

received other public and private gifts, its progress has been since uninterrupted. The academic body of the university consists of the chancellor, the lord rector, the dean of faculty, the principal and vice-chancellor, and the professors. The whole business of the university is transacted in three distinct courts, viz., the senatus, the faculty, and the comitia. There are many bursaries connected with the college, the most important being those bequeathed by Mr Snell, by Mrs Black, the widow of a late minister of the Barony church, and by Mr Orr-Ewing, M.P. for Dumbartonshire. The college buildings in High Street were principally erected in 1593 and 1658. The spire, which was 153 feet in height, possessed a lightning conductor which was reared under the auspices of Franklin in 1772.

The present university buildings at Gilmorehill occupy a magnificent site above the Kelvin, overlooking the Kelvingrove Park, and commanding a splendid view of the valley of the Clyde. In 1860 the commissioners under the "Universities Scotland Act" reported that in the interests of the university it was necessary that the college should be rebuilt, and that the site which it occupied in High Street was most ineligible for the purpose of the university. In 1863 the promoters of the City of Glasgow Union Railway Company offered to purchase the college grounds for the sum of £100,000, which was ultimately accepted; and during the negotiations Government offered to give £21,400, on condition that £24,000 for the erection of an hospital was raised by private subscription. On the 29th July 1864 the lands of Gilmorehill, consisting of 43 acres, were purchased by the senate for £65,000; about six months later the adjacent lands of Donaldshill were secured for £16,000, and the property of Clayslaps, containing 5 or 6 acres, was bought for a hospital site for the sum of £17,400. Part of the lands of Gilmorehill not required for the university were advantageously sold to the corporation of Glasgow.

Sir Gilbert Scott was appointed architect of the new buildings at the end of September 1864, and the plans were completed and approved of in the beginning of 1866. The estimated cost of the building, including hospital, was £266,000,—a sum far beyond the means of the university authorities. The citizens of Glasgow, however, came heartily to their help, and subscribed liberally to the building fund. In January 1868 Government agreed to give £120,000, on condition that the same amount was raised by private subscriptions. The work at once progressed under these assurances of support, and on the 8th October 1868 the foundation stone of the new buildings was laid by the Prince of Wales. In 1870 the buildings were so far completed that the removal from High Street took place, the last meeting of the senatus in the old college buildings having been held on 28th July of that year. The financial difficulty, however, proved a very serious one. The cost of the buildings greatly exceeded the estimate, and went far beyond the funds placed at the disposal of the senatus, although the public subscriptions amounted to nearly £160,000. The fine building is therefore up to the present time incomplete. The tower had to be stopped when less than half-way up, and the grand hall, designs of which were prepared by Sir Gilbert Scott, is still untouched. The senatus, however, has now been practically relieved of its difficulties by the splendid contributions of the marquis of Bute and of Mr Charles Randolph, one of the pioneers of steam shipbuilding on the Clyde. The marquis has given £40,000 for the erection of the common hall, and Mr Randolph bequeathed £60,000 for the completion of the buildings. With these sums at its disposal the senatus will no doubt in a few years finish this noble structure, and it will then be unequalled, so far as the building is concerned, as an educational institution.

The following notes, descriptive of the new buildings, are from the pen of the architect:—

The architectural style of the building is founded on that of works of the 14th century, subject to some modifications introduced with a view to giving the building a character allied to that of the old Scottish buildings. It is probable, however, that during the 14th century this specific character may not have prevailed in Scotland. It seems, in fact, to have been introduced from France at a later period, and worked up with so much originality into buildings in Scotland as to have become quite received as the style of the country. In France it had existed at least from the 13th century, so that what has been done in the design of the college is to translate back the characteristics in question, and to unite them with the general style of the architecture of the 14th century, though in Scotland they may not probably have actually existed till a later date. As the building stands on the crown of a hill, whose principal and rapid slope is toward the south, it has been made to occupy, as far as may be, the whole of the ridge facing in that direction by a long and continuous front of about 540 feet in length. In advance of this lengthened facade is a system of terraces, bringing the ground down by gradual steps towards the Kelvin, which flows through a deep ravine along its base. The southern facade comprises three more lofty portions, a central block and two corner towers, between which are two ranges of buildings of smaller elevation. The centre of the line of building facing the south is occupied by a lofty tower, through which, on the ground floor, is the principal entrance to the building. There is also a gateway through the centre of each of the lower ranges of building, arched and groined, leading into the east and west quadrangles. Another main entrance is provided in the central block of the northern range of building. This entrance consists of a double gateway, the passages from which turn round to meet one another in the basement within the building. Muck in the same manner, the north side of the building is divided into five parts, the angle blocks forming towers, similar to those in front; but facing each quadrangle there is a building of great dimensions, one of which is devoted to the museum and the other to the library. Between these is a central block, in this case of less elevation than the main side portions, containing the students' reading-room below and the hall of the Hunterian museum above.

The whole rectangular range of buildings, thus briefly described, is about 540 feet in length by 300 feet in breadth, occupying the greater part of the crown of the hill. From it to the west extend the different ranges of the principal's and professors' houses, while towards the south-east the outline is prolonged and diversified by the chemical laboratory, a partially detached building of octagonal form, and, at the north-east, by the anatomical rooms. The library and museum are alike in design. There are two great halls in each, occupying respectively the ground and first floors, these being 129 feet long by 60 feet wide.

Anderson's College, formerly called Anderson's (or the Andersonian) University, was founded by John Anderson, professor of natural philosophy in the university of Glasgow in 1795, and endowed by him with valuable philosophical apparatus, a museum, and a library. It is governed by 81 trustees, and its object is to bring literary and scientific education within the reach of the mass of the community. Every branch of study taught in Glasgow university is provided for, with the exception of divinity. Drs Garnett and Birkbeck were the original professors of natural philosophy and chemistry; Dr Ure and Thomas Graham also occupied chairs in this college; and it was there that the first mechanics' class was established in Great Britain. The trustees contemplate the removal of the institution to the west end of the city, where it is believed it will greatly extend its sphere of usefulness. The number of students in 1878 was 986; and those attending popular evening classes, at which lectures are delivered in various branches of science, numbered 992.

The High School or Grammar School, formerly in John Street and under the charge of the corporation, is the oldest educational institution in the city. It appears that a grammar school existed in Glasgow early in the 14th century, being then dependent on the cathedral church. Up to 1834 its masters taught only Latin and Greek, but at that period the school underwent a complete alteration. Two of the classical masterpieces were suppressed, and in lieu of these teachers of English grammar, foreign languages, writing, arithmetic, geography, mathematics, and drawing were introduced. The name was also changed

from the grammar school to the high school. The school was up to 1873 under the control of the corporation, but it was in that year placed under the jurisdiction of the school board of the city. In 1878 the school was removed to Elmbank Street, to the premises occupied by the Glasgow academy—a commodious building. The high school has been greatly improved by the school board, and is now one of the best secondary educational establishments in Scotland. It has upwards of 500 pupils. There are other secondary schools in Glasgow that are doing good educational work. Among these may be mentioned the Glasgow academy, the Kirklee academy, and the schools belonging to Hutcheson's hospital. There is also a Government school of design well attended, a technical school recently instituted, the mechanics' institution, founded in 1832, for the purpose of diffusing a knowledge of science among the working classes, the athenæum, which draws its students principally from the lower middle class, and the normal schools belonging to the Church of Scotland and the Free Church, for the training of teachers.

The passing of the Education (Scotland) Act in 1872 gave Glasgow an opportunity of dealing practically with the dense ignorance that prevailed within her boundaries. Before the Act passed it was believed that at least 20,000 (possibly far more) children in the city received no education whatever. The school board has persistently dealt with these uneducated waifs, and the most of this large ignorant mass have been reached. There are now not more than 3000 children of school age who are not receiving some education in the board and other schools. The school board rate in the city is 4d. per pound on the rental. The amount raised per annum is about £30,000.

**Libraries, Museums, &c.**—The libraries open to the public are Stirling's public library, a large collection of literature, and famous for its tracts of the 16th and 17th centuries, and the Mitchell public library, established a few years ago by the munificence of a citizen of Glasgow, who left about £80,000 for the purpose. This library is under the management of the town council, and during the short period of its existence has collected a large number of valuable books. It is meant to be a consulting library. The college library is very extensive, but can only be used by alumni of the university. An industrial museum was instituted some years ago in the old residential building of the West End Park. An addition was made to it about three years since, and the collection is now very considerable. It is supported under the Parks and Galleries Act, as are also the corporation galleries of art, a collection of pictures and statuary, acquired partly by purchase but more largely by donation and bequest. The galleries contain a very valuable series of old Dutch masters, and there is a noble statue of Pitt by Chantrey. The Hunterian and Andersonian museums are accessible to the public. The Hunterian contains a noble collection of anatomical subjects, and a most valuable assortment of coins. There is a botanical garden in Glasgow, but this has never been worthy of the city.

**Theatres.**—The drama has always been tolerably well patronized in Glasgow, which now contains some half dozen theatres.

**Commercial Institutions.**—The Chamber of Commerce was instituted in 1783, for the purpose of encouraging and protecting trade, and keeping a watchful eye on whatever might be supposed to affect the commercial interests of Glasgow and its neighbourhood. There are eight banks and branch banks in the city, two of them being properly Glasgow institutions; they are all joint-stock companies. In 1815 the first attempt was made in Glasgow to establish an institution for the accumulation of the savings of the community, the Provident Bank. This and some others of a like kind in 1836 were all merged in the National

Savings Bank, which has had a most successful career. The deposits now amount to about £2,771,066, and the depositors are 104,329 in number.

**Parks.**—The city is specially well provided with public parks, although not more than a quarter of a century has elapsed since it possessed only one—Glasgow Green—a noble expanse along the north bank of the river, which was long neglected and uncared for. Since that time Kelvingrove Park, in the Kelvin valley at the west end of the city, was acquired, and laid out under the direction of Sir Joseph Paxton, and it has been frequently added to. At a later date the Queen's Park, on the southern outskirts, was formed; and subsequently the city improvement trust expended £40,000 on the purchase and laying-out of the Alexandra Park on the north east side of the city. These parks are all liberally maintained by the parks and galleries trust of the town council.

Glasgow has been almost exclusively a commercial city within the last half century. As wealth increased culture also increased, though more slowly. The university has always been the centre of intelligence in the city, and many of its professors have been conspicuous for their devotion to the applications of pure science to the development of the arts and manufactures. Of the great names connected with this institution it may suffice to mention Baillie, whose letters on the troubles of the 17th century, recovered by the late Dr Laing of Edinburgh, added considerably to our knowledge of that period, and Professors Adam Smith and Thomas Reid. James Watt, though not a member of the university, was generously protected by it when the burghesses of Glasgow refused to allow him to open shop within the jurisdiction of the trades house and magistrates of the city. There are many literary men, and poets of the minor class, who claim Glasgow as their birthplace, but none of them reached sufficient eminence to claim particular notice. Of the practical workers who by their mechanical aptitude, amounting in many cases to genius, have pushed on the industries of the city, it is impossible here to give even meagre biographical details. The commercial capital of Scotland has prospered more by the general energy and indomitable perseverance of its inhabitants than by the special genius of individuals.

**INDUSTRIES.**—The most outstanding feature in the industrial position of Glasgow is the great variety and wide range of its manufacturing and trading activity. While no one of the great industries occupies a position of predominant importance so as to stamp itself as the peculiar characteristic of the town, there are numerous leading departments of industry which have been long established and are prosecuted on a great scale, while a variety of special manufactures have found their principal centre in Glasgow and the Clyde valley. When to this fact is added the consideration that Glasgow is one of the three principal seaports of the United Kingdom, it will at once be obvious that the wealth and prosperity of the city are contributed to by many separate and important streams. The circumstances and conditions which have favoured the establishment of the leading industries in Glasgow are quite as varied as are the industries themselves. The abundance of pure water in the hill streams around the city led at an early date to the introduction of bleaching, calico-printing, and allied pursuits; and these, in their turn, reacted favourably on hand-loom weaving and other textile manufactures. In a similar way the first beginnings of the now great chemical industries are clearly related to the early stages of the bleaching and printing trades. The fact, however, that the town is actually built within the richest coal and ironstone field in Scotland has had, of all causes, the most important influence in determining the current and prosperity of local industries. Further, the river Clyde, rendered navigable for vessels of the largest tonnage, flowing through the centre of that great coal and iron region, presents incomparable facilities for the prosecution of shipbuilding and marine engineering. But beyond the advantages of natural position and mineral wealth it is right to say that Glasgow owes much of her industrial prestige to a long line of highly-gifted, ingenious, sagacious, and energetic citizens, whose influence has not only been stamped on local industries, but has been felt and acknowledged throughout the entire world.

The principal industries of Glasgow range themselves under the



heads separately noted below. With respect to many of them it is a matter of regret that no trustworthy source of specific information exists; and thus the origin, vicissitudes, and progress of really important trades can only be recorded in vague and general terms.

**Textile manufactures.**—The industries embraced under this head were the first which gave Glasgow a place among the great manufacturing communities; but though, through many changes and fluctuations, they continue to yield extensive employment, they now occupy a comparatively secondary position. In the cotton trade, which originated about 1780, Glasgow possesses several factories which are reckoned among the largest in the trade; the industry has, however, for a number of years been in a stationary if not declining condition. The manufacture of light textures has always been the leading feature of the Glasgow trade,—plain, striped, and figured muslins, gingham, and fancy fabrics forming the staple. Thread manufacture, although specially a Paisley industry, is also extensively prosecuted in Glasgow. According to a return obtained in 1875 the whole cotton industry of Scotland afforded employment to 33,276 individuals, and excepting about 10 per cent. it was entirely centred in Glasgow and the surrounding district. Jute and silk are staples worked only to an inconsiderable extent in Glasgow, though about a century ago the manufacture of silk gauze flourished extensively, and has left traces of its former importance to the present day. The most characteristic of woollen and worsted manufactures is carpet weaving, all the leading kinds of carpets being extensively made, and the "tapestry" curtains and portieres made by several firms are examples of highly artistic woollen fabrics.

**Bleaching, Printing, and Dyeing.**—These allied industries took root in the Glasgow district at an earlier period than that of their introduction into the rival regions of Lancashire, calico-printing having been begun near Glasgow in 1738. The use of chlorine in bleaching was first introduced in Great Britain at Glasgow in 1787, on the suggestion of the illustrious James Watt, by his father-in-law, a local bleacher; and it was a Glasgow bleacher—Charles Tennant—who first made and introduced bleaching powder (chloride of lime). The dyeing of Turkey red was begun as a British industry at Glasgow by two eminent citizens—David Dale and George M'Intosh—and that unequalled colour was long locally known as Dale's red. All these industries continue to hold a foremost place in Glasgow, a large amount of grey cloth being sent from the Lancashire looms to be bleached and printed in the Scotch works. In particular Turkey red dyeing and printing have developed to an extent unequalled in any other manufacturing centre.

**Chemical Manufactures.**—The operations of bleaching and calico-printing in the early part of last century gave rise to such chemical manufactures—the preparation of dye liquors, &c.—as these industries demand. The discovery of bleaching powder by Charles Tennant in 1789 led directly to the development of the great chemical works of C. Tennant & Co. at St Rollox and its various branches, and gave the first great impetus to chemical manufactures in Glasgow. Among the prominent chemical industries are to be reckoned the alkali trades—including soda, bleaching powder, and soap-making—the preparation of alum and prussiates of potash, bichromate of potash manufacture (an industry peculiarly identified with Glasgow), the extraction of iodine and other products from sea-weeds, dynamite and gun-powder manufacture, the making of flint glass, bottle glass, paper, white-lead and other pigments, and brewing and the distillation of spirits. The numerous chemical preparations used in the bleaching and calico-printing trades are also among the local manufactures, as well as the preparation of starch, British gum, and dextrine, and the manufacture of lucifer matches.

**Iron Manufacture and other Metallurgical Industries.**—Although the blast furnaces of Scotland are distributed over several of the midland counties, the great proportion of them are in Lanarkshire and Ayrshire, and the trade is entirely controlled and practically monopolized in Glasgow. The discovery of the value of blackband ironstone by Mushet and the invention of the hot-blast by Neilson were two events which exercised a wonderful influence on the development of iron smelting in Scotland. So rapid was the expansion of the industry during the earlier half of this century that in 1859 one-third of the whole iron produced in the United Kingdom was Scotch. For 20 years past the trade has shown little elasticity, the annual production averaging about a million tons of pig iron,—the maximum output having been reached in 1870, when 1,206,000 tons were smelted. In 1877 of a total of 152 furnaces existing there were 109 in blast, and of these being 131 were situated in Lanarkshire and Ayrshire, 102 of these being in operation. The entire output of pig iron in that year was 982,000 tons, while in 1878 from 90 furnaces in blast the production is estimated at 902,000 tons. The number of malleable iron works in Glasgow and its neighbourhood is 22, having had during 1877 345 puddling furnaces and 53 rolling mills in operation. Mild steel is manufactured on an extensive scale by the Siemens-Martin process, and a small amount of crucible cast steel is also made. Other metallurgical industries include the extraction of copper by Henderson's wet process, and a limited amount of zinc smelting.

**Engineering.**—With abundance of iron and coal, and great

facilities of both land and water carriage, it is only to be expected that mechanical engineering should be carried on in Glasgow with peculiar energy and success. Almost all departments of engineering work are well represented in the district; and among the special features of the industries may be enumerated the great water and gas pipe casting establishments, sanitary and general iron-founding, malleable iron tube making, locomotive engine building, the manufacture of sugar machinery and of sewing machines,—two great establishments on the model of American factories for the latter trade being conducted by the Singer and the Howe Machine Companies respectively. The marine engineering works of the Clyde—which in many instances are worked in direct connexion with shipbuilding yards—are equipped on a scale worthy of the great industry of which they form an important part; and few establishments exist in any other quarter capable of producing the enormous forgings for propeller shafts, &c., of ocean steamers, which form a regular item in the undertakings of Glasgow engineering firms.

**Shipbuilding** is the greatest of all the modern industries of Glasgow, and the position attained by the shipbuilders of the Clyde is a matter of imperial consequence and national pride. The shipbuilding yards of the Clyde extend from Rutherglen above Glasgow to Greenock, Dumbarton, Port Glasgow, and Greenock having an important stake in the industry. In some years about half the total tonnage built in the United Kingdom has been launched from the Clyde yards, as is shown by the following statement:—

	1871.	1872.	1873.	1874.	1875.	1876.	1877.
Tonnage launched, Clyde.....	196,229	230,347	232,926	262,430	211,482	174,524	169,383
Tonnage launched, United Kingdom	331,058	474,718	453,543	603,867	472,058	378,020	450,963

During the year 1878 the tonnage launched on the Clyde from the yards of 35 different firms amounted to 222,853 tons, one vessel, the "Gallia," built for the Cunard Company, being of 5200 tons burthen,—a tonnage, however, which has been exceeded by the Guion steamer "Arizona" (5500 tons), launched in 1879. The work turned out is very diversified, but as a rule of the highest class, and includes armour-plated and other vessels for the Royal Navy, mail and passenger ocean steamers for the great Transatlantic and other lines, river steamboats famous throughout the world for swiftness and elegance of appointments, merchant sailing vessels, dredging plant, and hopper barges. With the exception of a very insignificant proportion of wooden vessels, the whole of the shipping built on the Clyde is of iron and steel, the latter having recently been introduced with great success. The shipbuilding trade in Glasgow indeed owes its extraordinary expansion almost entirely to the rapid supplanting of wood by iron as a building material. Twenty years ago, in 1859, the tonnage launched measured only 35,709 tons, from which amount, by rapid strides, it reached in 1863 a total of 123,262 tons, and in 1874 the maximum amount of 262,430 tons was floated off.

**COMMERCE.**—For a century past the records of the Clyde Navigation Trust indicate that the trade of Glasgow, so far as regards shipping, has progressed, with few and unimportant fluctuations, with steady rapidity. In 1778 the annual revenue of the Clyde Trust was £1733; in 1828 it amounted to £17,669, a tenfold increase in 50 years; and in 1878 the total amounted to £217,100. Of course these figures do not necessarily indicate a corresponding expansion of shipping trade, though they probably bear a close relation to the comparative value of cargoes carried. In the year 1828 the tonnage of vessels of all kinds which arrived in the harbour of Glasgow was 696,261, the sailing vessels having numbered 4405 of 214,315 tons, and the steamers 7100 of 481,946 tons. For the year ending 30th June 1878 the arrivals of sailing ships numbered 2727, with 457,290 tons capacity, and of steamers there were 13,210, the tonnage of which amounted to 2,154,733 tons,—in all 15,937 arrivals with a gross tonnage of 2,612,023 tons, being the greatest amount on record. In that year the weight of goods imported from abroad was 658,319 tons; and coastwise 586,576 tons were landed at Glasgow, making in all 1,244,895 tons. The foreign imports consisted in largest measure of Indian corn, wheat, flour, and other food substances, with timber, pyrites, iron ore, and sulphur, the coasting arrivals containing principally limestone, iron, cement, potter's clay, salt, timber, and food stuffs. The goods shipped to foreign ports amounted to 712,249 tons, and coastwise 603,374 tons left Glasgow, making in all 1,315,623 tons. The principal exports were coal, iron, cast pipes, chairs and other railway iron, chemical manufactures, and general machinery, with malt liquors and spirits; and in the coasting trade the leading articles were of a similar general description. The great bulk of the foreign trade is with New York and Canadian ports, India, France, Spain, and Belgium; and coasting traffic beyond the Clyde estuary is directed principally to Liverpool, Belfast, Dublin, Londonderry, Waterford, Bristol, and London; but there are few commercial ports throughout the world which have not more or less direct trading communication with the port and harbour of Glasgow. (J. H. S.—J. P.A.)

## GLASS

## HISTORY.

**T**HE art of glass-making, unlike that of pottery, would appear not to have been discovered and practised by different nations independently, but to have gradually spread from a single centre. No trace of it was observed among the inhabitants of America at the time when that continent was discovered, although considerable progress in the arts had been made by some among them, e.g., the Mexicans and Peruvians; but the steps by which it reached China may be indicated with much probability. The credit of the invention was given by the ancients to the Phœnicians, as is shown by the well-known story of its fortuitous discovery by Phœnician merchants, who rested their cooking pots on blocks of natron (sub-carbonate of soda), and found glass produced by the union under heat of the alkali and the sand of the shore (Pliny, *Nat. Hist.*, xxxvi. 26, 65). A glassy mass may, however, be produced in the smelting of many metallic ores, silica being present, while the fuel supplies the alkali; or by the combustion of great masses of reeds or straw, in which the elements of glass are present,—lumps of coarse imperfect glass being often found on the spot where a stack of wheat has been burned. Now the Egyptians practised metallurgic operations from a very early period, and vast heaps of straw are, and no doubt have been from the earliest times, accumulated in that country, and probably not unfrequently set on fire. The adoption of glass as a substance capable of being made subservient to the use of mankind may therefore be due to the intelligence of some one who noticed its fortuitous production there. Be this as it may, by far the earliest examples of glass existing of which the dates are attested by inscriptions are of Egyptian origin. The earliest of these, a small lion's head of opaque blue glass of very fine colour, but changed externally to an olive green, was found at Thebes by Signor Drovetti, and is now in the British Museum;<sup>1</sup> on the underside are hieroglyphics containing the name of Nuatuf IV., whose date according to Lepsius's chronology was 2423–2380 B.C. A bead of dusky green glass bears the phenomenon of Hatsu, a queen who is conjectured to have lived about 1450 B.C. (Wilkinson, *Manners and Customs of the Ancient Egyptians*, vol. iii. p. 88). That such may be the real dates of these objects is confirmed by the fact that glass bottles containing red wine are represented on monuments of the fourth dynasty, more than 4000 years old; and in the tombs at Beni Hasan, dating from the reign of Usurtesen I., at least 2000 years B.C., the process of glass-blowing is represented in an unmistakable manner (Wilkinson, vol. iii. p. 89). Very many examples of glass found in Egypt may be seen in museums, but, as they rarely bear inscriptions, it would be difficult to trace the progress of the art through them; no competent person has hitherto undertaken the task. The manufacture probably continued to flourish as well during the period of the native monarchy as in that of the Greek dynasty; and its importance after the subjugation of the country to Rome was probably even increased by the new market then opened to its products. Martial (*Ep.*, xxi. 74) alludes to the importation of Egyptian glass into Rome; and it is mentioned in an ordinance of Aurelian Hadrian in a letter addressed to the consul Servianus mentions glass-blowing as one of the chief industrial occupations of the inhabitants of Alexandria. The manufacture was not confined to that city, but was also carried on in the

lower Diospolis on Lake Mensaleh, as appears by a passage in the *Periplus Maris Erythraei* (c. 6).

Much of the Egyptian glass was uncoloured and of a somewhat dusky hue; of the coloured and ornamental varieties perhaps the most characteristic examples are the small vases usually in the form of either alabastra or amphora, but occasionally in that of an Egyptian column. In these the prevailing colour is a deep transparent blue; but not unfrequently the colour of the body of the vase is some shade of pale buff, fawn, or white (an imitation probably of arragonite, Egyptian alabaster), sometimes deep green, and in rare cases red. In almost every example the surface is ornamented by bands of colour, white, yellow, or turquoise blue, forming zigzag lines; in some examples there are only two or three such lines, in others the whole surface is covered by them. These lines are incorporated with the surface of the vessel, but do not penetrate through its entire thickness. By the Greeks and Etruscans such vessels were evidently much valued; the amphora have been occasionally found in tombs, furnished with a stand of gold. In Rhodes and elsewhere they have been found associated with objects which probably do not date from an earlier period than the 3d or 4th century before Christ, and it does not appear that they are met with in tombs later than the Christian era; when coloured or ornamental glass vessels are discovered in these last, they are of a different character. Another species of glass manufacture in which the Egyptians would appear to have been peculiarly skilled is the so-called mosaic glass, formed by the union of rods of various colours in such a manner as to form a pattern; the rod so formed was then reheated and drawn out until reduced to a very small size, a square inch or less, and divided into tablets by being cut transversely, each of these tablets presenting the pattern traversing its substance and visible on each face. This process was no doubt first practised in Egypt, and is never seen in such perfection as in objects of a decidedly Egyptian character in design or in colour. Very beautiful pieces of ornament of an architectural character are met with, which probably once served as decorations of caskets or other small pieces of furniture, or of triquetts; also tragic masks, human faces, and birds. Some of the last-named are represented with such truth of colouring and delicacy of detail that even the separate feathers of the wings and tail are well distinguished, although, as in an example in the British Museum, a human-headed hawk, the piece which contains the figure may not exceed three-fourths of an inch in its largest dimension. Works of this description probably belong to the period when Egypt passed under Roman domination, as similar objects, though of inferior delicacy, appear to have been made in Rome.

The Phœnicians probably derived their knowledge of the art from Egypt; whether this be so or not, they undoubtedly practised it from a very early period and to a very large extent. Probably much the same processes were employed in Phœnicia and Egypt during some centuries before the Christian era, as they certainly were in Phœnicia, Egypt, and Rome for some centuries after. It seems probable that the earliest products of the industry of Phœnicia in the art of glass-making are the coloured beads which have been found in almost all parts of Europe, in India and other parts of Asia, and in Africa. The "aggr" beads, so much valued by the Ashantees and other natives of that part of Africa which lies near the Gold Coast, have probably the same origin. These coloured beads are usually of opaque glass; they exhibit great variety of colour and

<sup>1</sup> See introduction to *Catalogue of Glass Vessels in the South Kensington Museum*, where an engraving of it is given.