A SMOKELESS AUTOMATIC STOKER.

It was with much interest that we accepted an invitation to witness the practical operation of a successful automatic coal stoker and smoke consumer actually applied to the well-known form of a Babcox & Wilcox water-tube boiler at the Stevens' Institute in Hoboken, N. J., where careful scientific tests have been made covering a period of over two months. It was especially gratifying to note that not a particle of smoke issued from the smokestack.

The stoker and furnace is the invention of Mr. Frederick Girtanner, and is exhibited, manufactured

AUTOMATIC STOKER FOR SMOKE CONSUMING FURNACE.

and applied to any boiler furnace by the Peerless Automatic Smokeless Stoker Company, No. 11 Broadway, N. Y.

The upper engraving presents an external view of the stoker as applied to the Stevens' Institute boiler in Hoboken.

It will be noticed there is an adjustable hopper filled with soft coal, and below a traveling endless grate feed-apron substantially air-tight, which is operated at an intermittent speed by a ratchet movement that carries forward from beneath the bottom of the coal heap a fixed amount of fresh coal to the interior.

Referring to the lower engraving showing a longitudinal section, it will be observed that as the coal is drawn in at the front no air is admitted. At this point the reflected heat from the intense fire at the rear bakes or cokes the coal as it enters the chamber, driving out the gas as in the process of gas manufacture, which, as it comes in contact with the fire beyond, is ignited and complete combustion is secured; as the coked coal is carried further to the rear it burns on the step-inclined grate in a smokeless flame, and is maintained at an intense heat by the draft of air passing through it; thus the full heat-giving efficiency of the fuel is obtained and nothing is lost.

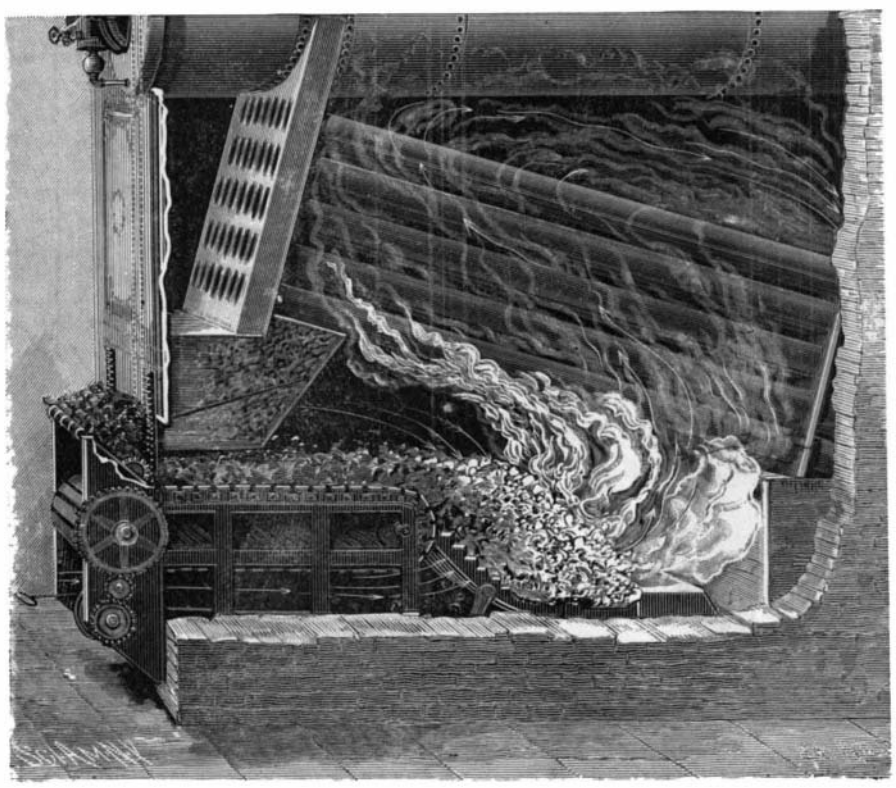
The inclined grate hinged at one end is occasionally swung back and forth automatically by a lever operated in connection with the feeding mechanism at the front and serves to slice or break up the fire, permitting a free circulation of air through it. The ashes fall from the inclined grate to a rear platform grate hinged at its rear, and from which the ashes are easily dumped into the ash pit below.

The practical efficiency of the stoker and smoke consumer over the ordinary method of hand firing is shown by the results obtained not only at the Stevens' Institute but also at a brewery in Guttenburg, N. J., where it was found that 10.20 pounds of water at 212 degs. Fahrenheit was evaporated with 1 pound of coal, as compared with 8.24 pounds of water to 1 pound of coal by the old methods, demonstrating a saving of 20 per cent. In the automatic stoker 480 pounds of ashes and clinkers were left as against 1,123 pounds in the old method. The double utility of this device in effecting economy in fuel and an elimination of smoke commends it to all users of soft coal.

Skillful Mending of a Propeller Shaft.

A clever engineering feat was accomplished during a recent voyage of the British steamship "Baroda" from Algoa Bay to Batavia, in connection with the repair of a fractured shaft while at sea. The vessel left Algoa Bay with a light cargo, and was therefore down at the head, which resulted in the propeller racing considerably more than if she were well down in the water, during rough weather. On the eighth day out the vessel ran into a gale, and during the evening the chief engineer, Mr. J. G. Shepherd, when entering the shaft tunnel noticed an eccentric movement, accompanied by a peculiar sound. The engines were stopped, and an examination of the shaft resulted in the discovery of a severe fracture at the after end of the third length of the shafting, 2½ feet from the coupling, and which extended into the holes of the first and fifth bolts. The engineer immediately set to work to repair the fracture to save the propeller, and as there was no special hurry, cut away the plating of the roof of the shaft tunnel over the injury, in order to obtain light and room to carry out the repair thoroughly. Closer inspection proved that the fracture was such that it could not be closed, so it was made solid with steel wedges, the crevices between which were afterward filled in with Parsons white brass. A number of 3-foot steel plates happened to be on board, and these were clothed round the fracture. This operation satisfactorily accomplished, the engineer proceeded to bind the shaft at the point of fracture with 360 fathoms of 2¾-inch steel wire rope. The wire rope was passed round a winch, and one end secured to the shaft by two 1-inch bolts and ½-inch plate washer. The engines were then set running slowly ahead, drawing the wire rope from the winch, with steam full against it, by which means the desired tension and strain were secured. The wire was carefully followed and tapped round the shaft as the binding proceeded. The rope was bound round the shaft in two layers and carried over the couplings. Progress was necessarily slow to insure the operation being carried out skillfully. So satisfactory, however, was the work performed, that the vessel steamed over 1,000 miles with this repair, and through exceptionally heavy weather; on one occasion she had to heave to for 24 hours until the sea moderated.

The British Zoological Society has been presented by the King with a remarkable zebra hybrid which was sent to His Majesty from South Africa, and is one of the most valuable acquisitions of the society in recent years. In appearance it resembles a small pony, and the color of the body of the animal is brown, lightening to bay on the head and legs. The striping is peculiar. The marks on the barrel are nearly vertical, as are those on the cheeks, while the limb markings are horizontal to the hocks, below which the color is black. On the flanks the stripes are arranged in small patches. The nostrils are black, and between the eyes the markings faintly resemble those of a Burchell zebra, but between this part and the nostrils the color is bright bay. The dorsal stripe is peculiar, tapering toward the tail. It is officially described as a pony bred from a cross between a zebra and a pony.



THE GIRTANNER AUTOMATIC SMOKELESS STOKER.

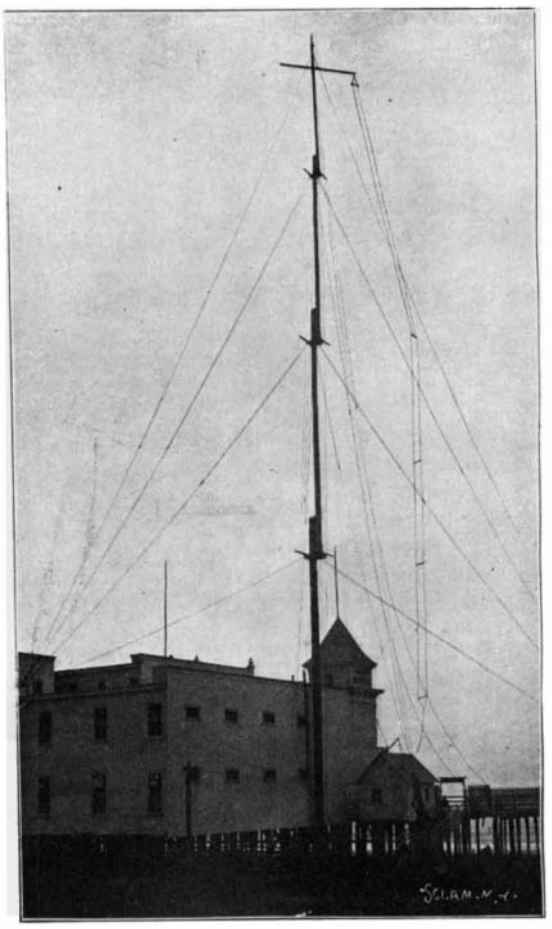
THE DE FOREST SYSTEM OF WIRELESS TELEGRAPHY.

For several months now a regular interchange of wireless telegraph messages has been maintained by the De Forest Wireless Telegraph Company between their stations near the Battery in New York, and at Staten Island.

The history of the inception of the new system is interesting. In 1899 the inventors began the search for a new receiver for use in wireless telegraphy, one possessing that much desired quality of auto-sensitiveness. From the first the necessity for tapping the old coherer to restore it to sensitiveness, the complicated apparatus thus involved, the uncertainty of its action, and the slow speed of word-transmission necessitated, has called for a better, simpler, quicker receiver than that of Branley's.

Starting on this quest various principles were tried, at first without satisfactory results. The device lacked either sensitiveness or reliability. None of the so-called "auto-coherers" filled the bill. During the year following Dr. De Forest carried on his researches in this field in the laboratory of Armour Institute, kindly tendered him for this purpose. There he received the assistance of E. H. Smythe, of the Western Electric Company, and the responder is the result of their combined effort.

The new receiver, or "responder" as it is aptly called, depends on an electrotypic principle for its action. The field of investigation was entirely new, no data existed on the subject, and the present state of commercial practicability attained, together with the complete theoretical study of the action involved, represents years of the closest, most painstaking work on the part of the inventors. The United States Patent Office has granted them very broad claims on the principles involved, and upon the issuance of the papers one will expect highly interesting contributions to the science.



CONEY ISLAND STATION OF THE DE FOREST WIRELESS TELEGRAPH. HEIGHT OF MAST 210 FEET.

During the past year Dr. De Forest has greatly increased the sensitiveness of the responder, while maintaining its great simplicity. For example, the receiver will respond with absolute certainty and regularity to a spark of one sixty-fourth inch length from a small coil forty feet distant, driven by one cell of storage battery with a two-foot antenna at receiver and coil, and without ground connection.

The De Forest transmitter does away with induction coils, all interrupters, and make-and-break devices, as it has been found that a large per cent of uncertainties and failures in wireless messages is due to the imperfections and irregularities of these devices. A special key very like the ordinary Morse key has been devised with a view especially to high speed work. The make-and-break is under oil and the operator is fully protected from contact with high voltage wires. By virtue of the automatic quality of the responder it is possible to use a telephone in circuit with the device, and the employment of a relay is rendered unnecessary. By this means a speed of forty words a minute can be obtained, and under ordinary circumstances a speed of twenty-five to thirty words is regularly accomplished. One hears in the telephone as it were the sound of the sending spark, be this a high or low fre-