

being worked by private enterprise. I saw no fossils, but the beds and the coal reminded me much of the older Australian coals along the Hunter River. The mines are of great value. They are rented for a few thousand dollars (by two enterprising Scotchmen) from the Sultan of Bruni. The same sovereign would part with the place altogether for little or nothing. Why not have our coaling station there? Or what if Germany, France, or Russia should purchase the same from the independent Sultan of Bruni?

The Sarawak coal beds I did not visit, but a collection of fossils was kindly sent to me by the Hon. Francis Maxwell, the Resident. I recognised at once well-known Australian and Indian forms, such as *Phyllothea australis* and *Vertebraria*. These are entirely characteristic of the Newcastle deposits in New South Wales. The connection thus established between the Carboniferous

deposits of India, Borneo, and Australia is exceedingly interesting.

I intend to publish in another form all the observations I have made on the coal formations of Borneo and their included fossils. The main result of all I have seen may be embodied in the following conclusions:—

- (1) There are in Borneo immense coal deposits of very different ages.
- (2) These formations extend from the Palæozoic to the Middle Mesozoic periods.
- (3) The fossils from some of the beds are specifically identical with those of certain well-known forms common to India and Australia.
- (4) The Labuan coals are probably of Oolitic age, and not connected with any marine formation, but apparently of Eolian origin.

J. E. TENISON-WOODS

Labuan, Borneo, November 25, 1884

THE PARIS CENTRAL SCHOOL OF ARTS AND MANUFACTURES

A RECENT article in *La Nature* describes the new buildings of the École Centrale des Arts et Manufactures. The school was founded in 1829 for 200 pupils by Dumas, Lavallée, Pécllet, and Olivier. The buildings remained from that date until quite recently in the rue de Thorigny, but the want of space

became more and more perceptible as the scheme prospered, and in 1874 the Council proposed that the old buildings should be abandoned, and new ones erected on a vacant plot of ground 6300 square metres in extent, the site of the old St. Martin's Market, which abutted on four streets. The principal advantage of this situation was that it faced the garden of the Conservatoire des Arts et Métiers, and was therefore within reach of the immense technical treasures of that establishment. The new buildings have

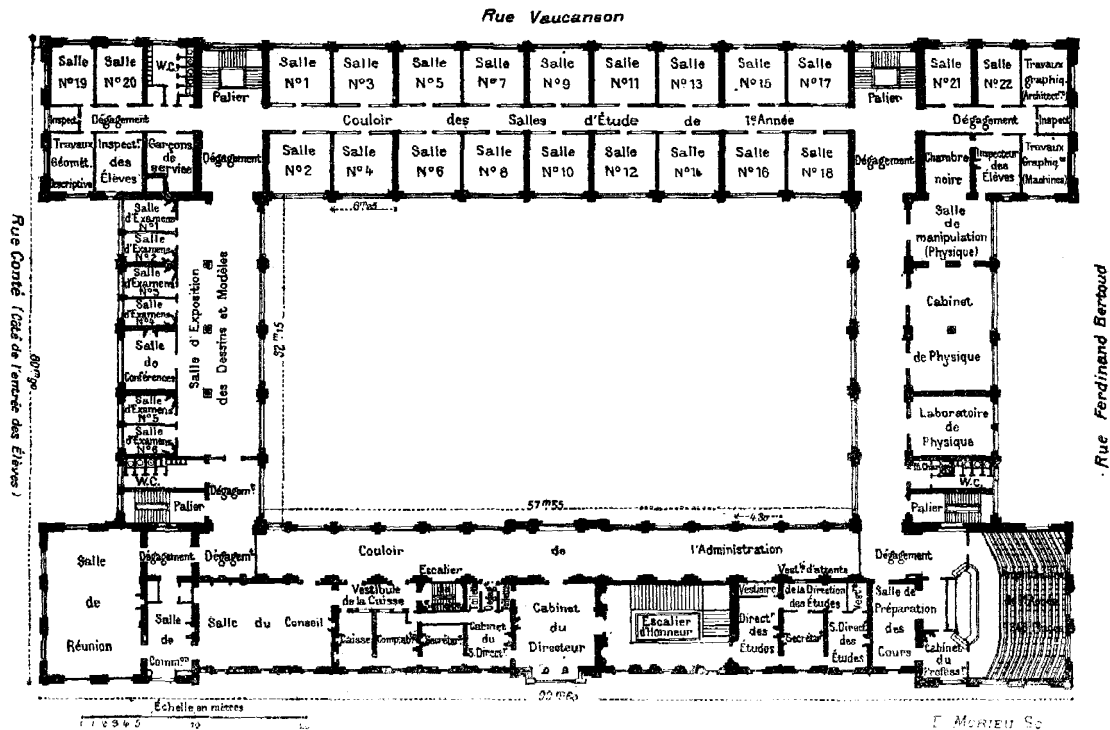


FIG. 1.—Plan of the New Central School.

a frontage of 99.60 m. and a depth of 60.90 m. They are rectangular, and inclose a large central court. The first floor is reserved for the administration and for the use of the first year's students, the second for the second year's, the third for the third year's, while the fourth and highest storey is reserved for the large laboratories. The basement and ground floor are used for the mechanical appliances, the kitchen, dining halls, the collections, and small laboratories for special purposes. Taking the building more in detail, and starting with the basement, we find that its galleries contain a line of rails with small

trucks, presented to the school. It is used for conveying fuel to the furnaces, and vessels full of acid to the lifts, by which they are conveyed to the laboratories. The offices of the administration are heated by hot air on the Perret-Olivier system, the apparatus being presented by the makers, while the rest of the building is heated by hot-water pipes. The basement also contains the kitchens of the rival restaurants, which are farmed out, the gas-meters, and three large Geneste and Herscher generators for heat and ventilation. The boilers also work the engines necessary for the generation of the

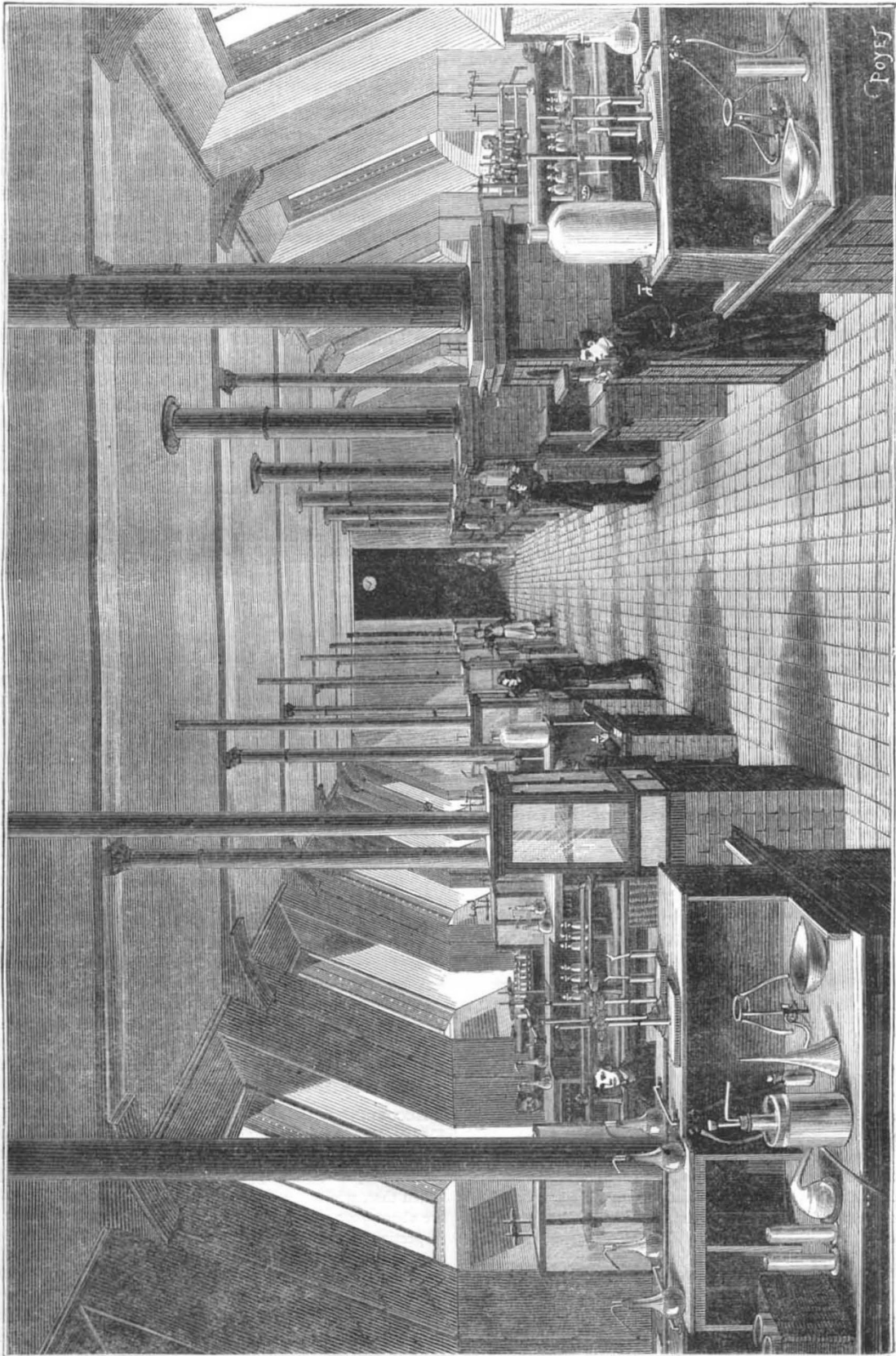


FIG. 2.—The New Central School: General View of the Great Laboratory or Third Year Students.

electricity employed for lighting purposes. The electrical works of the school are very remarkable. They include two engines, each of forty horse-power, which were presented by the makers. These work an Edison dynamo of 200 lamps, and three Gramme machines. The latter are each used alternately, and work six ventilators, which act over the whole building. Next to the electrical machines are two pumps which pump up water from a well; the school is also supplied with town water. Near the boilers is an Egot alembic for distilling water for use in the laboratories. The steam from the water is conveyed by pipes into the laboratories, where it is employed in heating the water for washing, the stores, &c. In the basement are the cellars, store-rooms for glass, rooms for the study of stereotomy, for the construction of models, for stone-cutting, &c. The ground-floor includes a large courtyard, in the centre of which has been left the old fountain of St. Martin's Square. To the right of the entrance from the Rue Montgolfier is a staircase leading to a large vestibule, where the busts of the founders are placed. On this floor are the Mineralogical Museum, the dining-room of the Inspectors, stationery room, and the laboratory of industrial physics, the restaurants, the laboratory of industrial chemistry, and other special first year's laboratories, all opening on the court, the students working in the open air when dealing with noxious gases. The offices of the administrative body are on the first floor, and include director's and secretary's rooms, committee-rooms, steward's offices, and the like. These are lighted both by gas and electric light. The remaining rooms on the floor are devoted to students in their first year. Each storey has its large amphitheatre, capable of holding 250 students. These are formed at angles of the building, and are lit both by gas and electricity. The large blackboards behind the professors are raised and lowered by hydraulic machinery. The halls of study are ranged in two rows on one side of the building, with a corridor or passage between the rows for purpose of superintendence. Twelve pupils can occupy each room, and there are twenty-two rooms on each floor. The second and third stories are arranged on the same principle, except that on the former are the library and cabinets of collections. The fourth storey contains the large laboratories of the second and third year. The laboratory of the third year, of which an illustration is given, is the most important one in the school. Its appliances are of the most convenient and useful kind. Each student has all that he wants for his experiments at his hand.

NOTES

H.R.H. THE PRINCE OF WALES laid the first stone of the Museum of Science and Art and the National Library of Ireland on the 10th inst.

MR. RAPHAEL MELDOLA has been appointed Professor of Chemistry in the Finsbury Technical College in succession to Dr. H. E. Armstrong, who holds the Professorship at the Central Institute.

A SPECIAL general meeting of the London section of the National Association of Science and Art Teachers will be held at the Technical College, Cowper Street, Finsbury, on Saturday next, the 25th inst., at 7.30 p.m., when Sir H. E. Roscoe, V.P.R.S., President of the Association, will deliver an address on its objects. All interested in the teaching of science and art are cordially invited to attend. The above association was started in Manchester about three years ago for the purpose of advancing the teaching of science and art and improving the position of teachers. It already has strong sections in Manchester, Liverpool, Birmingham, Newcastle, and other large towns in the north, and the London section was started last year.

MCGILL COLLEGE, Montreal, has received, since September last, two donations from the Hon. Donald A. Smith, amounting in the whole to 24,000*l.* sterling (120,000 dollars), for the establishment of separate Lectures for Women, preparatory for the ordinary B.A. or an equivalent degree.

THE project for making Paris a seaport was brought before the Congress of Learned Societies on the 11th inst in a paper by M. Bouquet de la Grye. He said the subject was of importance from two points of view. The first and most important was the military one. The defence of Paris demanded imperatively the establishment of a port which would assure the victualling of the capital and its suburbs at all times. The commercial and industrial importance of the project is evident. The port should be established in the Poissy basin, and the Seine should be dredged to a mean depth of 6½ metres. M. de la Grye's system requires neither dams nor locks, but only the deepening of the bed of the river by dredging. It could be executed in four or five years. The total expense would be about 100 millions of francs.

DR. ROWELL, of Singapore, is stated to have made a valuable ichthyological addition to the Raffles Museum there in the shape of a very complete collection of the fish and crustacea inhabiting the seas and rivers of the Malay Peninsula. Dr. Rowell, it is said, intends making a second similar collection to send to the Italian and Colonial Exhibition next year.

THE *Bulletin* of the Essex Institute (U.S.) contains a paper on American archæology, by Mr. F. W. Putnam, in which he refers to chipped stone implements. Referring to the statement often made that the making of arrowheads and similar objects is one of the lost arts, he says, that at the present time there are Indians in America who continue to manufacture them, and even work pieces of glass bottles into symmetrical and delicate arrowpoints. The method appears to be as follows:—A piece of stone is selected and roughly shaped by striking blows with a hammer-stone. If it is found to chip readily, it is shaped still further by light blows along the edges, each blow striking off a chip. Partly wrapped in a piece of skin, it is then held in the left hand and finished by flaking off little bits. This delicate part of the work is done with a flaking tool made usually of a piece of bone or antler. This is a few inches long, and about half an inch wide, having one end rubbed down to a blunt edge, which may be either straight, pointed, or notched. The other end is fastened to a piece of wood, so as to give a firm support to the hand. Sometimes this wooden handle is long enough to be held under the arm, thus steadying the implement which is grasped by the right hand. The edge of the flaker is pressed firmly against the edge of the stone, then with a slight rotation of the wrist a small flake is thrown from the edge of the stone. With a little practice this flaking can be done with considerable rapidity and precision. Some stones flake better after being heated. The various forms of chipped implements known as scrapers, drills, knives, spearpoints, and arrowheads probably were made by the method here described.

ACCORDING to the *Colonies and India*, Baron F. von Müller, K.C.M.G., has issued, under the auspices of the Victorian Government, a second supplement to his systematic census of Australian plants. It appears from the information now published that, whilst the known plants of Australia and Tasmania are about 9000, they occur in the following proportions in the respective colonies—viz. Western Australia, 3455; Queensland, 3457; New South Wales, 3154; Northern Australia, 1829; Victoria, 1820; South Australia, 1816; and Tasmania, 1023. The progress of botanical discovery in Australia within the last quarter of a century has been very marked, and the colonies are mainly indebted to Baron Müller for this result. In the beginning of the century (1805) Robert Brown, who may be called