

(No Model.)

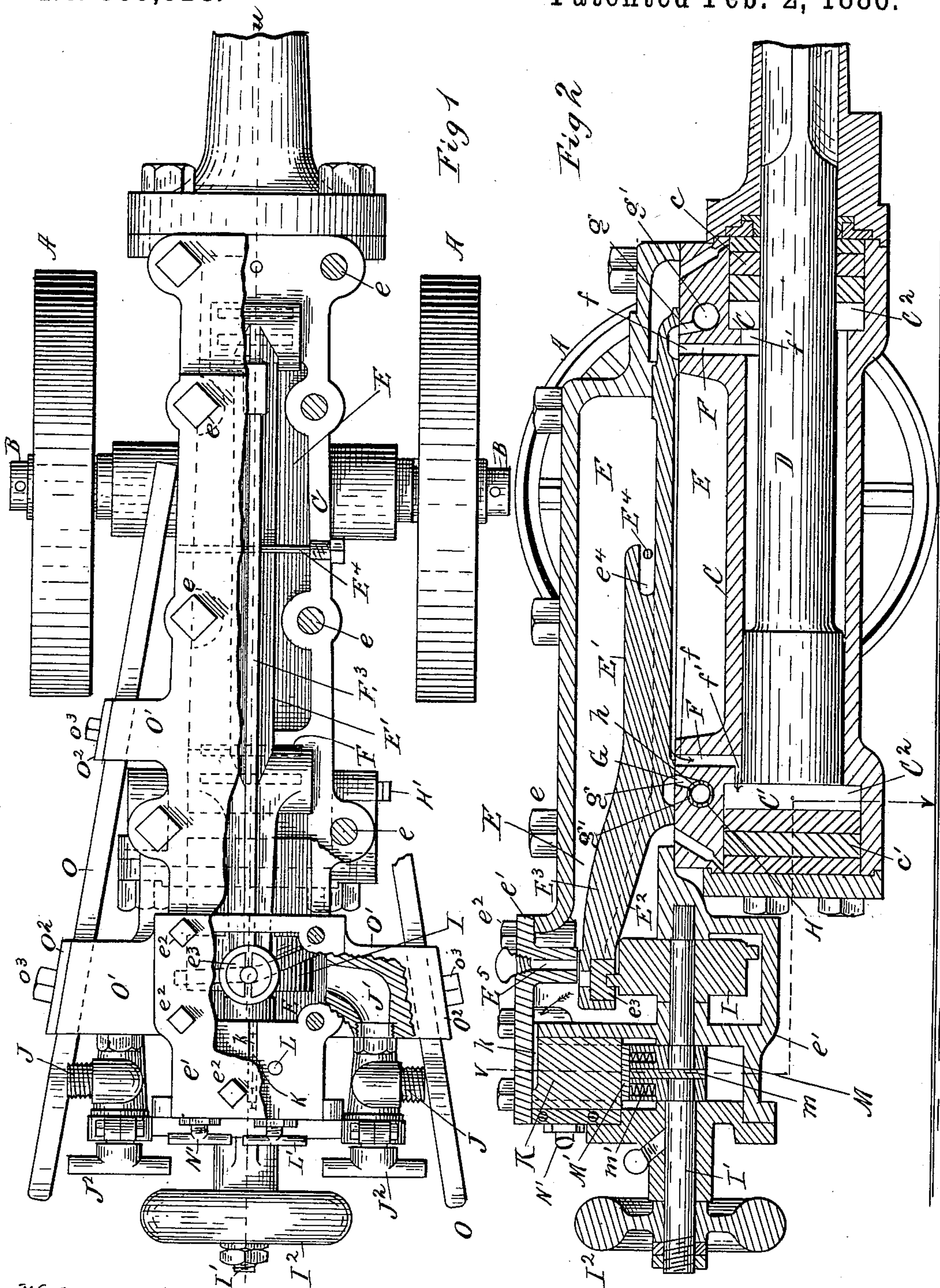
2 Sheets—Sheet 1.

G. D. WHITCOMB.

MINING MACHINE.

No. 335,328.

Patented Feb. 2, 1886.



Witnesses

M. C. Boies  
P. C. Remond.

Inventor

George D. Whitcomb

By Edmund T. Thacher  
Attorneys



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2 Sheets—Sheet 2.

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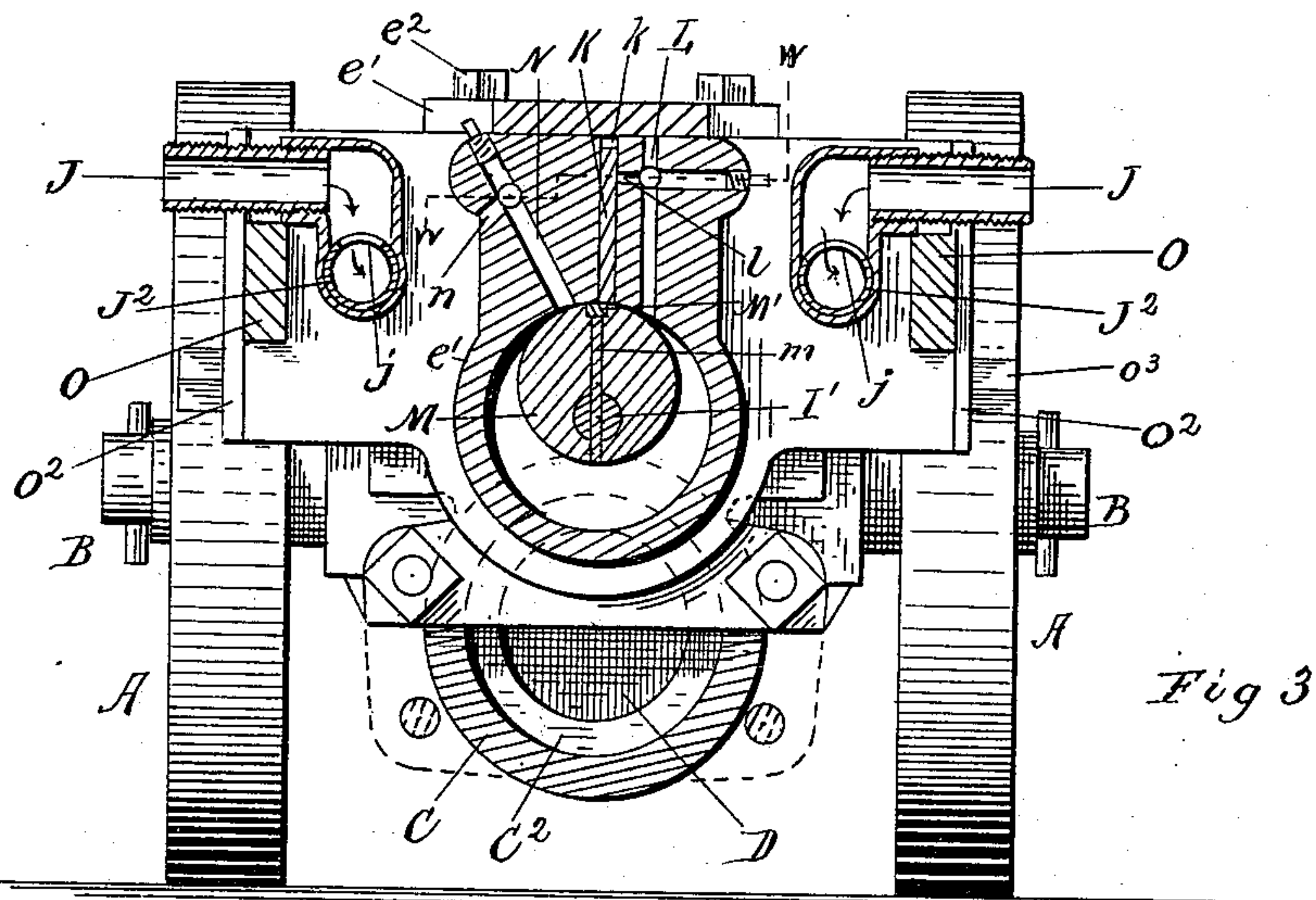
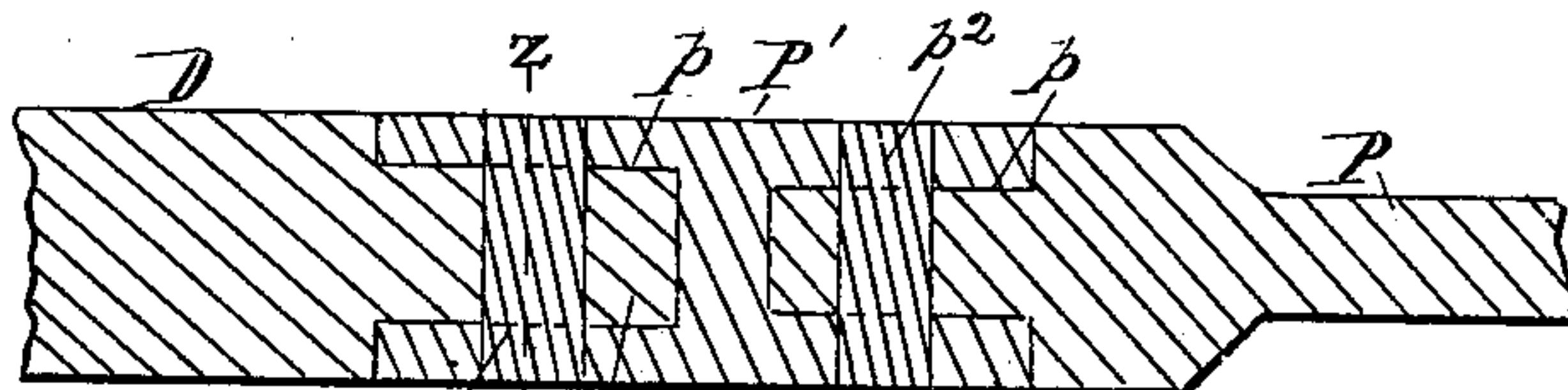
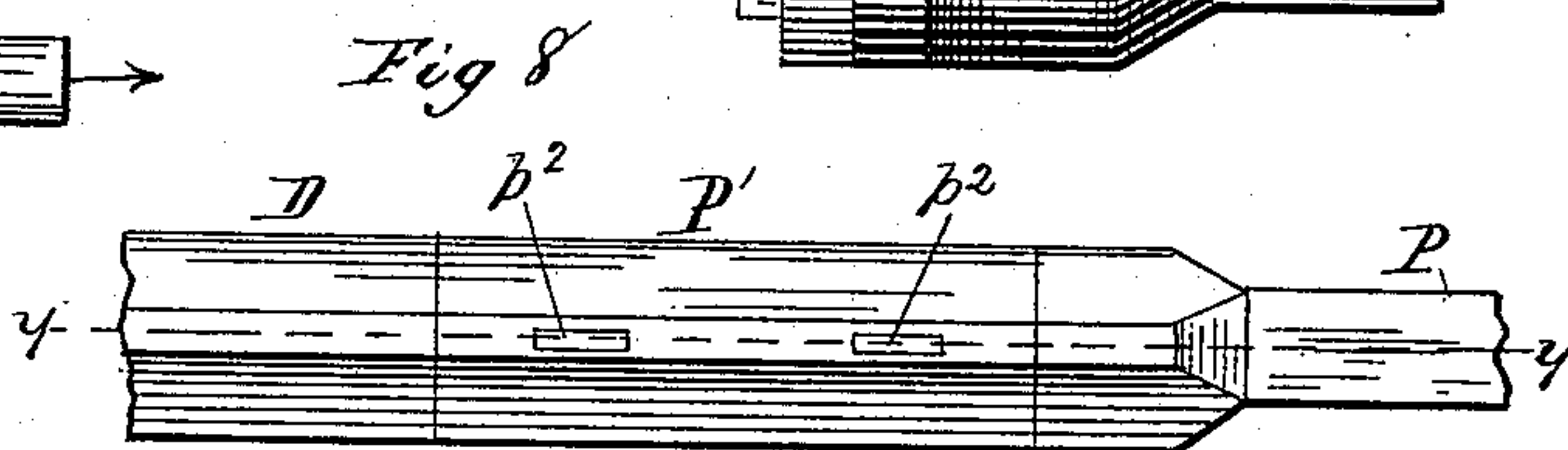
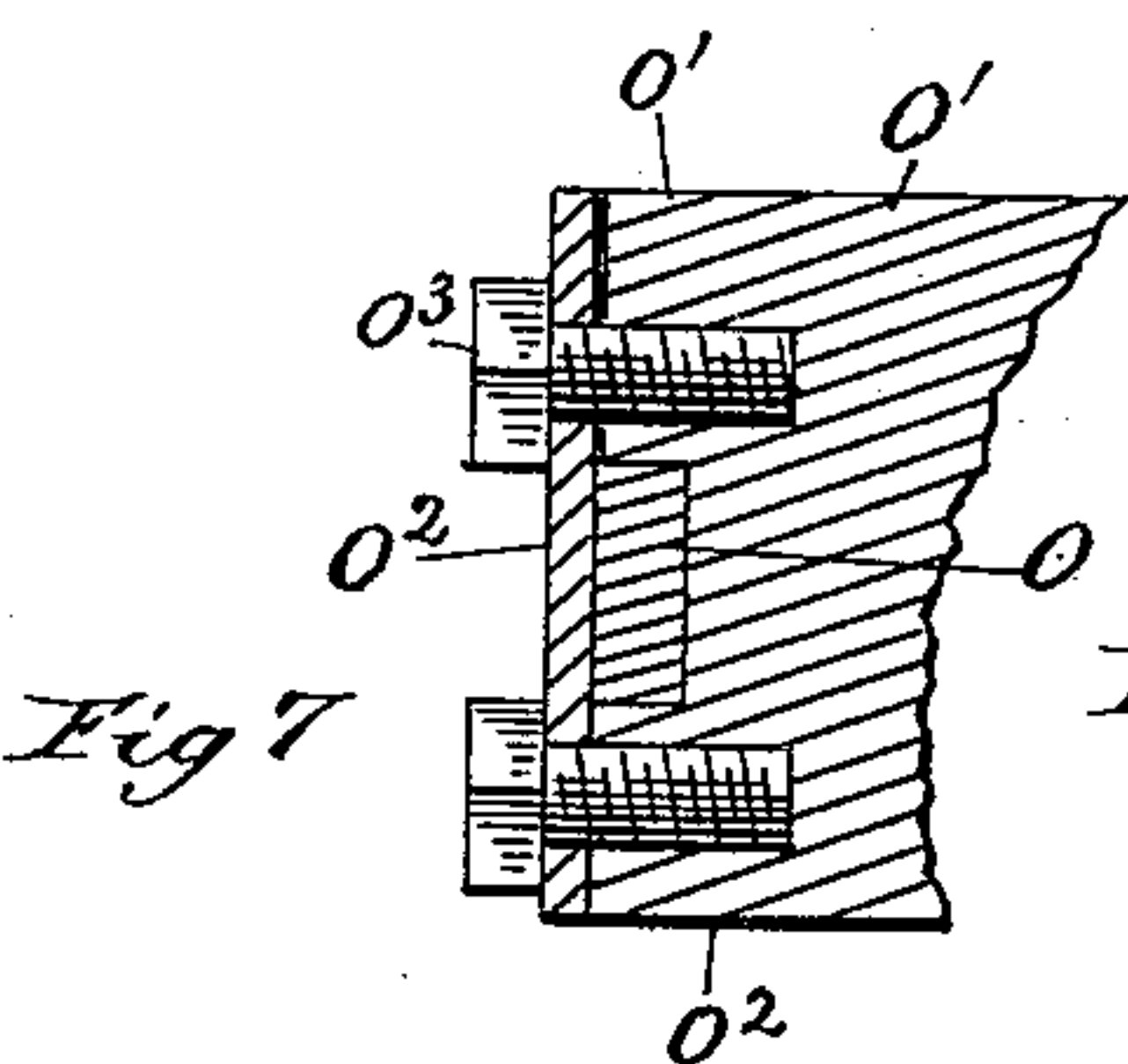
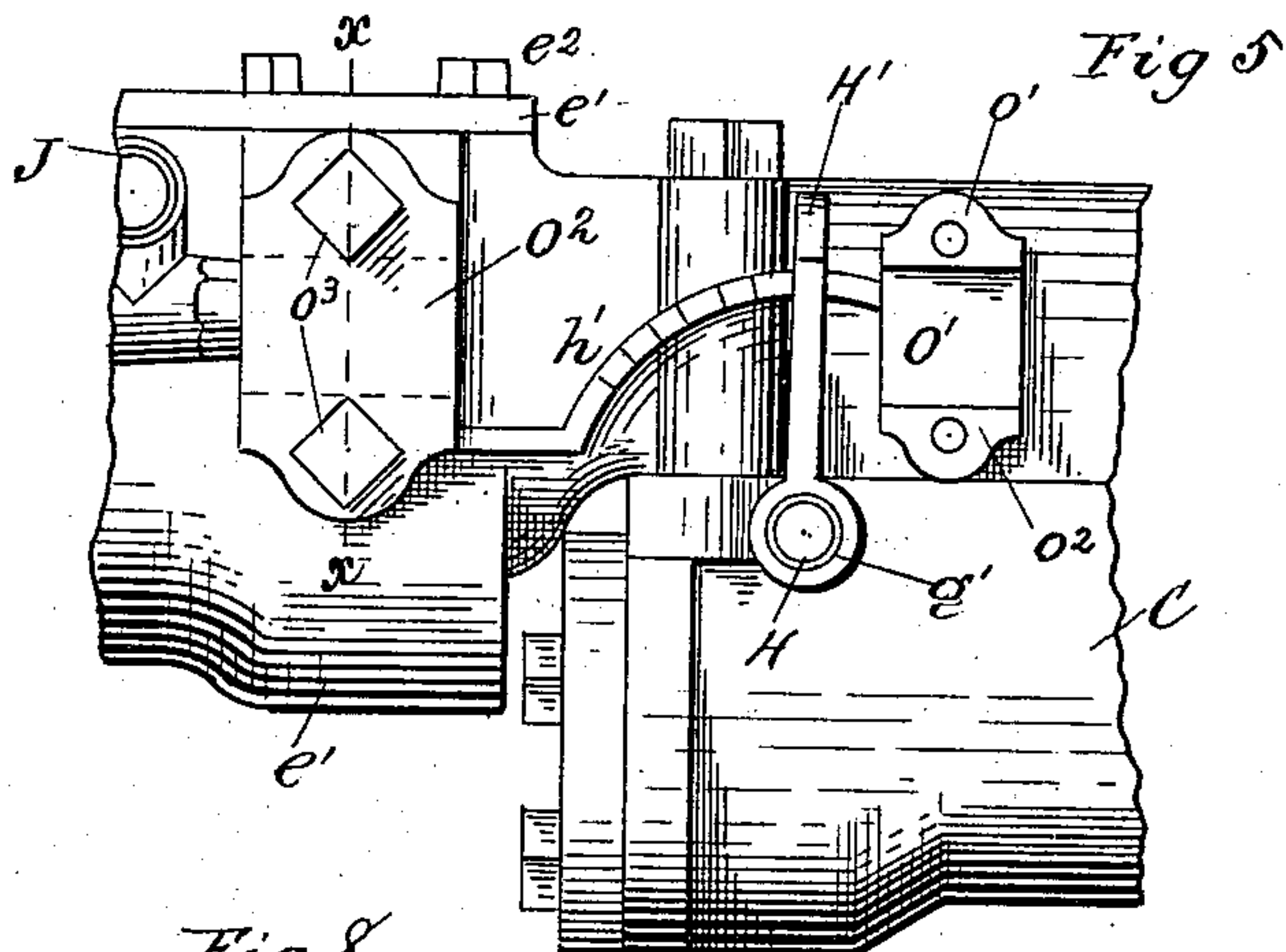
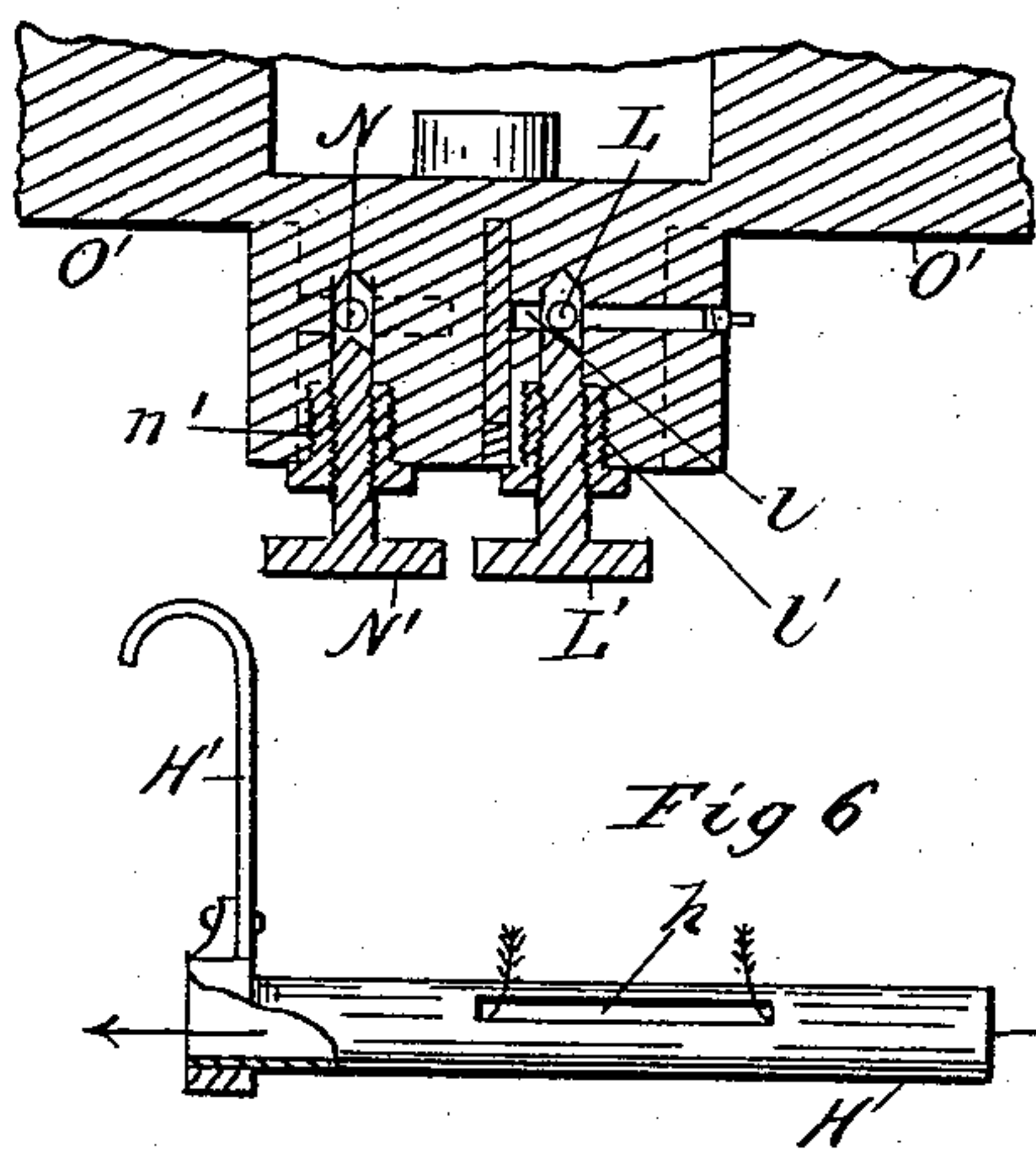


Fig 4

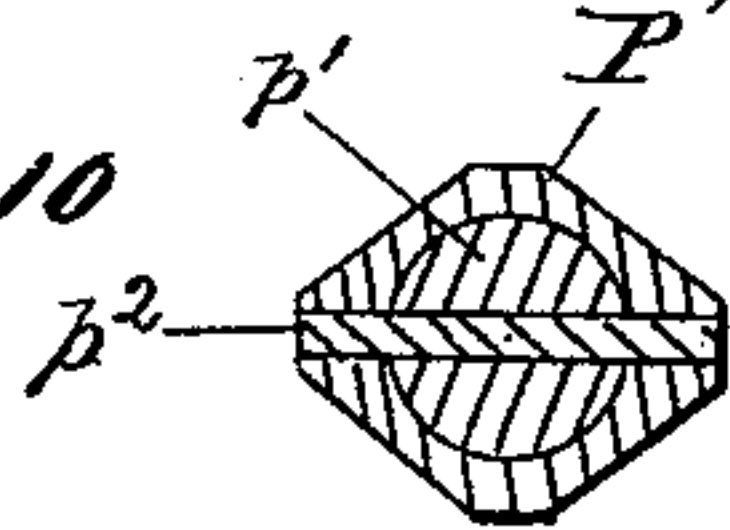


Witnesses

M. C. Collier

P. E. Remond

Fig 10



Inventor  
George D. Whitcomb

By Coburn Thacher  
Attorneys



# UNITED STATES PATENT OFFICE.

GEORGE D. WHITCOMB, OF CHICAGO, ILLINOIS.

## MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 335,328, dated February 2, 1886.

Application filed November 12, 1884. Serial No. 147,763. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE D. WHITCOMB, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Mining-Machines, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

10 Figure 1 is a plan view of a machine embodying my invention, one-half of the upper portion being removed; Fig. 2, a sectional view of the same on the line *u u* of Fig. 1; Fig. 3, a sectional view on the line *v v* of Fig. 1; Fig. 4, a sectional view on the line *w w* of Fig. 3; Fig. 5, a detail side elevation on an enlarged scale; Fig. 6, a detail view on an enlarged scale of the valve which regulates the exhaust from the main cylinder; Fig. 7, a sectional view on the line *x x* of Fig. 5; Fig. 8, a view of the pick and its operating-rod and the double socket connecting the same; Fig. 9, a sectional view on the line *y y* of Fig. 8; and Fig. 10, a sectional view on the line *z z* of Fig. 9.

Like letters refer to like parts in the figures.

My invention relates to coal and ore mining machines of that class set forth in Patents Nos. 198,610 and 219,090, granted to Jonathan W. Harrison, December 25, 1877, and September 2, 1879, respectively, the said patents being reissued October 12, 1880, and November 2, 1880, respectively, as Nos. 9,408 and 9,439, and in the following patents granted to me, No. 232,792, September 28, 1880, No. 259,956, June 20, 1882, No. 267,047, November 7, 1882, and No. 280,544, July 3, 1883.

My present invention is in the nature of an improvement upon the machines described in the said patents; and it consists in certain novel features, by means of which a more efficient operation and better arrangement of the parts of the machine are obtained.

45 I will now proceed to describe a machine embodying the novel features of my invention, and will then specifically point out in the claims that which I consider new and desire to protect by Letters Patent.

50 In the drawings, A represents the wheels on which the machine is mounted. These

wheels are mounted on suitable axles, B, attached to the machine at such a point as to properly balance the machine.

C indicates the main cylinder of the machine, in which works the piston D, to the end of which the pick is attached, as hereinafter set forth. At each end of the cylinder is a chamber, C', of greater diameter than the cylinder proper, in which are arranged cushions *c c'* for the piston-head to strike against to lessen the shock. The front cushion, *c*, surrounds the piston, as shown in Fig. 2, and forms a packing for the same. These cushions may be constructed of leather, india-rubber, or the like, and in the manner set forth in my Patent No. 267,047 above mentioned. These cushions do not completely fill the chambers C', leaving a space, C<sup>2</sup>, between their inner faces and the cylinder proper.

E indicates the air or steam chest, secured upon the main cylinder by bolts *e*, and E' the slide-valve arranged therein and operating in the usual manner to alternately open and close the inlet-ports F and exhaust-ports G, these latter being arranged between the inlet-ports and the ends of the cylinder, as in my Patent No. 267,047 above referred to. Each inlet-port consists of a vertical slot or opening, *f*, terminating at the cylinder proper, and a passage, *f'*, communicating with it at this point, and also with the chamber C<sup>2</sup>. The exhaust-ports consist of a similar slot, *g*, opening into a transverse cylindrical orifice, *g'*, opening at each side of the machine.

In order to regulate the exhaust at the rear end of the machine to form an air-cushion for the piston on the return-stroke, I place in the orifice *g'* a tubular valve, H, slotted at *h*, as shown in Figs. 2 and 6. This valve, by means of a handle-lever, H', may be turned in the orifice *g'*, so as to more or less close the lower end of slot *g*, according to the extent to which the slot *h* coincides with slot *g*, so as to allow the air to escape at any desired rate. The handle-lever H' may be made to catch in any one of the notches of a rack, *h'*, on the side of the machine to secure the valve in any position to which it may be adjusted. By this means the escape of the air can be regulated, so that it will accumulate between the piston and cylinder-head, and act as a cushion to



prevent the piston from coming into violent contact with the cushion *c*, thus preventing the jarring of the machine.

In using the machine in the ordinary position for mining or bearing under coal, the cushions *c c'* are quite sufficient for their purpose, as the openings in the main valve are so proportioned as to cause the machine to work with proper force and give the desired front and back stroke when the machine is in that position; but the machine is intended not only for use in the usual horizontal position for bearing under the coal, but also for shearing or making vertical cuts on the sides of an entry or chamber; and it is of great utility for this purpose in doing that class of work known as "entry driving" in a mine; and to do this work the piston-rod is sometimes inclined downward and at other times is horizontal, or pointed upward at an angle as great as forty-five degrees. Now, since the opening of the main valve at the forward port must be sufficient to give the required force to effectuate the back-stroke when the rod is pointed downward, and said stroke must therefore be made up-grade, it necessarily follows that when the position of the machine is changed and the rod pointed upward, so that the back-stroke is made down a steep incline, the rear cushion will be insufficient for its purpose, and the force of the back-stroke will be so great as to be destructive to the rear cushion and cylinder-head and severely shock the operator. I have therefore found it desirable to provide, in addition to the cushions *c c'*, adjustable means for regulating the exhaust at the rear port, to be used in conjunction with the said cushions, in order to make this a practical machine for both mining and shearing.

In machines of this projectile class there must be not only weight and velocity of the projectile, but also a penetration sufficient to undercut the coal clear to the back. I have found that it is not desirable to decrease the weight of the projectile, consisting of the piston, rod, pick, and connections between the same, and, moreover, this projectile must be well counterbalanced or the operator cannot properly direct it. Now, if the fulcrum or axle of the wheels is moved forward so as to render a lighter weight effectual as a counter-balance for the rod, the wheels will project forward of the cylinder-head and reduce the penetration, thus shortening the distance that can be undermined by a rod of given length.

Now, the machine constructed as set forth in my patents hereinbefore referred to is too heavy for practical and convenient use in many mines, and especially in that class of mines wherein the vein lies at a sharp dip or inclination. I have therefore found it desirable to reduce the weight of the machine considerably; but at the same time it is not desirable to reduce the velocity or weight of the projectile, and in order to obtain a practical counter-balance with such reduced weight

without reducing the weight of the projectile or moving the wheel farther forward, and thus reducing the penetration, I have arranged the valve-motor and rear parts in an overhanging position back of the main cylinder, as shown. To properly accomplish this, I attach the casing *e'* of the valve-motor to the rear of the air-chest *E* by means of bolts *e''*, so that its upper portion projects but slightly above the chest, and I attach to the upper side of the slide-valve *E'* an arm, *E''*, to the under side of which I attach the pivoted cup *e'''*, slotted transversely on the under side to receive the cam *I*, which is arranged underneath it on the main shaft *I'* of the valve-motor. By this construction the cam and its shaft are arranged below the level of the top of the main cylinder and the whole valve-motor, instead of being arranged on a level with the rest of the machine, and on top of the cylinder, as in my former patents, thereby greatly reducing the height of the machine, and adapting it for use in more contracted spaces.

I am aware that in the patents to Harrison, hereinbefore referred to, the valve-motor is arranged in the rear of the main cylinder; but it is attached directly to the same in such a manner as to render it necessary to disconnect the whole valve-motor in order to have access to the rear end of the cylinder to inspect and renew the cushions therein, whereas, by an inspection of Figs. 2 and 3 of the drawings, it will be evident that with my construction the cylinder-head may be readily removed for that purpose without detaching any other parts. Moreover, in the Harrison machine the valve-motor extends downward below the lower edge of the main cylinder, and limits the vertical range of the machine by striking upon the ground or upon the platform on which the machine rests, whereas in the construction set forth the valve-motor does not extend downward so far, and allows the machine a much greater vertical range.

The arm *E''* has a strengthening-rib, *E'''*, on its upper side, which is continued along the back of the slide-valve, as shown in Fig. 2, being slotted at *e''''* to receive a cross-rod, *E''''*, removably attached to the air-chest, the object being to cause the valve to be raised along with the air-chest and valve-motor when the two are detached and removed from the main cylinder for inspection or repairs.

*E''''* indicates a passage closed by a screw-plug, *e'''''*, which may be removed in order to inspect or lubricate the cams *I* and cup *e'''*.

The compressed air is admitted to the air-chest *E* at either side thereof, the air-conducting pipe or hose being attached to a nozzle, *J*, through which the air passes into a passage, *J'*, communicating with the air chest, as shown in Fig. 1. In this passage *J'*, at the rear end thereof, is arranged the valve or cock *J''*, consisting of a hollow cylindrical body fitting the passage *J'* and slotted at *j*, as shown in Fig. 3. This body has attached to it a suitable



handle projecting from the rear vertical face of the machine, by which the cock J<sup>2</sup> may be turned so as to regulate or entirely cut off the supply of air or steam to the whole machine.

5 One of these inlets is arranged on each side of the machine, only one of them being in use at a time, and that one being used which may be worked with the greatest convenience to the operator, according to the position of the machine and the convenience of the operator.

10 In the various machines set forth in the patents hereinbefore specified the air-inlet was on top of the machine, and materially increased the height of the same, whereas by my arrangement the machine is rendered more compact, and the valves are in easier reach and more readily controlled. Moreover, the inlet-tube when arranged on top, as in my former machine, was liable to be struck and injured  
20 by the platforms on which the machine stands while in operation when moving them forward from side to side of the machine. This difficulty is overcome by the present arrangement. The air passes from the air-chest E through a  
25 passage, *k*, and over the gate K, which is cut away along a portion of its upper edge adjacent to the passage *k*. By this means the gate K is always held down in place by the pressure of the air above it. The inlet-port L is  
30 arranged on one side of the gate, and has a small side passage, *l*, communicating with the gate-space, so that when the gate is lowered by the rotation of the eccentric-piston M, on which it rests, the air will pass through the  
35 inlet-port into the cylinder, and when the gate rises the supply of air will be cut off.

I<sup>2</sup> indicates a balance and hand wheel attached to the shaft I' of the engine, by means of which it can be started when at rest. The  
40 flow of air through this inlet-port is regulated by means of a screw stop-valve, L', working in a suitably-threaded bushing, *l'*, in the rear face of the machine and capable of being advanced more or less across the end of passage *l*.

N indicates the exhaust-port, arranged on the other side of the gate and communicating with a short passage, *n*, arranged at one side, whereby the exhaust air or steam is discharged at a point where it will cause no annoyance to the operator. The exhaust-port is also provided with a screw stop-valve, N', working through a bushing, *n'*, and arranged and operated in the same manner as the valve  
55 L'. By means of these two valves the speed of the valve-motor and consequently of the slide-valve and piston can be regulated regardless of the pressure of the air or steam in the air-chest. The handles of the valves are  
60 both arranged on the rear face of the machine in convenient reach of the operator, and where they will not increase the height of the machine or be subject to damage.

The piston M is secured on its shaft by a  
65 suitable key, *m*, passing through both parts, as shown in Figs. 2 and 3; and in order to

take up any wear between the piston and cylinder I place in a groove in the same a piece, M', of suitable anti-friction material, the said piece being held against the inner wall of the  
70 cylinder by means of springs *m'*.

In order to render the handles O of the machine readily adjustable, to accommodate them to the position of the machine, and at the same time to secure them firmly when adjusted, I  
75 attach to the sides of the machine socket-pieces O', having each a groove, *o*, formed by an upper projection, *o'*, and a lower one, *o''*. These projections are of unequal thickness, the lower one, *o'*, being of substantially the same thick-  
80 ness as the handle, and the upper one, *o''*, being of less thickness.

O<sup>2</sup> indicates a clamping piece or strap, secured to the face of the projections by screws *o''*. The handle being inserted in the groove  
85 *o*, the upper screw, *o''*, is screwed farther in, forcing the strap O<sup>2</sup> against the handle to clamp it in place, the upper projection, *o''*, being less in thickness than the handle to permit this. The handles are thus firmly held in place when  
90 adjusted, and may be readily changed as desired.

There are two socket-pieces shown on each side of the machine; but more or less than  
95 this number may be employed.

I find in practice that this fastening possesses many advantages over the hole-and-pin fastening shown in my Patent No. 232,792, hereinbefore mentioned, which is liable to be shaken loose by the jar of the machine when  
100 in operation.

In Figs. 8, 9, and 10 is shown my improved means for securing the pick P to the end of the piston-rod D. In the ordinary construction, where the pick is attached directly to  
105 the piston-rod, the end of the piston-rod is rapidly shattered and worn by the constant impact of the blows of the pick, necessitating the use of a new piston and rod. To overcome this objection, I employ a connecting-  
110 piece, P', having sockets *p*—one at each end—to receive the projections *p'* on the pick and piston-rod, the whole being secured together by keys *p''*, as shown, or by other suitable means. The rear socket *p* is larger than the  
115 front one, so as to give the piece P' as extended a bearing as possible against the end of the piston-rod.

By the use of the construction shown and described, the wear incident to the working  
120 of the machine comes upon the connecting-piece P', which can be readily renewed at a slight cost, instead of the piston-rod, which can only be replaced at a great loss of time and money. I make no claim, however, to  
125 this particular feature in my present application, reserving the right to file a separate application therefor hereafter.

In machines of this class it is undesirable and wasteful to cut a channel under the coal  
130 of greater vertical height than is necessary to clear the working-tools and have room for the



coal to fall; and it is therefore desirable to have the tools constructed in such a manner as to require the least vertical room for them to work in; hence it is not desirable to have any attachments to the rod requiring much, if any, more vertical space than is required for the rod itself, and at the same time it is very desirable to have a broad bearing for the keys that secure the pick to the rod.

I have experienced considerable inconvenience and loss by reason of the rapid wear of the keyways in my former machines, as it is necessary to have the keys or connecting-pins of sufficient size to endure the strain brought upon them in this work, which necessitates a socket in the end of the rod so large as to take away a great portion of the same, and leaves the thickness of the metal around the socket so small as to provide only a very thin and small bearing for the keys. Now, it will be observed that in the construction shown in the drawings (see Fig. 10) the rod and socket are made much broader horizontally than vertically, being approximately oval or ellipsoidal in shape, thereby causing a thickening of the walls of the sockets  $p$  at  $p^2$ , which provides an elongated keyway, giving a very much larger and more enduring bearing for the keys  $P^2$ , which are inserted horizontally, so that the vertical height is not increased and waste of coal is avoided.

From the above description, reference being had to the patents hereinbefore cited, the operation of my machine will be readily understood.

By the arrangement of parts described the machine is rendered more compact and more easily handled, the valves are all arranged together within easy reach and yet out of the way, and a machine produced which is capable of being operated to better advantage in many ways.

It is obvious that many mechanical changes may be made in the construction of my machine without departing from the principles of my invention; and I therefore do not wish to be understood as limiting myself to the precise details of construction shown and described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a mining-machine, the combination, with the piston D, of the cylinder C, having inlet-ports F, and outlet-ports G, consisting of slot  $g$  and cylindrical transverse passage  $g'$ , and tubular slotted valve H, capable of ro-

tation therein, and having a suitable handle-lever locking device therefor, substantially as and for the purposes specified.

2. In a mining-machine, the combination, with cam I, of slide-valve  $E'$ , having arm  $E^2$  extending over said cam and adapted to engage the same, substantially as and for the purposes specified.

3. In a mining-machine, the combination, with cam I, of slide-valve  $E'$ , having arm  $E^2$  extending over and engaging with said cam, and rib  $E^3$ , having slot  $e^4$  to receive rod  $E^4$ , attached to air-chest E, substantially as and for the purposes specified.

4. In a mining-machine, the combination, with air-chest E, of air-inlets arranged at each side thereof below the top and valves controlling said inlets, substantially as and for the purposes specified.

5. In a mining-machine, the combination, with air-chest E, of nozzles J and passages  $J'$ , and tubular slotted valves  $J^2$ , capable of rotation in said passages to control the same, substantially as and for the purposes specified.

6. In a mining-machine of the character described, the main air-inlets, and inlet and exhaust ports L and N of the valve-motor having their valves arranged at the rear face of the machine below the top thereof, substantially as and for the purposes specified.

7. In a mining-machine, the combination, with the handles O, of the socket-pieces  $O'$ , having grooves  $o$  and projections  $o'$   $o^2$ , one of which is substantially equal in thickness to the handles and the other of less thickness, strap  $O^2$ , and screws  $o^3$ , substantially as and for the purposes specified.

8. In a mining-machine, the combination, with the main cylinder and the air-chest mounted thereon, of the valve-motor attached to the rear end of the air-chest and overhanging the rear of the main cylinder clear of the cylinder-head, to permit access to the same and allow the machine a greater vertical range, substantially as and for the purposes specified.

9. In a mining-machine, the combination, with the main cylinder and its piston and rod, of the cushions  $c c'$ , arranged at the ends of the cylinder, the inlet and outlet ports, and a valve to open and close the same, and a valve to regulate the escape of air at the rear exhaust-port, substantially as and for the purposes specified.

GEORGE D. WHITCOMB.

Witnesses:

IRVINE MILLER,  
W. C. CORLIES.