of the aqueducts after their emergence. The arches of the Claudia and Anio Novus gradually increase in height from Capannelle to Roma Vecchia, until beyond it they reach their greatest elevation in this section, estimated by Lanciani at 27·41 metres. In this stretch they are extremely well preserved and have not required restoration to any considerable extent. The lower stone channel of the Claudia is surmounted by the concrete specus of the Anio Novus, faced with brick and *opus reticulatum*—an obvious afterthought, the detrimental effects of which we have already seen.

Further on, as we come nearer to the city, considerable reinforcements have become necessary. In many places the original stonework of the piers has been removed for building material, and Lanciani quotes the records of the sale of, *e.g.*, two or four peperino pillars by the Hospital of Sancta Sanctorum at the Lateran, to whom the ground belonged. But, as he also points out, sometimes the brickwork was removed and the stonework left; or, again, the brick facing is sometimes hammered away from the concrete.

The question as to the amount of water carried by the aqueducts depends upon the value given to the *quinaria*, the official unit of measure, explained by Frontinus, who, as *curator aquarum* under Trajan, wrote a treatise upon the aqueducts. The most probable value has recently been determined as 0·48 litre per second or 41·5 cubic metres in twenty-four hours; and we thus get the following table:

	Quinariae (Frontinus).	Litres per second.	Cubic metres per diem.
Anio Novus . . .	4738	2274	196,627
Claudia	4607	2211	191,190
Marcia	4690	2251	194,365
Anio Vetus . . .	4398	2111	182,517

There were no large clearing or settling tanks within the city, only comparatively small reservoirs (*castella*) from which distribution was made by lead pipes; and this is the case with the modern aqueducts also, so abundant is the supply.

The Romans, as we have seen, having at their disposal comparatively little theoretical knowledge of mechanics, they yet succeeded in achieving marvellous results, largely from their practical ability. They must have solved such problems as the transportation of an obelisk by the multiplicity of simple elements of traction employed and by the ingenuity displayed in their arrangement. When it is a question of sea transport, we cannot but admire the courage of those who succeeded in bringing such huge masses of stone through the Mediterranean from Egypt to Italy without the aid of steam — an even greater enterprise than dragging them along the land without the appliances that we now have at command. The study of practical engineering among the Romans shows us that in this, as in other spheres, they added very considerably to the sum of human achievement, and thus contributed in no small measure to make the condition of the human race what it is.

The Science Museum, South Kensington.

WORK has just been commenced on the eastern portion of the new Science Museum buildings in South Kensington, and by the spring of 1927 a handsome façade (Fig. 2) should have replaced the plastered brickwork which has stood on the west side of Exhibition Road since the War.

Behind this east face, however, much has already been done, and a series of galleries on each of the four floors have been completed during the past three years to replace the Western Galleries on the north side of Imperial Institute Road, which were transferred to the Imperial War Museum in 1922. With the completion of the eastern front, which includes four galleries facing Exhibition Road, the first portion of the new Science Museum buildings will have been provided, following the recommendations of Sir Hugh Bell's Committee of 1911.

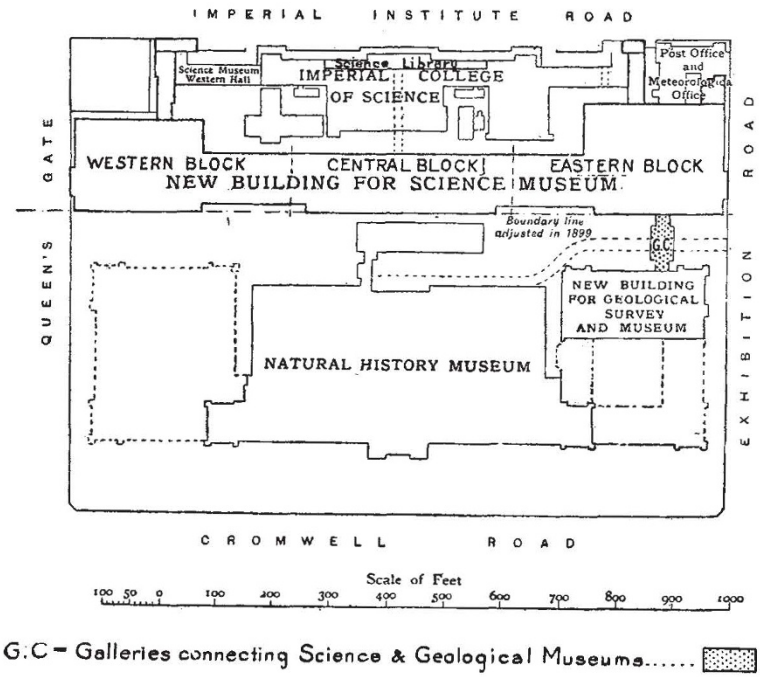

FIG. 1.—Plan of museum buildings, South Kensington.

This Committee recommended [1] that the existing buildings, which had been originally erected for the refreshment rooms of the Exhibition of 1862, should be replaced by three main blocks with connecting galleries, to be erected on the existing site and to extend ultimately from Exhibition Road to Queen's Gate between the Natural History Museum and the Imperial College of Science. The eastern block, which is now nearing completion, will provide 100,000 sq. ft. of exhibition space, and so much of the connecting galleries as are in use, though not completely finished,

[1] H.M. Stationery Office, Cd. 5625 and 6221, 1911, 1912.

brings the total up to 135,000 sq. ft., or about one-third more than was available in 1912; but since then it has been necessary to allot more than 20,000 sq. ft. to the aeronautical collection and to that which illustrates wireless telegraphy and telephony. Up to the present, therefore, the exhibition space which will shortly be available is only about half of what the Committee of 1911 considered to be immediately necessary, so that the construction of another block, to provide about 110,000 sq. ft., is already an urgent need, and this would bring the available accommodation about up to the Committee's recommendation; the old buildings which it would replace are constructed with wooden floors, staircases, etc., so that the risk of fire in them is great, and should a conflagration occur, practically nothing of the important naval and shipping collections which they now contain could be saved.

The provision of the third block, which will face Queen's Gate, would, in the opinion of the Committee, be needed later for the development of the collections or in consequence of an extension of the scope of the Museum, but not for several years.

For the present, the galleries in the eastern block which have been completed are being utilised to accommodate the collections which were exhibited in the galleries now occupied by the Imperial War Museum, that is, those illustrating physical science, mining and metallurgy, and some which have been long in store for lack of exhibition space; others have been moved there to allow more space for the aeronautical collection which is being developed rapidly. But in every case only a selection from each collection can be exhibited, since the space which is or shortly will be available is insufficient to do more than this.

The scope of the Science Museum as formulated by the Committee of 1911 is "to afford illustration and exposition of the various branches of Science within its field, and of their applications in the arts and industries," which is a very wide definition, as it includes the illustration of current practice as well as the preservation of objects of historical interest; so wide indeed is it that to develop the Museum on the lines of a storehouse of all that relates to advance in science and technical industry, would require accommodation far in excess of that which is likely to be available. The policy, therefore,[2] which has been adopted is to show for each group such a critically selected series of objects as will illustrate all important stages in the development of a group, and to exhibit also a number of examples to represent the current practice of to-day. But even this is difficult with the existing accommodation, and several groups are still inadequately represented.

In the series which illustrate historical development, examples of early mechanical and scientific apparatus which have been designed, constructed, or used by pioneers in various branches of science and technology are not only of great historical interest, but are also most stimulating to those who visit the Museum and study its collections. Among the more recent acquisitions several are of this kind, for example, the contents of James Watt's workshop, Henry Maudslay's screw-cutting lathe of 1810, Hughes' microphones of 1878, Prof. Fleming's thermionic valves (1889–1904), and early wireless apparatus lent by the Marconi Co. These and many others furnish starting-points of special interest from which history of the groups to which they belong can be studied.

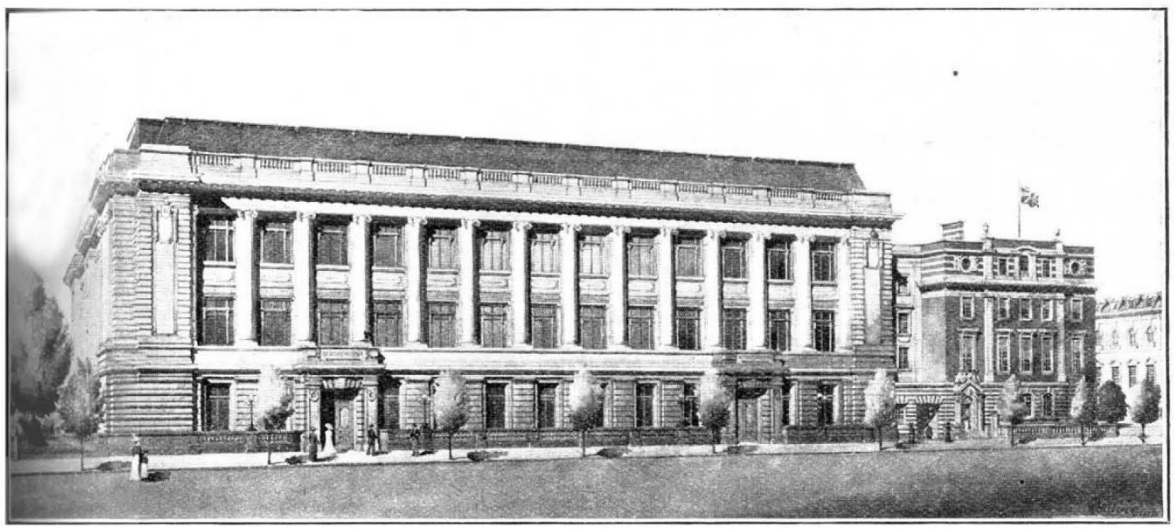

FIG. 2.—The Science Museum, South Kensington, when completed.

In various parts of Great Britain there must be many other objects of a similar character which might be with advantage presented or lent to the Museum for exhibition, if only to guard against the risk of them passing into the hands of those who may be ignorant of their historical importance and may therefore dispose of them, when they are usually lost sight of. The historical value of what has already been lost to the history of science in this way is incalculable.

The present arrangement of the collections is only temporary, being determined by existing conditions, and by the need for exhibiting the science collections which have been for the most part stored during the past three years. When another block of the new

[2] Report on the Science Museum for the year 1923 H.M. Stationery Office, 1924.

buildings becomes available, more satisfactory arrangements can be made, and collections which can now only be shown in part will be more adequately represented.

The ground floor contains the more important objects illustrating prime movers, and locomotive engineering. Six early pumping and rotative engines of great historical interest are placed on either side of the main hall, the atmospheric engine from Pentrich Colliery (1791), the Old Bess pumping engine by Boulton and Watt (1777), and Heslop's beam engine (1795) on the left, with Boulton and Watt's rotative engines of 1788 and 1797, together with a rotative beam engine of about 1820 on the right. Models of the principal types of stationary engines occupy the wall cases, while others of windmills, water power installations, etc., are in the south gallery. Such internal combustion engines as are not shown in connexion with aeronautics or motor transport are also exhibited here. On the north side of the floor, the four early locomotives, the *Puffing Billy*, the *Agenoria*, the *Rocket*, and the *Sans Pareil*, are arranged down the centre of the north hall, with models of many other types of locomotives on either side (see Fig. 3). This gallery was originally designed for special exhibitions in which various groups would be shown more fully than could be done in the normal collections, but this use of it has to be postponed until the locomotives can be accommodated elsewhere. At the end of this hall is the reproduction of James Watt's attic workshop at Heathfield, Birmingham, showing all his machines, tools, etc., as they were at his death in 1819; its position within sight of three of the engines designed by him and built at Birmingham towards the end of the eighteenth century is especially appropriate.

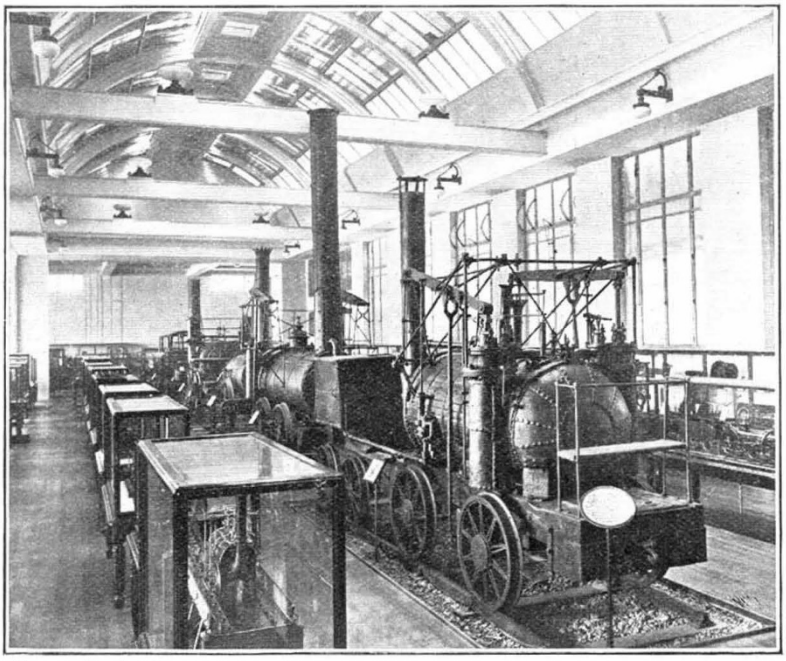

FIG. 3.—North hall, ground floor, Science Museum, South Kensington. Locomotive Collection.

The rest of the ground floor, the west gallery which is to connect the eastern with the centre block, contains part of the collection illustrating aeronautics. Here are models of the early machines of Henson and Stringfellow, Wright's aeroplane of 1908—the gliders of Lilienthal, Chanute, and Weiss, Maxim's flying machine and other objects illustrating the pioneer period of aviation. A collection of some fifty aeroplane models shows the strikingly rapid development of the heavier-than-air machine during the War, culminating in the Vickers-Vimy Rolls-Royce plane which was flown across the Atlantic by Sir John Alcock and Sir Arthur Brown in 1919. A large collection of aero-engines, many of them sectioned, is also shown here. The aeronautical collection has now extended into two adjoining rooms of the old buildings, where the structure of aircraft is illustrated; Roe's interesting triplane of 1907 is also here. Aeronautical instruments of all kinds are shown in the wall cases. The aeronautical collection includes that of the Imperial War Museum, which has been lent by the trustees of that institution, and the combined collections form an exhibit of air transport which is more complete and important than any other in existence; the full-size planes and some other of the larger exhibits have for the time being to be placed in the basement, where they are available to visitors, but it is hoped that later on the collection may be shown as a whole.

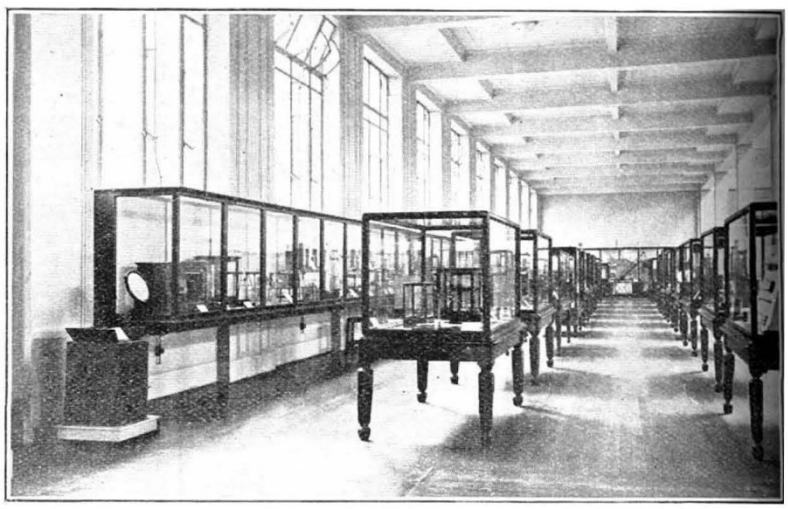

FIG. 4.—Centre gallery, first floor, Science Museum, South Kensington.

The first-floor galleries will before long be connected

by a bridge with the new Geological Museum which is about to be built alongside the Science Museum to receive the collections which are now in Jermyn Street, and the Office of the Geological Survey. In these galleries, therefore, so much of the collections illustrating mining, ore-dressing, and metallurgy are being arranged as can be shown there (Fig. 4). The north gallery on this floor will contain the valuable collection of textile machinery which has been in store for several years. Tools and machine tools are shown in the western cross gallery, where the development of certain selected tools, such as the axe, drill, hammer, etc., from the times of the earliest civilisations to the present day, form interesting and instructive exhibits. In the gallery which connects this floor with the old buildings, the collections of electrical engineering and of telegraphy, telephony, and radio communication are being arranged.

The upper floors of the eastern block are being utilised for the exhibition of the collections of scientific apparatus, which were formerly in the galleries on the north side of Imperial Institute Road. Of these the following are being arranged on the second floor: mathematical, electrical, thermal, and acoustical instruments, while the north gallery will contain the geophysical collections of meteorology, seismology, gravity instruments, and terrestrial magnetism. In the western gallery, which will later on connect this floor with the centre block, will be the collection of pumps, and also that which illustrates engineering construction, and certain aspects of municipal engineering which are now being developed. On the third floor the collections of astronomical and optical instruments will be shown, as well as those illustrating geodesy, surveying, cartography, geography, and oceanography, so far as the space allows. The western gallery of this floor has been allotted to chemistry and industrial chemistry, and these collections are being actively developed.

The naval and marine collections will still remain in the old buildings (the southern galleries). Many additions have recently been made to these, especially in the section of boats and small craft. Mechanical road transport will shortly be arranged in the western hall near to the Imperial Institute Road entrance.

The great superiority of the new galleries in their arrangements, the lighting, and generally in the facilities for exhibiting the collections to the best advantage, will be apparent to every visitor. The wall cases do not extend to floor level but stop at a height of 2 ft. 6 in. from it and are carried up to a height of 7 ft. By this means the whole of the contents are comfortably within the visitor's view, and the ineffective display of objects at ground level is avoided (Fig. 4). Channels in the floors carry electricity, compressed air, and gas to all the galleries for use in the demonstration models, and the number of these which are shown in motion or which can be operated by the visitor is being largely increased. Seating accommodation for visitors has not been overlooked, and the need of students in this respect who may wish to examine objects in detail, and to make notes, has been met by placing portable stools in each gallery.

Obituary.

SIR FRANCIS DARWIN, F.R.S.

A SON who follows a famous father is apt generally to find himself in somewhat of the position of a sequel to a very popular romance, and that Francis Darwin stands prominently forth in the light of his own achievements is enough to show that in him we possessed a man of great distinction. Whilst he will probably remain best known as the author of his father's Life, much of his work in other lines has borne fruit. But to those who had the privilege of his friendship, he will always be a living memory on account of his very human personality, his great kindness of heart and ready sympathy, and his extraordinary personal modesty. The writer well remembers his astonishment, when first attending Darwin's lectures, at his frequent confessions of ignorance (shared, of course, even if not admitted, by all other physiologists) upon this or that point that was under consideration. This, though to-day a more common frame of mind, was less customary at that time, when the teacher usually strove to make a more or less completely rounded presentation of his subject, avoiding the unknown or the little understood so far as was conveniently possible.

Educated at Clapham Grammar School and at Trinity College, Cambridge, where he obtained a first class in the Natural Sciences Tripos, Darwin afterwards went to Würzburg to study under Sachs, as did so many of our most capable men at that time. He afterwards graduated in medicine, but never practised.

Francis Darwin's earliest published paper appeared in 1872, during the time of his medical study at St. George's Hospital. It was a conjoint paper with the prosector at the Zoological Society's Garden, describing the anatomy of an ostrich which died of copper poisoning through the ingestion of "two pennies and fifteen halfpence." Then followed in 1876 the publication of his M.B. thesis on the causation of vascular dilatation in acute inflammation, which records experiments carried out under Dr. E. Klein at the Brown Institute in London.

During the next few years Darwin worked at Down, where for eight years he acted as his father's secretary, and assisted him in much of his work. More especially was this the case in Charles Darwin's researches into the movements of plants, the well-known book upon this subject appearing in 1880 under the joint names of Charles and Francis Darwin. Two years later the latter was elected a fellow of the Royal Society, and when his father died in the following year he removed to Cambridge, where, except for occasional absences in London and elsewhere during recent years, he resided during the remainder of his life, at first in one of the houses of the well-known "Darwinery" on the Huntingdon Road, and afterwards at 10 Madingley Road.

University lecturer in botany from 1884 until 1888, and reader from 1888 until 1904, Francis Darwin had much to do with the complete reorganisation of the Botany School that then went on, especially when from 1892 until 1895 he was deputy for Prof. Babington. He devoted the stipend to the improvement of the teaching in various departments of the subject, while he himself