Dec. 1, 1931. W. F. EPPENSTEINER ET AL 1,833,894

APPARATUS FOR USE IN POLING COPPER

Filed Dec. 27, 1929

Fig. 1.

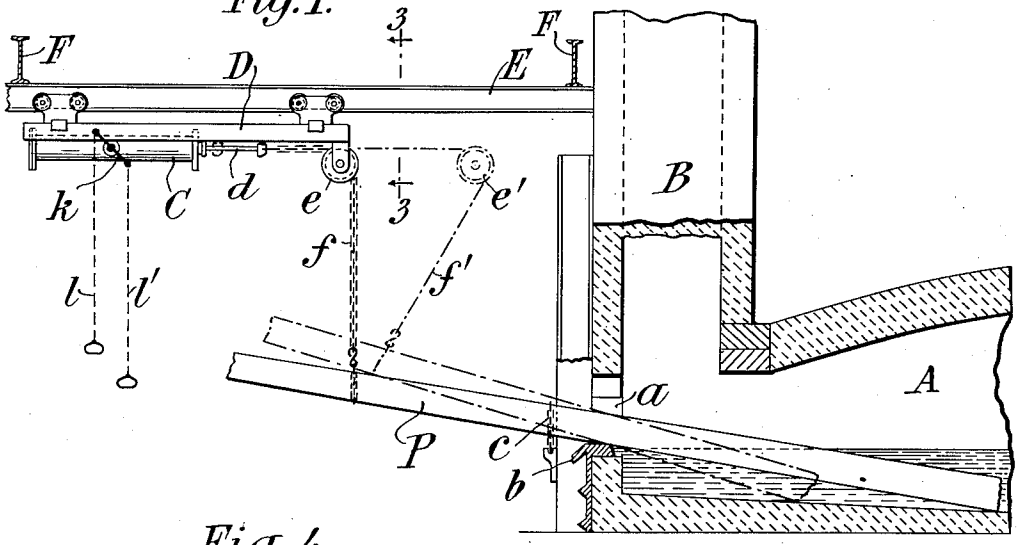


Fig. 4.

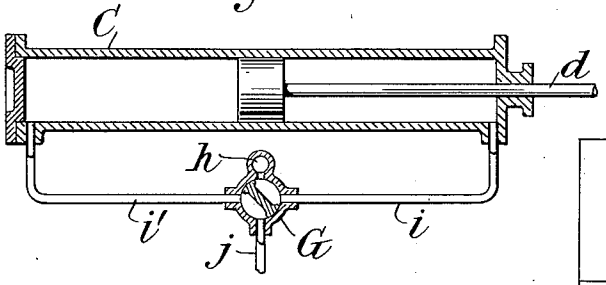


Fig. 2.

Fig. 3.

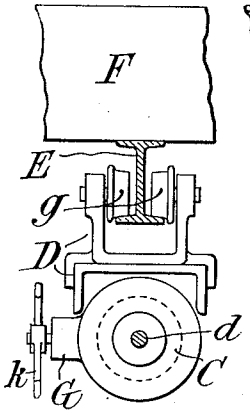
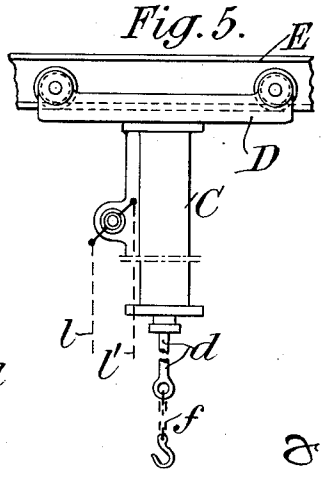


Fig. 5.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR USE IN POLING COPPER

Application filed December 27, 1929. Serial No. 416,923.

This invention relates to apparatus for facilitating the operation of poling in the refining of copper. As ordinarily practised, the pole is hoisted on a chain block, pushed butt first into the furnace as far as is desired, a chain is thrown over it just outside the furnace door and secured to hold it down and form a fulcrum, the chain block is disconnected, and the outer end is hoisted as high as the men can lift it in order to immerse the butt end in the molten copper. As the pole burns away within the furnace, its outer end requires to be lifted and the pole to be pushed forward into the furnace. The lifting and feeding of the pole requires the nearly constant attention of usually three men; if the work is neglected the pole burns away above the level of the copper and is not utilized in reducing the oxygen in the copper; this results in a waste of wood and, what is more important, a considerable waste of time.

The present invention provides means for economizing power in lifting and feeding the pole, and for rendering this operation at least partly automatic. It is designed to be operated by only one man after the pole is first introduced into the furnace, whereby two men are set free for other work.

According to the present invention a fluid pressure cylinder and piston are provided with a connection from the movable element thereof for attachment to the pole, so that the pole is lifted by the stress due to the fluid pressure in the cylinder. This fluid pressure is under control of a valve operated by the workman. The apparatus is movable toward and from the furnace, so that it may be fed up as the pole is consumed. After the operation is started, the fluid pressure, being left turned on, automatically lifts the pole as it is consumed.

The accompanying drawings show the preferred form and the modified form of construction embodying the invention.

Figure 1 is a side elevation, a portion of the furnace being in vertical longitudinal section.

Fig. 2 is a plan, a part of the furnace being in horizontal section.

Fig. 3 is a vertical transverse section on the line 3—3 in Fig. 1.

Fig. 4 is a somewhat diagrammatic detail showing the cylinder and its valve.

Fig. 5 is a view corresponding to part of Fig. 1, and illustrating a modified construction.

Referring to the drawings, let A designate as a whole a furnace which may be of any suitable type, and B the stack of the furnace. The furnace has the usual door *a* through which the pole P is introduced into the furnace. At the bottom of this door is the usual hearth or block *b* on which the pole rests. Just outside the furnace is a chain *c* which is thrown over the pole and fastened at both ends so as to hold the pole down, all as usual.

Adjacent the furnace is mounted in any suitable way a cylinder C adapted to receive fluid pressure, preferably compressed air. The piston of this cylinder has a rod *d* to the end of which is connected a chain *f* which may pass over a sheave or pulley *e*; this is the arrangement if the cylinder is horizontal, as in Fig. 1, but if the cylinder is arranged vertically as in Fig. 5, the sheave is not required. The cylinder is mounted on any suitable carriage D having wheels or rollers for rolling on a track E which may conveniently be suspended from beams F. The track E may conveniently be made of an I-beam, as shown in Fig. 3, in which case the carriage D may have rollers *g* from which it is suspended, and which roll upon the lower flange of the I-beam; any suitable construction of track and carriage may, however, be employed. The track is located above the door of the furnace, and its general direction is parallel to the general or average position of the pole; that is to say, the track is above and in the same vertical plane with the mid-position of the pole when in use. If two poles are used, the carriage, cylinder, and chain *f* may be duplicated, or a single cylinder and chain may be used, with provision for engaging both poles; as may be desired.

A suitable construction of cylinder and its controlling valve is shown somewhat diagrammatically in Fig. 4. The valve G may be any suitable form of valve, the one here

shown being an oscillatory valve of the plug type. Compressed air (or any other fluid under pressure) is admitted from any suitable source to a conduit *h*, and is directed by the valve through one or other of two conduits *i* or *i'* communicating with the opposite ends of the cylinder; so that in the position of the valve shown, the compressed air enters the right-hand end of the cylinder and presses the piston toward the left, the exhaust flowing through the conduit *i'* and escaping through the outlet *j*. The valve plug may be mounted on a spindle having at its outer end a crosshead *k*, the respective arms of which are attached to chains *l*, *l'*, hanging down within reach of the operator, so that he may readily turn the valve in order to admit compressed air to either side of the piston. In the position shown in Fig. 4 the fluid pressure exerts a pull on the chain *f* for lifting the pole. The proportions should be such, relatively to the pressure of the fluid, that the lifting effect will be adequate for raising a pole of any size or weight which is to be used.

In operation the pole is put into the furnace by man-power as usual, and the chain *c* is applied as heretofore. The valve G is reversed to drive the piston toward the right in Fig. 4, and thereby lower the chain *f*; this chain is then carried around the pole and fastened, and the operator, by pulling the chain *l'*, turns the valve to the position shown in Fig. 4, thereby driving the piston toward the left and lifting the chain *f*. This results in hoisting the pole until its butt end within the furnace is carried down to the bottom of the molten copper. The fluid pressure hoist thus lifts the pole higher than the three men heretofore employed for this purpose could do. Further, the air pressure being left turned on, the pull on the chain is continuous, and as fast as the pole is consumed the chain automatically pulls its outer end higher up and keeps its inner end immersed. The result is that no time is lost in the feeding of the pole, and all the wood of the pole that it is possible to carry beneath the copper is kept in that position and is utilized to deoxidize the copper. Further man-power is not required until it is necessary to push the pole endwise deeper into the furnace, and at this time the carriage D is pushed toward the furnace, thereby carrying the sheave *e* over to the position shown in dotted lines at *e'*, and exerting a diagonal pull upon the pole through the chain, as shown at *f'*; this of itself assists in feeding the pole into the furnace, and so far reduces the labor that one man is able to do the work. At all other times than when the pole thus requires feeding forward, the operation is wholly automatic, so that the three men heretofore required are released, so that their services may be otherwise utilized.

Accordingly, it follows that the present invention has the advantages of keeping the pole automatically lifted to its utmost, thereby eliminating waste of wood and diminishing the time required for the poling operation; and it conserves man-power, releasing three men for other work, except when a new pole is first introduced, and afterward, except occasionally when one man is required to push the pole forward into the furnace as it burns away.

The apparatus as illustrated and described is what is deemed its preferable form; but the invention may be embodied in other constructions capable of operating upon the pole in like manner, as will be obvious to those skilled in the art.

We claim as our invention:

1. Apparatus for poling copper comprising, in association with a furnace, a pole introduced into the furnace door and means adjacent the door for holding down the pole, improved means for operating the pole comprising means for lifting the outer end or lever arm of the pole, including a pressure-actuated lifter adapted to exert a constant upward stress on the outer end of the pole to lift it automatically as its end within the furnace burns away.

2. An apparatus according to claim 1, including a flexible connection between the pressure-actuated lifter and the pole, and means under manual control for varying the angular direction of lifting pull as the pole burns away.

3. An apparatus according to claim 1, the lifter being fluid-pressure-actuated, and a carrier for said lifter movable toward and from the furnace and adapted on moving toward the furnace to exert its lifting stress obliquely tending to move the pole into the furnace.

4. An apparatus according to claim 1, the lifter being fluid-pressure-actuated, and a carrier for said lifter mounted on tracks longitudinally of the mean direction of the pole and movable thereon to exert its lifting stress obliquely tending to move the pole into the furnace.

5. An apparatus according to claim 1, the lifter comprising a cylinder and piston, a pulley, a chain extending over said pulley and from the piston to the pole, and a mounting for said pulley permitting of advancing it to vary the direction of the lifting pull as the pole burns away.

In witness whereof, we have hereunto signed our names.

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