

An Anti-Smoke Law.

The legislature of Massachusetts, at its last session, enacted the following law relating to the prevention of smoke:

"In cities of over 800,000 inhabitants, no person shall, after the first day of July, in the year 1893, use bituminous coal for the purpose of making steam in boilers in any building, unless the furnace in which said coal is burned is so built, managed, arranged, or equipped that at least 75 per cent of the smoke from said coal is consumed or otherwise prevented from entering the atmosphere, the degree of suppression being determined by the quantity of such smoke emitted, as shown by the density and color of the issuing smoke, and the length of time which it is visible, the maximum standard of comparison being a continuous discharge of dense, dark smoke during the time the furnace is in active operation."

MILL ENGINES.

The illustration represents a pair of high-pressure non-condensing reversing mill engines, as constructed by Galloways, Limited, Manchester, for Messrs. Leach, Flower & Co., of the Melyn Tin Plate Works, Briton Ferry, and shown in the *Engineer*. These engines

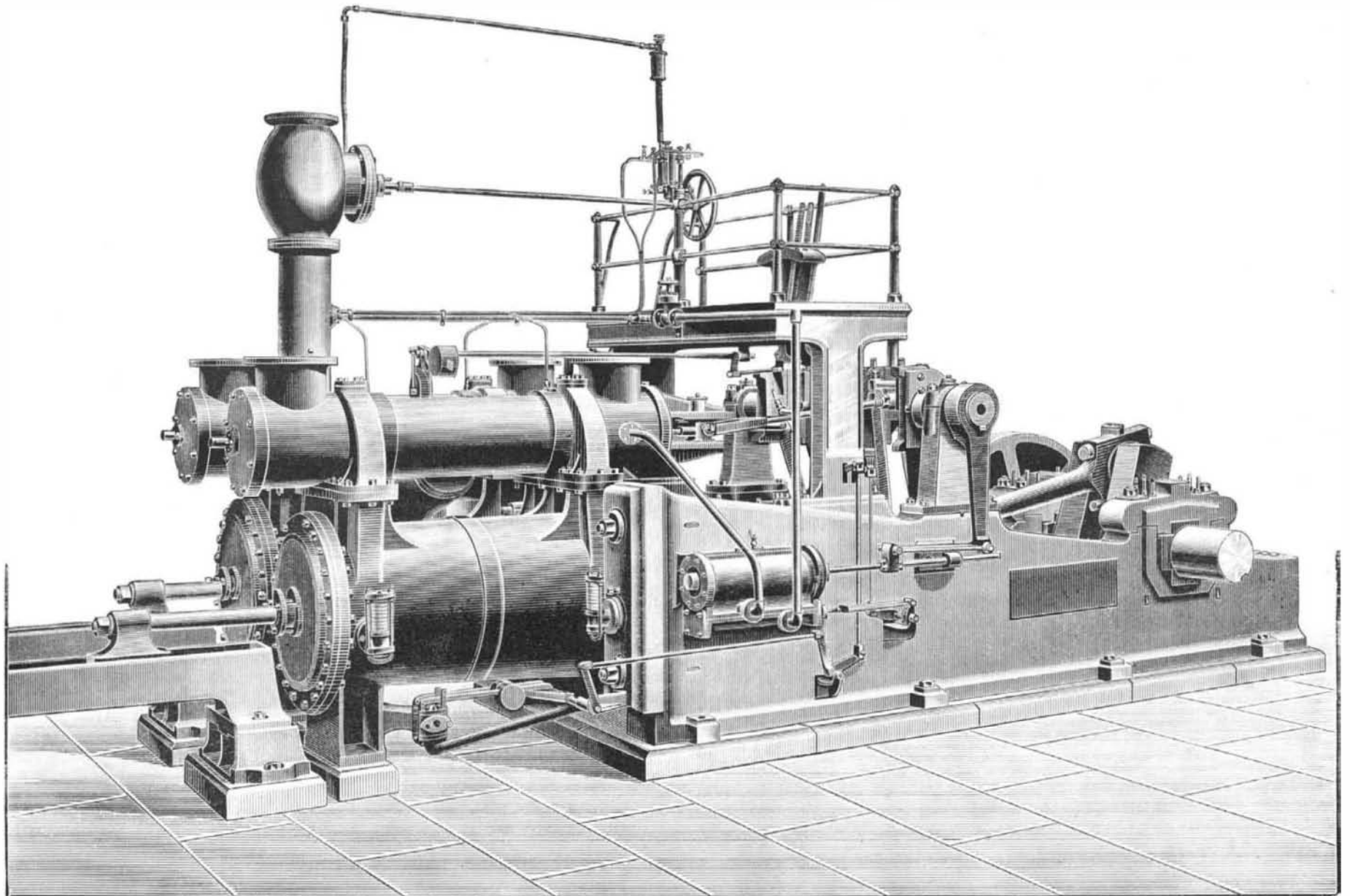
Volatility of Metals.

Interesting experiments with the electric furnace, says *Nature*, described by M. Moissan in the current number of the *Comptes Rendus*. By attaching to the furnace a condensing tube of copper shaped like the letter U, and so constructed as to be surrounded by an outer jacket of cold water constantly changing under high pressure, M. Moissan has been enabled to distill and condense most of the elements which have hitherto been found so refractory. When a piece of metallic copper, weighing over a hundred grammes, was placed in the inner crucible of the furnace and subjected to the arc furnished by a current of 350 amperes, brilliant flames shot forth from the apertures through which the carbon terminals were inserted. The flames were accompanied by copious yellow fumes, due to the combustion of the issuing vapor of copper in contact with the oxygen of the air. After the expiration of five minutes nearly thirty grammes of copper had been volatilized. Under the cover of the furnace an annular deposit of globules of metallic copper was found, and upon examination of the condensing tube a large proportion of the volatilized copper was discovered condensed in almost a pure state.

It has long been known that silver is volatile; it is

limite of a deep purple color. Manganese is remarkably volatile. A quantity of the metal weighing four hundred grammes entirely volatilizes in ten minutes. Iron is likewise readily distilled, and is deposited in the form of a gray powder, among which are interspersed numerous small particles exhibiting brilliant surfaces.

Not only are the metals capable of distillation at the temperature of the electric arc. Silicon rapidly volatilizes and condenses in the copper condensing tube in minute spheres and dust. Carbon becomes almost immediately converted to graphite, which distills over into the condenser and deposits in the form of light semi-transparent plates, which by transmitted light exhibit a beautiful chestnut color. Distilled carbon would thus appear to consist of the fourth variety of the element recently described by M. Berthelot. The refractory alkaline earths appear also to be capable of distillation in the electric furnace. The experiment succeeds best, however, with a more powerful arc. Employing an arc furnished by a current of a thousand amperes, M. Moissan has distilled one hundred grammes of lime in five minutes, the vapor condensing in the copper tube like fine flour. Magnesia passes over somewhat more slowly than lime, but its distillation is one



ROLLING MILL ENGINES, MELYN TIN PLATE WORKS.

embody the results of the very large experience which the makers have had in supplying machinery for the tin plate trade and rolling mill purposes generally. The engines in question have cylinders 40 in. bore and 4 ft. 6 in. stroke, the main shaft has a single-sweep crank for one cylinder, the other cylinder being connected to a crank pin secured in a disk at the end of the shaft, this disk being arranged to balance the connecting rods of both engines, as well as the sweep crank, so constituting a very simple and efficient form of connection to the mill. The valve gear, as will be seen, is on Joy's system, which lends itself admirably to the type of engine here illustrated. The platform is so arranged that the man handling the engine looks direct to the rolls, and has under his immediate control the reversing gear, steam stop valve, regulating valve, waste water valves, and the lubrication of the steam cylinders.

Natural Water Pipes.

A curious phenomenon has been discovered near Eddy, New Mexico. In Dark Canyon, about three miles from Eddy, a number of tunnels were run in order to tap streams of water to get a supply for the waterworks. The water was found running in small natural pipes, made by the deposit of lime from the water. The whole space cut by the tunnels was found to be perforated with these lime pipes.

now found that at the temperature of an arc of the above description silver may be brought to full ebullition in a few moments, and it distills with ease, condensing in the copper condenser in the form of globules, whose size varies from that of small shot to spherules of microscopic dimensions, and a certain proportion is usually deposited in the form of arborescent fragments. Platinum fuses in a few minutes, and very soon after commences to volatilize, and condenses in the U-tube in brilliant little spheres and fine dust. Aluminum distills very readily, and condenses in the form of a gray powder, containing admixed spherules exhibiting brilliant metallic luster. Tin likewise distills with facility, and the condensed product usually contains a considerable proportion of a curious fibrous variety of the metal. The distillation of gold in the electric furnace is particularly interesting. Abundant fumes of a light yellowish-green color are emitted at the electrode apertures, and the metal is deposited in the condenser in the form of a powder, exhibiting a beautiful purple sheen. The powder consists of minute regular spheres, which, when examined under the microscope, appear to reflect the usual yellow color of gold. Upon the under side of the cover of the furnace three distinct annular deposits are observed, the inner one consisting of yellow globules of considerable size, round which is a metallic deposit of smaller spheres of such a size as to reflect a bright red tint, and outside this is an annular sub-

of the prettiest of these remarkable experiments, the tints assumed by the escaping fumes and the brilliance of the incandescent vapor being particularly striking.

Illustrations of the electric furnace and other interesting particulars will be found in the *SCIENTIFIC AMERICAN* for May 13, 1893, and in our *SUPPLEMENT*, Nos. 896, 901, 904, 905.

A Locust Year.

The Department of Agriculture has sent out circulars making inquiries over a wide extent of territory regarding the "seventeen-year locusts," which have made an appearance this year in eight States of the Union. The object of the department is to ascertain accurately the limits of the areas occupied by the insects. There are twenty-two known broods of them, and they turn up in different years in various parts of the country. Though to some extent the infested territories overlap, each brood comes out of the ground only once in seventeen years. Strictly speaking, the insects are not locusts, but cicada. Some years ago it was sought to introduce these insects as an article of diet; but the experiments in that direction did not promise success. Clearing of land has done much to diminish the number of these creatures; but their most destructive foe is the English sparrow, which drops every other kind of food and feeds on them exclusively when it has the opportunity.