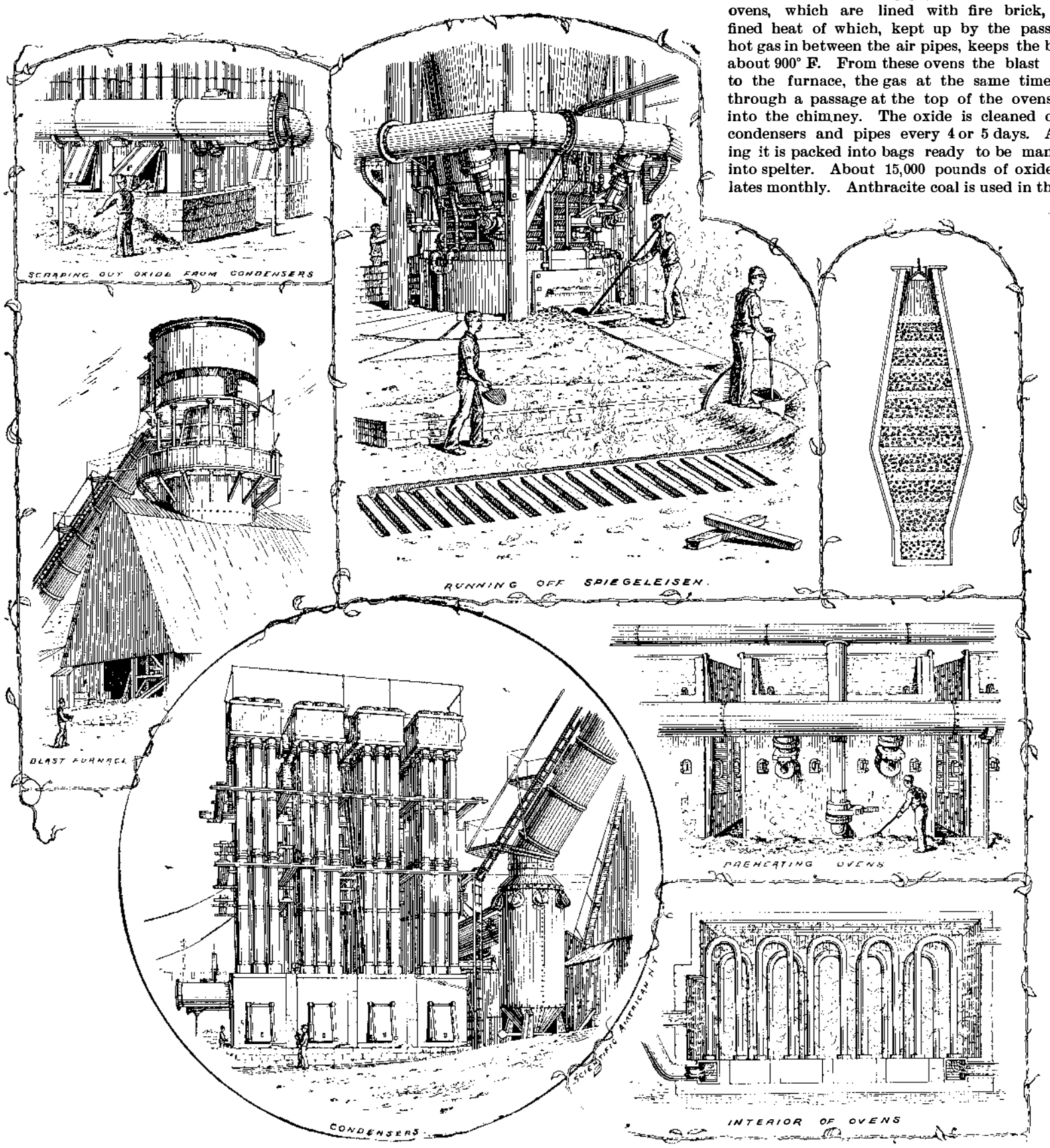
MANUFACTURE OF SPIEGELEISEN.

The illustrations accompanying this subject were taken from the plant of the Passaic Zinc Company, on the Hackensack River, near Jersey City, N. J. Spiegeleisen is used in the manufacture of Bessemer steel. The Bessemer process consists of blowing air through molten pig iron, the latter containing silicon and carbon. The combustion of the former during the "blow" produces an intense heat, the carbon being subsequently eliminated through the reactions created between oxides of iron formed and carbon. In order to get rid of the oxides of iron in the steel produced, to give it the exact carbon contents required by the use to which the steel is to be put, and at the same time secure certain advantages which the presence of manganese in the steel gives in the subsequent processes of rolling, alloys of iron and manganese called "spiegeleisen" or "ferromanganese," according to their manganese contents, are added to the fluid steel. The spiegeleisen manufactured by this company is made from the residuum of zinc ore, which contains quantities of iron and manganese. The furnace in which the material is melted is an elongated, barrel-shaped structure, about 45 feet in height from the hearth to the charging floor. The body is formed of steel plates, riveted together, forming a shell, which is lined inside with fire brick from 25 to 30 inches in thickness. The molten metal and slag or cinder accumulates in the hearth or crucible, which is about 6 feet in diameter inside. About 5 feet above the bottom of the furnace are a number of "tuyeres" through which the air or "blast" is blown by a blowing engine, the blast being conducted to the tuyeres from a pipe which encircles the lower part of the furnace. The material, which consists of coal residuum and limestone, is charged at the top of the furnace in alternate layers, the "stock," as it is called, being first hoisted to the top in cars on an inclined plane, 96 feet in length. It is then dumped into a bell which closes up the top of the furnace and then lowered, admitting the material, and raised again by means of an air cylinder. The gas is utilized in heating the blast in hot blast stoves or ovens, and in raising steam to supply the blowing engine, pumps and elevator with power. Those parts of the blast furnace which are exposed to the greatest heat are saved from destruction by a system of water cooling. The blast comes in contact with the material at the level of the "tuyeres," the blast being about 900° F., melting the residuum which collects down into the crucible. The ascending current of hot gas heats the descending column of solid material which comes down as the lower parts are melted and tapped off. The molten metal is tapped off at the bottom of the crucible three times every 24 hours, running out at each cast about 6 tons of spiegeleisen. The cinder or slag which constitutes the impurities of the ore, such as silicon, alumina, lime, magnesia and the ash of the fuel, being lighter, the iron floats on top, and is allowed to flow off about fifteen times daily.

The residuum contains about 24 per cent iron, 11 per cent manganese and about 6 per cent of zinc. The intense heat distills the zinc, which passes off with the gas in the form of vapor. Connected to the side of furnace near the top is a 4 foot pipe, called the down-comer. This down-comer connects itself to the sides of two sets of condensers, each set containing 72 pipes 1 foot in diameter and 35 feet in height. Connected to the other sides or ends of condensers is another pipe 3 feet in diameter which passes along and connects itself to a number of hot blast stoves or ovens, the interiors of which are fitted up with 21 iron U-shaped pipes, 14 feet in height and 19 inches in diameter. The pipe through which the air is blown connects itself to each set of pipes in the ovens. Through these pipes, which lead into each other, the air is blown into the furnace by the blowing engine. The gas pipe from the condensers also heats the boilers which furnish the steam to run the blowing engine. The gas and zinc vapor pass from the furnace to the down-comer and into the condensers, where the vapor oxidizes and forms itself into a black powder, which, when coming in contact with the air, changes to a buff color. The down-comer and condensers being exposed to the atmosphere causes the temperature to fall to about 400° F., the decrease causing the vapor to oxidize. The gas passes from the condensers into the 3 foot pipe, and into the 12×30 foot ovens, which are lined with fire brick, the confined heat of which, kept up by the passing of the hot gas in between the air pipes, keeps the blast up to about 900° F. From these ovens the blast passes out to the furnace, the gas at the same time escaping through a passage at the top of the ovens and out into the chimney. The oxide is cleaned out of the condensers and pipes every 4 or 5 days. After cooling it is packed into bags ready to be manufactured into spelter. About 15,000 pounds of oxide accumulates monthly. Anthracite coal is used in the furnace, the charges amounting to about 3,000 pounds daily, or every 24 hours. The charges of residuum and limestone amount to about 5,000 pounds every 24 hours. The plant turns out about 17 to 20 tons of spiegeleisen daily. The limestone used comes from Jerman Valley, N. J. Spiegeleisen is cast in pigs weighing from 100 to 200 pounds each. About 50 pounds of spiegeleisen is used in every 1,000 pounds of steel. Bessemer steel is used for a large variety of purposes, such as structural material, steel rails, plates, and also for wire and nails.



THE MANUFACTURE OF SPIEGELEISEN FROM ZINC ORE RESIDUUM.

A WRITER in the London Electrical Review holds that there are very strong reasons for believing that the ether obeys the ordinary laws of gravitation. "If we accept the notion that ether attracts itself, and obeys the ordinary laws of gravitation in regard to itself and to other forms of matter in a condensed form, then it is not difficult to understand its whole phenomena of disturbance."

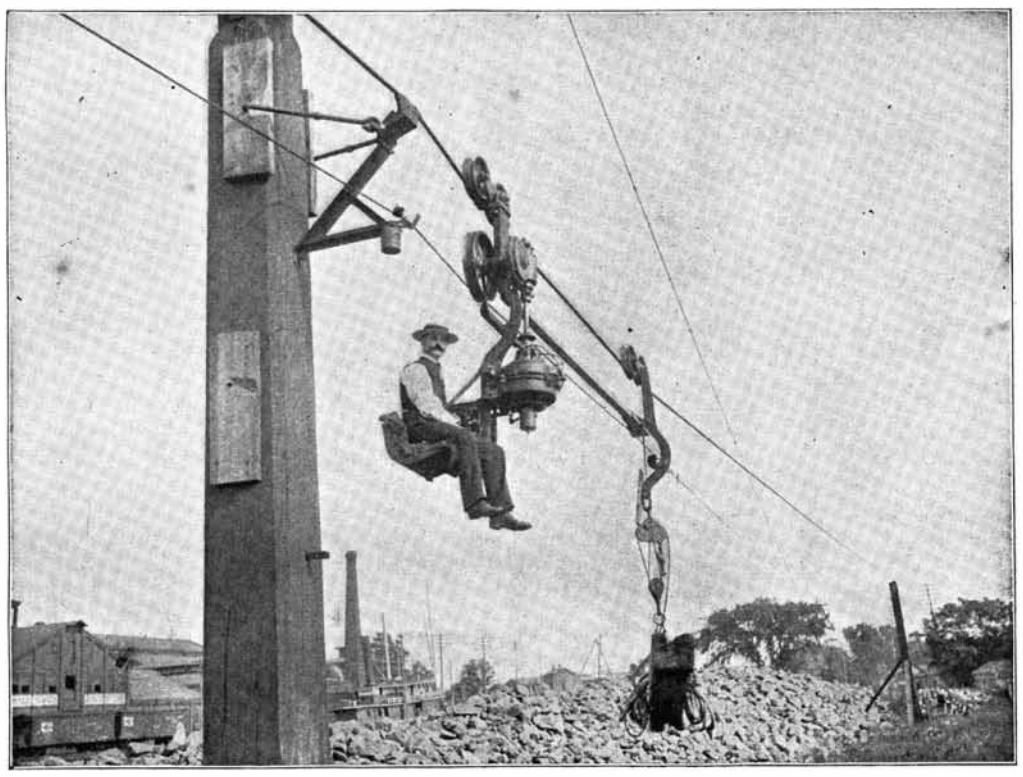
The Electric Coherer.

The Electrical Review, London, in speaking of Dr. Oliver Lodge's new instrument for detecting Hertzian oscillations, has the following:

"Prof. Oliver Lodge is a worthy continuator of the epoch-making work of the great Hertz. In his recent lecture at the Royal Institution he showed some interesting electric wave experiments with apparatus of remarkable simplicity and sensitiveness. As he remarked, 'the detector for Hertz waves might have been used in the last century; it might have been used by Benjamin Franklin.' The instrument which Dr. Lodge has devised for detecting electric waves he calls a coherer. It may be described as an electric welder on a very small scale, the electric welding being effected by the exceedingly minute currents produced at the contact of two pieces of metal by Hertz waves. Lodge had observed, in 1889, that two knobs, so close together that the air gap was unable to stand any such voltage as an electroscope can show, would actually cohere when a spark passed between them. The joint thus welded was capable of conducting an ordinary bell-ringing current if a single voltaic cell was in circuit, and required a perceptible amount of force to separate it. This arrangement has been developed by Lodge into an extremely sensitive wave detector. One terminal of an electric circuit, containing a single voltaic cell and a moderately sensitive galvanometer, consists of an iron wire which rests lightly on an iron plate attached to the other terminal. The instrument is most sensitive when the contact is sufficiently good to allow a very small current to pass. If electric waves are produced, say by charging and discharging an insulated sphere at some distance, the insulating layer at the contact of the coherer breaks down, and a considerable deflection is shown on the galvanometer. With this simple apparatus the reflection, refraction, polarization, and other optical properties of electric waves can be readily demonstrated. Electric oscillations in a sphere sixty yards distant have been indicated, and Dr. Lodge estimates that they would be detected half a mile away. The sensitiveness of the contact can be restored by tapping the plate.

"On these phenomena Dr. Lodge has founded an ingenious theory of vision. The retina of the eye is supposed to be furnished with cohesive contacts which allow an electric current to flow in the nerves when acted upon by the electromagnetic waves of light. Mechanical vibration supplied by the tissues restores the sensitiveness of the contact at intervals of a tenth of a second. A model has been constructed by Dr. Lodge to illustrate this theory. An electric bell or other mechanical vibrator is mounted on the same board as a tube of filings, which in this case acts as a detector, and has its sensitiveness restored by the vibrations of the bell. This apparatus can be arranged so that a feeble electric stimulus produces a feeble, steady effect, and a stronger stimulus a stronger effect.

"The coherer is more sensitive to short waves than to long. The sparking at the contacts of an electric gas lighter will produce a marked effect, while heavy sparks from a large influence machine will not affect the instrument. Like the eye, the coherer has a limited range of wave lengths. This field of investigation promises results of great theoretical interest at least. Whether electric oscillations of these extremely high frequencies are ever to have any technical application is doubtful. The experiments of Tesla and others in this direction have not been promising."



ELECTRIC CABLEWAY.

STEAM AND ELECTRIC CABLEWAY FOR LOGGING AND CANAL BOAT TOWING.

Considering the fact that there is in this and other countries great wealth of swamp forests heretofore unavailable, it is surprising that some one has not devised a practical system for logging swamps before this date. With the exception of two systems, which are only available for short distances, no appliance has been invented until Richard Lamb, of New York, designed and put into practical use his steam logging system.

As the total area of forest to be cleared at any one setting would not require much time, the system had to be designed to be easily removed from place to place. Trees had to be used as supports, as they are the only foundation to be found in a swamp. Naturally any steam logging system has to be worked in practically a straight line. To attempt to find trees in a straight line would be difficult if the distance apart was not great; but it was found that in a forest of ordinary density a practically straight line could be got with trees from 100 to 225 feet apart; consequently this system was designed for long spans.

Iron brackets are put upon trees or timber uprights. The endless steel hauling cable is suspended by the snatch-block and swinging sheaves on the brackets, and is made to pass around a large metallic sheave on the tailtree. Two or three turns of this cable are taken around an elliptically grooved sheave. This sheave is run by an engine having one lever, which regulates the speed, reverses the engine, and shuts and opens the throttle valve.

The bearing cable is hauled out in sections by the endless cable and joined together by patent couplings, over which the cars pass without interference.

The cars have grooved wheels to run upon the bearing cable, with a hanging arm, to which the hauling cable is attached. A metallic tackle block, having a grip to sustain the load, is hung from the hanging arm. By confining the end of the rope and moving the car, the log, which is attached by tongs to the lower block, is raised and is held suspended until it is desired to lower same, when the grip is released and the log falls.

Logs are hauled in from either side up to the bearing cable by a cable which is attached by tongs to the log. This cable is passed through a sheave, placed as high up a tree, near the cable, as the stiffness of the tree will admit, thence through a sheave attached to the same tree at the same elevation as the bearing cable. A strut is placed between the tree and the bearing cable, and a sheave is attached at the

ELECTRIC CABLEWAY FOR LOGGING.