

candidus or *melanopterus* of modern writers, and belongs to the group *Limicola*, having been usually placed in the Family *Scolopacidae*, though it might be quite as reasonably referred to the *Charadriidae*, and, with its allies to be immediately mentioned, would seem to be not very distant from *Hematopus*, notwithstanding the wonderful development of its legs and the slenderness of its bill.

The very peculiar form of the Stilt naturally gave Buffon occasion (*Hist. Nat. Oiseaux*, viii. pp. 114-116) to lament the shortcomings of Nature in producing an animal with such "enormous defects," its long legs in particular, he supposed, scarcely allowing it to reach the ground with its bill. But he failed to notice the flexibility of its proportionately long neck, and admitted that he was ill-informed as to its habits. No doubt, if he had enjoyed even so slight an opportunity as occurred to a chance observer (*Ibis*, 1859, p. 397), he would have allowed that its structure and ways were in complete conformity, for the bird obtains its food by wading in shallow water and seizing the insects that fly over or float upon its surface or the small crustaceans that swim beneath, for which purpose its slender extremities are, as might be expected, admirably adapted. Widely spread over Asia, North Africa, and Southern Europe, the Stilt has many times visited Britain—though always as a straggler, for it is not known to breed to the northward of the Danube valley,—and its occurrence in Scotland (near Dumfries) was noticed by Sibbald so long ago as 1684. It chiefly resorts to pools or lakes with a margin of mud, on which it constructs a slight nest, banked round or just raised above the level so as to keep its eggs dry (*Ibis*, 1859, p. 360); but sometimes they are laid in a tuft of grass. They are four in number, and, except in size, closely resemble those of the OYSTERCATCHER (vol. xviii. p. 111). The bird has the head, neck, and lower parts white, the back and wings glossy black, the irides red, and the bare part of the legs pink. In America the genus has two representatives, one¹ (fig. 1) closely resembling that just described, but rather smaller and with a black crown and nape.

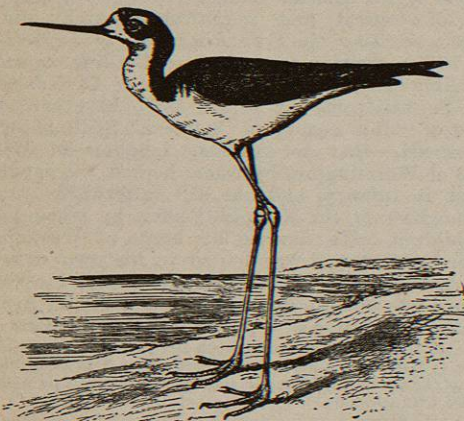


FIG. 1.—Black-Necked American Stilt. (After Gosse.)

This is *H. nigricollis* or *mexicanus*, and occurs from New England to the middle of South America, beyond which it is replaced by *H. brasiliensis*, which has the crown white. The Stilt inhabiting India is now recognized to be *H. candidus*, but Australia possesses a distinct species, *H. novæ-hollandiæ*, which also occurs in New Zealand, though that country has in addition a species peculiar to it, *H. novæ-zelandiæ*, differing from all the rest by assuming in the breeding-season an altogether black plumage. Australia, however, presents another form, which is the type of the genus *Cladorhynchus*, and differs from *Himantopus* both in its style of plumage (the male having a broad bay pectoral belt), in its shorter tarsi, and in having the toes (though, as in the Stilt's feet, three in number on each foot) webbed.

Allied in many ways to the Stilts, but differing in many undeniably generic characters, are the birds known as Avosets,² forming the genus *Recurvirostra* of Linnæus.

¹ This species was made known to Ray by Sloane, who met with it in Jamaica, where in his day it was called "Longlegs."

² This word is from the Bolognese *Avosetta*, which is considered to be derived from the Latin *avis*—the termination expressing a diminutive of a graceful or delicate kind, as *donnetta* from *donna* (Prof. Salvadori in *epist.*).

Their bill, which is perhaps the most slender to be seen in the whole Class, curves upward towards the end, and has given the oldest known species two names which it formerly bore in England,—"Cobbler's-awl," from its likeness to the tool so called, and "Scoop," because it resembled the scoop with which mariners threw water on their sails. The legs, though long, are not extraordinarily so, and the feet, which are webbed, bear a small hind toe.

This species (fig. 2), the *R. avocetta* of ornithology, was of old time plentiful in England, though doubtless always restricted to certain

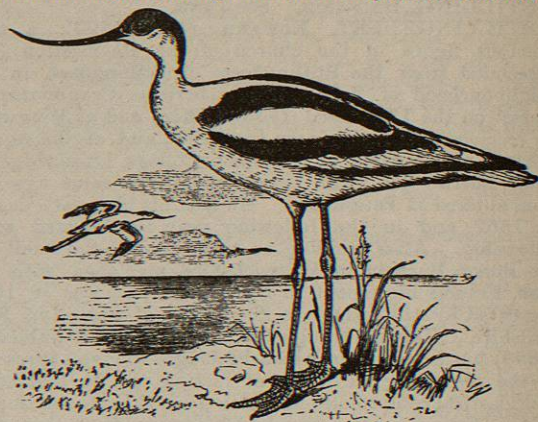


FIG. 2.—Avoset. (After Naumann.)

localities. Charleton in 1668 says that when a boy he had shot not a few on the Severn, and Plot mentions it so as to lead one to suppose that in his time (1686) it bred in Staffordshire, while Willughby (1676) knew of it as being in winter on the eastern coast, and Pennant in 1769 found it in great numbers opposite to Fosslyke Wash in Lincolnshire, and described the birds as hovering over the sportsman's head like Lapwings. In this district they were called "Yelpers" from their cry,³ but whether that name was elsewhere applied is uncertain. At the end of the last century they frequented Romney Marsh in Kent, and in the first quarter of the present century they bred in various suitable spots in Suffolk and Norfolk,—the last place known to have been inhabited by them being Salthouse, where the people made puddings of their eggs, while the birds were killed for the sake of their feathers, which were used in making artificial flies for fishing. The extirpation of this settlement took place between 1822 and 1825 (cf. Stevenson, *Birds of Norfolk*, ii. pp. 240, 241).⁴ The Avoset's mode of nesting is much like that of the Stilt, and the eggs are hardly to be distinguished from those of the latter but by their larger size, the bird being about as big as a LAPWING (vol. xiv. p. 308), white, with the exception of its crown, the back of the neck, the inner scapulars, some of the wing-coverts and the primaries, which are black, while the legs are of a fine light blue. It seems to get its food by working its bill from side to side in shallow pools, and catching the small crustaceans or larvæ of insects that may be swimming therein, but not, as has been stated, by sweeping the surface of the mud or sand—a process that would speedily destroy the delicate bill by friction. Two species of Avoset, *R. americana* and *R. andina*, are found in the New World; the former, which ranges so far to the northward as the Saskatchewan, is distinguished by its light cinnamon-coloured head, neck, and breast, and the latter, confined so far as known to the mountain lakes of Chili, has no white in the upper parts except the head and neck. Australia produces a fourth species, *R. novæ-hollandiæ* or *rubricollis*, with a chestnut head and neck; but the European *R. avocetta* extends over nearly the whole of middle and southern Asia as well as Africa.

A recent proposal (*Ibis*, 1886, pp. 224-239) to unite the Avosets and Stilts in a single genus seems to have little to recommend it but its novelty, and will hardly meet with acceptance by systematists. (A. N.)

³ Cf. "Yarwhelp" (GODWIT, vol. x. p. 720) and "Yaup" or "Whaup" (CURLEW, vol. vi. p. 711). "Barker" and "Clinker" seem to have been names used in Norfolk.

⁴ The same kind of lamentable destruction has of late been carried on in Holland and Denmark, to the extirpation probably of the species in each country.

STIRLING, a midland county of Scotland, is bounded N. by Perthshire, N.E. by Clackmannan and the Firth of Forth, S.E. by Linlithgowshire, S. by Lanarkshire and a detached portion of Dumbartonshire, and S.W. and W. by Dumbartonshire. In the north-east there are two isolated portions,—one forming the parish of Alva, bounded partly by Clackmannan and partly by Perthshire, and the other forming part of the parish of Logie and bounded by Perthshire. The outlines of the main portion are extremely irregular, the boundary on the north following for the most part the windings of the Forth, while on the west it passes through the middle of Loch Lomond, and on the south coincides to a considerable extent with various streams. The extreme length of the county from north-west to south-east is about 45 miles, and the greatest breadth from north to south about 18 miles. The land area is 286,338 acres, and the total area 298,579 acres, or about 466 square miles. Apart from the district round Loch Lomond, the principal charm of the scenery of Stirlingshire is in the views of the valley of the Forth with the winding river, and for background the distant peaks of the Grampians, or the nearer ranges of the Ochils, which encroach on the north-eastern corner and detached sections of the county. The valley of the Forth runs along nearly the whole of the northern border, widening towards the east. The centre of the county from north-east to south-west is occupied by the broad irregular ranges of the Lennox Hills, which are known under four different names, according to the parishes in which they are principally situated,—the Gargunchock Hills (attaining a height of 1591 feet), the Fintry Hills (1676), the Kilsyth Hills (1393), and the Campsie Fells (1894). Nearly the whole of the county to the north-east of Loch Lomond is occupied by a spur of the Grampians, reaching in Ben Lomond a height of 3192 feet. Besides Loch Lomond, situated partly in Dumbartonshire, and Loch Katrine, which bounds the county at its north-western corner, the principal lakes are Loch Arkel to the south of Loch Katrine, Loch Coulter, in the south of St Ninians parish, Loch Ellrig in Falkirk parish, and Black Loch partly in Lanarkshire. The river Forth, from its junction with the Kelty near Gartmore, forms the northern boundary of the county, except where it bounds on the north the part of Kippen parish which is in Perthshire and separates a portion of Lecropt parish from that of St Ninians and a portion of Logie from that of St Ninians and Stirling. It receives from the north the Teith, which touches the county at Lecropt parish, and the Allan, which separates the parishes of Lecropt and Logie, and from the south the Boquhan burn, the Touch burn, and the Bannock burn. The Carron water flows eastwards from the Fintry Hills to the Firth of Forth at Grangemouth. On the south there are a number of streams which form at various places the boundary of the county,—the Endrick water flowing westwards from the Fintry Hills to Loch Lomond, the Kelvin from near Kilsyth flowing south-westwards to the Clyde, and the Avon from Lanarkshire flowing north-eastwards to the Firth of Forth. The Forth and Clyde Canal crosses the south-eastern corner of the county from Castlecary to Grangemouth.

The whole of the district to the north of Loch Lomond is occupied by the crystalline schists of the Highlands, which, by the existence of a great fault, are connected on the east with the Old Red Sandstone, which occupies the broad valley between the base of the Highland hills and the chain of the Ochils. These latter heights, portions of which are included in detached areas of the county, consist of volcanic rocks associated with the Old Red Sandstone (see vol. x. p. 343). The Lennox Hills in the centre of the county are formed by volcanic rocks of Carbonifer-

ous age resting on strata of red and white sandstone (see vol. x. p. 346). The lower grounds are deeply buried under glacial drifts, and conspicuously marked by broad terraces that represent former sea-margins. On one of these, at a height of 50 feet above the present sea-level, lies the Carse of Falkirk. Another stands at an elevation of about 100 feet. There are saline mineral springs at Bridge of Allan.

The coalfield runs obliquely along the south-east of the county, the principal seams being in Denny, Kilsyth, Larbert, Falkirk, and Slamannan parishes. Ironstone, fire-clay, and oil-shale are also found. Limestone is extensively wrought in the Campsie district, and there are a number of sandstone quarries in various parts of the county. The total output of coal in 1884 was 1,182,891 tons, of ironstone 75,351 tons, of fireclay 15,872, and of oil-shale 4535.

Agriculture.—According to the landowners return of 1872-73 the land was held by 4257 proprietors, possessing 284,751 acres, at an annual valuation of £521,407, an average value all over of £1, 16s. 3½d. Of the proprietors 3409 possessed less than one acre. The following possessed over 5000 acres each:—Duke of Montrose, 68,878; William Forbes, 13,041; Rear-admiral Sir William Edmonstone, 9778; Hon. Mrs. Margaret Lennox, 7606; Alex. Graham Speirs, 7172; W. C. G. Bontine, 6931; Lieutenant-Col. John Murray, 6813; Sir Alex. C. R. Gibson-Maitland, 6023; Henry Fletcher Campbell, 5679; and James Johnstone, 5340. The two arable soils of Stirlingshire are distinguished locally as carse and dryfield, the remainder of the county being occupied by mountain pasture land, moor, and moss. The Carse of Stirling extends along the banks of the Forth from Buchlyvie to the eastern extremity of the county,—a length of about 28 miles, with a breadth varying from 1 to 4 miles, the total area being about 30,000 acres. The carse soil consists of the finest clays, without stones, but interspersed with strata of marine shells. It has been partly reclaimed from superincumbent peat moss, of which there are still considerable areas adjoining it. It requires a great deal of labour, but, by means of draining, subsoil ploughing, and the use of lime, has been rendered one of the most fertile soils in Scotland, being specially well adapted for wheat and beans. The dryfield occupies the slopes of the hills above the carse and the valleys in the interior of the county, which constitute the more fertile portions; the crops for which it is best suited being potatoes and turnips. A great part of the dryfield has been reclaimed from moor within the present century. The Lennox Hills, occupying about a fourth of the total area of the county, form one of the most valuable tracts of pasture land in Scotland. The following table gives a classification of the holdings in 1875 and 1885:—

	50 acres and under.		50 to 100 acres.		100 to 300 acres.		300 to 500 acres.		500 to 1000 ac.		Above 1000 ac.		Total.	
	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.		
1875	789	13,130	382	28,493	329	52,080	29	10,411	7	4299	1	1418	1637	109,831
1885	725	12,550	363	27,876	370	59,418	28	10,325	5	3489	1	1418	1492	113,076

According to the agricultural returns for 1886, out of a total of 295,285 acres 115,477, or nearly 39 per cent., were arable land, the area under corn crops amounting to 29,306 acres, under green crops to 8752, rotation grasses 30,664, permanent pasture 45,232, flax 15 and fallow 1508. Oats, the principal corn crop, occupied 19,662 acres, wheat 2065 acres (a decrease of about one half within twenty years), barley 4297 acres, rye 30, beans 3221, and pease 31. Of green crops the principal are potatoes (3500 acres) and turnips (4623 acres). Considerably more than half of the arable area is occupied by rotation grasses and permanent pasture, and their acreage is constantly increasing, which is sufficiently accounted for by the steady increase in the numbers of sheep and cattle. The number of horses in 1886 was 4616, of which 3176 were used solely for purposes of agriculture, and 1440 were unbroken horses and mares kept solely for purposes of breeding. The Clydesdale breed are in general use on the larger farms. Cattle in 1886 numbered 29,422, of which 10,745 were cows and heifers in milk or in calf, and 8684 were other cattle two years old and above. Butter-making is largely practised on the dryfield farms, the Ayrshire being the principal breed of cows, but cattle-feeding is also an important industry, for which Irish cattle and cross breeds are frequently bought, a considerable number of shorthorns being also reared. Sheep, chiefly blackfaced, for which there is extensive pasturage on the Lennox Hills and the slopes of the Grampians, numbered 109,897 in 1886, and pigs 1775.

Though, as is evident from the remains of trees in the mosses, an extensive district of the county was at one time occupied by forest, it is now comparatively devoid of timber, the area under woods in 1881 being only 12,483 acres. There is a natural tendency to the growth of birch on the lower slopes of the mountains in the parishes

of Buchanan and Drymen, and oaks grow extensively on the borders of Loch Lomond. Larch and Scotch firs principally occupy the modern plantations in the other parts of the county. In 1886 there were only 31 acres under orchards, 27 under market gardens, and 53 under nursery grounds.

Manufactures.—The Carron ironworks, founded in 1760, for a long time led the van in British iron manufacture, and are still among the most extensive in the kingdom. The Falkirk ironworks, founded in 1819, are the next to them in importance in the county, but there are many others in the same district. The woollen manufacture is next to iron in importance. It includes carpets, tartans, shawls, and tweeds, the principal seats of the industry being Alva, Bannockburn, Cambusbarrow, and Stirling. Calico printing is carried on in the western part of the county, especially at Campsie and Milngavie. There are chemical works at Stirling, Falkirk, Denny, and Campsie. Throughout the county there are a considerable number of breweries and distilleries. At Grangemouth, the principal port in the county, shipbuilding is carried on.

Administration and Population.—Stirling is included with Dumbarton and Clackmannan in the same sheriffdom, but has two sheriff-substitutes, who sit at Stirling and Falkirk respectively, and there are prisons in both towns. The high court of justiciary holds circuit courts at Stirling. There are 21 entire civil parishes within the county and parts of 5 others. Stirling (population 12,194) is a royal and police burgh, Falkirk (13,170) a police burgh and burgh of regality, Kilsyth (5405) a police burgh and burgh of barony, and Alva (4961), Bridge of Allan (3005), Denny and Dunipace (4080), Grangemouth (4424), and Milngavie (2636) police burghs. In addition to these the following places had each upwards of 2000 inhabitants: Bannockburn (2549), Lennoxton (3249), and Stenhousemuir (2617). From 39,761 in 1765 the population of the county had by 1801 increased to 50,825, by 1831 to 72,621, by 1861 to 91,926, by 1871 to 98,176, and by 1881 to 112,443, of whom 56,147 were males and 56,296 were females. The number of persons to the square mile is 251, and in point of density Stirling ranks ninth among the counties of Scotland. One member is returned to parliament by the county, and Stirling and Falkirk are members of separate districts of burghs, which are respectively named from them, each returning one member.

History.—In 81 A.D. the Romans under Agricola penetrated as far north as the firths of Clyde (Clota) and Forth (Bodotria). To secure their conquests they erected between these a line of forts or *præsidia*, generally two miles apart. In 139 Lollus Urbicus erected along the line of the forts the rampart of Antoninus's wall, afterwards known as Graham's dyke. The wall, after crossing the parish of East Kilpatrick, passed outside the present county of Stirling, till it reached Castlecary, whence it passed by Camelon and Falkirk to Carriden in Linlithgowshire. Castlecary, where many Roman remains have been found, was perhaps the principal Roman station on the line of the wall, and there was another important one at Camelon. A Roman road, the Camelon causeway, passed eastwards from Castlecary to the south of the rampart, and after two miles crossed it and held on to Camelon, whence it went northward by Bannockburn, St Ninians, and Stirling to the Forth, where there was an important station near the present bridge of Drip. Thence it passed north by Keir to Dunblane. To the north-east of the Carron ironworks there was at one time a finely-preserved circular Roman building, called Arthur's Oon (oven) or Julius's Hof, which was demolished in 1743, but of which a drawing is preserved in Camden's *Britannia*. In the parish of Dunipace are two beautiful mounds called "the Hills of Dunipace," which some have supposed to have been erected as monuments of peace between the Romans and Caledonians, but which are more probably of natural origin. The remains of what was supposed to have been an early British stronghold were discovered at Torwood in 1864. A group of cairns at Craigmaddie, near Milngavie, is supposed to mark the scene of a battle between the Picts and Danes. Among the remains of old feudal castles may be mentioned Graham's castle, among the Fintry Hills, which belonged to Sir John de Graham, who was killed in the battle of Falkirk in 1298; Herbertshire, on the north bank of the Carron near Denny, originally a royal hunting seat, and still one of the finest embattled residences in the county (now a boarding school); the ancient keep of Castlecary, partly destroyed by the Highlanders in 1715; Torwood, surrounded by the remains of the Caledonian forest, in one of the oaks of which Wallace took refuge; and the round tower of Carnock, called Bruce's castle, of unknown history. Sir William Wallace lived occasionally with his uncle, the parson of Dunipace, and the county is specially associated with

his exploits and those of Robert Bruce, being the scene of some of the principal battles in the struggle for Scottish independence (Stirling bridge, September 10, 1297; Falkirk, July 22, 1298; Bannockburn, June 24, 1314). At Sauchieburn, 11th June 1488, James III. was defeated by his insurgent nobles, and during his flight, having stopped at a cottage in the village of Milton, was there stabbed to death. Kilsyth saw the defeat of the Covenanters by Montrose, 15th August 1645, a result which for a time laid Scotland at Montrose's feet; and a hundred years afterwards—17th January 1746—the Highlanders under Prince Charles Edward routed the Hanoverians at Falkirk.

See Sir Robert Sibbald's *Description of Stirlingshire*, 1710; and Nimmo's *History of Stirlingshire*, 1777 (MacGregor Stirling's edition is the best). (T. F. H.)

STIRLING, a royal and parliamentary burgh and the county town of Stirlingshire, is finely situated on the slopes



Plan of Stirling.

of an isolated eminence overlooking the valley of the Forth and abruptly precipitous towards the north-west, at the junction of several railway lines, 36 miles west-north-west of Edinburgh and 30 north-north-east of Glasgow. Originally the town was protected on all the accessible sides of the rock by a wall, of which there are still some remains at the southern end of the Back Walk. There were two principal entries to the town,—the South Port, originally 100 yards more to the west of the present line of Port Street, and the bridge over the Forth to the north. The earliest bridge was at Kildean, a mile to the west; the existing old bridge, now disused, probably dates from about the end of the 13th century; the new bridge was erected in 1829, from the designs of Stevenson, at a cost of £17,000. The streets of the old town are for the most part steep, narrow, and irregular, and contain a large number of quaint and antique dwellings. The town has now much outgrown its ancient limits, and the surrounding suburbs on the low grounds contain numerous villas. The castle crowning the eminence, and commanding a splendid panoramic view of the wide valley between the Lennox Hills and the Highland mountains and Ochils, with the links of the Forth and the widening estuary to the east, is of unknown antiquity, but from the time that Alexander I. died within its walls in 1124 till James VI. ascended the throne of England it was intimately associated with the fortunes of the Scottish monarchs, and after the accession of the Stuarts it became a favourite royal residence. The building was extended by James III., who erected the parliament hall, now used as a barrack-room. The palace, begun by James V. and finished in the reign of Mary, is

at the south-west of the fortress, and forms a quadrangle, the front and pillars of which are adorned by quaintly sculptured figures. The royal chapel founded by Alexander I., rebuilt in the 15th century, and again by James VI., was subsequently converted into an armoury and is now used as a store. To the west of it is the Douglas room, the scene of the treacherous murder of William, eighth earl of Douglas, by James II. in 1452. Below the castle on the north-east is the road of Ballangeich, which supplied a fictitious title to James V. when wandering in disguise. Beyond it is the Gowan or Gowan Hill, at the west corner of which is Mote Hill or Heading Hill, where Murdoch, duke of Albany, and several of his relatives were beheaded in 1425. On the north-east side of the esplanade a statue of King Robert Bruce was erected in 1877. Below the castle rock to the south-west were the king's gardens, now laid out in grass, with an octagonal mound, called the King's Knot, in the centre. Farther south is the King's Park, now used for recreation, and as a drill ground. In the cemetery to the south of the castle esplanade there are a number of interesting monuments. Near the main entrance to the esplanade is the building called Argyle's Lodging, erected by the poet, Sir William Alexander, who was created earl of Stirling by Charles I. It passed into the possession of the Argylls in 1640, and was the headquarters of John, duke of Argyll, during the rebellion of 1715. South-west of it is Mar's Work, the ruins of the palace built as a residence by the earl of Mar about 1570, from the ruins of Cambuskenneth Abbey. Next to the castle the most interesting public building is the Greyfriars church, some portions of which date from the 13th century, although the monastery with which it was connected was not founded till 1494. The greater part of it is in the Later Pointed style. The church was the scene of the coronation of James VI., 29th July 1567, when John Knox preached the coronation sermon. The site of the Dominican monastery founded by Alexander II. in 1223 is now occupied by the National Bank. In the immediate neighbourhood of Stirling, on the other side of the Forth, in Clackmannan county, is the beautiful ruin of Cambuskenneth Abbey, chiefly Early English or First Pointed, founded by David I. in 1147 for canons regular, associated with the meeting of parliaments and other interesting events in Scottish history, and the burial-place of James III. and his queen, Margaret of Denmark.

The principal secular buildings are the old town-house, erected in 1701; the new town buildings; the jail, erected in 1848 at a cost of £12,000; the county buildings (1875, £15,000); the Smith institute, founded by the bequest of £22,000 and a valuable collection of paintings by Thomas Stewart Smith, and embracing a picture gallery, a museum, and a reading room; the public halls (1883, £12,000); and the high school (1855, £5000; now being extended at a cost of £8000). Among the benefactions are Cowane's hospital, founded by the bequest of John Cowane, dean of guild in 1633, for twelve decayed members of the guildry, but the distribution of the charity has since been altered, and the building erected in 1639 now forms the guild hall; Spittal's hospital, founded by Robert Spittal, tailor to James IV., about 1530 for decayed tradesmen; Allan's hospital, founded in 1725 for the maintenance of children of poor townsmen; and Cunningham's mortification, founded in 1808 with an endowment of £4000 for the clothing and schooling of sons of mechanics. By the operation of the Endowed Schools and Hospitals Act the charities are now largely devoted to education.

As early as the 15th century Stirling had a trade with the Netherlands in worsted cloth, shalloons, stockings, and thread, but the manufactures afterwards declined. The cotton manufacture carried on in the beginning of the present century has now entirely ceased. During the last century the manufacture of tartans and carpets was carried on, but this also languished about the end of the century, and was not revived till about 1820. The woollen manufacture is now the staple industry, the principal goods being carpets, tartans, tweeds, and shawls. There are also breweries, coachbuilding works, and agricultural implement works. The population of the royal burgh in 1871 was 10,873, and in 1881 12,194. The population of the parliamentary burgh, which includes the village of St Ninians, in 1871 was 14,279, and in 1881 it was 16,001.

The town is of unknown antiquity, and undoubtedly owed its origin to the fortress on the rock, which became one of the most important strongholds in Scotland and the centre of the struggle between Scotland and England. As early as 1119 the town was a royal burgh, and under Alexander I. it became one of the four towns which constituted the Court of the Four Burghs, superseded under James III. by the Convention of Royal Burghs. Its earliest charter was that of Alexander II. in 1226, who first made the castle a royal residence. Its last governing charter was obtained from Charles I. in 1641. On account of a combination of three members of the council to retain themselves in office it was deprived of its corporate privileges in 1773, and they were not restored till 1781. The castle was held by William the Lion before 1174, was occupied by Edward I. with his army in 1296, and was burned with the town in 1298 by the Scots on their retreat from the battle of Falkirk. Between this time and 1341 it was frequently besieged and taken by the English, the longest period during which it remained in their hands being from its capture by Edward I. in 1304 till his son's defeat 10 years afterwards at the battle of Bannockburn. It was the birthplace of James II. in 1430, and, it being the jointure house of his mother, he was removed to it in 1438 from Edinburgh to thwart the ambitious purposes of Sir William Crichton. It was in one of its rooms that James, as stated above, slew the earl of Douglas, after which the town was burned by the earl's brothers. James V. took refuge in it after his escape from Falkland in 1528. During the reign of Mary and the period of the Reformation, Stirling occupied a position of almost as great prominence as during the wars of Scottish independence. Here the infant queen was crowned by the cardinal's party in 1543; here her son, afterwards James VI., was baptized according to the Roman Catholic ritual, 17th December 1566; and here he was crowned by the leaders of the congregation on July 29th of the following year. In 1571 rival parliaments were held by the queen's party in Edinburgh and the king's lords at Stirling, shortly after which an attempt was made by the queen's adherents to surprise Stirling castle, which was almost successful, the regent (Lennox) being slain in the fray. On the 26th April 1578 the castle was surprised by Morton, after which a reconciliation took place between the two parties. In 1584 the castle was occupied by the earls of Angus and Mar, the Protestant leaders, but on the approach of the king with a large force they fled to England. Returning with a formidable army collected in the south in the following year, they compelled James after the flight of Arran to open the gates to them, safety to his person having been guaranteed. The town was the scene of the baptism of Prince Henry with great pomp in August 1594, for which purpose the chapel royal was rebuilt on a larger scale "to entertain the great number of strangers expected." The meetings of the privy council and court of session were held in 1637 at Stirling on account of the disturbed condition of Edinburgh, and a parliament was held at it in 1645, on account of Edinburgh having been visited by the plague, but the outbreak of the disorder in Stirling caused an adjournment to Perth. During the Civil War Stirling was held by the Covenanters, and the committees of church and state adjourned to it after the victory of Cromwell at Dunbar 3d September 1650. In August of the following year the castle was taken by General Monk. In 1715 it was held by Argyle to prevent the passage of the Forth by the Jacobites; and during the rebellion of 1745 it was unsuccessfully besieged by the Highlanders.

See *History of the Chapel Royal of Stirling*, Grampian Club, 1882; *Local Notes and Queries relating to Stirling*, 1883; *Charters of Stirling*, 1884; *Burton, History of Scotland*. (T. F. H.)

STIRLING, EARL OF. See ALEXANDER, SIR WILLIAM, vol. i. p. 493.

STIRLING, JAMES (1692-1770), mathematician, third son of Archibald Stirling of Garden, and grandson of Sir Archibald Stirling of Keir (Lord Garden, a lord of session), was born at Garden, Stirlingshire, in 1692. Part of his early education was probably obtained at Glasgow, but at eighteen years of age he went to Oxford, where, chiefly through the influence of the earl of Mar he was nominated (1711) one of Bishop Warner's exhibitioners at Balliol. During his residence at Oxford he made for himself considerable reputation as a student of mathematics. In 1715, however, he was expelled on account of his correspondence with members of the Keir and Garden families, who were noted Jacobites, and had been accessory to the "Gathering of the Brig of Turk" in 1708. From Oxford he made his way to Venice, where he occupied himself as a professor of mathematics. In 1717 appeared his *Lænes Tertii Ordinis Newtonianæ, sive . . .* (8vo, Oxford), which contained one or two notable additions to the theory. While in Venice, also, he communicated

through Sir Isaac Newton, to the Royal Society a paper entitled "Methodus Differentialis Newtoniana illustrata" (*Phil. Trans.*, 1718, p. 1050; Abridg., vi. p. 428). Fearing assassination on account of having discovered a trade secret of the glass-makers of Venice, he returned to London about the year 1725. In London he remained for ten years, being most part of the time connected with an academy in Tower Street, and devoting his leisure to mathematics and correspondence with eminent mathematicians. In 1730 his most important work was published, the *Methodus Differentialis, sive Tractatus de Summatione et Interpolatione Serierum Infinitarum* (4to, London), which, it must be noted, is something more than an expansion of the paper of 1718. In 1735 he communicated to the Royal Society a paper "On the Figure of the Earth, and on the Variation of the Force of Gravity at its Surface" (*Phil. Trans.*, Abridg., viii. pp. 26-30). In the same year his worldly fortunes changed permanently for the better, through his appointment to be manager for the Scots Mining Company at Leadhills, an appointment which gave scope both to his scientific talents and to his great, though hitherto latent, administrative ability, and which was eminently fortunate for his employers. We are thus prepared to find that his next paper to the Royal Society was concerned, not with pure, but with applied science—"Description of a Machine to blow Fire by the Fall of Water" (*Phil. Trans.*, 1745, p. 315; Abridg., ix. pp. 109, 110). His name is also connected with another practical undertaking since grown to vast dimensions. The accounts of the city of Glasgow show that the very first instalment of ten millions sterling spent in making Glasgow a seaport, viz., a sum of £28,4s. 4d., was for a silver tea-kettle to be presented to "James Stirling, mathematician, for his service, pains, and trouble in surveying the river towards deepening it by locks." This was in 1752. Stirling died in Edinburgh on 5th December 1770.

See W. Fraser, *The Stirlings of Keir, and their Family Papers*, Edinburgh, 1858; "Modern History of Leadhills," in *Gentleman's Magazine*, June 1853; Brewster, *Memoirs of Sir Isaac Newton*, ii. pp. 300, 307, 411, 516; J. Nicol, *Vital Statistics of Glasgow*, 1881-5, p. 70; *Glasgow Herald*, 5th August 1886.

Another edition of the *Lineæ Tertii Ordinis* was published in Paris in 1797; another edition of the *Methodus Differentialis* in London in 1764; and a translation of the latter into English by Halliday in London in 1749. A considerable collection of literary remains, consisting of papers, letters, and two manuscript volumes of a treatise on weights and measures, are still preserved at Garden by Stirling's great-grandson and namesake.

STOAT. See ERMINE.

STOBÆUS, JOANNES, a native of Stobi in Macedonia,—whence the surname Stobæus or Stobensis,—is known to us as the compiler of a very valuable series of extracts from Greek authors. Of his life nothing is known, but he probably belongs to the latter half of the 5th century. From his silence in regard to Christian authors, it is inferred with some probability that he was not a Christian; that he was a man of wide culture and general reading is clear from the anthology which bears his name.

The extracts were intended by Stobæus for his son Septimius, and were preceded by a letter briefly explaining the purpose of the work and giving a summary of the contents. From this summary (which is preserved in Photius's *Bibliotheca*) we learn that Stobæus divided his work into four books; the first contained sixty chapters, the second forty-six, the third forty-two, and the fourth fifty-eight. In most of our MSS. the work is divided into three books, of which the first and second are generally called *Ἐκλογαὶ φυσικαὶ καὶ ἠθικαὶ*, and the third *Ἀρθολόγιον* (*Florilegium* or *Sermones*). As each of the four books is sometimes called *Ἀρθολόγιον*, it is probable that this name originally belonged to the entire work;

the full title, as we know from Photius, was *Ἐκλογῶν ἀποφθεγγμάτων ἰσοθρησκῶν βιβλία τέτταρα*. Between the account which Photius gives of Stobæus's work and the form in which we have it there are several marked discrepancies. The second book in particular is little more than a fragment. From this and other indications Wachsmuth has made it probable that our Stobæus is only an epitome of the original work, made about the end of the 11th century at Byzantium, "ab homine Platonis Aristotelisque amantissimo."

The didactic aim of Stobæus's work is apparent throughout. The first book teaches physics—in the wide sense which the Greeks assigned to this term—by means of extracts. It is often untrustworthy: Stobæus betrays a tendency to confound the dogmas of the early Ionic philosophers, and he occasionally mixes up Platonism with Pythagoreanism. For part of this book and much of book ii. he depended on the works of Aetius, a Peripatetic philosopher, and Didymus. The third and fourth books, like the larger part of the second, treat of ethics; the third, of virtues and vices, in pairs; the fourth, of more general ethical and political subjects, frequently citing extracts to illustrate the pros and cons of a question in two successive chapters. In all, Stobæus quotes more than five hundred writers, generally beginning with the poets, and then proceeding to the historians, orators, philosophers, and physicians. It is to him that we owe many of our most important fragments of the dramatists, particularly of Euripides.

The first complete edition of Stobæus was published at Geneva in 1609; the last is Meineke's (Leipzig, 1855-1864). The best critical edition of books i. and ii. is by Wachsmuth (Berlin, 1884); a companion edition of books iii. and iv. (the *Florilegium*) is promised by Otto Hense.

STOCK EXCHANGE, a market for the purchase or sale of all descriptions of public securities. Previous to 1773 the London stockbrokers conducted their business in and about the Royal Exchange, but in that year, having formed themselves into an association under the designation of the Stock Exchange, they, after temporarily locating their headquarters in Sweeting Alley, Threadneedle Street, removed to Capel Court, Bartholomew Lane. The growth of business necessitating improved accommodation, a capital of £20,000 in four hundred shares of £50 each was raised in 1801 for the purpose of erecting a new building in Capel Court, which was finished and occupied in the following year, the members at that date numbering about five hundred. With the occupation of the new building new rules came into force; all future members were admitted by ballot, while both members and their authorized clerks were required to pay a subscription of ten guineas each. As only the wealthier members of the association had provided the capital for the new building, the Stock Exchange henceforth consisted of two distinct bodies—proprietors and subscribers. In 1854, the membership having increased to about one thousand persons, an extension of the premises in Capel Court was effected at a cost of £16,000. A further and very extensive increase in the accommodation was made in 1885, the number of members and authorized clerks having risen at that date to above two thousand five hundred. The extended-buildings now occupy the whole of a triangle to the east of the Bank of England, having as its base Bartholomew Lane, its north side Throgmorton Street, and its south side portions of Threadneedle Street and Old Broad Street. The completed buildings comprise two large halls, where the various markets are held, settlement rooms, reading room, committee rooms, managers' rooms, and various other offices. It is intended ultimately to remove the partition between the two halls, when a vast business apartment,

having an area of about 16,000 square feet, will be available for the use of members. The immensely valuable property of the Stock Exchange is now owned by about 1050 proprietors, additions both to the proprietary and to the capital invested in the buildings having been from time to time effected during the past fifty years. The interests of the proprietors are attended to by nine of their number, who are termed managers, and by a secretary and staff of clerks. The income of the association now amounts to about £130,000 per annum, and is derived from the annual subscriptions of members and their clerks, from entrance fees paid by new members, and from rents and investments. All members of the Stock Exchange are not proprietors, neither are all proprietors necessarily members. Admission as a member is open to any person not engaged in another business. He must, however, be recommended by three members, who each guarantee to the committee of the house payment of £750 in the event of the new member being declared a defaulter within two years of his election. A personal guarantee of this description is imperative, the object being to exclude all persons of doubtful character. Elections are by ballot, and for one year only, all members being theoretically liable to exclusion at the expiry of that period.

The stock exchange opens every morning at 11 o'clock and closes at 4, except on Saturday, on which day the doors are shut at 2 o'clock. All members of the house are either jobbers or brokers, the former term being applied to those who are dealers in stocks. It is contrary to the etiquette of the London Stock Exchange for brokers to deal with brokers, and all transactions are accordingly effected between brokers (representing their clients) and jobbers. Brokers' charges vary from one-sixteenth to as much as one-half per cent., and the jobbers' "turn" or profit from one-eighth to two or three per cent., according to the character of the stock dealt in. The turn of the jobber amounts in the aggregate to an enormous tax upon the British public, and the question of the utility of this intermediary has been much discussed at various times. On buyers and sellers the tax operates in this way:—A wishes to buy and B wishes to sell £1000 of Caledonian Railway stock, but, brokers being forbidden to deal with brokers, recourse is had to the jobber C, who makes a price to the brokers of say 98 to 98½, that is to say, he offers to buy at 98 or to sell at 98½; the buyer A accordingly pays 98½ plus his broker's commission, and the seller B receives 98 minus his broker's commission, the jobber C pocketing the difference or "turn" of ½ per cent. The argument in favour of the jobber is that he supplies at all times and in all circumstances a ready market, and it must be allowed that in ordinary times he is a very convenient functionary. But, as a matter of fact, in excited times the system often breaks down, as the jobbers frequently shut their books and refuse to deal at the very moment when their help is most needed. What are known as the "markets" in the stock exchange are simply groups of jobbers distributed here and there on the floor of the house. Habit or convenience seems to have determined the particular spots occupied, which are known as the consol market, the English railway market, the foreign stock market, and so on.

In active times the business transacted daily on the London stock exchange amounts to an enormous total. Yet no written contracts or notes pass between jobbers and brokers, verbal communications being alone in use. Notwithstanding this apparent looseness of practice where millions of property are bought and sold almost hourly, there is hardly a single instance of attempted repudiation on record. All transactions are entered into for the fortnightly settlements, the precise dates for which are always fixed a few weeks in advance by the committee of

the house. Each fortnightly settlement includes three days: the first is the continuation or contango day, when all transactions of a merely speculative description are continued for another fortnight, the second the ticket day, when names are passed for actual purchases or sales, and the third the pay day, when all amounts or balances are paid or received. As the great bulk of business is purely speculative, the contango or continuation day is by far the busiest of the entire fortnight. The floor of the house is then crowded with an eager throng of from 2000 to 3000 brokers, jobbers, and clerks, and during the greater part of the day little is done beyond arranging the account. Continuation rates or contangos vary with the value of money and the state of the account. When money is dear, or speculative buying active, rates are high, but when speculative selling has preponderated, and the account has become what is called a "bear" account, rates are light. An enormous amount of capital is engaged in stock exchange speculation in London. Banks, financial companies, and private firms and individuals lend freely on stock exchange securities, and thus encourage, if they do not initiate, most of the great speculative movements. Besides the great central institution in London, stock exchanges exist in nearly all the large cities of the United Kingdom. The principal are those of Glasgow, Liverpool, and Manchester, which provide excellent markets for local stocks and shares.

On the Continent the two chief centres for the transaction of stock exchange business are Paris and Berlin. In Paris the business can be traced back for about five hundred years, but it was not until 1726 that the Bourse was legally recognized, sixty *agents de change* for the transaction of business being appointed that year by the king. The Bourse now consists of two distinct bodies, known as the *parquet* and the *coulisse*. The *parquet* is composed of the sixty official brokers or *agents de change* appointed by the Government, who alone are admitted to the inner business ring of the Bourse. The *coulisse* are the outside dealers or brokers, but, unlike the same class in London, these comprise firms of solid standing, bankers, and arbitrage houses. Although a partial settlement occurs once a fortnight, the great bulk of the business on the Paris Bourse is settled for once a month, the arrangements connected therewith occupying no less than six days. Another peculiarity in the mode of conducting business in Paris is that sellers can be compelled to deliver stock at any time during the currency of the account. At Berlin the Bourse is not under Government control, and although a certain number of licences are issued any one may act as a broker. The Bourse can be used by the public on payment of an annual subscription, and all debts incurred there are as obligatory in law as ordinary commercial debts. The settlement occupies three days, and occurs at the end of each month.

Although stock exchange business in the United States has now attained enormous proportions, it is of comparatively recent origin. The first organization of brokers in New York dates from about 1820. The mode of conducting business in Wall Street differs in some respects from both the English and the Continental procedure. Transactions entered into on one day are settled on the following, and the full amounts involved, and not the mere differences, are paid and received. The jobber, who is of so much importance under the English system, is unknown in New York, as in all cases brokers deal direct with brokers. While stock exchange business in London is of immense variety, and comprises all descriptions of home and foreign Government bonds, railway stocks, and miscellaneous shares, in New York it is confined almost entirely to American railway bonds and shares. In these securities, however, the volume of business in active times is enormous, the vast railway system of the United States providing an ample choice for the investor and a wide field for speculative manipulation. (W. P. H.)

STOCKHOLM, the capital of Sweden, is situated at the point where Lake Mälaren mixes its waters with those of the Baltic, and at the meeting-place of two provinces, Upland and Södermanland. The old cities of Sweden are regularly found in places where in early times the inhabitants of neighbouring districts came together for purposes of exchange or sometimes of worship, or where a river brought the interior of the country into closer connexion with the coast. By the passages that wind among the numerous isles off Stockholm ships at an early date came to the mouth of the lake, only to continue their voyage into its