Official Publication of

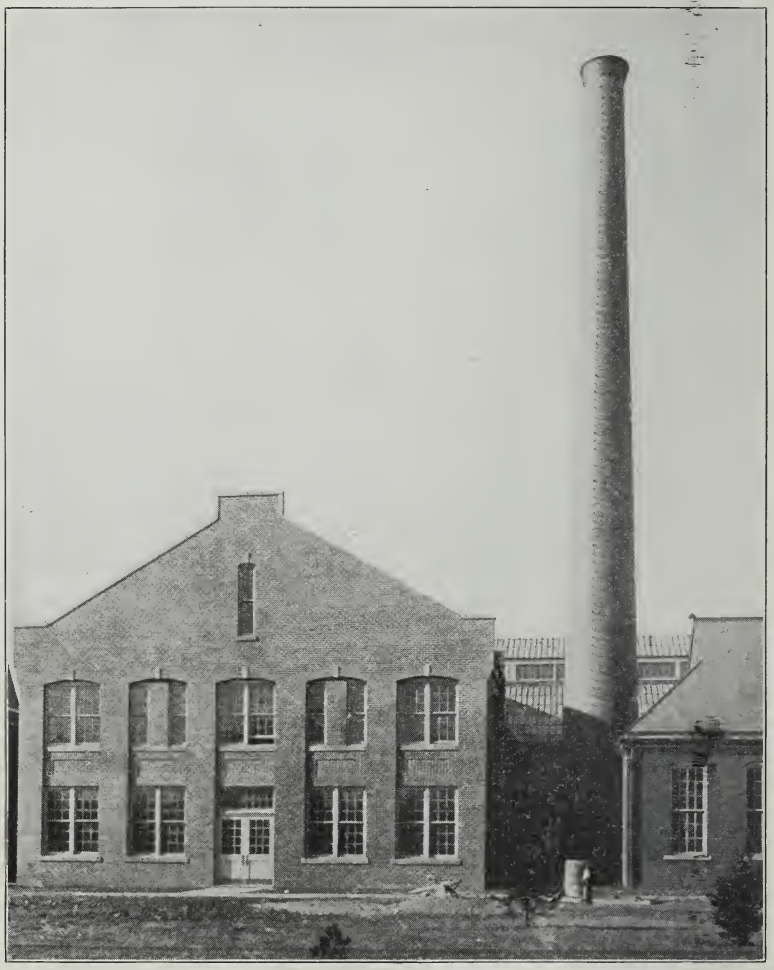
IOWA STATE COLLEGE
OF AGRICULTURE AND MECHANIC ARTS

Vol. XIII June 1, 1914 No. 2

NEW DEVELOPMENTS IN ENGINEERING EDUCATION AT AMES

Ames, Iowa

Published Tri-Monthly by the Iowa State College of Agriculture and Mechanic Arts Entered as Second-class Matter, October 26, 1905, at the Post Office at Ames, Iowa, under the Act of Congress of July 16, 1904.



The New Steam and Gas Laboratory at Iowa State College

The New Steam and Gas Laboratory at Iowa State College*

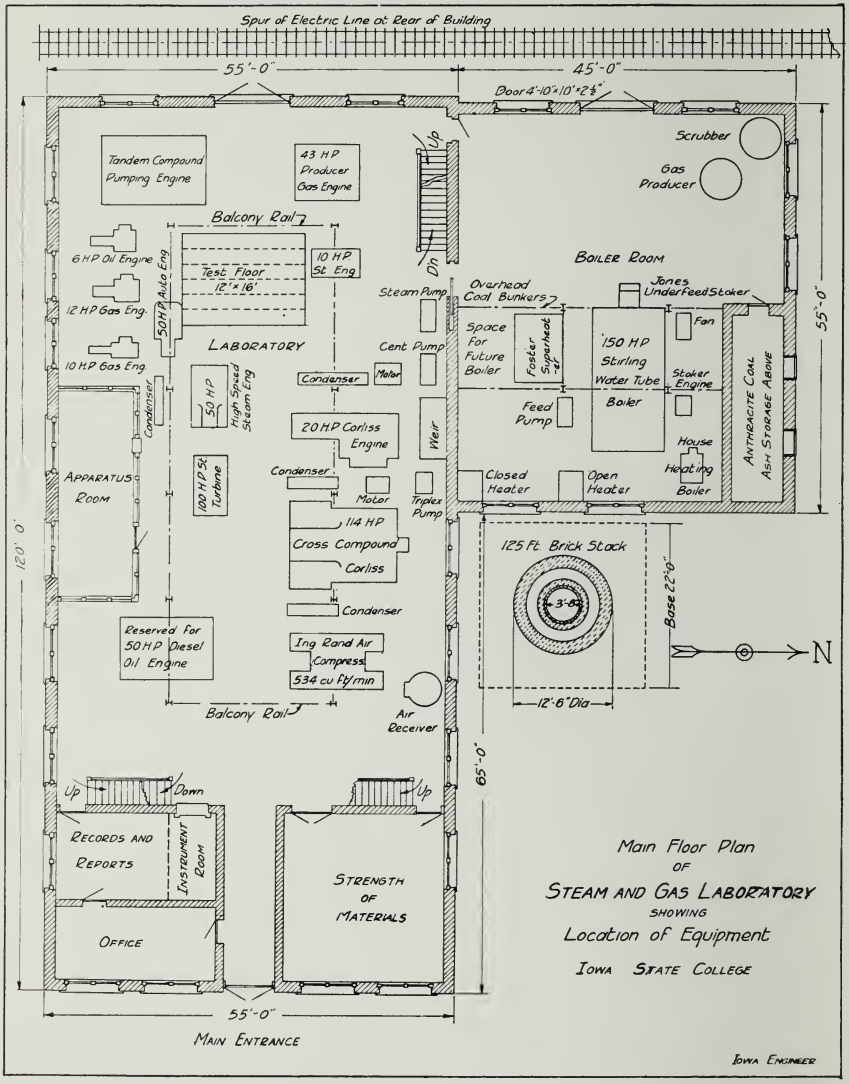
The Department of Mechanical Engineering has waited long and patiently for the time to come when sufficient equipment, and a suitable building for housing that equipment, would be available for the teaching of Steam and Gas Engineering as it should be taught in an institution of this kind. The department was handicapped on every side in its endeavor to meet the needs along these lines. While some of the equipment had been purchased recently and represented the best in type and construction, the remainder was old and worn and somewhat out of date. It was scattered throughout several buildings and in many cases had to be moved from place to place each year to make room for other things.

Those in touch with the situation and knowing the needs in this direction have worked long and tirelessly for something better, and at last it is in sight and every one is rejoicing over this success. The efforts have resulted in a new Steam and Gas Engineering Laboratory which will have an equipment for experimental work only second to none in the country.

Last winter an appropriation of $50,000.00 was made for the building, and special appropriations of about $13,000.00 for new equipment. The contract was let to Mr. C. E. Heaps of Davenport, Iowa, for $39,700.00. The old power plant which the older engineering alumni will remember with kindly thoughts was wrecked to make room for this, its worthy successor.

The new building is in the shape of an L with the main part extending east and west between the old engineering hall and the foundry and facing the east. It is 55 by 120 ft. The wing is 55 by 45 ft. and extends north back of the foundry. The building is built of hard burned brick and has a steel and Federal tile roof and is fire-proof throughout. The east 24 ft. of the building proper is full two stories high. This part has a basement containing toilet and locker room, and a store room. The first floor contains two offices and instrument rooms, a materials testing room, and a front hall leading to the main engine room. On the second floor of this portion of the building will be found two report rooms and a lecture room. Each room is equipped with blackboards, and the report rooms with oak tables and chairs besides other necessary equipment.

* Reprint from Iowa Engineer, January, 1914. Contributed by M. P. Cleghorn, Associate Professor of Mechanical Engineering, Iowa State College.



Main Floor Plan
OF
STEAM AND GAS LABORATORY
SHOWING
Location of Equipment
IOWA STATE COLLEGE

IOWA ENGINEER

The remainder of the building is of the one story and balcony type with monitor roof for admitting light and air.

The main engine room is 55x96 feet. Near the center and at the south side is located a tool and instrument room. The equipment on this floor includes a 10x20x24 Cross Compound Corliss engine of the rolling mill type capable of developing 114 indicated h. p. at 125 revolutions per minute. It will have its own condenser, and be equipped with steam jackets and special devices for carrying on a great variety of experimental tests. Next to this is an Ingersoll Rand Cross Compound Two Stage air compressor with 12x18x14 steam cylinders and 16x10x14 air cylinder and capable of compressing 534 cubic feet of free air per minute. This will also have its own condenser and be arranged for special tests. In the same group and in line with the above engines may be seen a 20 h. p. Corliss engine. This engine is equipped with the old fashioned "crab claw" valve gear and is of considerable interest in that respect, but it is well preserved and well adapted to student use. The student will also have at his disposal a 12 horse power, and a 50 h. p. high speed steam engine and a 100 h. p. steam turbine. All of these steam engines are located as shown on the plans so as to be in close proximity to the pipe tunnel carrying the main steam and exhaust pipes.

The gas producer power plant should not be overlooked. It is composed of a 50 h. p. Fairbanks Morse Suction Gas Producer connected to a 43 horse power two cylinder vertical gas engine built by the same company. The plant uses hard coal or coke and the engine is equipped with indicators, brake, speed counters, gas sampling connections, etc.

To the south side of the room are located the 12 h. p. Olds gasoline engine, the 10 h. p. Otto gasoline engine, the 6 h. p. Mietz and Weise oil engine, and the 50 h. p. 4 cylinder automobile engine. A 50 h. p. Diesel Crude Oil Engine will be noticed on the plans. This has not been purchased as yet but the space is reserved for this and it will be obtained as soon as possible.

Pumps of various types, both rotary and reciprocating, are located along the north wall of the engine room and in close proximity to a large weir where the water from them may be measured. This weir may also be used for measuring the circulating water from the various condensers. This water may be returned to the storage tanks in the boiler room basement if desired. The tandem compound pumping engine having a rated capacity of 5,000 gals. per hr. is located over the 2,250 foot well. This is to be overhauled and will be splendid equipment for pumping tests and for determining cost of pumping water with this type of pump.

A test floor 12x16 feet built of steel beams set in concrete is located to the west end of the main floor and directly in front of the large outside door, and arranged for the bolting of machines to it for testing. This will be appreciated when machines are sent in to the Department for testing and are not to remain a sufficient time to demand a foundation of their own. This floor is to be supplied with saturated and superheated steam, and with water. At this point it may be well to call attention to the arrangement around this floor. As is seen on the plan the 43 h. p. Producer gas engine, the 10 h. p. steam engine, the 50 h. p. steam engine, the 5 h. p. Mietz and Weise oil engine, the 12 h. p. Olds gasoline engine and the 50 h. p. automobile engine, are arranged in such a way that any one may be belted to machines on this test floor.

All steam, water, gas and air pipes and electric wiring are carried in the large 5x10 ft. tunnel which extends through the center of the building. Here are located the main headers for saturated and superheated steam, and exhaust, with all cross connections and valves easily accessible and making the equipment very elastic. Goose necks of long radius bends extend from the tunnel to the engines above. Very little piping will show above the floor. Small tunnels 21x30 inches in section are located where needed to supply the engines not adjacent to the large tunnel. The main floor is well supplied with floor drains to take care of drip water from brakes, condensers, etc.

Two glass inclosed rooms on the balcony of this engine room will be used for coal and gas analysis and for instruments. The remainder of the balcony will be used for the small gas and gasoline engines, hot air engine, fan blower, refrigeration machine, water wheels, injectors of various types, gauge and indicator calibrating devices, all fitted up for testing, and other small apparatus that enters into the complete equipment of such a laboratory.

The north wing contains the gas and steam generating equipment. A 150 h. p. Sterling water tube boiler has been installed which was designed for a working pressure of 250 pounds per sq. inch. This is equipped with a Jones Under Feed Mechanical Stoker. To overcome the difficulty experienced with this type of stoker in the removal of the ashes the Department of Mechanical Engineering has designed a special dumping grate which it is hoped will at least partly solve the problem. The ashes will be dumped into a bucket conveyor and elevated to an ash bunker where it may be spouted to wagons outside. Over the boiler are located the coal bunkers and the conveyor, which is arranged for handling both the coal and ashes. From the bunkers the coal will gravitate through downspouts to the stokers.

Adjacent to the boiler stands the Foster separately fired su-

perheater capable of heating the steam to 600 degrees F. The gas producer mentioned above stands in one corner of the boiler room and near to the coal storage. Space is also reserved for the addition of another boiler in the future as occasion demands it.

In the basement below are three large water proofed tanks equipped with weirs and holding 50,000 gals. of water for boiler feed or for pumping experiments.

The chimney for the boilers is 125 feet high and has an inside diameter of 44 inches. This is built of radial brick and connected to the boilers by means of an underground smoke duct.

The New Transportation Building *

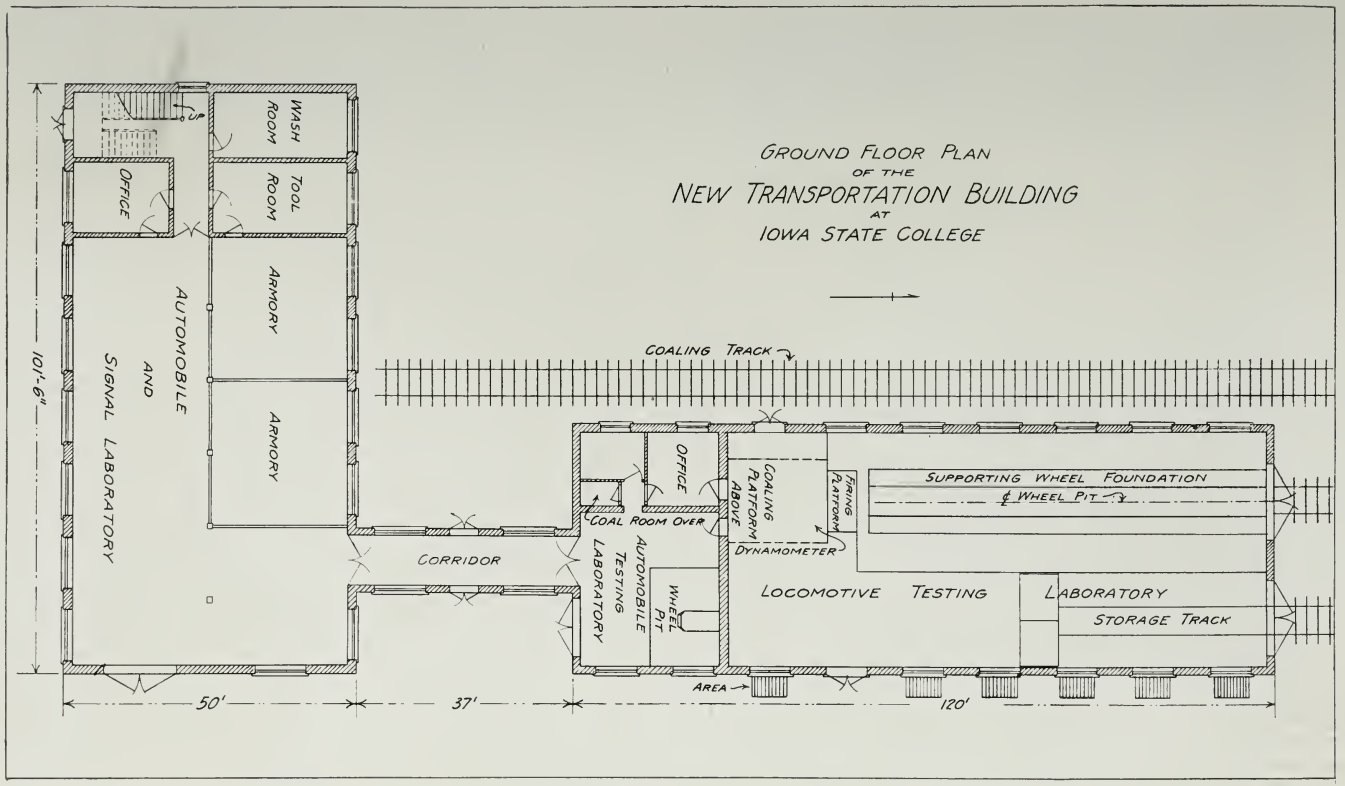
At its last session, the State Legislature of Iowa set aside the sum of $65,000 to be used for a new Transportation Building at Iowa State College. The plans for this building were drawn up by Proudfoot, Bird & Rawson, architects, under the general specifications prepared by Dean Marston. The contract was let to Arthur H. Newman & Co., general contractors, Des Moines. They begun work in July, 1913, and finished in February, 1914. The building stands just west of and parallel to the Engineering Annex. It consists of two wings, one 50 feet by 100½ feet used for recitation and laboratory purposes, and one 43 feet by 120 feet for laboratory and experimental purposes. The structure is practically fireproof throughout. The walls are built of brick and the floors of hollow tile and concrete. The window sash are steel and allow a much larger percentage of lighting area than is usually found in this type of building.

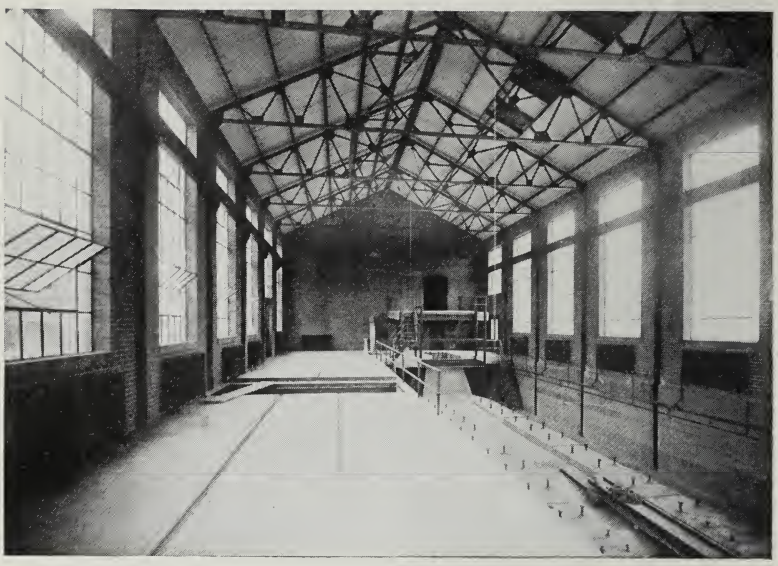
The recitation wing is constructed on the monitor plan and is three stories high. On the first floor is a large laboratory to be used for automobile and signal instruction, a combination office and tool room, a wash and locker room, and two temporary rooms for the College Armory. On the second floor are two large class rooms, two drawing rooms, a study room for students, and three offices. On the third floor is a large drawing room and office. These two upper floors will be used for instruction in Railway and Highway Engineering.

The experimental wing consists of two main rooms, one of which will be used for locomotive testing and the other for automobile testing. The locomotive room and equipment are

The New Transportation Building, Iowa State College. The third to be built in this country.

* Reprint from Iowa Engineer, April, 1914. Contributed by E. E. King, Professor of Railway Engineering, Iowa State College.


GROUND FLOOR PLAN
OF THE
NEW TRANSPORTATION BUILDING
AT
IOWA STATE COLLEGE
WASH ROOM
TOOL ROOM
OFFICE
ARMORY
ARMORY
AUTOMOBILE AND SIGNAL LABORATORY
101'-6"
COALING TRACK
CORRIDOR
COAL ROOM OVER
OFFICE
COALING PLATFORM ABOVE
FIRING PLATFORM
DYNAMOMETER
SUPPORTING WHEEL FOUNDATION & WHEEL PIT
AUTOMOBILE TESTING LABORATORY
WHEEL PIT
LOCOMOTIVE TESTING LABORATORY
STORAGE TRACK
AREA
50'
37'
120'



Interior view of Locomotive Testing Laboratory showing pit for support wheels, dynomometer and coaling platforms. The amp e lighting area will be noted.

designed to accommodate the largest engine now in existence. The plant will be built in general after standard plans of those already in service but many details have been varied to suit local conditions.

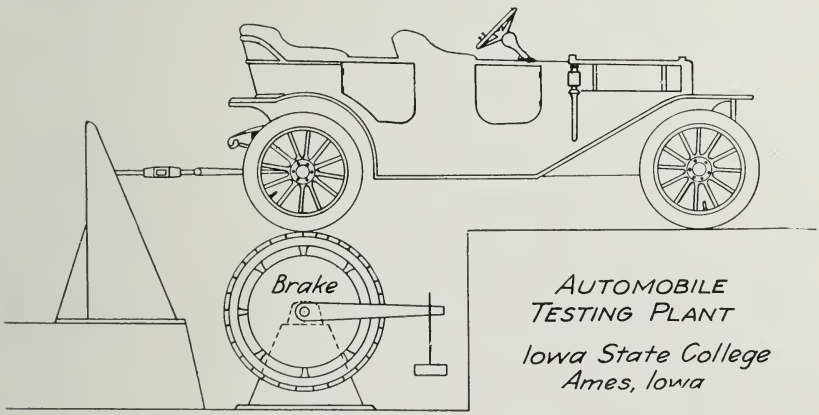
While being tested the engine will have its drivers mounted upon support wheels 52 inches in diameter. The tops of these support wheels will stand exactly level with the main floor of the room. It is aimed that the drivers will revolve at the same relative speed in the pit as they do under ordinary working conditions on the road. The load will be applied by means of Alden brakes attached to each end of each supporting wheel axle. The locomotive supporting mechanism is all carried by a heavy reinforced concrete foundation 13 feet wide and varying in depth from 3½ feet at the front end to 6 feet at the rear. The draw-bar pull of the engine will be registered directly by means of a dynamometer mounted on a heavy concrete pier placed in the rear of the engine. The basement which contains all of this apparatus and the piping for delivering water to the brakes runs the entire length of the room. There will be an overhead traveling crane of 12½ tons capacity extending the full width of the locomotive laboratory. This will be a three movement crane and will be used to handle the supporting equipment when making adjustments for different sized loco-

motives. For the present it is proposed to install just a smiple smoke jack and carry the smoke and gases through the roof making no provision whatever for collecting the cinders.

The College now possesses two locomotives. Both of these will be stored in this laboratory but only one of them can be used for testing. The older of these is a 36 inch gauge machine, the first one to cross the State of Iowa. It was owned by the Burlington Railway and was given to the College by that company. The other is an American type of locomotive and was donated by the Chicago & North-Western Railway. After proper overhauling, this engine can, in all probability, be used for running locomotive tests.

This plant will be used for instructional work in graduate and undergraduate courses and for experimental purposes in connection with the Engineering Experiment Station. Its services will be available to any road that cares to take advantage of the opportunities it offers. Several roads in the state have expressed their willingness to loan the College authorities such locomotives as they may be able to give up from time to time and to co-operate with them in making these tests wherever mutual benefits can be obtained.

The automobile testing plant will be constructed to operate the largest automobiles now built. The mechanism will be very simple consisting of two wooden rim wheels 48 inches in diameter and 15 inch face mounted in a pit so the top of the wheels will come just level with the main floor of the building. These wheels will carry the rear wheels of the automobile. The load will be applied by means of a brake attached to one end of the support wheel shaft. This brake will be used also for determining the horse-power delivered at the rim of the wheel. In addition there will be a lever dynamometer placed in the rear of the machine to register the draw-bar pull.



In all probability the equipment will be installed ready for operation by the end of the present semester. To a certain extent the plant may be used for commercial testing but its primary object will be for instructional work in connection with the Automobile Engineering courses and for investigational purposes under the direction of the Engineering Experiment Station.

Iowa State College offers 4-year courses in agronomy, agricultural education, animal husbandry, ceramic engineering, chemical engineering, dairying, horticulture and forestry, home economics, industrial science, and structure design; 4 and 5-year courses in agricultural, civil, electrical, mechanical and mining engineering; 5-year courses in science and agriculture, science and engineering, and science and home economics; a 6-year course in science and veterinary medicine. There are also 2-year sub-collegiate courses in agriculture, in vocational work along engineering lines, and in home economics; and 1-year course in dairying.