LABORATORIES

The Engineering Laboratories Form One of the Institute's Assets.

By PROF. E. F. MILLER.

The Engineering Laboratories consist of the "Steam Laboratory," the "Hydraulic Laboratory," and the "Strength of Material Laboratory." These laboratories occupy a floor space of about 23,500 sq. ft. They are used in the regular work of instruction by the Mechanical, Civil, Chemical, Sanitary, Electrical and Mining Engineers, by the Naval Architects and by the Naval Constructors.

In addition to the above, many students make use of the apparatus contained in these laboratories in carrying out investigations made in connection with some thesis.

The plans of these laboratories, given on an accompanying page, show the location of the larger machines. A study of these plans will give one some idea as to the scope of the instruction in testing and to the great variety of apparatus, with which a student must become familiar.

There are many Laboratories in Germany, and some few in this country, which in variety and in amount of equipment in some one branch are superior to our engineering laboratories, but considering the Steam, Hydraulic, and Strength of Material Laboratory as a whole, the Engineering Laboratories of the Institute are still in the front rank.

In the Engineering Laboratory the objects sought are the following:—

1. To give the students practice in such experimental work as engineers in the pursuit of their profession are called upon to perform.

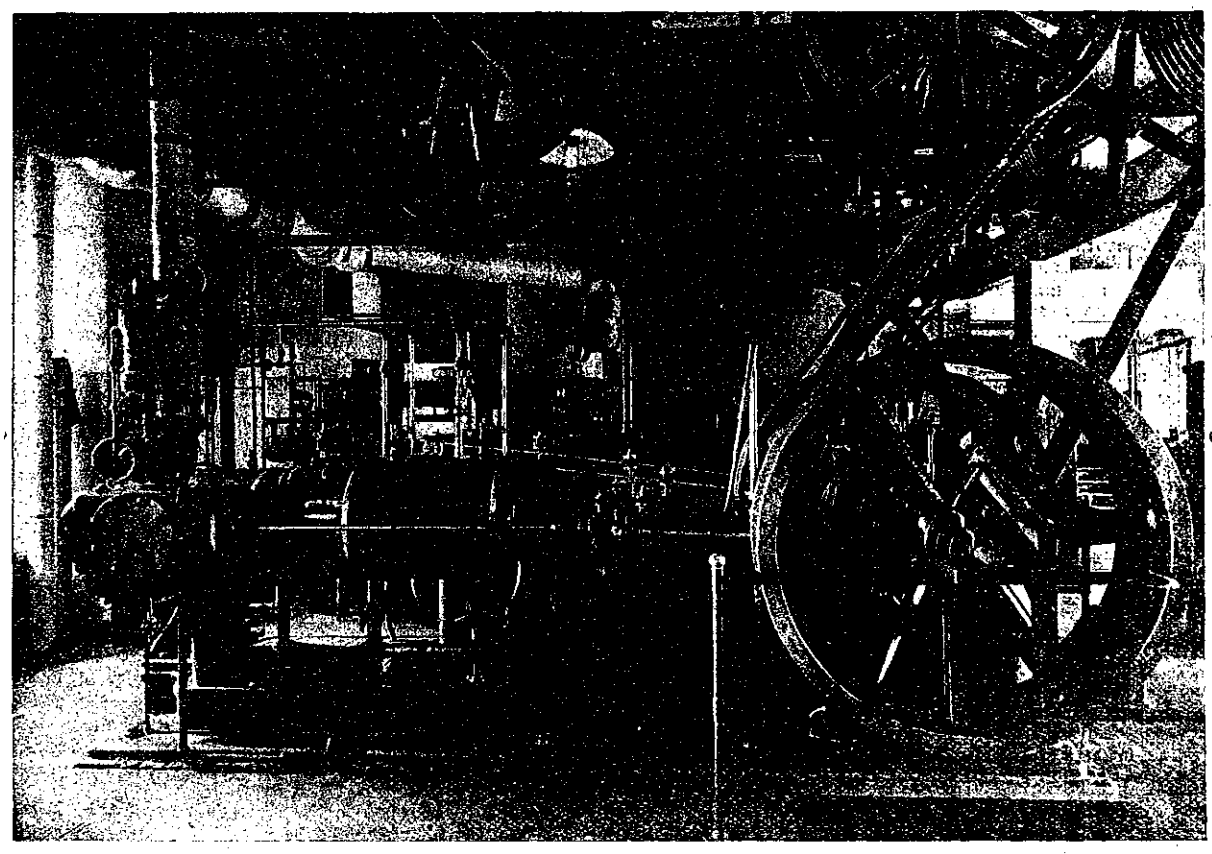
2. To afford some experience in carrying on original investigations in egnineering subjects with such care and accuracy as to render the results of real value to the engineering community.

3. By publishing from time to time the results of such investigations, to add greatly to the common stock of knowledge.

4. By a systematic series of tests made on new machines either presented or loaned to the Institute to aid the manufacturer or the designer in improving or in perfecting such machines.

The primary object of the laboratory is to give instruction in the methods of conducting tests. Students are not admitted to the laboratory work unless they have had the theoretical work necessary to enable them to conduct the experiment and make the necessary calculations intelligently. On this account, it is possible in a two-hour period for a student to do a considerable amount of experimental work, because none of the time is used up in explaining the principles involved or methods of calculation required. Some details about the installation and certain constants, are all that the student needs before beginning his work.

The various tests which the students are called upon to conduct are so chosen as to illustrate the various methods which a mechanical engineer would use in the measurements of steam, water, gas, air, in the determination of efficiences and in the calculation of power.



During the past two or three years it has been the custom to assign the men to the work in squads of three, one man of the squad having charge of the test, and the other men in the group reporting to him as they would to an engineer for whom they were working. This man in charge of the group decides on what observations should be taken, how often these observations should be taken, and which of his observers should be assigned to certain stations. From day to day the man in charge of the squad is changed so that every student in the course of the senior year takes charge of at least 16 tests.

Each and every test made by a student is calculated and reported by that student. His results are compared with those obtained by the instructors in the laboratory who calculate every test, using the data obtained by the students.

Students first begin their laboratory work in the third year, where they are made familiar with the use of the steam engine indicator and are taught how to make engine tests. Three engines are run for this work, a 150 H. P. triple expansion Allis, a 200 H. P. McIntosh & Seymour, and a 450 H. P. Russell Engine. Each student makes complete calculations of three of these tests determining by the necessary thermodynamic equations the quality of the steam at cut-off and at release, and the British Thermal Units per horse power per minute. He also plots on the temperature entropy diagram the expansion line between cut-off and release.

The apparatus in the Engineering Laboratories is used to a great extent both by the students and by the instructing staff in carrying on original investigations. Many of these investigations are undertaken at the suggestion of some engineer or some manufacturer who has some technical or mechanical problem which he cannot solve.

Of late a considerable amount of new apparatus has been presented to the Institute with the understanding that the donor was to have the benefit of any improvements which might be suggested as a result of the tests made on the apparatus.

As a larger amount of new apparatus is installed each year than the old removed, the laboratories have become very much crowded. This crowding is felt especially in the Strength of Material Laboratory, where there is no room for the storage of, or for the manufacture of large concrete beams. At present such beams must be made outside and carted to the laboratory for test, and then removed before other beams can be brought in.

MECHANICAL ENGINEERING.

(Continued from page 14.)

regular laboratory work and partly by means of the thesis work, may be classified as follow:—

(a) Those made in the laboratory itself.

(b) Those made at some outside plant.

In the case of the first, many have for their object the determination of results of value to engineers and manufacturers, and others engaged in industrial pursuits. The engineering labora-

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tories are often the means of giving direct aid in solving industrial problems such as determining the efficiency of new

(Continued on page 22.)