

## The Knowledge Bank at The Ohio State University

### Ohio State Engineer

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# THE OHIO ENGINEERING EXPERIMENT STATION

By W. R. FISHER, '39

**J**UST as agriculture is aided and guided by work carried on in agricultural experiment stations, so the field of engineering, especially as it relates to industry, is aided by similar institutions for experimental work in engineering. Because of the close connection between the activities and equipment of both the engineering experiment stations and of the technical colleges, it was logically decided to establish the experiment stations as adjuncts to the state technical colleges or universities. In 1903 the first engineering experiment station was founded at the University of Illinois, the second at the Iowa State College in 1904. Today 38 land grant colleges have engineering experiment stations.

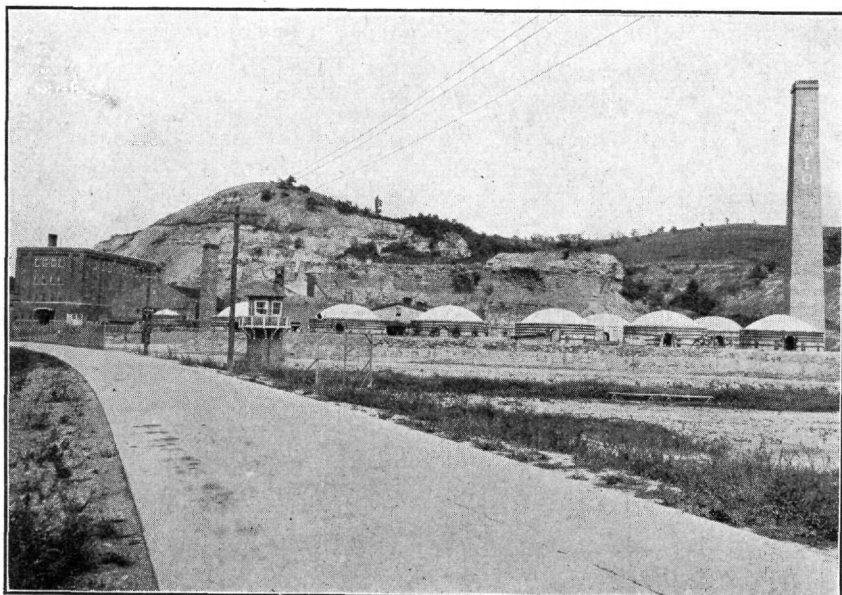
Ohio's Engineering Experiment Station was set up as a part of the College of Engineering at Ohio State University in 1913, having as its purpose, according to the act of establishment, "to make technical investigations—and to promote the conservation and utilization of the state's resources."

Following the vote to establish an Ohio engineering experiment station a rather curious chain of events led to the construction of the present station building which faces Woodruff Avenue on the north edge of the University campus. In 1918 Mr. Steeb, secretary to the board of trustees, and Mr. McCracken, superintendent of buildings and grounds, went to Langley Field, Virginia, to look over power plant equipment. Shortly before, the steel members and parts for a war-time power plant

had been fabricated and transported to Langley Field, only to be consigned to the junk heap after the Armistice. When Mr. Steeb and Mr. McCracken saw the abandoned steel, they realized its value and immediately telegraphed C. T. Morris, professor of structural engineering, asking if this steel would be of use to the University. Three or four years previously Professor Morris had been considering the purchase of a 500,000 lb. column testing machine. The problem of housing so large a machine was a knotty one until this opportunity to secure building material appeared; with no hesitation Professor Morris wired "yes," and the experiment station prepared to build itself a home.

Funds were granted by the state legislature, and Joseph N. Bradford, then at Ohio State, was appointed architect. According to his plans, the building when completed will be about four times the size of the present structure and nearly five times the size of the first unit, which was not completed until 1925. The power plant for which the steel members were originally fabricated had been designed as a two story structure. The experiment station building to be erected was to be a four story structure which required the addition of a third and fourth floor. Columns which were too long for this added portion were, of course, cut off; some of the waste pieces may still be seen lying along the university tracks at the west end of Woodruff Avenue.

Originally most of the second floor was assigned to the State Highway Department, formerly located in the



ROSEVILLE  
BRICK PLANT

*Cuts Courtesy Experiment Station News*

present photography department's quarters on the ground floor of Brown Hall. The new quarters seemed at the time quite ample. However, expansion followed, and, in the words of J. R. Shank, research professor of civil engineering,

"the Highway Department began to exert pressure on the walls, tending to squeeze them out, but since the pressure on the other sides was equal, the situation became acute. The remedy came when the Highway Department constructed a wing to the original building in which they now house one of the most efficient and complete laboratories of its kind in the country. In my personal opinion, it is the best."

As established by law the Ohio Engineering Experiment Station is a research organization consisting of four main groups of facilities classified as follows:

- (1) The Engineering Experiment Station building and special apparatus at The Ohio State University.
- (2) Other laboratories and equipment at the University, facilities used primarily for instruction, but available for station projects. (Conversely, research equipment of the station is available for instruction use.)
- (3) The experimental heavy clay products plant situated at Roseville, Ohio.
- (4) The power plant, radio station and other items of the University's physical plant. In addition, structures and plants in Columbus and elsewhere, used from time to time on a cooperative-project basis fall in this class.

Two activities, not directly connected with the station have quarters in the station building. They are the State Highway Testing Laboratory, already mentioned, and the Ohio Stream Flow Survey.

When the State Highway Department's laboratories were moved from the second floor of the original unit of the building to the new wing, the auxiliary prison plant was abolished at Roseville and ceramic research men came to Columbus, quickly occupying the space vacated by the highway department's move. Professor Shank's "squeezing out" process has once again started and competition for space is growing acute at the present time. The establishment of a new division known as the Lumber Research Foundation will likely intensify the struggle for space.

The Highway Testing Laboratory makes complete tests of brick, stone, cement, concrete, asphalt, tar and other materials used in the construction and maintenance of Ohio roads. Equipment for compression tests of large concrete and vitrified clay sewer pipe, for bending tests and for tensile tests of steel is available. Close cooperation is maintained between the Engineering Experiment Station and the Highway Testing Laboratory, and an interchange of equipment is encouraged when it is not in use at the office which owns it.

The State of Ohio and the United States Geological Survey are cooperating on a survey of Ohio's water resources. Close connection of this work with that of the Station is brought about because the investigator in charge

of Station Project No. 1, Ohio Stream Flow, is the representative of the Governor of Ohio on the Cooperative Survey. The stream flow survey activities are carried out on the fourth floor of the station building.

A number of particular advantages were gained in making the experiment station a part of the University's College of Engineering. Faculty members of the university, well qualified to direct research, are given opportunity and encouragement to supplement teaching with industrial research problems. More intensive use of equipment primarily intended for instruction is secured by using it for research when it is not needed in teaching. The closer contact of student and instructor brought about by proximity with industrial problems improves the university's service-instruction.

Some research workers are at their best when devoting their entire time to research. By maintaining a full time research staff in addition to the faculty staff members, the advantages of both types of workers are obtained.

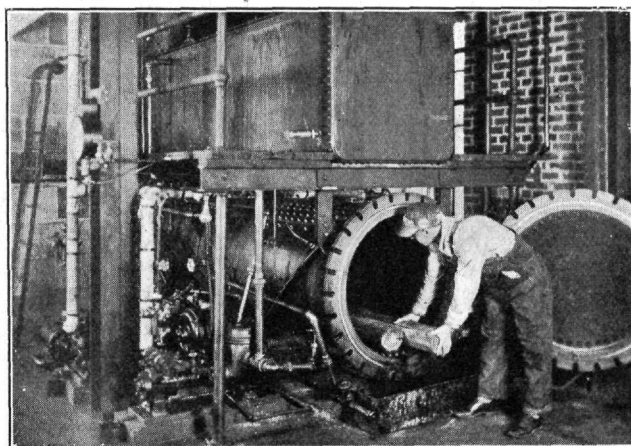
The act of establishment defined a very broad field of investigation for the station. While it is usually possible to produce an accurate measurement of an institution's value from financial records or reports, this cannot easily be done for the service given by the station. Some businesses, perhaps, will never be reached; others may be revolutionized by discoveries made by this institution.

The ceramic industry whose product ranges from heavy, coarse but useful sewer pipe and paving brick to fine, delicate art objects and dinnerware, has benefited from the station's investigations as has also the casting industry, which produces castings of all types in iron, steel, brass, aluminum and the other metals and alloys. Both these major industries are composed of innumerable units, scattered widely over Ohio. Even though many of these groups are very small, the aggregate volume of business is large, amounting to several billions of dollars each year.

It is these small, decentralized industrial establishments which the research of the Engineering Experiment Station, can be of the greatest benefit to.

Among other projects on which the station has made

#### TIMBER TREATMENT LABORATORY



investigations may be mentioned the method of concreting steel structures already in service. In 1928 the High Street viaduct was found to be in a dangerous condition because of rusted and corroded steel members brought about by smoke from the locomotives. It was suggested that the rusted members be placed by steel rods and the whole structure covered with "gunite," a plastic mixture of sand and cement shot on by air pressure. Before any repair was undertaken at the viaduct, the method was thoroughly tested at the experiment station on corroded beams reinforced with rods, gunited and placed under load. Following the satisfactory results of the test, the viaduct was repaired to the entire satisfaction of the engineers concerned and at no inconvenience to the traveling public.

In cooperation with the Batelle Memorial Institute and with some assistance from the producers of Ohio coal the gasifying and coking properties of various Ohio coals were determined. Results indicated that while the low price of natural gas makes the process unprofitable at present, certain of the coals are well suited for gas and coke production and may in the future be used for this purpose, should a change of conditions make it economically possible.

The usefulness of coals from the Hocking and Cambridge mines for power plant purposes was carefully studied in a series of experiments carried out in cooperation with Ohio coal producers.

Development of formal instruction in ceramics at The Ohio State University, and Ohio's leadership in the

production of clay products have tended to give the field of ceramics the greatest attention at the experiment station.

De-airing, a process developed at the station for making clay wares, is at present widely used not only in ceramic industries, but for purposes other than those for which it was developed. Widely separated examples are the de-airing of candy-bar machines and of concrete mixers.

Tests at the station showed the great value of shaping clay mud in a vacuum. The resulting cohesion between the particles produced an extremely dense and gummy material, with properties quite different from that made in the ordinary way and much better. By use of the process all clay products are improved to such an extent and its adoption so widespread that the ceramic industry has practically been revolutionized.

All of us are familiar with the highway warning, "slippery when wet." Back of that warning statement is a problem that has been attacked and solved at the Engineering Experiment Station.

Road surfaces made with paving brick are constructed with the space between the brick filled with a sealing material, usually tar or asphalt. This has an unpleasant way of coming out on top where it is unsightly and dangerous when wet. In cooperation with the National Paving Brick Association, the station has produced a filling material that will stay between the brick where it belongs.

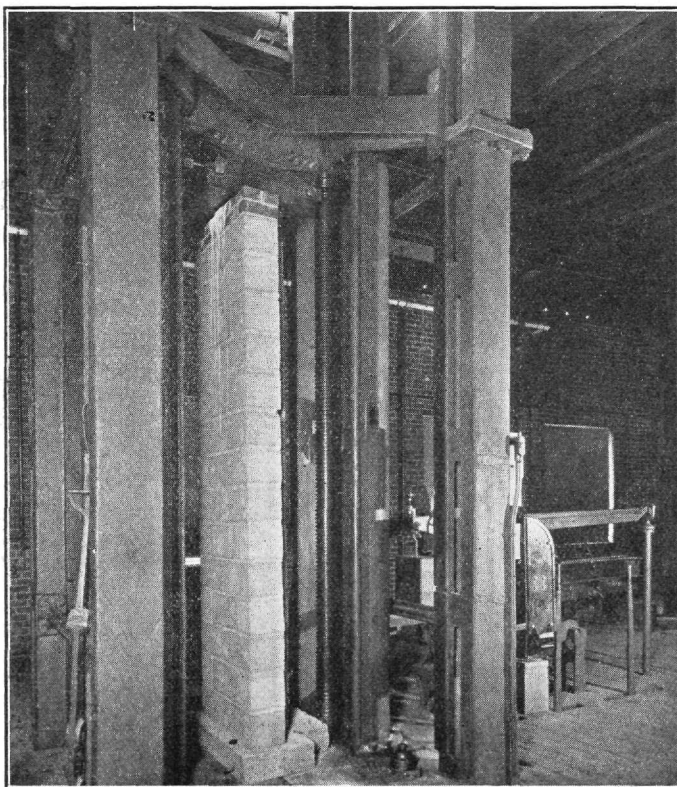
Brick and tile produced from dense, hard clay are strong, but heavy. In some cases less strength and less weight are desirable. Out of this need arose a station project in cooperation with the Structural Clay Tile Association, the purpose of which is to develop a light-weight clay product. Such a material was discovered and is now being offered to the public through the regular markets. The material possesses sound absorption and high insulation properties as well as light weight, and may be used in filtration and sewage treatment.

The general chemical method for producing the light weight building materials developed in this project may prove even more valuable than the product itself. The revolutionary idea of the lightest possible material for the necessary strength requirements has given tremendous impetus to the "light weight idea" and has influenced developments in other materials, including concrete.

This list of station projects and results could continue in an almost unending flow, although unfortunately many are at practically a standstill at present, because of lack of sufficient funds for further work.

It might seem from the variety of projects mentioned that the selection of the problem is a matter of chance or the whim of a staff member. Such is not the case. A well planned effort is made to choose important subjects and those best

PILASTER IN 500,000 LB. TESTING MACHINE



sued to the facilities available. The choice is also determined in some cases by offers from industry and government to undertake the project on the cooperative basis.

To coordinate research problems with available equipment, to make contact and encourage cooperation between the station and the outside industry, as well as prepare and furnish detailed cost estimates and any other information pertinent to the industry contemplating cooperative research with the station, a new office known as the Director of Industrial Research, was established by the university in 1934 with Mr. Hurlbut S. Jacoby as acting director. Time and space prevent further informa-

tion on the valuable service performed by this office of the station and it must be left to a future discussion.

Results of the station's work are reported in technical papers presented by staff members at professional societies, and published in prominent engineering journals.

Station publication of bulletins, circulars and the bi-monthly *News* aid in distributing information.

By these methods the purpose of the Ohio Engineering Experiment Station is accomplished by its staff members—to learn the truth and make it public in the interest of safety, economy, and efficiency.

