at a proper distance from the wall, and are well aired; and that the windows are opened every morning. Barrack-rooms are warmed in two ways, viz., by radiant heat from an open fire, and by warm air obtained from an air chamber behind, and heated by the fire. Much attention has been paid of late years to the improvement of the means of cooking the meals of soldiers. Either steel boilers and Deane's ovens or "Warren's" apparatus are now ordinarily provided for this purpose. Every headquarter barrack now has a gymnasium and also a chapel school, as well as a sergeants' mess establishment. Besides a canteen with