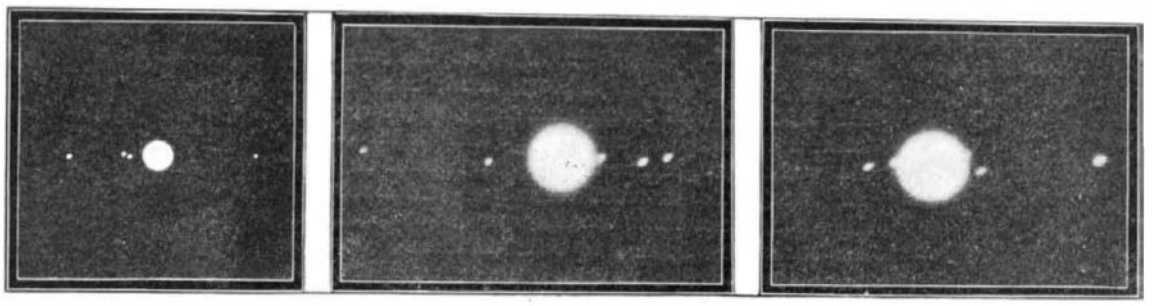
PHOTOGRAPHY OF JUPITER'S SATELLITES.

The satellites of Jupiter form one of the most wonderful aspects of the heavens and, likewise, one of the most easy to observe and most difficult to photograph. In fact, the image upon the plate is small, and the brilliancy of the planet is so great as compared with that of the little moons which revolve around it, and which at the most are of only the sixth magnitude, as to efface any trace that they might leave.

M. L. Rudoux, however, has, in his private observatory at Donville (Mauche), succeeded in fixing the Olympian family upon a plate placed in the focus of his equatorial, which has a 25-millimeter objective. This instrument has a focus of 1.4 meter. During the exposure the planet was followed as closely as possible, since the least deviation is very perceptible with such a focal length. The disk of Jupiter that is seen in the photograph is not its real disk, since lateral diffusion occasions here an excessive enlargement. In the first place, M. Rudoux tried long exposures, say of seven minutes, with an ordinary plate; and then he reduced the time to one minute with a non-halation plate. This short exposure made it possible to follow the planet more closely. The best results were obtained with exposures of from 1 to 1½ minutes.

The photographs taken show that satellite IV., which is the second in size, is always the faintest in photography, while satellite II., although the smallest, is very brilliant, and, with equal surface, the most luminous. M. Rudoux's photographs are the first of a series through which the observatory purposes to study various phenomena. The satellites of Jupiter, in fact, undergo very notable variations in luster, and their systematic notation may lead to interesting researches, such, for example, as those upon their revolution. For this purpose it would be necessary to observe the repetition of the variations, the return of the same brilliancy at determinate positions, etc. In theory, such observations are easy, but, in reality, they are somewhat difficult to make. A long series of them can alone give a solution of the question.



Oct. 7, 1903. Sept. 18, 1903. Sept. 19, 1903.

PHOTOGRAPHS OF THE PLANET JUPITER AND ITS SATELLITES TAKEN AT DONVILLE OBSERVATORY.

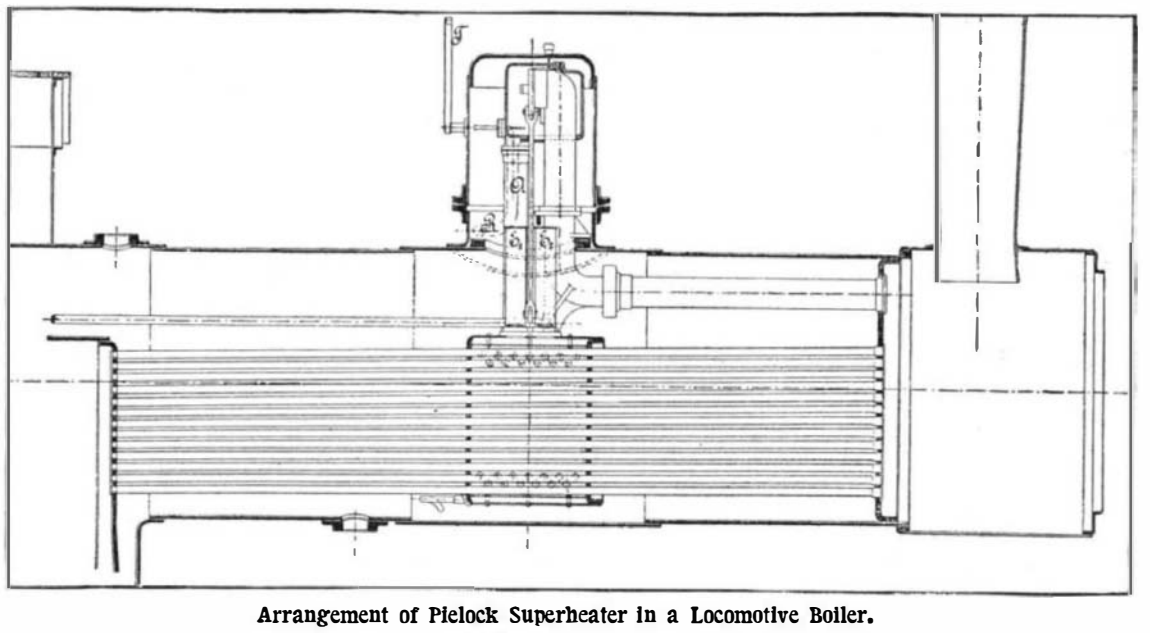
THE PIELOCK SUPERHEATER SYSTEM.

BY DR. ALFRED GRADENWITZ.

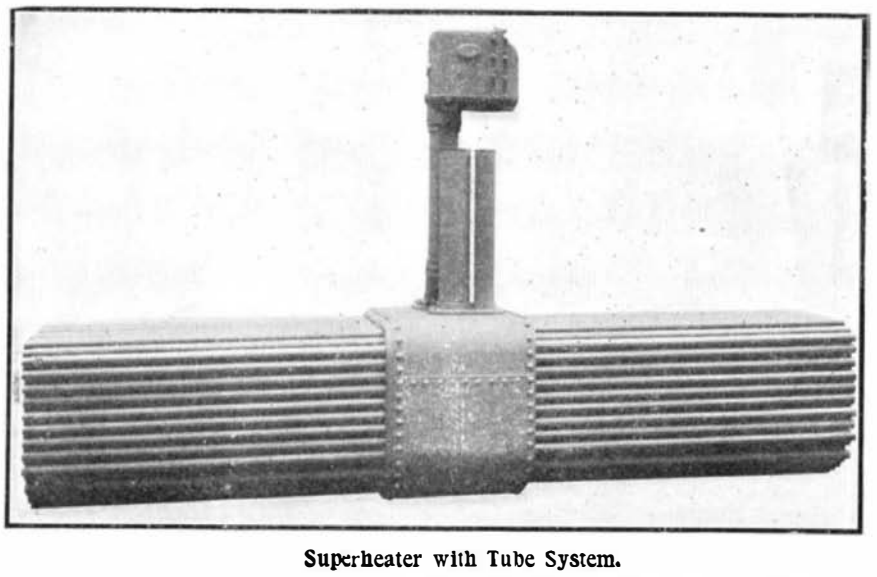
Although the use of superheated steam in stationary steam boiler and steam engine plants was long ago demonstrated to be advantageous, superheaters for locomotives were not designed before 1898, when the Prussian Railway Administration caused extensive experiments to be made in connection with such steam engines. These experiments resulted in proving the superiority of the superheated steam locomotive over the ordinary type being demonstrated.

Now, present superheater types, while fully meeting the requirements of safe operation, cannot be installed without expensive reconstruction except in the case of newly-constructed locomotives, necessitating even in the latter case a not immaterial cost (with the Prussian 2/4 high-speed locomotives about 6,000 to 8,000 marks).

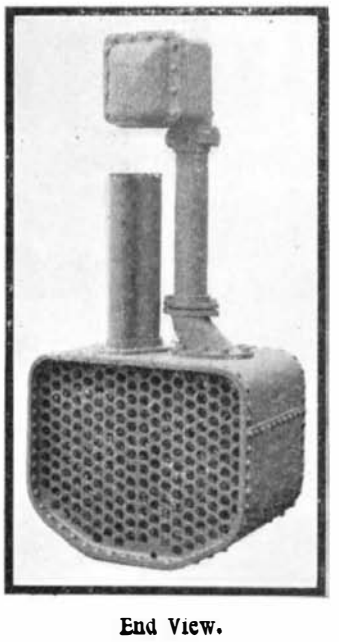
The Pielock superheater (just brought out by the Hannoversche Maschinenbau A. G. vorm. Georg Egestorff, Linden near Hanover) is remarkable for its simplicity and suitable arrangement, in addition to its low cost. This superheater is designed not only for locomotives, but for nearly any hot tube boilers. It is readily installed in connection with new as well as with existing boilers. In the case of locomotive superheaters, the apparatus is placed in the multitubular boiler, using the existing heating surface of the tube, so as to have the fire gases, necessary to superheat the steam, enter the superheater at a convenient temperature, sufficient to obtain the required steam temperature with a minimum heating surface, being on the other hand sufficiently cool to prevent the fire gases from seriously injuring the tube. The superheater consists mainly of a box surrounding the existing tube system in the boiler, being readily tightened against the surrounding water, as the pressures in the superheater box and in the boiler are identical. This box is divided by partition walls into different compartments, this insuring a contact as prolonged and as intimate as possible of the steam and the heating tube. The steam enters the superheater box at boiler pressure through the inlets E_1 and E_2, when the steam traverses the various compartments and ultimately finding its way through the tube A, enters a box surrounding the governor head ("Regulatorkopf"). The temperature of the superheated steam is indicated by a thermometer T provided with large figures, so as to be easily read from the mechanic's stand. A tube, R, leading from the governor through the dome foot serves to supply superheated steam to the air pump as well as for cleaning the rails, heating, etc. If disturbances should be observed, the amount of leakage of the superheater may be ascertained. Experiments so far made on the Pielock superheater have fully borne out the claims of its inventor. In connection with experiments made on behalf of the Prussian railway authorities, a saving of coal as high as 15 per cent and of water as high as 18 per cent was noted as compared with similar wet steam locomotives. In virtue of the reduced space of the superheater, any desired temperature up to the maximum of 300 to 350 deg. may be obtained, according to the position and length of the apparatus.



Arrangement of Pielock Superheater in a Locomotive Boiler.



Superheater with Tube System.



End View.

THE PIELOCK SUPERHEATER SYSTEM.

Dr. Pupin's Lecture on Wireless Telegraphy.

On the evening of May 25, at one of the lecture halls of Columbia University, Prof. M. I. Pupin gave, under the auspices of the New York Electrical Society, a lecture upon the subject of wireless telegraphy.

Dr. Pupin devoted his remarks largely to "resonance"—a subject concerning which there is a good deal of confusion in the popular mind.

There are, he said, three distinct kinds of electrical resonance, to wit:

1. Simple resonance, which is the commonest type, and is analogous to the resonance of a sounding body, such as a bell or a stretched string. Simple resonance is manifested whenever the electrical state of a conducting body is changed abruptly, as when a simple metallic body is charged by a spark from a Leyden jar. The simple resonance of a body is changed most conveniently by altering its inductance or capacity.

2. Multiple resonance, which appears when a composite structure, built up of a number of conducting bodies, each having simple resonance, are connected together into a unitary system. In this case the system as a whole can have as many frequencies as there are simple resonators in its make-up. For instance, if the system comprise ten simple resonators, each having an individual frequency, the system is capable of manifesting ten frequencies at the same time, provided the ten simple resonators are all in action.

3. Selective resonance, whereby one or individual circuits, or several circuits connected together in a system, may select or pick out, from a system adapted for multiple resonance, vibrations or oscillations of definite frequency or of some other definite characteristic. For instance, if a system of ten resonators is impressing waves of ten different frequencies upon the ether, or is impressing alternating currents of ten different frequencies upon a single wire, or is impressing alternating currents of ten different voltages upon the wire, it is possible for a number of receiving instruments, actuated by the waves or by the currents as the case may be, to respond independently, and without interference of any sort one with the other.

He explained the multiple selective system of his own invention, and which, with slight modification, is adapted for use with either electromagnetic waves acting through space or with alternating currents traversing a wire. He exhibited a model of his system as applied to wire telegraphy, but as the apparatus was not in working order, no practical demonstration was made.

Large Boring for Water-Works.

The largest boring for water-works purposes in England was recently completed for the Gainsborough Urban District Council. According to the Engineer, this borehole is 1,515 feet deep, and was not sunk without some annoying delays. One of these was particularly serious. When a depth of 725 feet had been reached, the rope carrying the boring tool broke, and buried the tool. This accident caused an interruption of no less than twenty-two months, but eventually the tool was recovered, and the boring completed to its full depth in 1900. Pumping machinery designed to have a maximum capacity of 70,000 gallons per hour has been installed.