

E. T. DRAVO.  
Machine for Making Plumbago Crucibles,  
and other Articles.  
No. 221,672. Patented Nov. 18, 1879.

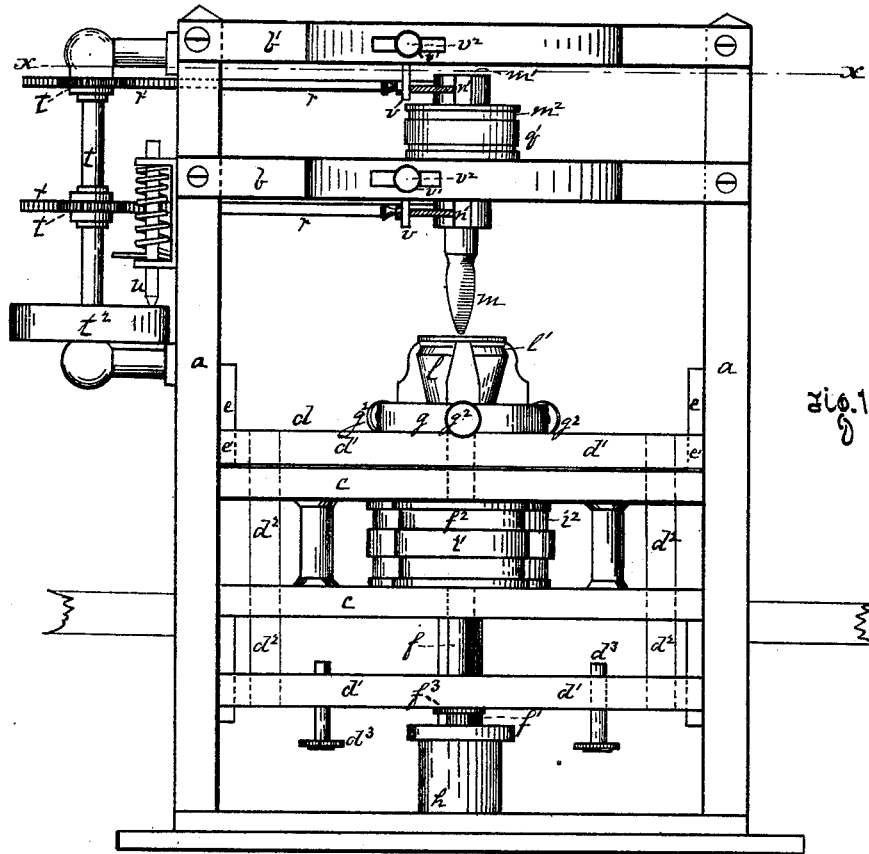


fig. 1.

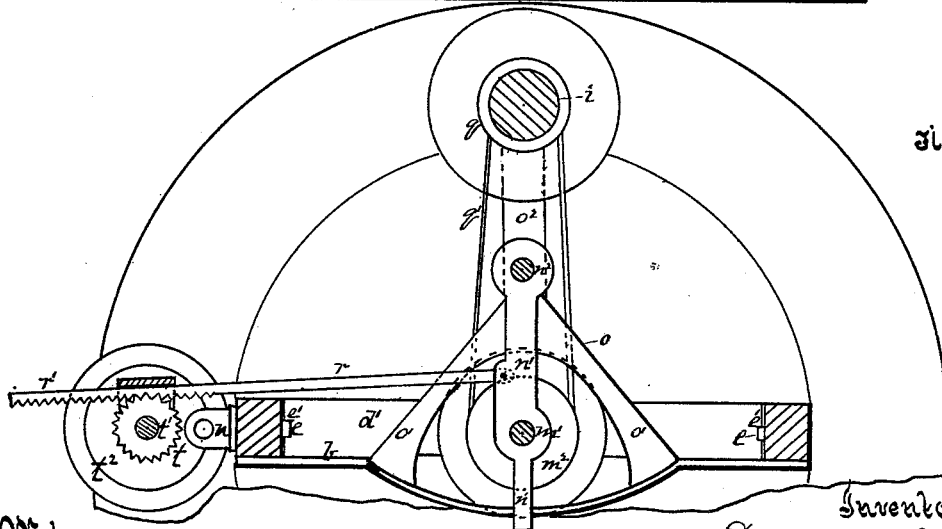


fig. 2.

Witnesses.  
R. W. Marshall  
John K. Smith

Inventor  
Edward T. Dravo  
by Baker & Kern  
Attorneys

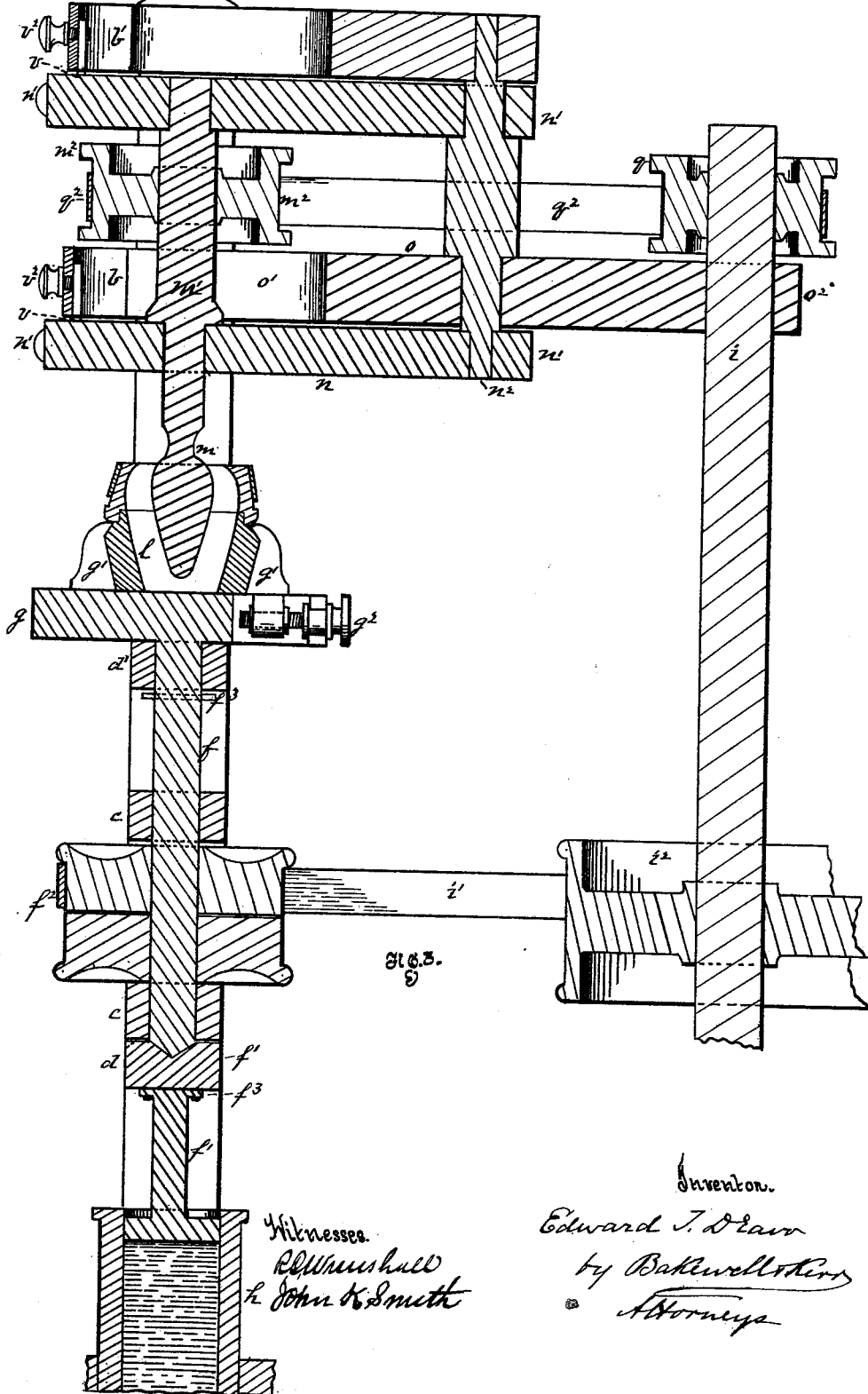
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# UNITED STATES PATENT OFFICE.

EDWARD T. DRAVO, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN MACHINES FOR MAKING PLUMBAGO CRUCIBLES AND OTHER ARTICLES.

Specification forming part of Letters Patent No. **221,672**, dated November 18, 1879; application filed September 22, 1879.

*To all whom it may concern:*

Be it known that I, EDWARD T. DRAVO, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machines for Making Plumbago Crucibles and other articles; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front elevation of my improved crucible machine. Fig. 2 is a section, at  $x x$ , Fig. 1; and Fig. 3 is a vertical section.

Like letters of reference indicate like parts in each.

My invention relates to the manufacture of plumbago crucibles, such as are used in the manufacture of steel, brass, and other metals.

To enable others skilled in the art to make and use my invention, I will now describe particularly its construction and mode of operation.

The machine has a strong frame-work,  $a$ , by which all of the working parts are sustained. On it are two cross-heads,  $b b'$ , and two center stays,  $c$ . Outside of the stays  $c$  is a sliding frame,  $d$ , composed of the cross-bars  $d'$  and uprights  $d^2$ . The ends of the cross-bars  $d'$  are grooved or recessed at  $e'$ , and slide on the ways  $e$ . The screw-stops  $d^3$  limit the movement of the frame  $d$  to any desired height, said movement being shortened by turning up and lengthened by turning down the screws. The lower stay,  $c$ , acts as the stop.

In the center of the frame  $a$  is a vertical shaft,  $f$ , upon the upper end of which is the chuck  $g$ , while the lower end is stepped in a piston,  $f'$ , which operates in the hydraulic cylinder  $h$ . On the shaft  $f$  is a fast-and-loose pulley,  $f^2$ , by which it is operated by the belt and pulley  $i'$  and  $i^2$  on the power-shaft  $i$ . The shaft  $f$  has a vertical movement through the pulleys sufficient to carry the mold up to position. The pulley is connected to the shaft by a feather or spline. The shaft is operated by the hydraulic cylinder  $h$ , and raises the mold into position, the sliding frame  $d$ , which acts to steady and guide the shaft, being also raised

by it, by means of a pin or collar,  $f^3$ , on the shaft, which comes under or on both cross-bars,  $d'$ .

The mold  $l$  is held in place on the chuck  $g$  by the spring-dogs  $g'$ , each of which is provided with a screw,  $g^2$ , by which it is moved toward and from the center of the chuck.

The plunger rib or former  $m$  has a shaft,  $m'$ , by which it is mounted in the swinging frame  $n$ , which is composed of the two arms  $n'$  pivoted on the shaft  $n^2$ . The shaft  $n^2$  is stationary, and mounted on the bracket  $o$ , and its upper end may be held true by an additional bracket. The bracket  $o$  projects from the cross-head  $b$ , to which it is fastened by two arms,  $o'$ .

From the junction of the two arms  $o'$  a third arm,  $o^2$ , extends back to the power-shaft  $i$ , which passes up through it. On the upper end of the power-shaft  $i$  is a pulley,  $q$ , which, by means of the belt  $q^2$ , operates the pulley  $m^2$  on the plunger shaft  $m'$ , and thereby rotates the plunger.

The lateral motion of the plunger or former  $m$  in the mold  $l$  is obtained by means of the rods  $r r$ , which are pivoted to and extend from the swinging arms  $n'$  to the side of the machine, where, being provided with racks  $r'$ , they mesh into the pinions  $t$ , which are mounted on the shaft  $t'$ , and are operated by the wheel  $t^2$ . A spring catch or stop,  $u$ , engaging the wheel  $t^2$ , holds the former  $m$  at its central position, and when it is necessary to move the former  $m$  in making a crucible, the stop  $u$  is first thrown out of hold. The former  $m$  in its lateral movement travels in the arc of a circle, the center of which is the shaft  $n^2$ . It is only necessary that it should go from the center to the side of the mold. To insure its certain stopping at the proper distance from the side of the mold, to obtain a proper thickness of crucible, there are two adjustable stops,  $v$ , against which the two arms  $n'$  come, and which stop them at the proper point. These stops  $v$  are adjustable in the slots  $v'$  by the clamps  $v^2$ , and also may be lengthened or shortened by turning them in their threaded collars. Thus the lateral movement of the former  $l$  may be arrested at the center, or at any desired point at that side.

The mold *l* is made of any desired and suitable material, and is partible either vertically, as shown, or horizontally, at pleasure. When made as shown the two halves are held together by a ring, *l'*.

It will be seen that the pulleys which turn the former *m* are smaller than those that turn the mold *l*. Consequently the speed of the former is less than that of the mold.

The operation of my machine is as follows: The ball of plumbago-batch is placed in the mold, and the belt *i* thrown on the fast pulley *f*<sup>2</sup>. The mold is then raised by the hydraulic press *h*, which is of the usual well-known construction, and operated by the workman in the usual way at any desired moment. As the mold rises the former *m* enters the batch at the center of the lump, and when the mold has reached the molding position, which is at the highest point of its vertical movement, the workman, by turning the hand-wheel *t*<sup>2</sup>, causes the former *m* to move slowly from the center toward the side of the mold until the arms *m'* encounter the stops *r*, which determine the thickness of the sides of the mold. The former *m* is then drawn back to the center of the mold by reversing the wheel *t*<sup>2</sup> and securing it there by the stop *u*. The chuck is permitted to descend to its lower position, the belt *i* thrown off the fast onto the loose pulley, the dogs *g'* screwed back to release the mold, the mold removed from the chuck and taken apart, and, finally, the molded crucible removed to the drying-room.

The advantages of my machine are that all of the operations are performed by the machine and that none are left to the skill or judgment of the workman, and that, therefore, the cru-

cibles have the uniformity and perfection of finish that are present in machine-made articles which are formed on the same pattern. In addition to this the cost of production is reduced. The operation of the machine is rapid. The effect of the former, revolving by a positive and independent revolution from that of the mold and at different speed, is to give it a kneading and smoothing action on the batch, which produces a very firm, compact, and smooth crucible.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In the formation of crucibles and like articles by machinery wherein the former and mold are rotated, the method herein described of causing the former to have a kneading and smoothing action on the batch, the same consisting in rotating the former independently of and at a lower rate of speed than the mold, substantially as specified.

2. In a machine for forming crucibles and like articles, the combination of a vertically-adjustable mold and a horizontally-swinging pivoted former, substantially as and for the purpose specified.

3. The combination, with a vertically-movable mold and a horizontally-movable former, of two sets of adjustable stops, one set to limit the motion of the former and the other to limit the motion of the mold, substantially as and for the purpose specified.

In testimony whereof I, the said EDWARD T. DRAVO, have hereunto set my hand.

EDWARD T. DRAVO.

Witnesses:

A. C. JOHNSTON,  
T. B. KERR.