

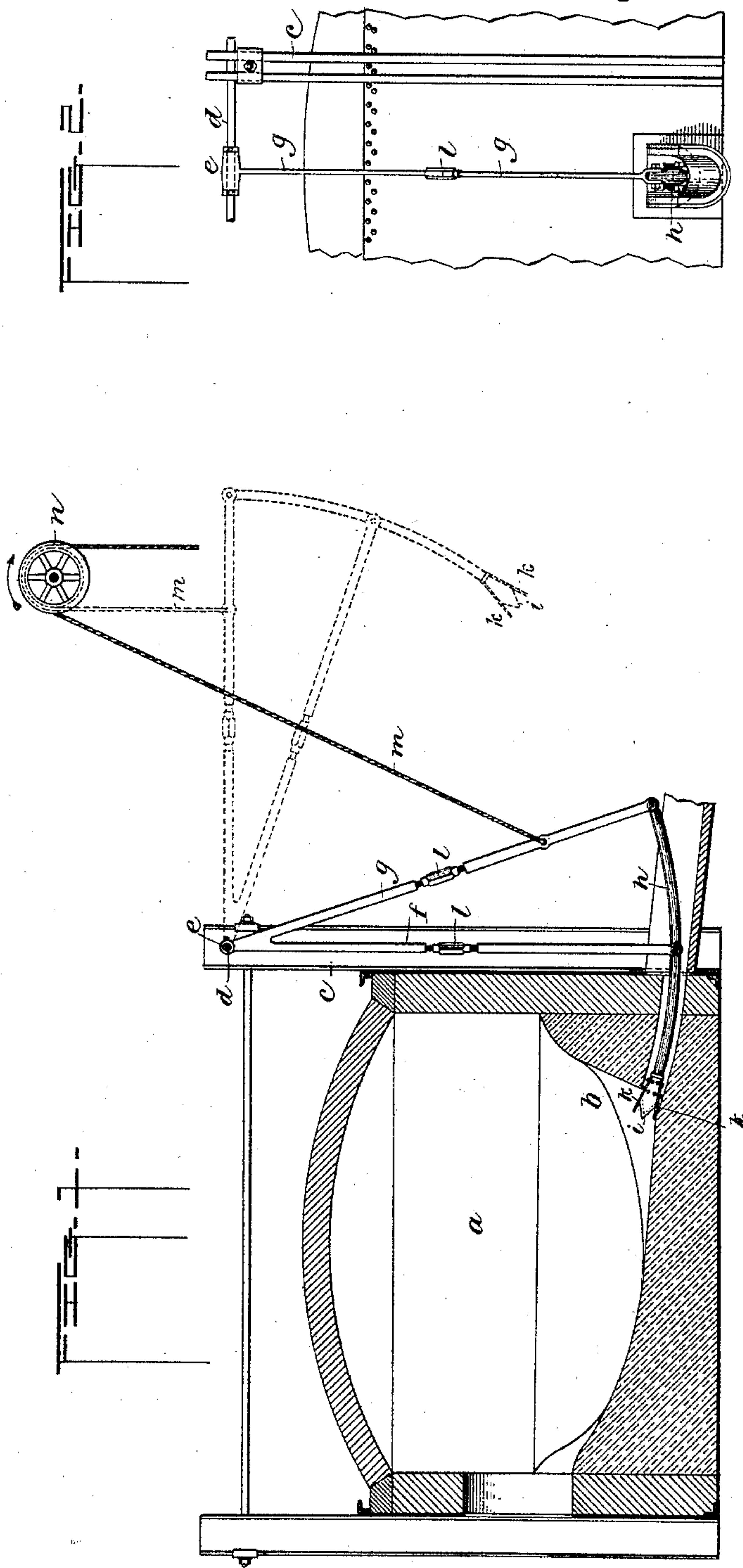
(No Model.)

2 Sheets—Sheet 1.

J. PURVES.
APPARATUS FOR TAPPING FURNACES.

No. 436,461.

Patented Sept. 16, 1890.



WITNESSES

J. M. Corwin
M. B. Corwin

INVENTOR

James Purves
by *W. Russell & Sons*
his Attorneys

(No Model.)

2 Sheets—Sheet 2.

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FIG. 3.

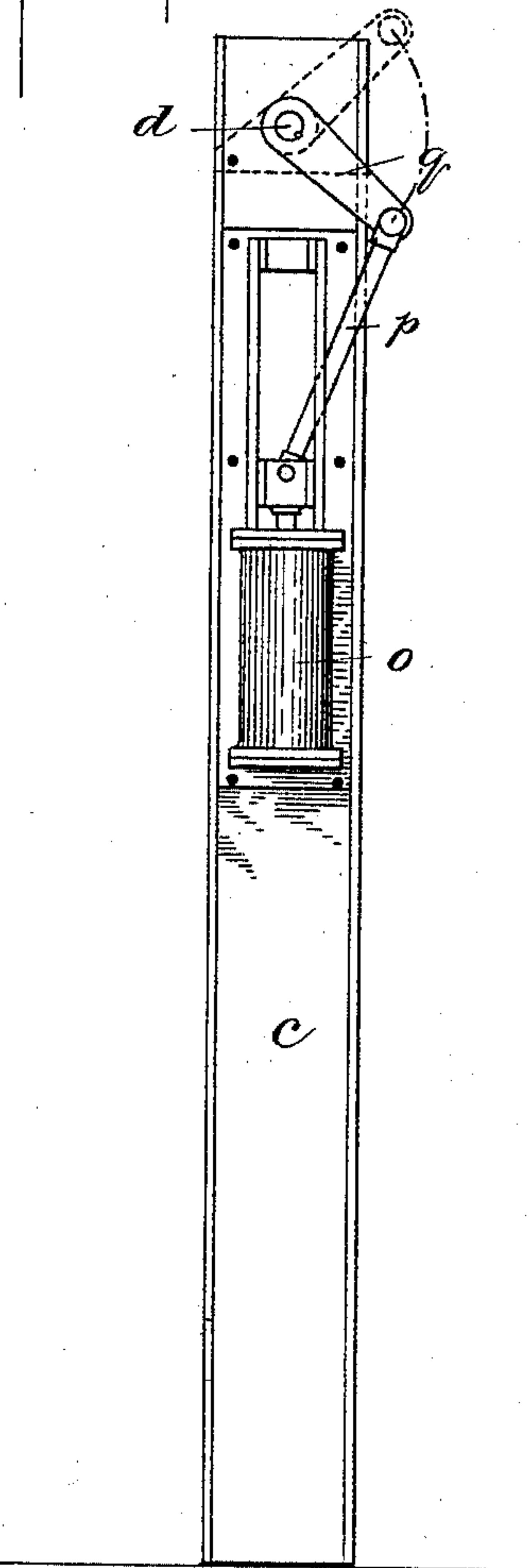


FIG. 4.

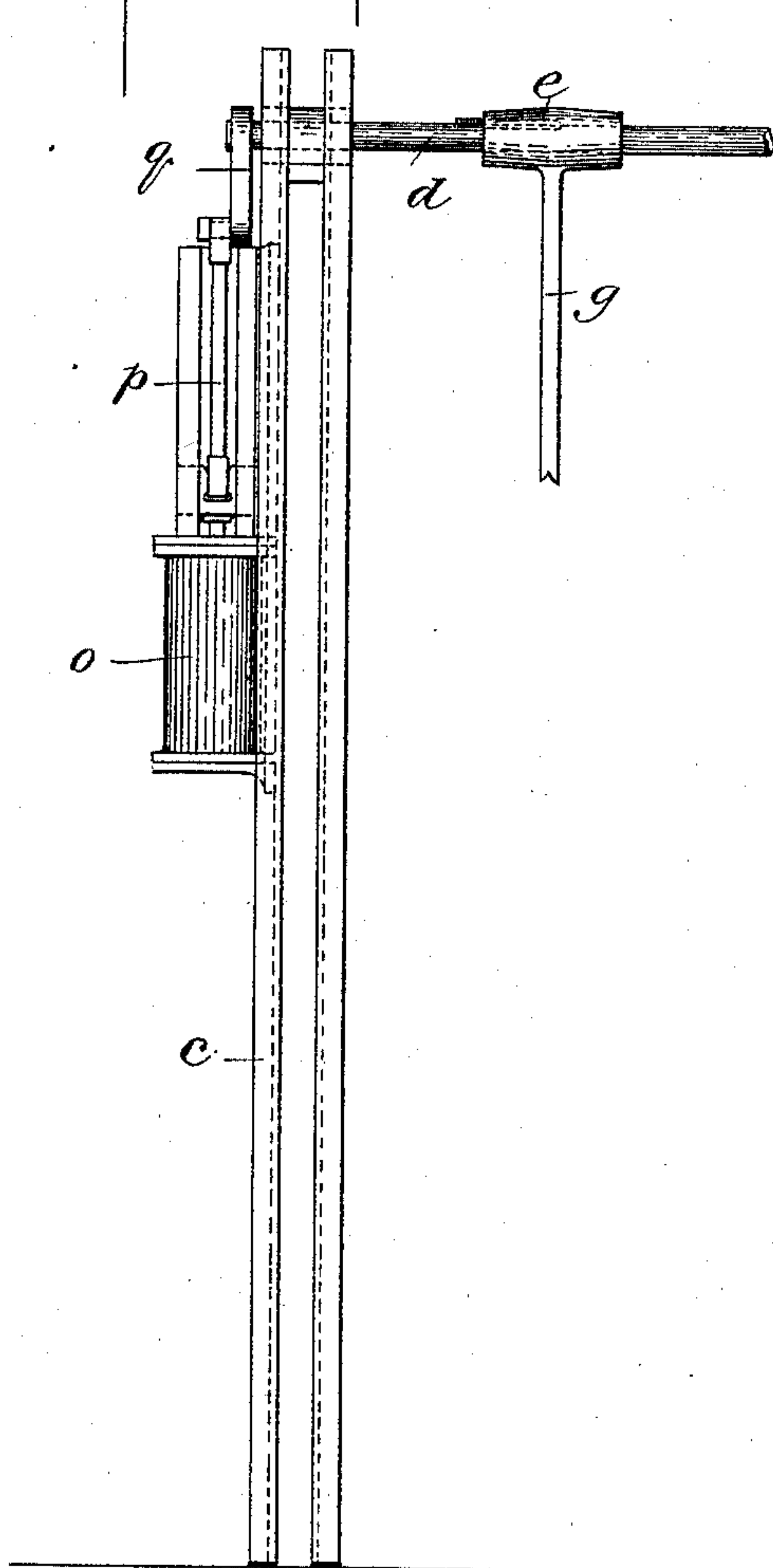


FIG. 5.

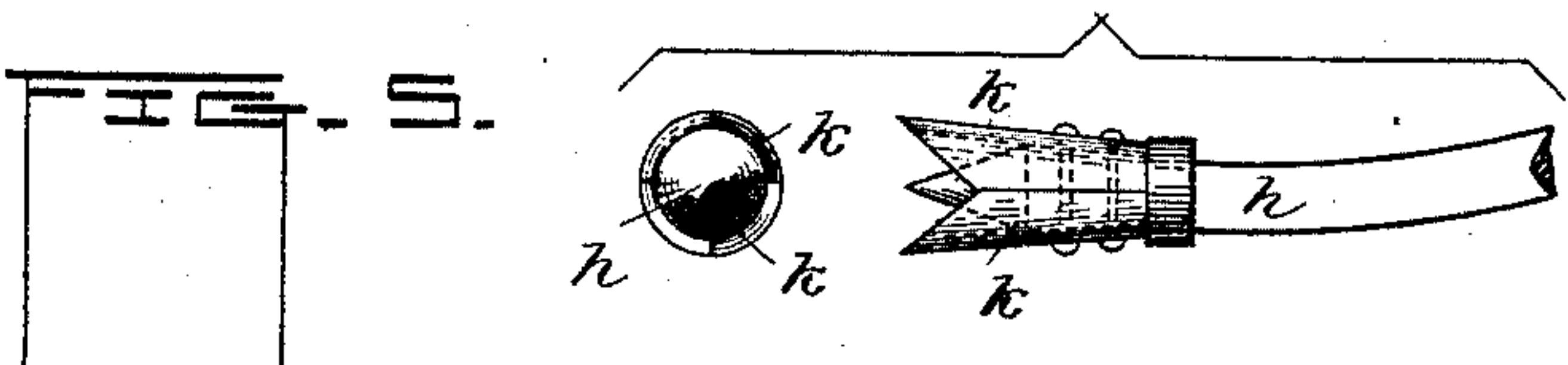
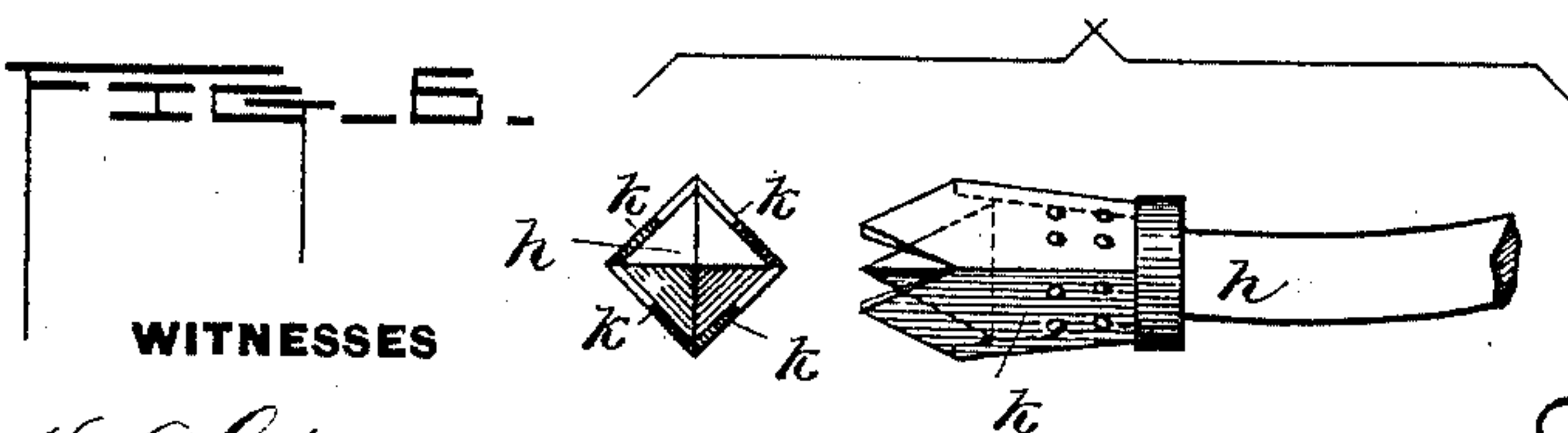


FIG. 6.



WITNESSES

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UNITED STATES PATENT OFFICE

JAMES PURVES, OF HOMESTEAD, PENNSYLVANIA.

APPARATUS FOR TAPPING FURNACES.

SPECIFICATION forming part of Letters Patent No. 436,461, dated September 16, 1890.

Application filed May 27, 1890. Serial No. 353,392. (No model.)

To all whom it may concern.

Be it known that I, JAMES PURVES, of Homestead, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Tapping Furnaces, of which the following is a full, clear, and exact description.

My invention relates to an improvement in appliances for furnaces; and it consists in devices for cutting out the stopping of the tap-holes of steel-melting and other metallurgical furnaces.

Hitherto it has been usual to cut out the stopping by means of steel bars and sledge-hammers operated by men standing in front and by the side of the tap-hole. The disadvantage of this method is that it is slow and somewhat dangerous; it does not always insure a free flow of the metal, and in case of open-hearth furnaces, where the tapping-hole often becomes clogged with cinder, the work of opening the hole by hand-labor is extremely difficult. At the end of the open-hearth process the diminution of the carbon is quite rapid, and delay ensuing from the necessity of opening the tapping-hole often results in spoiling the product of the furnace.

To obviate the present difficulties, I employ a tap-bar hung by swinging, preferably adjustable, arms from a point above the tap-hole, so that if raised and then permitted to drop the bar will enter the tap-hole and cut or force out the stopping without injuring the lining of the spout, and I operate the bar by mechanism which enables it to be withdrawn from the tap-hole quickly to avoid the sudden out-rush of metal when the stopping is pierced.

I will now describe my invention so that others skilled in the art may construct and use the same, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical cross-sectional view of a furnace, showing the application of my improvement. Fig. 2 is a partial front elevation thereof. Figs. 3 and 4 are side and front views of a modified form of apparatus for operating the tapping-bar and Figs. 5 and 6 are detail views of the end of the tapping-bar, showing two forms thereof.

Like symbols of reference indicate like parts in each figure.

In the drawings, *a* represents the furnace,

and *b* the tap-hole. A shaft *d* is fixed to the buckstaves or frame *c* of the furnace near the top of the latter, and on this shaft is a loose sleeve *e*, from which depends a frame composed of bars *f g*, set at an angle to each other. Secured to the lower end of the bars *f g* is a curved tapping-bar *h*, having a point *i* and prongs *k k*. These prongs may consist of diverging plates fixed to the sides of the tapping-bar at the end of the latter. They may be cast integrally with the bar or may consist of separate plates bolted thereto.

In Fig. 5 I show the tapping-bar with its end substantially rectangular in cross-section and with the four plates or prongs fixed to the sides of the bar. In Fig. 6 I show a bar whose end is circular in cross-section, and is provided with two pen-shaped prongs. The tapping-bar is adapted to enter through the tap-hole, and the shape of the bar and the curvature of the hole conform in arc to a circle of which the bars *f g* are radii. These bars are preferably made in sections provided with adjusting sleeve-nuts *l l*, by means of which the length of the bars may be adjusted at pleasure. The bars *f g* and tapping-bar together form the swinging tapping device. In order to impart the desired swing to this device, a rope, chain, or belt *m* extends from the bar *g* over a preferably driven pulley *n*. By drawing on the free end of the rope it is tightened on the pulley, the revolution of which raises the tapping-bar to the desired elevated position, as shown by dotted lines in Fig. 1, and then the rope being released and loosened from contact with the pulley the tapping-bar will fall and its end will strike against the stopping in the tapping-hole, as shown by full lines. When the end of the tapping-bar reaches the hole, the impetus of the heavy bar striking the stopping causes the point to pierce and the prongs to cut it, so that in one or more strokes of the bar the stopping is removed. During this work the bar remains under perfect control of the operator, who, by merely tightening the rope *m* on the pulley, can stop or retract the bar instantly. This is of material advantage, because it is important that the bar be withdrawn as soon as the stopping is pierced, in order to escape the outflow of metal. By reason of the fact also that the tapping-bar swings in a certain arc which is

variable by adjustment of the bars *f g* the lining of the trough at the tap-hole is not liable to be injured by striking of the bar against it.

5 In order to actuate the tapping-bar, I may employ various mechanical devices other than that above described. Thus in Figs. 3 and 4 I show a device comprising a cylinder *o*, secured to the frame of the furnace, the piston-rod *p* of the cylinder being connected by the crank-arm *q* with the shaft *d*, to which the crank-arm is keyed. Suitable steam, hydraulic, or pneumatic power may be applied by any system of pipes to the cylinder. When 10 the motive fluid is admitted to the cylinder, the reciprocation of the piston produces an oscillation of the crank-arm, the extent of which is indicated in Fig. 3, thereby rocking the shaft *d* and swinging the tapping-bar 15 back and forth. The valve of the cylinder affords an efficient means for checking or withdrawing the tapping-bar at any moment, just as the valve of a steam-hammer enables it to be controlled.

25 The advantages of my invention will be appreciated by those skilled in the art. The apparatus is simple in its construction and is very effective. It possesses all the advantages of the usual hand-operated tapping-bar 30 in respect of its controllability, together with the added advantages of greater effective power and quickness of action.

The form of the parts and the mechanism for operating the same may be varied in many 35 ways by the skilled mechanic.

What I claim is—

1. A tapping-bar for steel or other metallurgical furnaces, having a point and outer cutting-prongs, substantially as and for the 40 purposes described.

2. The combination, with a furnace, of a tapping-bar, a pivotal support above the tapping-hole of the furnace, and adjustable oscillatory arms or bars by which the tapping-bar is suspended from said pivotal support, whereby when the arms or bars are oscillated a reciprocating motion is imparted to the tapping-bar, substantially as and for the purposes described. 45

3. In combination with a furnace, a tapping-bar, a pivotal support from which it is suspended, and mechanism for swinging the bar, substantially as and for the purposes described. 50

4. In combination with a furnace, a swinging frame, a pivotal support on which the frame is mounted, and a curved tapping-bar secured to the frame and adapted to enter the tapping-hole when the frame is swung on said pivotal support, substantially as and for the 55 purposes described. 60

5. In combination with a furnace, a swinging tapping-bar, a pivotal support on which it may swing, and mechanism, substantially as described, for raising, dropping, and controlling the tapping-bar, substantially as and for the purposes described. 65

6. The combination, with a furnace, of a swinging tapping-bar, a driven wheel, and a rope, chain, or belt which passes over the wheel and is connected with the tapping-bar, whereby on tightening the rope, chain, or belt it is drawn by the wheel and the bar raised, substantially as and for the purposes described. 70

In testimony whereof I have hereunto set my hand this 17th day of May, A. D. 1890. 75

JAMES PURVES.

Witnesses:

W. B. CORWIN,

THOMAS W. BAKEWELL.