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THE MANUFACTURE OF SHEET LEAD AND LEAD PIPE.

The principal manufactures of lead are sheet lead, lead pipe, and shot. The first two constitute the subject of the present article: the third we shall consider separately in a future issue. Lead enters into commerce in the form of pigs, varying in shape, weight, and fineness, as it comes from different sources. Spanish lead is imported in pigs weighing from 150 to 170 lbs. each, and is the pure metal, having been thoroughly refined before export. American lead, and especially that from the Mississippi valley, is commonly sent East for extraction of the silver, the baser metal being afterwards sold for about enough to pay the cost of the refinement. As a rule, manufacturers purchase their stock from bankers and other financial agents, to whom the metal is consigned in return for advancements, and who thus constitute a class of middlemen between producer and the class above mentioned.

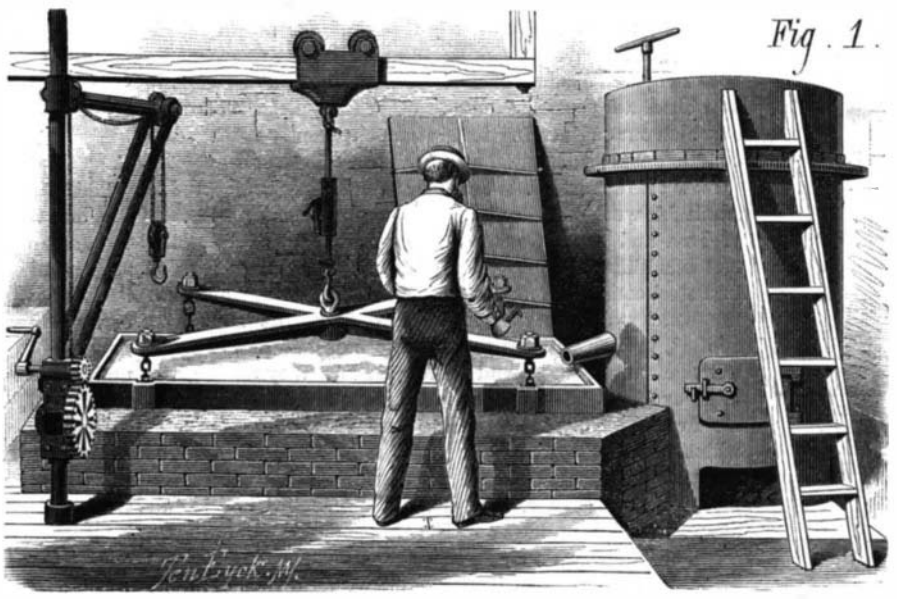
As lead is made into sheets by rolling, the first process to which it is subjected is melting and casting into cakes of suitable size. The melting kettle and mould are represented in Fig. 1. About ten tons are melted at a time, and the liquid metal is, on raising a valve in the kettle, allowed to escape directly into the iron mould, which receives four and a half tons. Lifting hooks are previously adjusted in place under the cake so that the latter, when solidified, can be lifted out of the mould and carried by a crane upon the table of the rolling mill. The size of the cake is seven feet ten inches by five feet. After remaining in the mould some days to cool, it is lifted out, and the rough edges are trimmed off with an adze. It is then placed upon the rolling mill table in the direction of its least width; that is, so that the breadth of seven feet ten inches shall be invariable, while the five feet length is increased by the rolling.

The mill, Fig. 2, is a single cylinder of cast iron thirty inches in diameter and nearly nine feet long. It is geared directly to the main driving engine, and has the adjustments common to all rolls. The table is an assemblage of small rollers arranged in two parallel lines. Between them is a rack, the teeth of which serve as fulcra for the insertion of levers whereby the cake is pushed under the cylinder. The rolling once begun, the metal passes to and fro under the roll about a hundred and fifty times, so that it is finally reduced to a sheet thirty feet long and of the width above stated. It then weighs 30 lbs. to the square foot. This sheet is cut into smaller pieces by vertical knives, which are actuated by a screw, so that they move across the table and between the cylinders on which the metal rests. The smaller sheets are now rolled into eighteen foot lengths, and vary in weight from 2½ to 10 lbs. per square foot. These constitute the usual sheet lead stock—the variation being half a pound to the foot up to five pounds, and one pound per foot thereafter. Their principal utilization is in chemical works for lining acid-proof receptacles, notably sulphuric acid chambers and concentrating pans, and also for the interior of tanks, cisterns, etc. The thinnest sheet lead is that employed by the Chinese for covering the interior of tea chests. This, however, is produced in China by simple casting and pressure. The operation is performed by two men, one of whom pours the molten lead from a crucible upon a large flat slab, when the other quickly places a large stone on the fluid lead and presses it out to a thin flat plate which is then removed and trimmed. Sheet lead is also used in the manufacture of the so-called tin foil. A sheet of lead is placed between two layers of tin, and the whole is rolled and re-rolled until the thin material with which all are familiar is produced. The tin serves in this case simply as a covering for the lead, and prevents the latter metal communicating its deleterious properties to the substance inclosed.

Lead pipe is made by forcing the partially congealed molten lead through dies in which a core is inserted by hydraulic pressure. The apparatus for this purpose is exhibited in the large illustration (Fig. 3); and in Fig. 4 a section of the essential portion of the same is shown. The die, A is simply a metal disk in which is an aperture which fixes the outside diameter of the pipe to be made. This opening flares downward. The die is inserted in a collar which, in turn, rests in the bed piece, and is adjustable so as to bring the die accurately in line by means of the set screws, B. Resting above die and bed piece is the lead

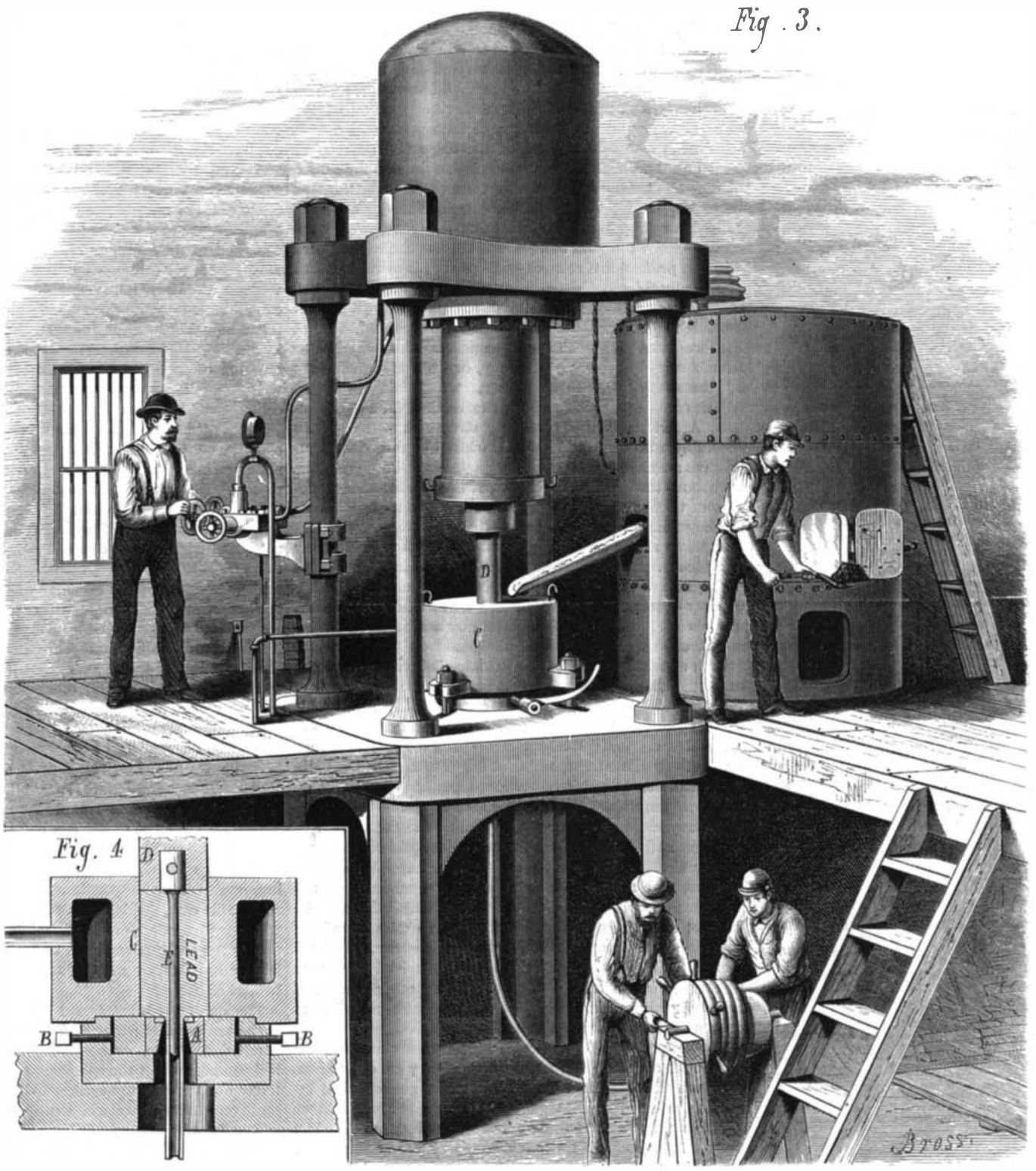
[*Continued on page 34.*]

Fig. 1.



MELTING THE LEAD.

Fig. 3.



THE MANUFACTURE OF SHEET LEAD AND LEAD PIPE.

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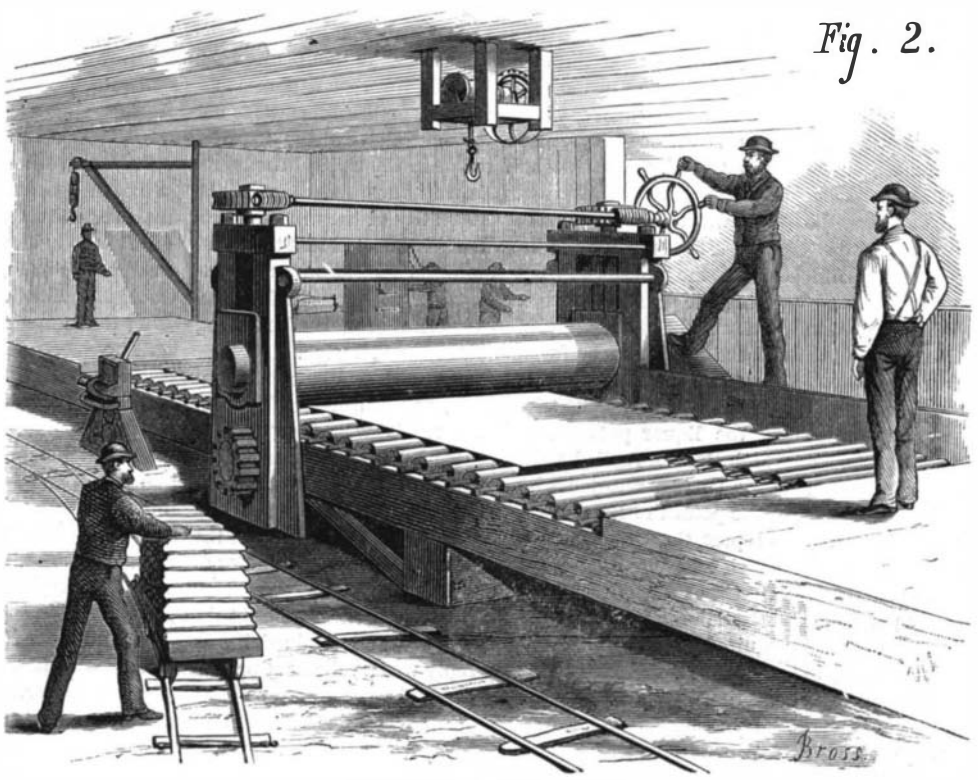
receptacle, C. This is a heavy cylinder having an annular chamber formed in it to receive the steam by which it is kept hot. D is the press plunger working downward, and in it is inserted the core, E, which enters the die aperture. The metal is drawn off directly from the kettle, and the plunger is at once brought down upon it, so that it may be kept under moderate pressure until sufficiently congealed. The press is then set in operation, and the lead is forced through the annular space between the core and die, and emerges in the form of pipe. The process is quite rapid, and there is nothing further to do but reel up the pipe as it is drawn. As soon as one charge is exhausted or rather partially so, as a portion is left in the chamber to which the new charge unites, more lead is admitted from the furnace, and the operation is repeated. The amount of pipe made at a single pressure depends upon the weight of the same when finished. Thus an extra light one-inch pipe weighs 2 lbs. to the foot, and the chamber may, for example, hold 135 lbs. Therefore 67½ feet of pipe are produced at each descent of the plunger. Different sizes of pipes are produced by substituting suitable dies and cores. The die is easily reached by lifting the chamber, C, which is done by attaching the same to the press plunger and elevating the latter.

Tin-lined lead pipe is produced somewhat differently. Before the lead is run into the chamber, a mandrel is inserted, which closes the die aperture and extends up through the receptacle. This mandrel consists of a central stem, around which are grouped dovetailed sections, so that when the central portion is removed the sections are easily taken out, leaving a hollow space in the lead which is run in while the mandrel is in place. The sides of the mandrel are tapered, or rather crenelated, there being three or four shoulders and a different taper from each. The object of this is that after the mandrel is removed, the tin which is poured into its place may have several purchases against the lead which surrounds it. Of course before the tin is let in, the core, as already described, is inserted. Afterwards the pressure is applied in the usual manner, the result being that the pipe emerges with a thin lining of tin. Tin-lined lead pipe and plain lead pipe weigh the same.

There are some trade peculiarities about the sale of lead pipe which are worth remembering. That which is termed tubing measures from ⅛ and ¼ inch in diameter, and weighs 2 and 5 ounces to the foot. Ordinary lead pipe varies ⅛ inch in diameter from ⅜ to ¾ inch, inclusive; then ¼ inch from 1 to 1⅛ inches, and lastly there is a 2 inch size. Beginning at 1⅛ inch, and ranging at ⅛ inch increase to 5 and then to 6 inches, comes lead waste pipe. Of ordinary pipe there are, besides, several classes depending on weight and ranging from extra strong to "fountain" size. The Colwell Lead Company, of this city, has courteously offered us the facilities or the preparation of the foregoing description and illustrations.

Fig. 2.



ROLLING THE LEAD.

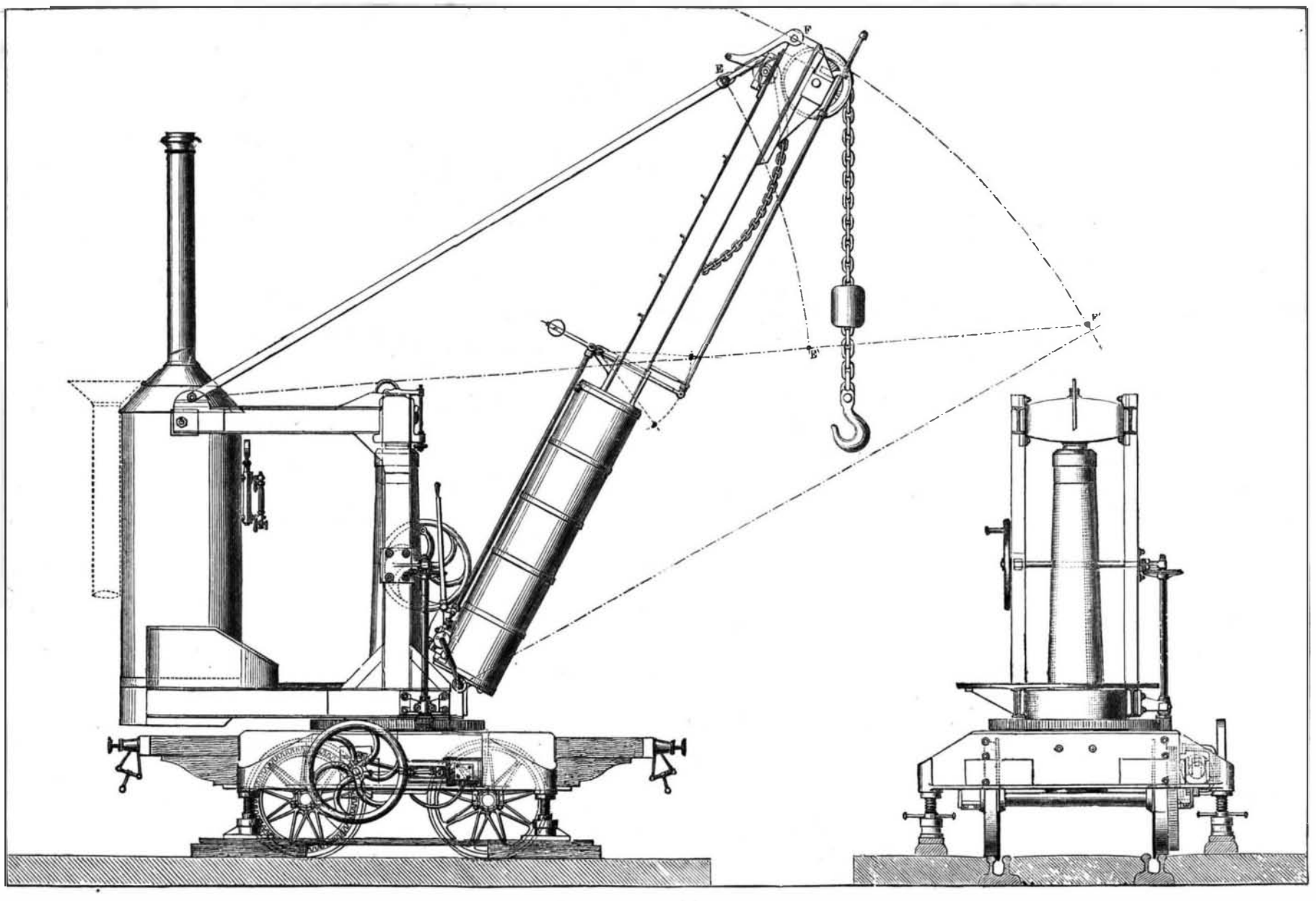
THE following compound is recommended by the *Revue Industrielle* as an artificial fuel well suited for cooking purposes: To 176 lbs. of small charcoal made from light wood add 44 lbs. of pulverized charcoal, 11 lbs. of nitric acid, 4·4 lbs. of nitrate of potash, and 11 lbs. of gum arabic. The gum serves as agglomerating material. A rather expensive fuel this!

LARGE LOCOMOTIVE CRANE.

We illustrate herewith a new 10-ton locomotive crane, the invention of M. J. Chretien, and designed for use on the Northern Railway of France. The principal feature of novelty in the machine is that the load is lifted by the direct pull of the piston in a long steam cylinder, the piston rod being attached to the lifting chain or to pulleys of the same. A D slide valve admits steam and is changed automatically in time to prevent the piston meeting the end of the cylinder by a simple stop mechanism.

The machine consists of a strong cast iron frame mounted on wheels, and having at its center a column which serves as a pivot for the traverse which supports the turning portion of the crane. The boiler is placed in rear and serves as a counterpoise. The derrick arm consists, first, of a cylinder 15·6 inches in diameter, and 111 inches long, and a double T arm which supports the chain pulley. The apparatus may be used not only for handling heavy loads, but as a locomotive for hauling cars. Means are provided for lowering both smoke stack and derrick so that bridges may be passed under.

The locomotive engine is placed under the platform, as shown. It has a single cylinder connected with the boiler by a pipe passing through the crane pivot. Simple gearing serves for the transmission of power to the driving wheels. For rendering the apparatus stationary four jack screws, placed at the corners of the carriage, are employed. These press the traverse to which they are connected firmly against the ground, and thus render the machine immovable. For raising or lowering the arm, the mechanism for elevating the load is easily employed. When the arm is in normal position, as indicated in the engraving, the guys are retained above by two catches. Two small chains attached to the guys are pendant or fixed to retaining hooks. To lower the arm, the lower ends of these chains are taken to the piston, and there secured to hooks provided for the purpose. Steam is then admitted above the piston. As soon as the chains are tautened the arm rises slightly, and the disengaged catches lift. Then the steam is allowed to escape slowly, and the arm is thus permitted gradually to descend until stopped by the piston reaching the end of the cylinder. During this operation the point, F, travels to F′, E to E′.



NEW 10-TON LOCOMOTIVE CRANE.