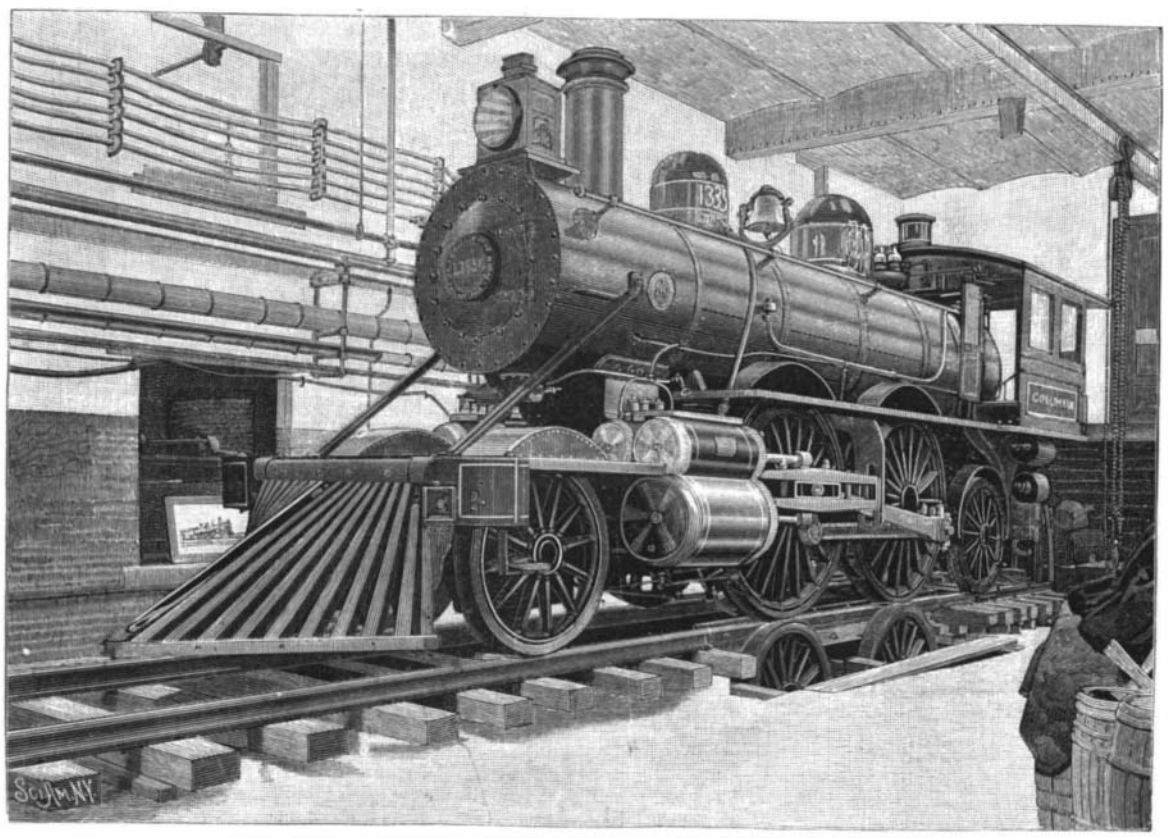
THE NEW TESTING LOCOMOTIVE AT COLUMBIA UNIVERSITY.

BY HERBERT T. WADE.

In the development of engineering education, a most striking feature has been the great improvements that have been made in the laboratories and apparatus placed at the disposal of the student. Where formerly one or more rooms, equipped with small testing machines and working models of engines, pumps, and other machinery, were used to instruct the embryo engineer on the practical side of the subject, we now see entire buildings fitted with machinery of the same size and design as would be encountered in actual practice. While this statement holds good for a number of our larger scientific schools, it is particularly true in the case of the new laboratory of mechanical engineering at Columbia University, which is now being installed in the large basement vault between Havemeyer Halland the Engineering building. It will contain, when completed, departments devoted to steam and motive power engineering, air and gas engines, hydraulic motors and pumps, and locomotive engineering. This equipment has been presented to the university by such engineering firms as the Allis Company, of Milwaukee; the Ingersoll-Sergeant Company, of New York; and the Worthington Pump Company, of New York; and is already in position or is in process of construction.

The locomotive laboratory, in particular, is of interest, inasmuch as its chief piece of apparatus is a full size passenger locomotive, which was the gift of the Baldwin Locomotive Works, of Philadelphia. During the winter this engine has been erected on a short section of track, and in its position at the west end of the laboratory forms the subject of our illustration. It is known as the "Columbia," and was originally built to be shown at the World's Fair, at Chicago, in 1893, where it formed a part of the locomotive exhibit at the Transportation building. At its new home in the Columbia Laboratory this engine is not to be regarded merely as a large exhibition piece of machinery, but as actual scientific apparatus that will be put to active use. In addition to its educational functions, it will be used in solving various questions connected with the design and economy of locomotives. In order that the engine may be operated under steam, it is mounted on a system of friction wheels, each of the four driving wheels resting on a large wheel mounted in massive bearings. To the axles of the friction wheels are fitted heavy brakes, which are used as dynamometers and absorb the energy developed. It may be remarked in passing, that at the present time there are only two other such locomotives in the United States, at Purdue University and at the shops of the Chicago and Northwestern Railroad. In the case of the former a number of tests have been made, and much data of importance has been obtained, which has been greatly appreciated by locomotive designers and engineers.



THE NEW TESTING LOCOMOTIVE AT COLUMBIA UNIVERSITY.

The mechanical problems involved in transportation are constantly attracting more attention from engineers, and it is the intention at the Columbia School of Engineering to give the students a thorough foundation in the theory and practice of locomotive construction and operation. The locomotive "Columbia" is what is known as a compound express passenger locomotive, and was built from designs by S. M. Vauclain, of the Baldwin Works. It is of full size, of the standard gage, 4 feet 8½ inches, and rests on four driving wheels which are brought close together directly over the center of gravity of the engine. As the engine is compound, there are two cylinders on each side, the high pressure cylinder being 13 inches in diameter and the low pressure cylinder 22 inches. The tender has been omitted from the equipment on account of lack of room, but there is a platform behind the cab supplied with scales and tanks, so that the coal and water consumption can be measured while the locomotive is being run at various speeds. The engine is fastened to a sternpost which will also absorb a certain amount of energy, and by means of traction dynamometers the hauling power at different rates of speed can be found. When running at a speed of from 40 to 45 miles per hour some 1,600 horse power is exerted, and its measurement is effected by the dynamometers mentioned above, attached to the axles of the friction wheels on which the locomotive rests. These have heavy brakes with which a force of known intensity can be applied, and the amount of energy absorbed from the driving wheels ascertained. Elaborate safety appliances have been added wherever necessary, as the effect of such a machine breaking loose in case of accident would be disastrous in the extreme. The locomotive is so arranged that it can be operated with steam from the boilers at the power plant of the university, or connected with an air compressor should it be desired to use compressed air as the motive power; or its own boiler and firebox can be used and steam generated as in actual use. There is also a full Westinghouse air brake equipment which is applied to all the wheels.

The interest that has been taken by members of the engineering profession in the equipment of the Columbia Engineering Laboratory is well shown by the generosity manifested in connection with the erection of the locomotive. The short section of track on which it stands rests on ties furnished by the New York Central and Hudson River Railroad, which also furnished the skilled labor to spike the rails in place. The rails themselves were a gift from the Maryland Steel Company, while the supporting girders for the bearings and the safety rails were presented by the Carnegie Steel Company. The Ellis bumping post was given by the Mechanical Manufacturing Company, of Chicago, and the great bearings were obtained from the George V. Cresson Company, of Philadelphia, at a specially favorable price. The dynamometers are not yet in place, as a donor has not come forward; but with this exception the equipment as regards the engine is singularly complete.

Standing near the locomotive on the opposite side of the laboratory is a trolley car of full size also, which is to be used in the same manner. It is supplied with brakes, wheels, and motors of the standard pattern and will afford opportunities for measuring the efficiency of electricity as a motive power under different conditions.

The advantage to the student of using actual size machinery in the course of his engineering education must be quite apparent, for in this way he is made acquainted with conditions as they actually exist, which in many cases vary considerably with the increased size of the machine. Having operated such machinery, it necessarily follows that he is in a better position to design or superintend its construction. In the new laboratory at Columbia it is intended to have all the practical work take this form, and the various engines, pumps, and other mechanical apparatus, either in place or in course of construction, all carry out the same idea. Such an equipment has been secured by the generosity of leading American manufacturers of machinery, who in this substantial way have shown their interest in the attempt of the university to provide a thorough education in the principles of mechanical engineering. They, however, will doubtless secure an ample return, not only in an improved grade of engineers, but also in having a place where tests and experiments of a scientific character may be made with different appliances and materials, and data deduced which in most shops and factories it would be next to impossible to secure.

A HEAVY snowstorm in Belgium has completely disorganized the telephone system around Brussels. The damage done to the wires was so extensive that it is not likely the necessary repairs can be made within a month.

Fibers and Fabrics and Their Relation to Manufactures.

At a recent meeting of the Household Economic Association and the Domestic Science Department of the Brooklyn Institute, an interesting paper entitled "Fibers and Fabrics: Connecting them with Dress and Healthful Conditions," was by Mrs. S. S. Woolman, of Teachers' College. She said it is women who are injuring the market, not manufacturers, the trouble coming from the former's failure to understand the fiber itself. A woman wishes a certain material and says she must have it at a certain rate. In order to give her what she asks, cheaper chemical dyes must be used and various adulterations must be resorted to. If women go to the stores and insist on having foreign goods for the first-class materials, it forces American manufacturers to make cheaper goods; whereas, American manufacturers can make the best quality of goods if there is a trade for them. The effect of the adulteration is already becoming noticeable. If women think they are getting a good silk at 50 cents a yard, they are mistaken; they will find it is nearly all cotton, for there is no silk obtainable at that price but the Japanese. Among the many adulterations used now in the manufacture of silk to give it the required gloss, "scroop" (the crisp rustle), and body, Mrs. Woolman mentioned the use of the rough floss silk for the woof which makes it soon wear shiny, and artificial silk made of cellulose and treated with chemicals; and the introduction of Sea Island cotton, which looks almost the same as silk, but will not wear as long, also the use of cotton which has been mercerized, as described a short time since in the SCIENTIFIC AMERICAN. This gives a transparent effect, and is excellent for cotton, but not as a silk fabric. Pressing is also resorted to in some brands of silk. This increases the weight, but sacrifices the strength. The lecturer gave a series of tests for silks.

Emperor William's New Rifle.

The Emperor William has a new rifle which resembles the Mauser revolver. It is a foot long and the magazine contains ten cartridges, as in the Mauser revolver. The rifled barrel is constructed to use a projectile covered with nickel and shaped at the end like a "Dum-dum" bullet. The propellant is cordite, and the rifle is sighted up to a distance of one thousand meters. The pistol fits into a wooden frame which, together with the butt-end proper, forms the shoulder-rest and gives the revolver the appearance of a magazine rifle. It is said that Mr. Maxim has made important additions to the weapon.

The Current Supplement.

The current SUPPLEMENT, No. 1215, is filled with interesting and important articles. "The Construction of a Voltmeter and Ammeter Suitable for the Small Switchboard" is an article by Nevil Monroe Hopkins and has been prepared at the request of many of our readers. It is accompanied by fifteen illustrations and working drawings. "A Horizontal-Base Range and Position Finder for Coast Artillery" is an article by Lieut.-Colonel George O. Squier, Ph.D., and Prof. A. C. Crehore, and is accompanied by interesting illustrations. "Trade Suggestions from United States Consuls" are published as usual, and a new feature is introduced, which is an index to all the advance sheets of the Consular Reports, by the aid of which our readers will be informed as to all of the Consular Reports that are issued, whether published in the SUPPLEMENT or not. There is also an interesting article on the "Woehnelt Current Interrupter."

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(Illustrated articles are marked with an asterisk.)