J. Greacen, Jr. A. Foster & J. H. Cooper.

Brick Machine

No. 56,496. Patented July 17, 1866.

Fig. 2.

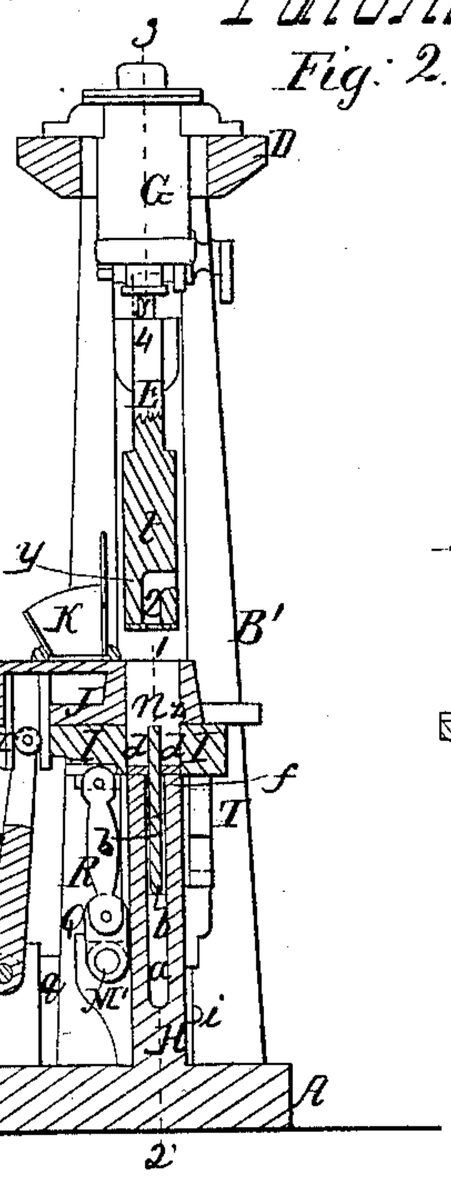


Fig. 3.

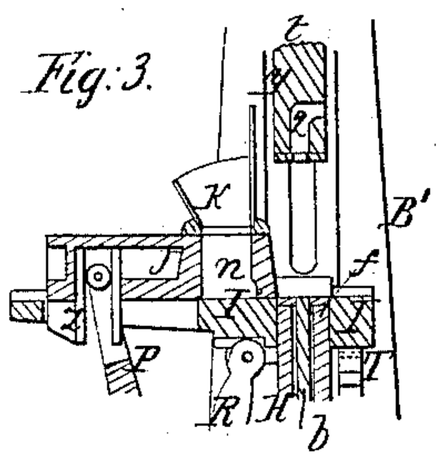


Fig. 4.

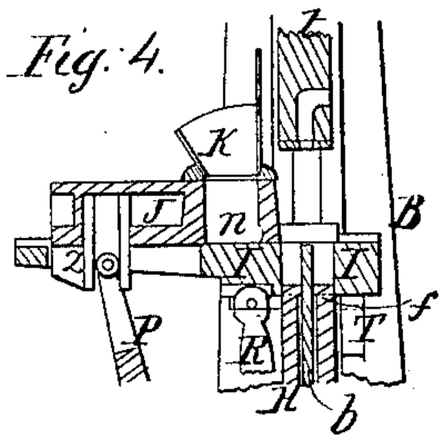


Fig. 5.

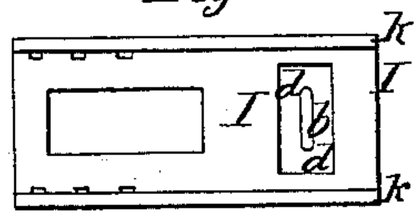


Fig. 8.

Fig. 1.

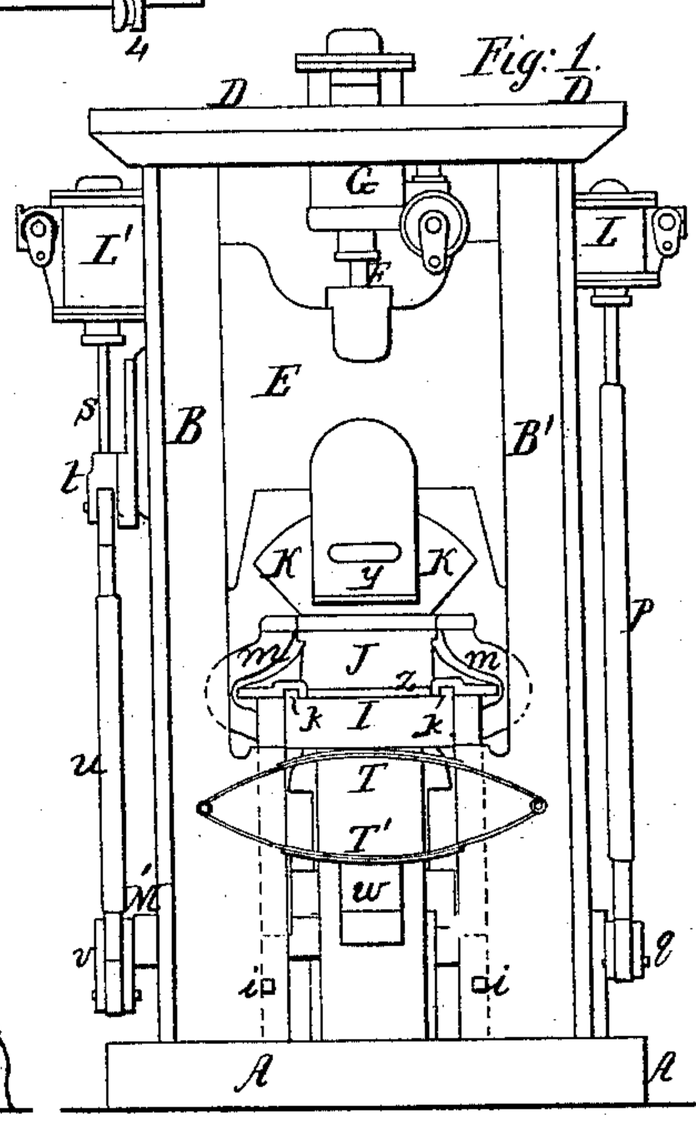


Fig. 11.

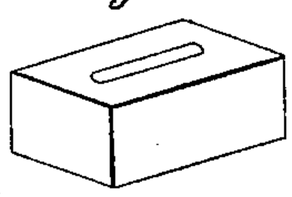


Fig. 6.

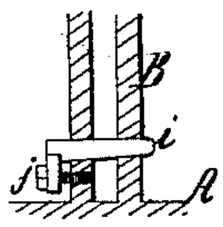


Fig. 9.

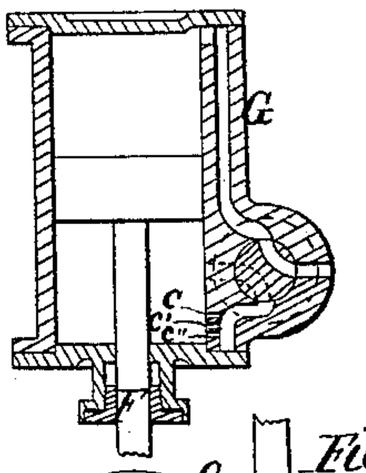


Fig. 7.

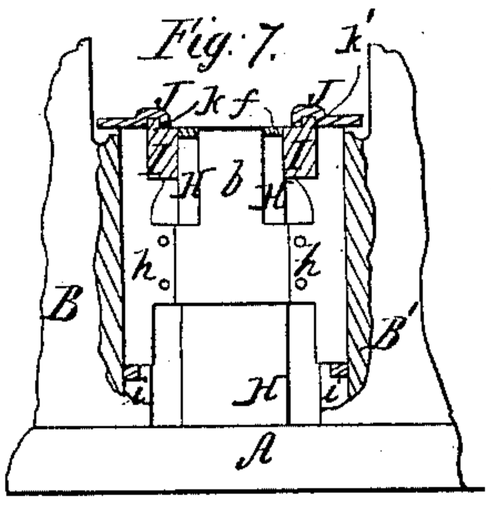
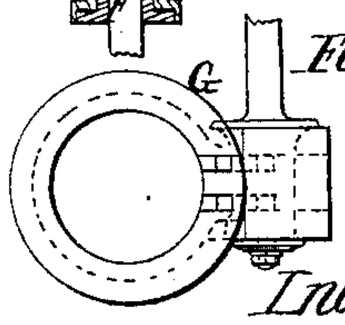


Fig. 10.



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J. H. Cooper
By their attorney
H. Howson

UNITED STATES PATENT OFFICE.

JOHN GREACEN, JR., AND AMBROSE FOSTER, OF NEW YORK, N. Y., AND JOHN H. COOPER, OF PHILADELPHIA, PA., ASSIGNORS TO THE AMERICAN BUILDING BLOCK COMPANY, OF NEW YORK CITY.

MACHINE FOR MOLDING MATERIALS ADMITTING OF COHESION.

Specification forming part of Letters Patent No. **56,496,** dated July 17, 1866.

To all whom it may concern:

Be it known that we, J. GREACEN, Jr., and A. FOSTER, of the city and State of New York, and J. H. COOPER, of Philadelphia, Pennsylvania, have invented a Machine for Molding Materials Admitting of Cohesion; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Our invention consists of certain mechanism, fully described hereinafter, for molding by impact materials admitting of cohesion.

In order to enable others skilled in the art to which this most nearly appertains to make and use our invention, we will now proceed to describe the manner of carrying it into effect.

On reference to the accompanying drawings, which form a part of this specification, Figure 1 is a front view of our machine for molding materials admitting of cohesion; Fig. 2, a transverse vertical section; Figs. 3 and 4, parts of Fig. 2; Fig. 5, a plan view of the mold; Fig. 6, a detached sectional view of part of the machine; Fig. 7, a vertical section on the line 1 2, Fig. 2; Fig. 8, a view illustrating a device which may be used for operating the valves used in connection with the machine; Fig. 9, a section of one of the cylinders of the machine on the line 3 4, Fig. 2; Fig. 10, a plan view of Fig. 9, and Fig. 11 a perspective view of a building-block made by the machine of a material admitting of cohesion.

A is the base of the machine, to which are secured the two frames B and B′, the latter being connected together at the top by the plate D.

A hammer, E, is arranged to slide in grooves in the frames B and B′, the hammer being secured to the piston-rod F of the steam-cylinder G, which is attached to the plate D.

To the base A is secured the anvil H, down which extends the vertical slot *a*, for the reception of the tongue *b* of the mold I, as best observed on reference to Figs. 2 and 7, this mold having a chamber, *d*, of the form of the object to be molded, a steel plate, *f*, secured to the top of the anvil H, forming the bottom of this chamber under the circumstances described hereinafter.

The mold has two legs, *h h*, projecting downward, one leg being adapted to a vertical groove in one frame of the machine and the other to a groove in the other frame, (see Fig. 7,) each leg, when the mold is at the limit of its downward movement, resting on a tapering key, *i*, fitting into the frame, and rendered adjustable by a set-screw, *j*, for a purpose described hereinafter.

It will be observed on reference to Fig. 7 that projections on the tongue *b* are secured to the legs *h h* of the mold.

On guiding-strips *k k*, secured to the top of the mold, slides the feed-box J, and above the feed-box is a hopper, K, for receiving the material of which the object to be molded is made, this hopper being attached to the brackets *m m*, which are secured one to each side of the mold-box I.

The feed-box has an opening or chamber, *n*, of the same form as, but somewhat larger than, the chamber *d* of the mold, and the movement of the feed-box is of such an extent that its said opening can be made to coincide with the chamber *d* of the mold or with the opening at the bottom of the hopper K, these points being the limit of the rearward and forward movement of the box, and this movement is imparted by the cylinder L and its piston, the rod *p* of the latter being connected to an arm, *q*, on a shaft, M, which is adapted to suitable bearings on the base A, and to which is secured an arm, P, the upper forked end of which has a roller adapted to a vertical slot formed in projections from the feed-box J.

A vertical reciprocating movement is imparted to the mold I (the feed-box and hopper moving with it) by the cylinder L′ and its piston, the rod *s* of the latter being connected to a cross-head, *t*, to which is jointed the upper end of the rod *u*, the lower end of the latter being connected to an arm, *r*, on a shaft, M′, which is adapted to appropriate bearings on the base A, and which has an arm, Q, connected by a rod, R, to a pin on the under side of the mold I.

T and T′ are ordinary elliptical springs, the lower spring resting on and being secured to a projection, *w*, on the anvil, and the mold I resting on the upper spring, under the circumstances and for the purpose described hereinafter.

The cylinders G, L, and L′ are provided with valve-chests, and in the present instance with ordinary plug-valves, on the spindle of each of which may be an arm, these arms being operated by mechanism described hereinafter, or by any other suitable devices which may be deemed appropriate. The exhaust-ports of each cylinder communicate with the interior of the same through openings *c c′ c²*, which are arranged as shown in Fig. 9, for a purpose described hereinafter.

Compressed air, steam, or other elastic fluid is conveyed through pipes to the several valve-chests, great care being taken to set the valves properly and to so operate them that the movements of the parts described may be performed at the proper time and in unison with each other.

Operation: The first position of the several parts is as follows: The hammer is elevated, the mold and its appurtenances depressed to the limit of their downward movement, and the feed-box moved to the limit of its backward movement. (See Fig. 3.) The first movement is effected by the elastic fluid admitted to the cylinder L, which completes the forward movement of the feed-box, the opening or chamber *n*, with its contents, derived from the hopper, being now directly over the face of the anvil. The mold, feed-box, and hopper are now elevated by the cylinder L′ and mechanism described to the position illustrated in Fig. 2, so that the top of the anvil, which was previously on a level with the top of the mold, now forms the bottom of the chamber into which the material falls. The valves of the cylinder G now come into play, so that the hammer is permitted to fall one or more times, while the other parts of the machine remain quiescent, the projection *y* of the hammer passing through the feed-box, thus packing the material tight into the chamber *d*. After this the feed-box is moved back, in doing which a sharp edge, *z*, scrapes the superfluous material away, leaving the surface of that in the chamber perfectly level, the feed-box being moved so far back that its opening coincides with that of the hopper. Immediately after the feed-box has retreated the hammer again descends and strikes the material in the chamber *d* another blow, thereby compressing it to the required density and smoothing the face and solidifying the corners of the block formed. In thus giving the last blow the projection *y* of the hammer enters the mold a short distance, there being in no case anything to resist the full force of the blow excepting the material itself, for on this depends the success of the operation. The mold is now depressed, while the formed block remains behind on the face of the anvil, from which it can be readily removed by hand or by any suitable mechanism. A repetition of the above-described movements now takes place.

As the piston in either cylinder approaches the exhaust-port the air escapes freely through the openings *c*, *c′*, and *c²*. When, however, the piston is nearly at the limit of its motion the openings *c*, *c′*, and *c²* will be successively covered, the passage for the escape of the air being thus gradually diminished in size, so that the air is condensed beneath the piston and acts as a cushion, which gradually arrests the motion of the same, the injurious jars and strains imparted to the machine when the movement of the piston is too suddenly arrested being thus prevented.

In the present instance the machine has been arranged for molding building-blocks of the form illustrated in Fig. 9—that is, an oblong block with a hole through it. Hence the use of the tongue *b*, the upper portion of which occupies a central position in the chamber *d* of the mold, the hole 2 in the projection *y* of the hammer preventing the latter from striking any material which may remain on the tongue, which material would otherwise be the means of transmitting a dangerous blow to the said tongue and of neutralizing the desired effect of the blow, which, as before remarked, should be resisted by the material in the mold only. Whatever material is caused to pass into the hole 2 by the tongue falls back into the chamber *d* on the return of the hammer.

It will be evident that the mold, hammer, and other parts of the machine may be so arranged as to construct blocks or other objects of different forms.

Many machines have been devised and experimented with for the purpose of constructing building-blocks of materials possessing slight cohesive properties—such, for instance, as sand combined with pulverized unslacked lime and water, or sand combined with silicate of soda and lime.

These machines have hitherto failed in practice for reasons which may be explained as follows: First, machines in which a direct, gradual, and rigid pressure has been used for forming the blocks did not complete the work properly, owing to the peculiar nature of the material, which, as we have discovered by practical tests, requires a blow or a succession of blows to reduce it to the proper density; second, machines in which cams and other like appliances have been used have been found deficient, as the strain and wear and tear on the operating parts must, in all such cases, be excessive and destructive, and especially in the present instance, where the material is of a peculiarly unyielding character, and where a hammer of twelve hundred pounds weight is required to give thirty blows per minute, falling a distance of ten inches. Hence we prefer separate cylinders for causing elastic fluid to operate the main parts of the machine, the pistons of the several cylinders working in

unison and performing their proper duties at the proper times, owing to the operation of the several valves from one source.

It will be evident that this use of cylinders and elastic fluid will obviate the danger of frequent accidents, for although an obstruction may present itself, it can do little more than stop the piston of the cylinder which actuates the part of the machine obstructed without disarranging or damaging any other part, and, after the removal of the obstruction, the several parts resume their proper relative action, owing to that of the valves.

Many different devices may be used for operating the valves. For instance, three scroll-cams, 4, Fig. 8, may be secured to one shaft, 3, and the pin on each arm attached to each valve-spindle projects into the groove of one of the cams, these grooves being so formed that on turning the shaft the proper relative movements will be imparted to the several valves.

We have not illustrated nor described minutely the construction and operation of the cylinders and valves, nor explained in detail the manner in which they are caused to operate in unison, so as to actuate the different parts of one machine at the proper time, as these are considered as two distinct inventions applicable to many machines, and as separate applications for Letters Patent for the said inventions will be made by the authors, Mr. J. H. Cooper, of Philadelphia, and Mr. J. Greacen, of New York.

The feed-box is somewhat larger than the mold, so that there may be in the opening or chamber *n* an excess of the material over and above that required for forming the block, whatever excess may remain after the material has been struck into the mold being, as before remarked, scraped off by the sharp edge *z*.

The opening or chamber *n* of the feed-box retains the material within bounds, so that on the falling of the hammer through the opening the chamber *d* is equally filled and a block of the desired uniform density is formed.

It should be understood that the feed-box is not in actual contact with the mold, but slides on the guiding-bars *k*, previously alluded to, the feed-box being always maintained at a height of about one-sixteenth of an inch above the mold, so that the clogging and grinding of the surfaces may be avoided, whatever sand may gain access to the feed-box and mold passing through suitable perforations in the projecting bracket at the rear of the mold.

When the mold is elevated it is supported by the rod R and arm Q, which, being in a straight line with each other and with the shaft M′, present a rigid support to the mold, so that the latter cannot be disturbed from its positions by jars to which it is subjected on the descent of the hammer.

There is another advantage in this arrangement of the rod R, arm Q, and shaft M′. They are in the best position to act as mediums for causing the cylinder L′ and its piston to exert the greatest power at the right time—that is, on the commencement of the downward movement of the mold, at which point the greatest power is demanded. Hence a comparatively small cylinder may be used.

The elliptical spring T is not in contact with the mold when the latter is elevated to its highest point. Hence it presents no resistance to the first exertion of power to commence the downward movement of the mold; but when the latter has descended a short distance, and when no exertion is required to cause the further descent of the mold, the spring comes into play and acts as a partial counter-balance to the mold, and thereby insures a comparatively uniform resistance for the piston to overcome.

We claim as our invention and desire to secure by Letters Patent—

1. The use, in combination with a machine constructed substantially as described, of two or more cylinders and pistons connected to separate operating parts of the machine and operating in unison, substantially as and for the purpose specified.

2. The use, in combination with the above-described machine, of cylinders having openings *c*, arranged in respect to and communicating with the exhaust-ports, substantially as and for the purpose set forth.

3. The combination of the reciprocating feed-box J and its opening *n* with the sharpened edge *z*, for the purpose described.

4. The combination of the mold-box and anvil, so adapted to each other that the former can descend while the anvil and formed block remain stationary, for the purpose explained.

5. The combination of the mold-box I, connecting-rod R, arm Q, and shaft M′, the whole being arranged and operating substantially as and for the purpose herein set forth.

6. The spring T, or its equivalent, interposed between the mold-box and any stationary part of the machine, and operating as and for the purpose herein set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN GREACEN, JR.
AMBROSE FOSTER.
JOHN H. COOPER.

Witnesses:
CHARLES E. FOSTER,
JOHN WHITE.