

**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.**

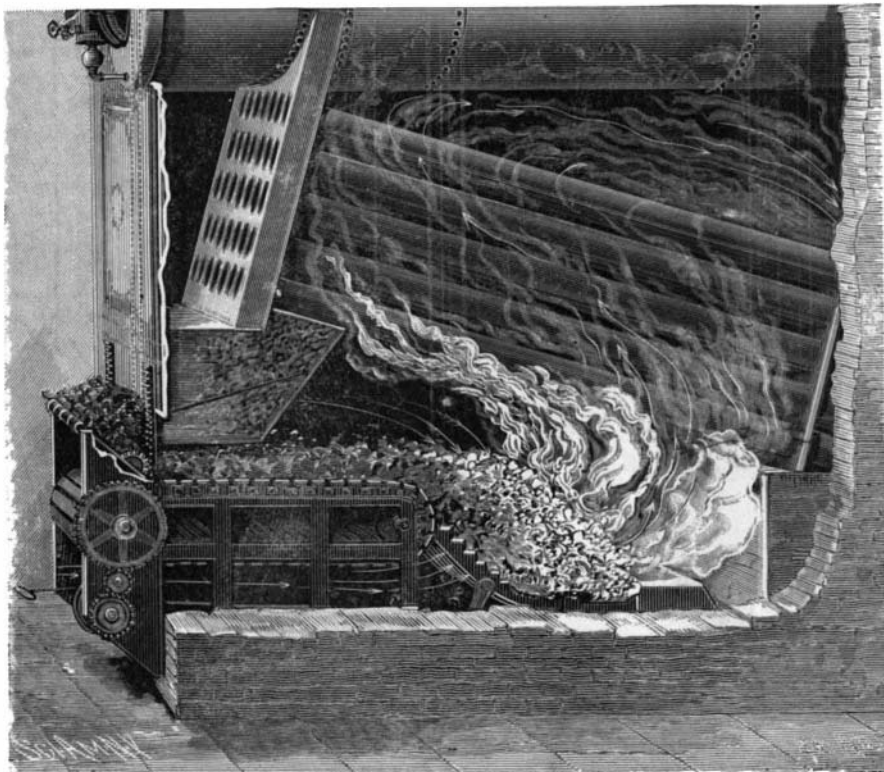
and applied to any boiler furnace by the Peerless Automatic Smokeless Stoker Company, No. 11 Broadway, N. Y.

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 oper-



**THE GIRTANNER AUTOMATIC SMOKELESS STOKER.**

ated 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.

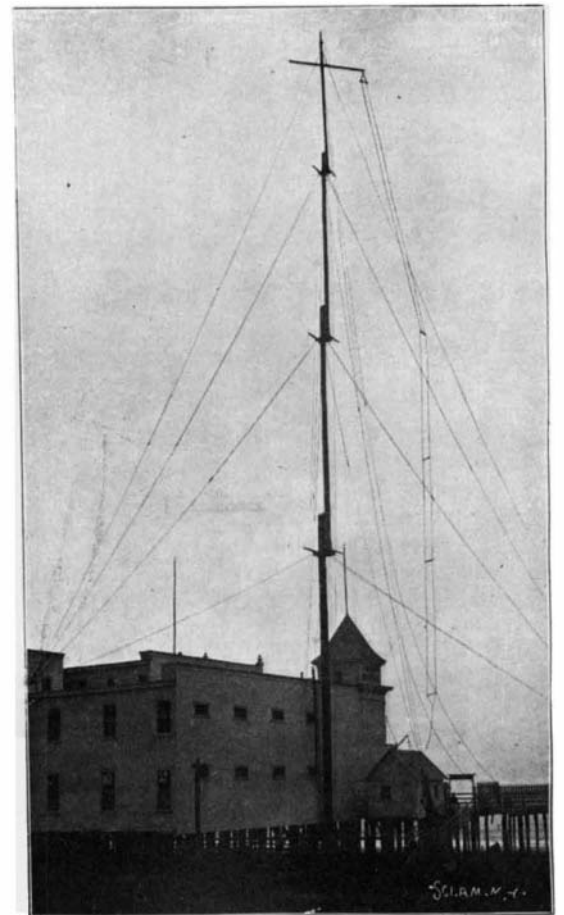
**THE DE FOREST SYSTEM OF WIRELESS TELEGRAPHY.**

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 com-



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

mercial 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.

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-

quency, in dots and dashes. An ordinary Morse operator can learn to read with the new apparatus with a few days' practice. The sending requires no special knack other than a firm touch, with dashes clean cut.

Although, as the illustration shows, the operator reads from the head telephone, a relay or recording device can be substituted therefor; only there is always this condition, that, inasmuch as the responder, unlike the coherer, is a quantitative device and the telephone and ear the most sensitive signaling device known, at the extreme range messages can be clearly read which are altogether too weak to operate any relay. Thus, through the extreme sensitiveness of the responder, an operator with head telephone can receive messages many miles further than a coherer (all other arrangements at transmitter and receiver being the same) can record them. In proof of this it is interesting to cite the test of February 22, when signals from the "Etruria" were heard at the Jersey City station, from a mast but thirty feet above the roof, when the steamer was fully ninety miles distant. This was without any "jigger" or transforming device whatever at the receiving end, and represents an astonishing degree of sensitiveness in this new "responder."

By virtue of the automatic quality of the receiver, whereby the sound impulses as heard are identical in frequency with that of the transmitter spark, the relay or "call" in use employs a reed attuned to a certain frequency per second. Thus only when the calling station uses a frequency of spark in tune with this reed will the "call" respond and summon the listening operator. The opportunity this feature gives to the system for a mechanical or acoustic syntony, in distinction from and in addition to the electrical syntony is highly significant.

During the last month a regular station and school for operators has been opened by the De Forest Company on the roof of the Cheeseborough Building, 17 State Street, New York. Here, as shown in the illustration, is a house built of glass over an iron frame, and fully equipped with sending and receiving apparatus. The antenna here is sixty feet in height. The companion station is located at Hotel Castleton, Staten Island, the first hotel in the world, by the way, to be equipped with a wireless plant.

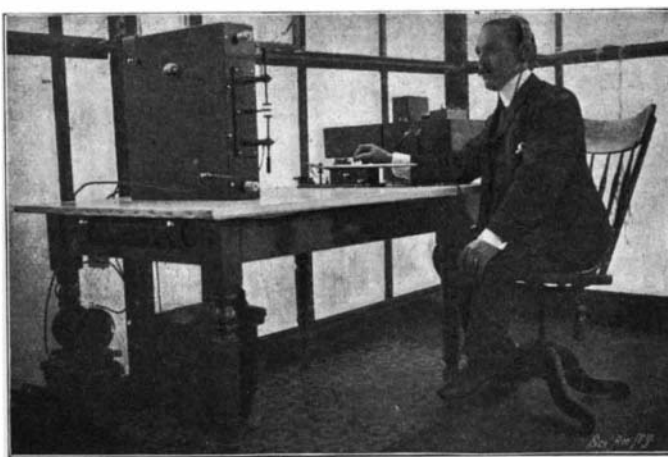
The most important land station yet established by the De Forest Company is that at Steeplechase Park, Coney Island. This enjoys the distinction of having the tallest mast in America, a fine stick of four pieces, standing 210 feet high. This station is supplied with 60-cycle alternating current, at 110 volts, from the Edison mains. This is stepped up in two transformations to 25,000 or 50,000 volts, as desired, and applied direct to the spark terminals. These latter are of special construction and connected with the condensers give a spark of exceptional clearness and power.

On June 14, the first day the Coney Island station was operated, the first communication with a vessel equipped with the De Forest system was also established. On the Ward Liner "Morro Castle," bound for Havana, a moderately high (60-foot) antenna had been rigged, and transmitter and receiver installed, and messages to and from ship and shore were exchanged, until the vessel was fifty miles from port. The Staten Island station kept up a lively exchange of messages until the boat reached the Narrows, when she called off, and the Coney Island station picked her up.

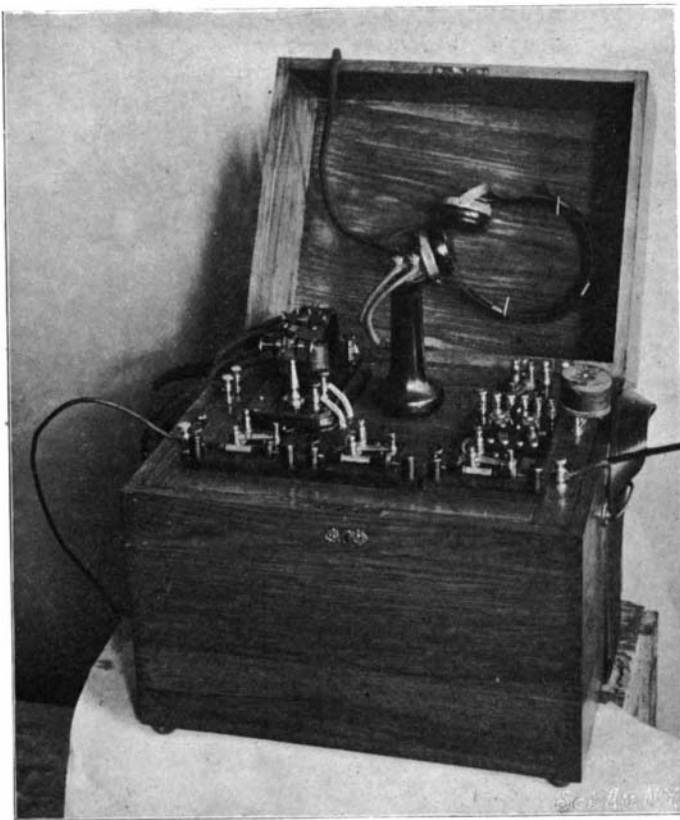
The De Forest Company has secured desirable land near the government light-house at Montauk Point, and proposes erecting a station there at once, as well as others at important points along the coast.

During the last week two operators of the De Forest Wireless Telegraph Company accomplished a feat which, while new in the annals of wireless telegraphy, is only significant of the possibilities before the "responder" or automatic receiver in combination with the telephone.

At the 17 State Street station, this city, two messages were received and read simultaneously by the two operators, listening in on two separate telephone



INTERIOR OF A NEW YORK CITY DE FOREST STATION.



THE DE FOREST RECEIVER

receivers, attached to one and the same responder, and without any special attuning or syntoning device in circuit. One message was from the Staten Island station and was sent quite rapidly, thirty words per minute, with a high-frequency spark (120 per second). The other was from some foreign station, probably a Marconi installation. The speed was about ten words per minute, sent with a low-frequency interrupter.



MASKS FROM BRITISH COLUMBIA. THE RIGHT-HAND MASK IS DECORATED WITH PORCUPINE SPINES.



MASKS WORN BY THE COAST INDIANS OF BRITISH COLUMBIA.

Mr. Horton concentrated his attention upon the Staten Island message, while Mr. Barnhart was able to pick out by their peculiar drumming sound the signals from the other station.

The result is no more remarkable than the fact that two conversations can be carried on simultaneously over the same telephone wire, if the two voices differ considerably in pitch and timbre. But the fact that without any tuning device this can be accomplished with one and the same responder certainly demonstrates the advantage of the telephone receiver over any sounder or tape-recording device, and the greater immunity of such a system from atmospheric and foreign disturbances.

#### Osier Culture.

BY GREY E. MITCHELL.

On many farms where there is some water front, land otherwise waste can be profitably used for osier culture. While willows will grow almost anywhere, they should be planted for greatest profit in a deep sandy loam, well drained and thoroughly prepared. The ground should be level and moist, but there should be drainage. However, willows will grow in a comparatively dry soil, but the whips will be smaller, though tougher and more durable than when grown in a rich, moist soil. The growth under moist conditions is naturally more vigorous and much more rapid. According to Dr. B. E. Fernow, Professor of Forestry at Cornell, the best situation for free and rapid growth is along the banks of rivers and brooks which pass through a level country and on the small islands which frequently occur in the midst of streams. Hollows or swales, the soil of which is composed of rich, soft, earthy particles, and which can be laid dry, furnish eligible situations for conversion into osieries; if water can occasionally be diverted onto such lands during the dry summer months, the situation may be considered as perfect. There are at present thousands of acres of marshy lands in the country, Mr. Fernow states, not paying 2 per cent per annum, which, if drained at a small outlay and planted with willows, would yield an immense return, paying as high as 20 or 30 per cent profit. The willow reaches its greatest production in the third year, and with proper care and good cultivation it will continue to yield good results for a long run of years.

Willow baskets, hampers, chairs, etc., are a class of articles for which there is to-day an enormous demand. The manufacture in this country is increasing rapidly, but not sufficiently to meet this demand. Five cents a pound for dry willows is the price generally paid. At even a much less price there is a large profit in growing willows and an occupation is furnished for the winter months.

#### A GROUP OF INDIAN MASKS.

BY FRANK YEIGH.

The fondness of the American Indian for masks or false faces goes to prove that secret societies exist among the red men as among the whites. According to Iroquois belief, certain spirits, whose entity is comprehended in ugly visages, have the power to inflict bodily ailments and to cause diseases to afflict their people. To counteract their evil designs, the Society of the False Faces is maintained among the pagan Iroquois, in order to appease the evil spirits from whom they take their name, as well as to effect a charm against disease and to cure others. When a candidate is initiated into this strange society, the chief False Face thus addresses him: "Brothers, listen! Now you must know that we did not make this custom. The beginning is from Niyoh, our Creator, who is above the false faces. A member of the False Faces must go about among the people in the spring and fall to keep them from sickness, and must visit sick people at all

times when called upon. This is all I have to say." Whereupon the new member replies: "I will act according to the ancient customs as advised by the leader of your Society, of which I am now a member."

In a report made to the New York University in 1852 Lewis H. Morgan thus describes the workings of this curious order: When any one was sick with a complaint