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Lowell Laboratories of Electrical Engineering at the Massachusetts Institute of Technology.

Through the generosity of five children of the late Augustus Lowell, George A. Gardner, Mrs. Walter Scott Fitz and C. C. Jackson, the Massachusetts Institute of Technology now has one of the most convenient electrical laboratories to be found in any of the educational institutions in the world. Owing to the manufacturers' slowness in filling orders, all of the equipment has not been installed, but, barring accidents, the opening of the next school year will find everything in place and the students enjoying the facilities afforded by the most completely equipped educational electrical laboratories in this country or Europe.

In recognition of Mr. Lowell's services to the Institute, the building containing these laboratories has been named the Lowell Building, and the electrical portion is known as the Augustus Lowell Laboratories of Electrical Engineering. Of the money available for the erection and equipment of the building, $50,000 came from Mr. Lowell's children, including Professor A. Lawrence Lowell of Harvard University and Percival Lowell, the astronomer, both members of the Technology corporation; $10,000 was given by Mr. Gardner, also a member of the corporation; Mrs. Fitz gave $2,000, and Mr. Jackson, who is vice-president of the Boston Stock Exchange, contributed $3,000.

The building, as shown in Fig. 2, on the next page, is a brick structure, one story high and covering 45,000 square feet of ground. It contains two lecture rooms, professors' rooms, a library, a standardizing laboratory, a laboratory of dynamo-electric machinery, and rooms for photometric measurements and special research. The plan is shown in Fig. 3. The building is lighted through skylights, which open toward the north. Ventilation and warmth are obtained by forcing air from outdoors over a heating coil and through false ceilings. Fans draw the exhausted air through openings in the skylights.

The principal room is the laboratory (or "power house"), devoted to electrical appliances and machinery and the accompanying engines and boilers. This laboratory is 40 by 270 feet, occupying the entire width of the west end of the building. This is equipped with a complete electric-lighting and power plant and an extensive collection of alternating and direct-current machinery, testing instruments, induction motors, etc. It also contains a traveling crane, electrically driven, with a capacity of 12½ tons. This crane travels the long way of the room, and it is so arranged that it can pick up a piece of machinery at the outer door and deliver it in any part of the room or to movable tables, by which it can be transported to the large lecture room. Fig. 4 is a view in the main laboratory, showing the crane carrying an engine. It gives no idea of the length of the room, however.

On the west side of this laboratory, and opening into it, is a fully equipped machine shop to which machinery can be delivered direct by the crane. Near the center of this laboratory a flat concrete bed, 30 by 12½ feet, has been laid in the floor. Flush with the top of this bed are anchor-bolted steel rails to which any description of heavy machinery can be fastened by iron fingers which clasp the rails through grooves in the surrounding cement.

The boiler room adjoins the laboratory on the north and contains two 250-horsepower Babcock & Wilcox boilers, with space for 50 per cent. increase. The engines are in the north end of the laboratory, there being five of them. There is a Russell horizontal cross-compound engine driving a 480-kilowatt double-current generator, with a direct-current output of 2,000 amperes at 230 volts and connected, on the alternating-current side, with the six-phase primary winding of 25-cycle transformers which deliver a three-phase current at 2,300 volts; a tandem-compound McEwen engine, direct-connected to a General Electric 60-cycle, four-phase generator which delivers current to a five-wire, four-phase system at a pressure of 230 volts; two Westinghouse compound engines, direct-connected to Westinghouse generators and a compound engine and pair of General Electric dynamos for general instruction in various methods of plant testing. A Worthington combined air pump and circulating pump are used in connection with the steam-condensing apparatus. Outdoors there is a large Worthington cooling tower in which warm water from the circulating pump is cooled by rapid evaporation produced by a current of air from a motor-driven fan.

The large lecture room (Fig. 1) seats 300 persons. The seats are placed on an inclined floor at such elevations that every person therein can see the entire front and top of the demonstration table. The room is ventilated by properly heated air blown in through small openings placed under each chair, the air leaving the room at the top. The room can be completely darkened and the electric lights can be controlled from any part of the room by means of switches attached to flexible connecting wires. On either side of the lecture room are preparatory rooms, the one on the east for the chemical demonstration and the one on the west, between the lecture room and the electrical laboratory, for the electrical demonstrator. From the west side of the laboratory, tracks are laid across the laboratory, through the electrical preparatory room, the lecture room, and the chemical preparatory room. Large and strong tables resting on six wheels with vertical pivots so arranged that the wheels can be placed in any position, run on these tracks. These tables can be run under the traveling crane, where an engine, or any heavy machinery can be placed thereon, and taken to the lecture room for the purposes of demonstration. In the electrical preparatory room tracks are laid at right angles to the tracks running into the lecture room, and on these several tables can be prepared for lectures and run thence into the lecture room. This room is large enough and the tracks are so arranged that the tables can be run by each other and taken to the lecture room in any desired order. This system of tracks was devised by Professor William L. Puffer, who has charge of the laboratory of dynamo-electric machinery.

The standardizing laboratory, which is in charge of Professor Frank A. Laws, contains facilities for testing and instruction in measurements in technical work. The equipment permits careful investigation of any proposed scheme of measurement. It is provided with circuits furnishing alternating current at 25 and 60 cycles, both three-phase and quarter-phase, also direct current. There is a storage battery giving 1,000 amperes, a special set of dynamos giving potentials to 3,000 volts, the necessary controlling devices, standard ammeters and voltmeters, and a potentiometer reading to 1,500 volts. By means of special transformers, alternating currents up to 4,000 amperes and potentials to 50,000 volts can be obtained. There are several oscilliographs for the examination of wave forms and all necessary appa-

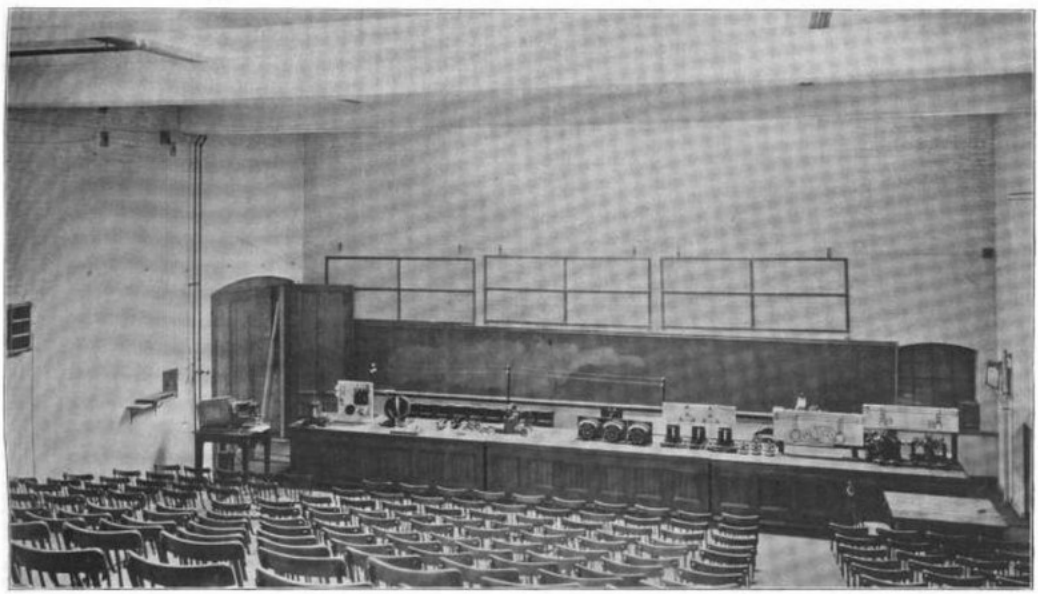

FIG. 1. ELECTRICAL LABORATORIES AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY. LECTURE ROOM WITH PLATFORM APPARATUS.

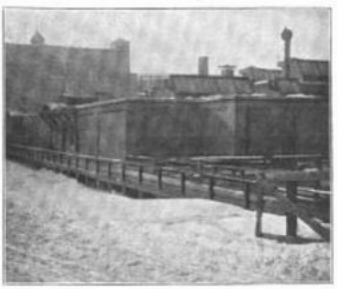

FIG. 2. LOWELL BUILDING AT BOSTON "TECH."

ratus for measuring high and low resistances and for calibrating resistance boxes.

The especial novelty of the building is an arc-light photometer devised by Professor Puffer and set up by Instructor Ralph R. Lawrence. The special features of this instrument are the entire absence of reflecting mirrors and the direct comparison of the arc light, at any desired angle, with a standardized incandescent lamp. The arc lamp hangs by gravity in a stirrup, supported on ball bearings, so that the center of the arc is at the height of the bearings. The arc lamp is placed at one end of a frame that turns on trunnions, over which is placed a fixed screen. The standardized incandescent lamp is placed on the frame back of the screen; that is, with the screen between it and the arc light. The distance between the arc light and the screen is constant—10 feet—while the incandescent lamp can be moved to and from the screen. The observer stands by the trunnions and controls the distance between the screen and the standardized incandescent lamp, this distance being shown on a tape automatically wound on or unwound from a drum, as the position of the incandescent lamp is changed. The frame is turned by a hand wheel, shaft worm and gear, the latter graduated to show the angular distances in a vertical plane, or angles above and below the horizon. At any and all positions of the photometer, the incandescent lamp, the center of the screen and the arc light are in a straight line. The extreme range of the arc light is from 90° above to 90° below the horizon. The arc lamp is pivoted so that it can be continuously rotated by a motor. All the parts are carefully counterbalanced and every movable portion is moved with the greatest ease. Of course, the walls of the room are painted black to prevent the reflection of the light.

The entire department is under the charge of Dr. Louis Duncan, professor of electrical engineering. William L. Puffer is associate professor of electrical engineering; Frank A. Laws is assistant professor of electrical testing; Elihu Thomson is non-resident professor of applied electricity; Harry E. Clifford is associate professor of theoretical electricity; Ralph R. Lawrence and Harrison W. Smith are instructors in electrical engineering, and Harry E. Dart is assistant in electrical engineering.

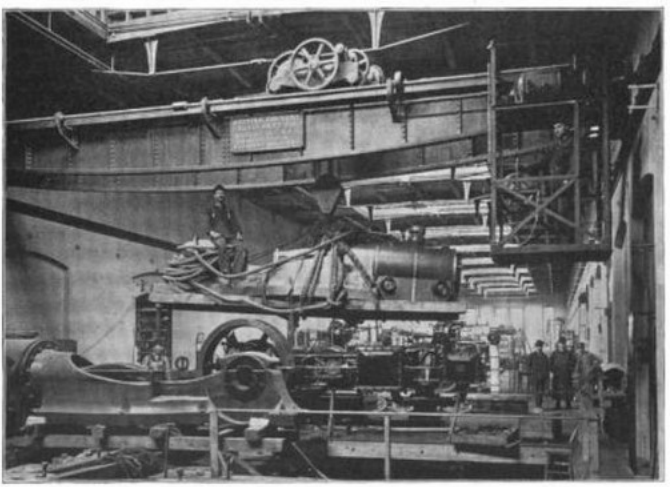

FIG 4. LOWELL ELECTRICAL LABORATORIES.—VIEW OF MAIN LABORATORY SHOWING OVERHEAD CRANE.

Hongkong Electric Railway.

Operations have commenced on the new power plant of the Electric Tramway Company of Hongkong, China, and the laying of the line will be proceeded with this month. It is hoped that the road will be in working order in 12 months' time.

The generating station and car shed, offices, etc., will be situated on the eastern bank of the Bowrington Canal, bordered on three sides by Canal Street, Russell Street and Sharp Street. The area of this compound is about 1,800 square yards. In the first instance 26 cars will constitute the complement, 10 being for natives. The cars run entirely independent of each other. The European cars are to be of a roofed semi-open pattern (no accommodations on top), with an enclosed center. The enclosure seats will be longitudinal, but those at the open ends cross-bench. Sun blinds will be provided. The native cars are to have cross-bench seats, and open right along. The lines will be laid to the gauge of three feet six inches, and each rail joint will be double-bonded. The overhead work is to be partly side-pole construction. The poles will be of mild steel and the conditions will conform with the rules laid down by the British Board of Trade for the erection of overhead trolley wires.

The line is to be divided into half-mile lengths by means of section insulators. At each of these points a feeder box will be located and the current taken from feeder cables. The cables from the feeder boxes to the line wire will be carried up inside the poles, emerging at the top, and running along the bracket arms, while the feeder cables will be laid in cast-iron troughs, which are to be filled up with bitumen and buried under the surface of the road.

At the generating station the boilers will be of the Babcock & Wilcox type, each to have approximately 3,700 square feet of heating surface, and will each be capable of evaporating with ease under normal conditions and with burning ordinary Japanese engine slack, at least 12,000 pounds of water per hour. The large engines will be of the cross-compound type, the fly-wheel and generator being arranged between the cylinders upon the main shaft of the engine. With a steam pressure of 150 pounds each engine will give 428 brake horsepower while running at a speed of 100 revolutions. The direct-current generators are guaranteed to give at terminals a constant potential of 550 volts. The switchboard, in addition to being fitted with the necessary instruments for distributing the current, is also fitted with special instruments for testing purposes as required by the British Board of Trade. The gradients over the line are not considered of any importance.

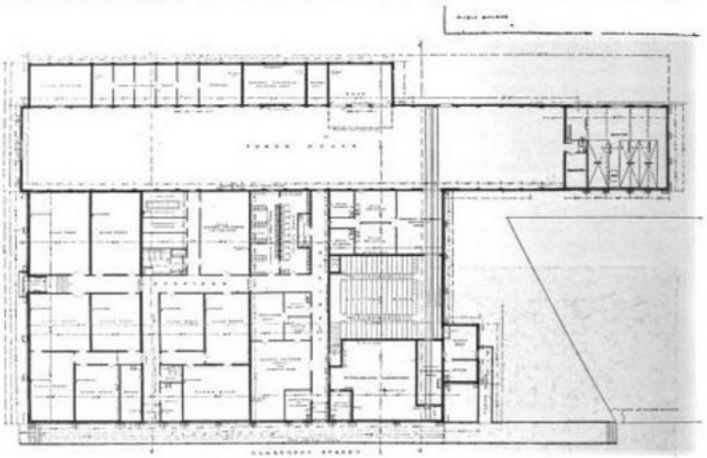

FIG. 3. FLOOR PLAN OF ELECTRICAL LABORATORIES AND POWER HOUSE AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

National Fire Protection Association.

The seventh annual meeting of the National Fire Protection Association will be held in the assembly room of the Chicago Underwriters' Association, 151 LaSalle Street, Chicago, on May 25th to 28th. An interesting programme has been arranged. The objects of the association are to promote the science and improve the methods of fire protection; to obtain and circulate information on this subject, and to secure co-operation in matters of common interest. Only fire-insurance men are eligible to membership. Among other subjects which will be discussed, those of an electrical nature will be presented by committees as follows: "Thermo-electric Fire Alarms," F. E. Cabot, chairman; "Heavy-current Protectors on Wires of Signaling Systems," Ralph Sweetland, chairman; "Electric Fire Pumps," Ralph Sweetland, chairman.

On Thursday the association will visit the Underwriters' Laboratories at 67 East Twenty-first Street, where the work of the Underwriters' National Electric Association will be inspected. Fire-extinguishing devices of various kinds will be on exhibition for the inspection of members. The programme will be concluded by the operation of any testing apparatus which appears of interest.

The association now numbers 35 active members and about 160 associate members. The present officers are: President, C. A. Haximer; vice-president, William A. Anderson; secretary and treasurer, Everett U. Crosby.

Municipal Lighting Proposed for the Twin Cities.

Congressman Stevens of St. Paul proposes to have the streets of Minneapolis and St. Paul lighted by electricity generated from the government dam in the Mississippi River, between the two cities. The dam was constructed for the purpose of improving navigation, but it is estimated that from 4,000 to 6,000 horsepower is available. It is planned to light the government buildings and the buildings at Fort Snelling, and then let the surplus power be apportioned to the two cities. An act of Congress would be necessary before this could be done, but it is thought that there would be no difficulty in getting such legislation.

A bill requiring street railways to equip their cars with vestibules for the protection of motormen and conductors during the months of November, December, January, February and March was passed at the recent session of the Illinois General Assembly.