

(No Model.)

2 Sheets—Sheet 1.

S. STUTZ.
MINING MACHINE.

No. 302,957.

Patented Aug. 5, 1884.

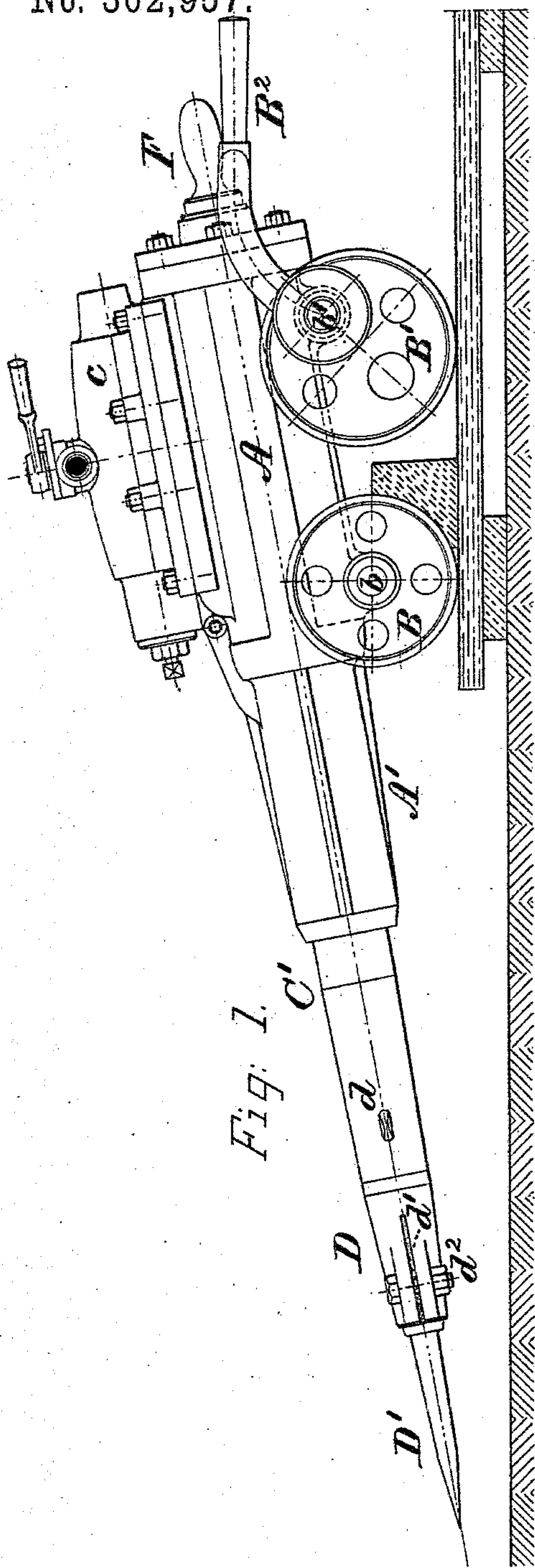


Fig. 1.

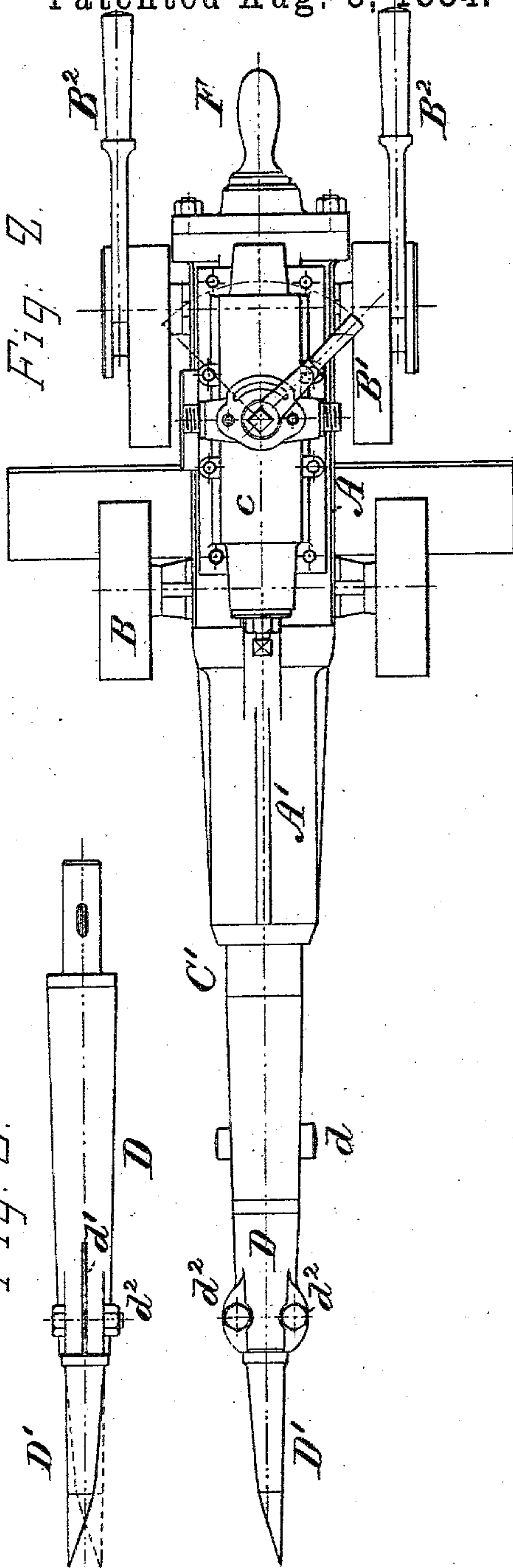


Fig. 2.

Fig. 3.

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2 Sheets—Sheet 2.

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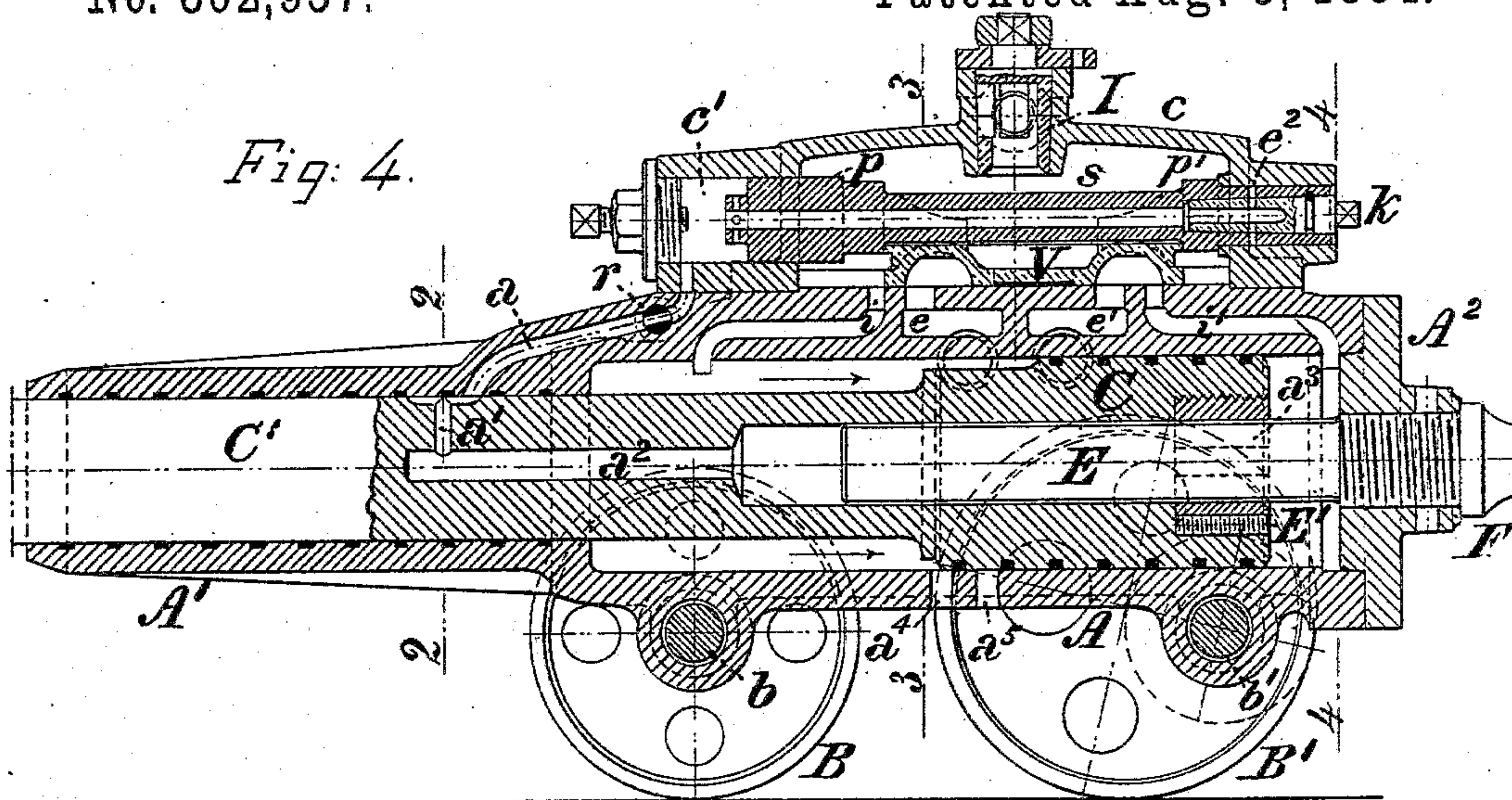


Fig: 5.

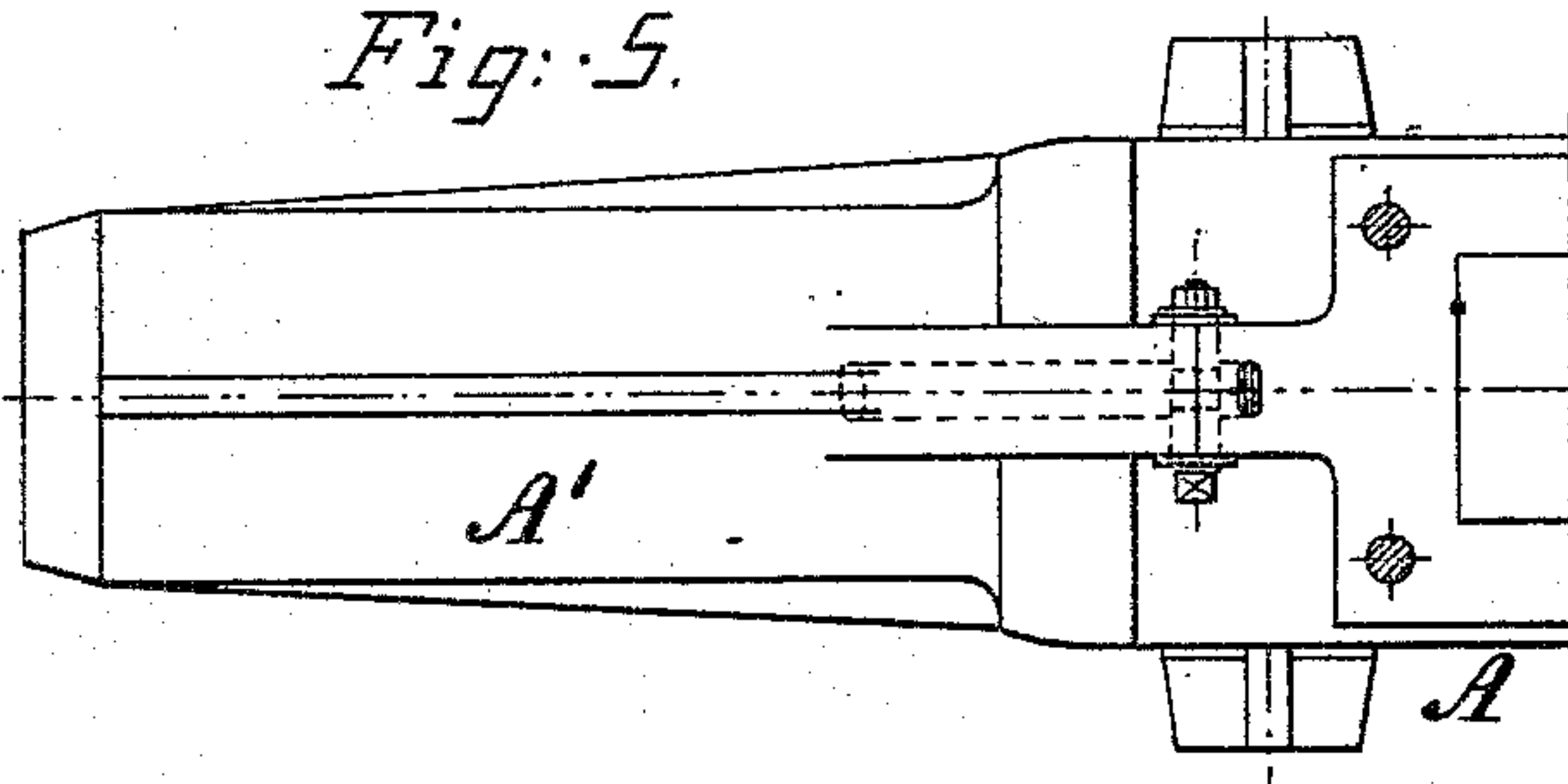


Fig: 6.

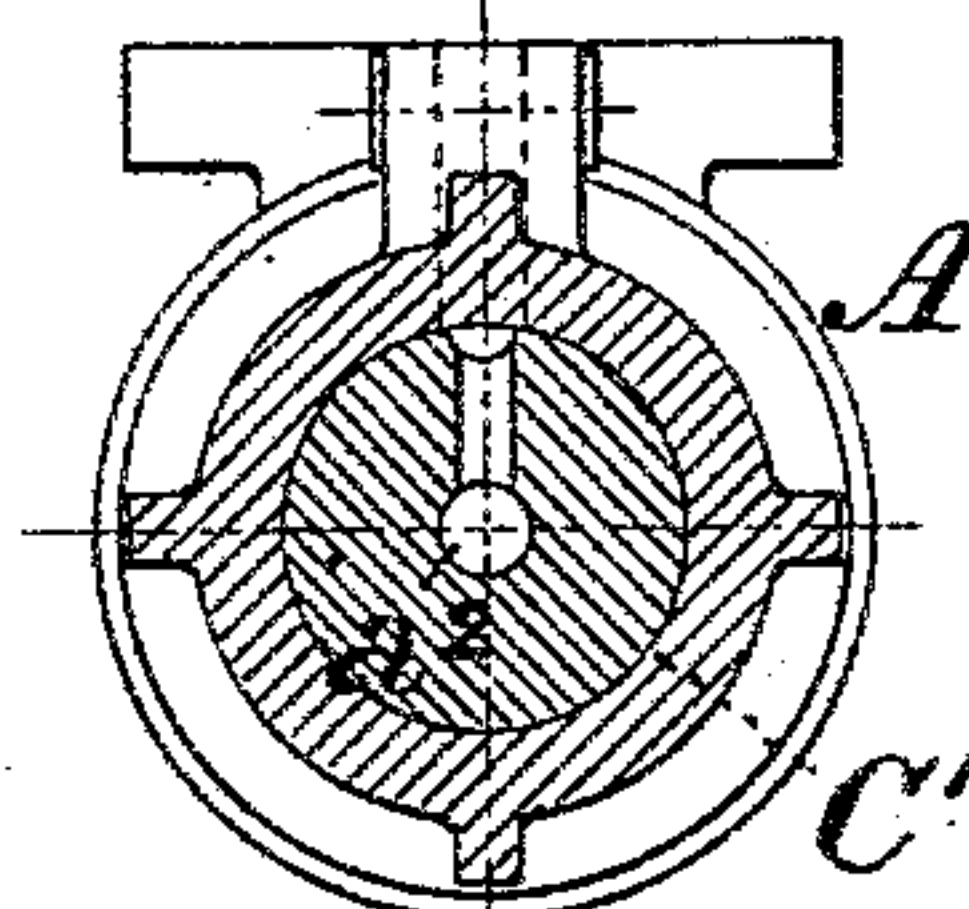


Fig. 8.

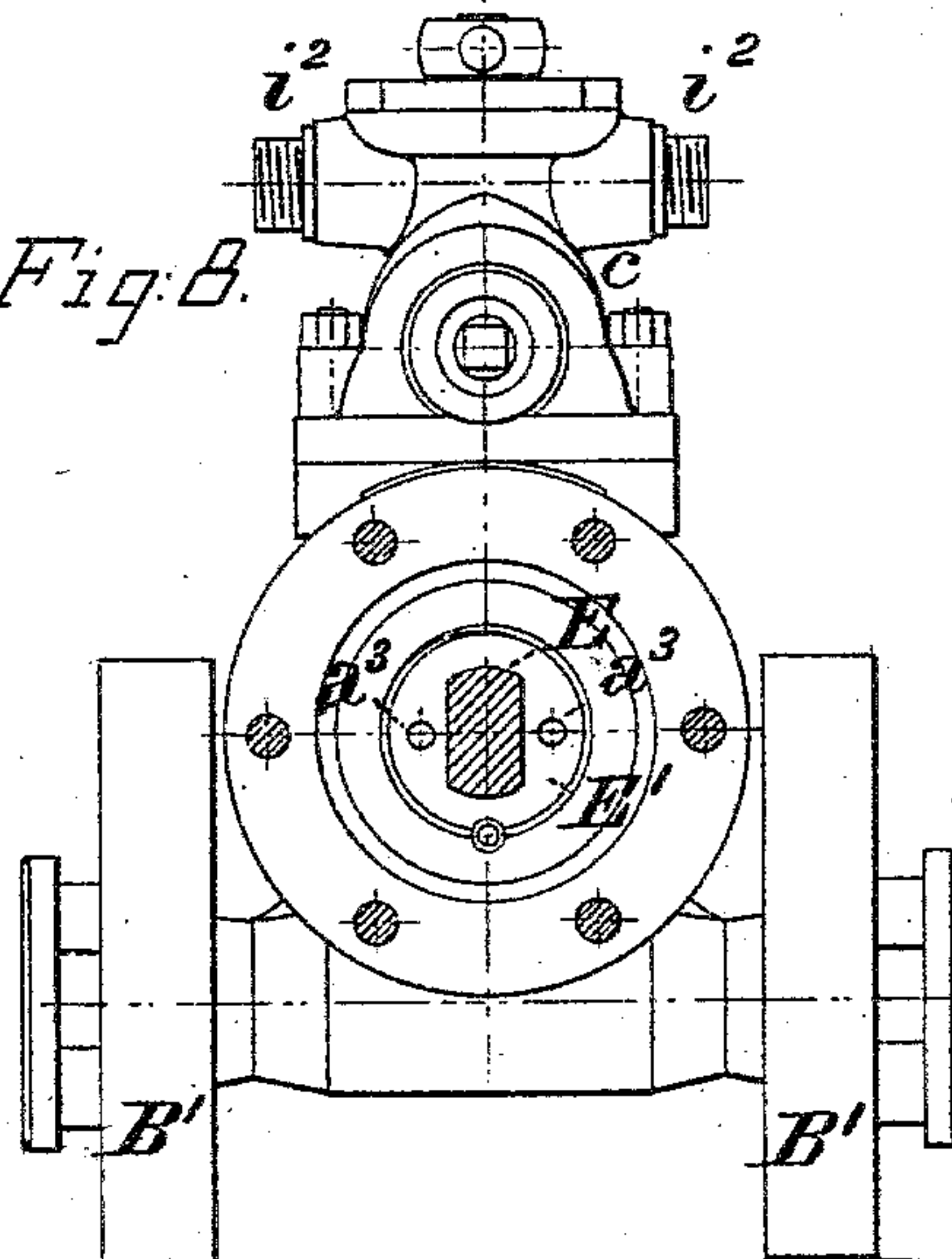
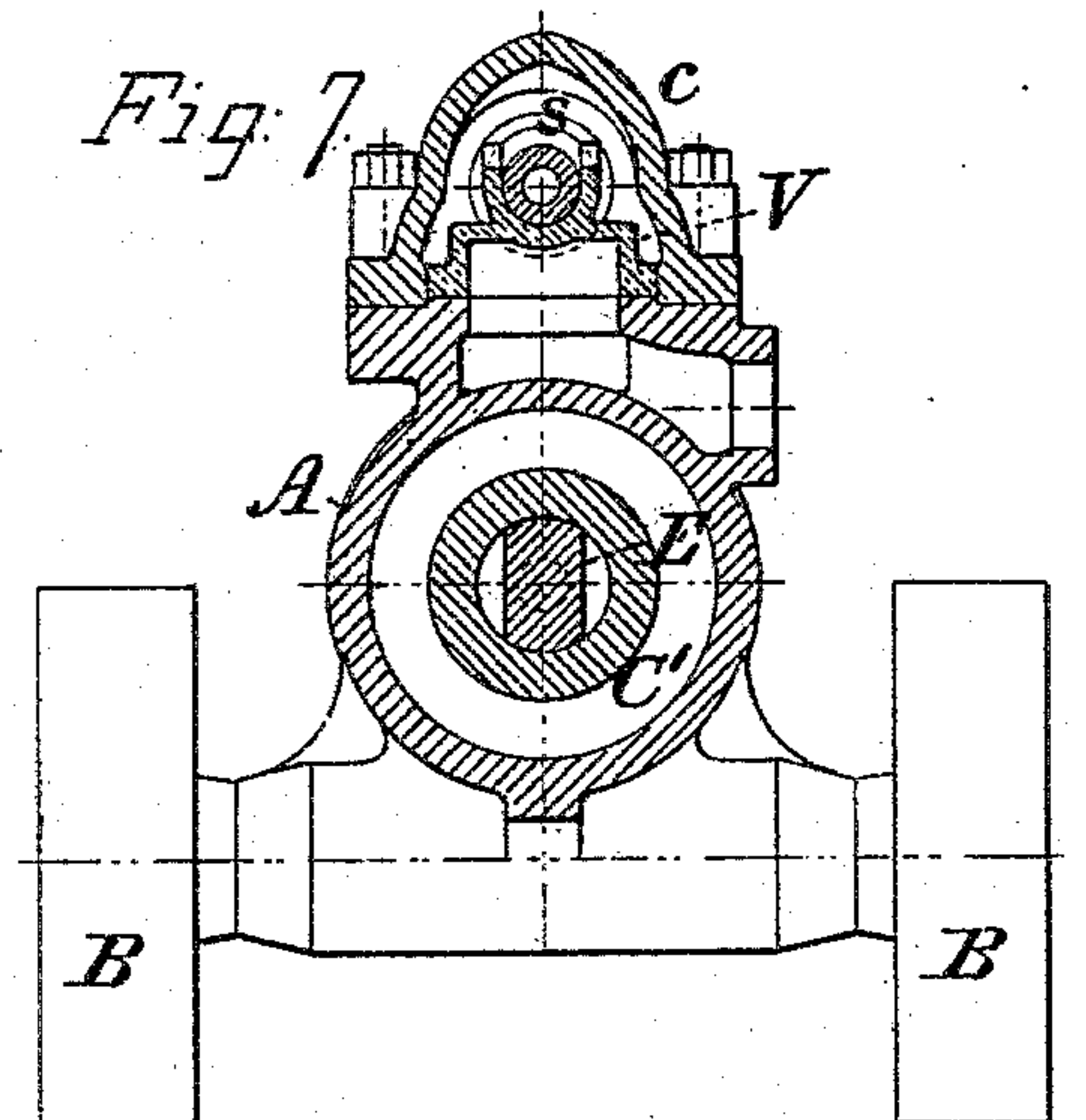


Fig. 7.



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UNITED STATES PATENT OFFICE.

SEBASTIAN STUTZ, OF PITTSBURG, PENNSYLVANIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 302,957, dated August 5, 1884.

Application filed November 24, 1883. (No model.)

To all whom it may concern:

Be it known that I, SEBASTIAN STUTZ, a citizen of the United States, residing at Pittsburgh, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Mining-Machines; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a side view in elevation of a mining-machine embodying my invention; Fig. 2, a plan or top view of the same; Fig. 3, a side view of a pick-holder of greater length than that shown in Figs. 1 and 2; Fig. 4, Sheet 2, a vertical longitudinal central section, on an enlarged scale, through the cylinder, valve-chest, and guide; Fig. 5, a plan or top view of a portion of the cylinder and the guide; Fig. 6, a vertical transverse section through the guide and piston-rod at the line 2 2 of Fig. 4; Fig. 7, a similar section through the cylinder and valve-chest at the line 3 3 of Fig. 4, and Fig. 8 a similar section at the line 4 4 of Fig. 4.

My present invention relates to coal and ore mining machines of the class in which a pick or cutting-tool is operated by a piston reciprocated in a cylinder by fluid-pressure, and is an improvement upon that for which I have filed an application for Letters Patent of the United States under date of September 10, 1883, Serial No. 106,057.

My improvements are designed to attain increased economy and effectiveness in the construction and operation of the machine; and they consist in certain novel devices and combinations hereinafter set forth, including a cylinder, a main piston and rod working therein, a slide distribution-valve governing the supply and exhaust of said main piston, a pair of differential-valve-operating pistons connected by a hollow stem, an auxiliary exhaust-port extending from the valve-chest to the piston-rod guide, an exhaust-passage extending from one side of the main piston to a point in the periphery of the piston-rod, supplemental exhaust-ports located on the lower side of the cylinder, valves or cocks for regulating the speed of the distribution-valve by controlling

the supply or exhaust of its operating-pistons, a rear guide for steadying and preventing axial movement of the main piston and rod in the cylinder, and a handle connected to the rear cylinder-head for governing the position of the machine in operation.

In the practice of my invention the cylinder A is mounted and supported upon front and rear bearing-wheels, B and B', secured, respectively, upon axles *b* and *b'*, which are fitted to rotate in bearings cast upon the lower side of the cylinder A. The front wheels, B, are fitted concentrically with and the rear wheels, B', eccentrically to their respective axles, and a pair of operating-handles, B², are fitted into recesses or sockets in the hubs of the rear wheels, said handles projecting rearwardly for a sufficient distance to be conveniently grasped by the operator when seated in position for governing the machine. The main piston C, which fits accurately the bore of the cylinder A, is formed upon or secured to a piston-rod, C', which passes through a properly-packed guide, A', projecting centrally from the front head of the cylinder. A removable pick-holder, D, secured by a key, *d*, or in any other proper manner, to the outer end of the piston-rod, carries a pick or cutting-tool, D', by the blows of which upon a mass of coal or other mineral the undercutting, undermining, slotting, or excavation of the same is effected. The pick-holder is so connected to the piston-rod that it may be readily removed and replaced or another substituted whenever required, and in the operation of the machine several pick-holders of different lengths may be provided, that the machine may perform its work when located at a greater or less distance from the material to be cut, as circumstances may require. In the instance illustrated the connection of the pick D' and pick-holder D is effected by inserting a cylindrical shank on the rear end of the pick into a corresponding socket in the front of the pick-holder, the latter being slotted at each side from said socket to its periphery, as at *d'*, and provided with clamping-bolts *d*², by which it may be closed tightly on the pick. The latter will thus be firmly held, and may, by slackening the clamping-bolts, be turned in its socket, so as to vary the posi-

tion of its cutting edge as desired, as indicated by dotted lines in Fig. 3. The supply of motive fluid to and its exhaust from the cylinder A to impart reciprocating movement to the main piston C is effected by a slide distribution-valve, V, which is adapted to reciprocate on a valve-face on the upper side of the cylinder within a valve-chest, *c*, secured thereto, and to govern the opening and closure of supply and exhaust ports *i i' e e'* therein.

In the proper operation of machines of the class to which my invention relates it is necessary that the movements of the distribution-valve should be independent of those of the main piston, inasmuch as the length of stroke of the latter will vary from time to time in correspondence with the constantly-varying distance between the working-face of the material to be cut and the edge of the cutting tool or pick. The main piston in its movements always reaches the same point in the cylinder as the rearward extremity of its traverse, but may move in the opposite direction only a fraction of its greatest admitted stroke, when the pick will strike the material to be cut, and require that the distribution-valve shall open the supply-port at the forward end to move the piston back to its starting-point for striking another blow. Such independent operation of the distribution-valve is effected by the construction now to be described. Two valve-operating pistons, *p p'*, are formed on or secured to a hollow stem, *s*, fitted to reciprocate in the valve-chest *c*, and having downwardly-projecting collars or flanges, which engage shoulders on the distribution-valve V, so as to effect movement of said valve coincidently with that of the stem and pistons. The larger piston, *p*, fits accurately in a chamber, *c'*, at the forward end of the valve-chest, from which chamber an auxiliary exhaust-port, *a*, governed by a cock or valve, *r*, leads to the inner surface of the piston-rod guide A'. Ports *e²* lead from the internal passage of the stem *s* to the periphery thereof, and are closed when the stem is at and near the end of its traverse to the right by a socket in the right-hand end of the valve-chest, within which the stem fits. Operating-fluid is admitted to the valve-chest by a cock or valve, *I*, governing side-nozzles, *i²*, to either of which a supply-pipe may be connected, and the opening of the ports *e²* for supply may be increased or diminished, as desired, by a cock, *k*. A lateral exhaust-port, *a'*, formed in the main piston-rod C', communicates with a longitudinal passage, *a²*, therein, said passage extending to and through the main piston C, and being enlarged for a portion of its length to receive a rear guide, E, the section of which is that of a zone or other figure differing from a circle, and which is secured to the right-hand cylinder-head A'. Said guide, the purpose of which is to prevent axial rotation of the main piston, and rod and insure accurate longitudinal movement, passes through an opening of corre-

sponding section in a nut, E', screwed into the right-hand side of the main piston, and made fast therein by a pin or key. Openings *a³* in the nut E' establish communication between the passage *a²* and the cylinder A on the right-hand side of the main piston.

In lieu of employing a central rear guide of a section differing from a circle, as shown, a cylindrical rod set outside of the axial line of the cylinder may be employed, if preferred.

Referring to Fig. 4, the main piston C is shown as moving to the right, under the pressure of motive fluid which enters from the valve-chest by the port *i*, and has reached a point in its traverse when the lateral port *a'* of its rod C communicates with the auxiliary exhaust-port *a*, thus opening an outlet through the ports *a, a', a², a³, i', and e'*, which relieves pressure on the left side of the larger valve-operating piston, *p*. The preponderance of pressure in the valve-chest on the right side of the piston *p*, due to the excess of its diameter above that of the piston *p'*, will then force said pistons and their stem *s* to the left, carrying with them the distribution-valve V, and thereby opening the inlet-port *i'* to the cylinder. This movement of the stem *s* brings the inlet-ports *e²* into communication with the valve-chest *c*, thus admitting motive fluid through the stem *s* to the left side of the larger piston *p*. When the movement of the main piston closes exhaust through the auxiliary exhaust-port *a*, the exhaust of fluid-pressure passing through the hollow stem *s* is prevented, and a preponderance of pressure is thereupon exerted on the left side of the valve-operating piston *p*, by which the valve-operating pistons and valve V are moved to the right, opening the left-hand supply port *i*, as in Fig. 4, for the next right-hand stroke of the main piston. It will thus be seen that the movements of the valve V effected by the operating-pistons *p p'* are governed entirely by the fluid admitted to and exhausted from the left side of the piston *p*. The speed of the valve can be accurately regulated as required by increasing or diminishing the area of the supply or the exhaust passages, or both, by the cocks *k* and *r*.

For the purpose of quickly relieving the main piston C of pressure prior to the completion of its stroke in each direction, so as to prevent injurious shocks from its contact with the cylinder-heads, I provide supplemental exhaust-openings *a⁴ a⁵*, which are formed in the bore of the cylinder and on the lower side thereof. Said openings are located in such position that one of them shall be uncovered by the piston just prior to the termination of its stroke in each direction, and serve to quickly relieve the pressure upon the piston, as well as to drain from the cylinder any water which may find entrance thereto, as will be frequently the case, whether steam or compressed air be employed as the operating-fluid.

In order to counteract the tendency of the

blows of the pick to raise the rear end of the machine when cutting upwardly, I provide a handle, F, which is secured to the rear cylinder-head, A², projecting therefrom, so as to be grasped by the operator with one or both hands. By means of said handle he can press downwardly to resist any tendency to upward movement of the machine, and can also use it in connection with one of the side handles, B², for moving the machine laterally, to change the position of the pick relatively to the material to be cut.

I claim herein as my invention—

1. The combination, substantially as set forth, of a distribution-valve working in a valve-chest and adapted to govern the supply and exhaust passages of a steam or air cylinder, a pair of differential pistons coupled to said valve, said pistons having their inner sides exposed continuously to the pressure in the valve-chest, and means for reciprocating said pistons and valve by alternately applying a preponderance of fluid-pressure to the inner and to the outer sides, respectively, of the larger piston by the opening and closure of an auxiliary exhaust-passage leading therefrom.

2. The combination, substantially as set forth, of a valve-chest, a distribution-valve, a pair of differential valve-operating pistons fixed on a hollow stem which is coupled to said valve, a supply-port in said stem, through which fluid-pressure from the chest may be exerted upon the outer side of the larger piston, and an auxiliary exhaust-port for releasing pressure upon the outer side of said piston.

3. The combination, substantially as set forth, of a distribution-valve adapted to govern the supply and exhaust passage of a steam or air cylinder, a pair of differential pistons coupled to said valve, a supply port and passage adapted to conduct motive fluid to the outer side of the larger valve-operating piston, an auxiliary exhaust-passage leading therefrom, and cocks or valves by which the opening of said supply and exhaust passages, or either, may be increased or diminished, as desired.

4. The combination, substantially as set forth, of a cylinder, a main piston and rod adapted to reciprocate therein, a distribution-valve governing the supply and exhaust passages of the cylinder, a valve-chest, a pair of

differential valve-operating pistons secured to a hollow stem which is coupled to said distribution-valve, a port in said stem adapted to alternately open and close communication between its bore and the valve-chest, a chamber fitting the larger valve-operating piston, an auxiliary exhaust-port connecting said chamber with a guide or casing inclosing the main piston-rod, and an exhaust-passage extending from a point in the periphery of said rod to the opposite side of the main piston.

5. The combination, substantially as set forth, of a cylinder, a piston and rod working therein, and a guide bar or rod connected to the rear head of the cylinder and entering a longitudinal opening or socket in the piston and rod, said guide acting to prevent axial rotation of said piston and rod and insure accurate longitudinal movements thereof.

6. The combination, substantially as set forth, of a cylinder, a piston and rod working therein, a rear guide having a section which is different from a circle, a nut or cap having a similarly-formed opening and secured to the piston, and one or more side openings or passages, and an exhaust-passage of greater sectional area than that of the guide, said passage being formed in the piston-rod and communicating with the side passage or passages of the nut or cap in the piston.

7. The combination, substantially as set forth, of a cylinder, a piston and rod adapted to reciprocate therein, a distribution-valve governing main supply and exhaust passages in the cylinder, and a supplemental exhaust-passage leading from the bore of the cylinder to the atmosphere on the lower side of the cylinder.

8. In a mining-machine, the combination, substantially as set forth, of a cylinder, a piston and rod working therein and adapted to reciprocate a pick or cutting-tool, wheels supporting the cylinder, one or more side operating-handles extending rearwardly therefrom, and an operating-handle connected to the rear head thereof.

In testimony whereof I have hereunto set my hand.

SEBASTIAN STUTZ.

Witnesses:

J. SNOWDEN BELL,

R. H. WHITTLESEY.