(No Model.)

3 Sheets—Sheet 1.

H. C. SERGEANT.

COAL MINING MACHINE.

No. 411,305. Patented Sept. 17, 1889.

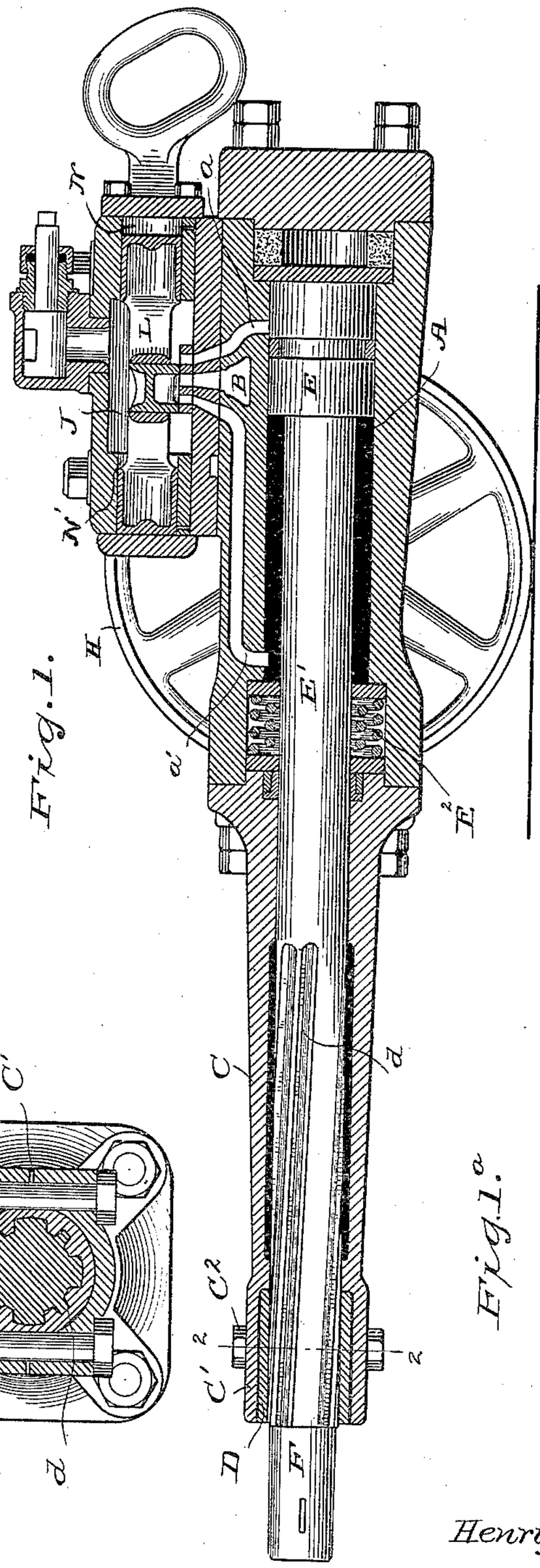

Fig. 1.

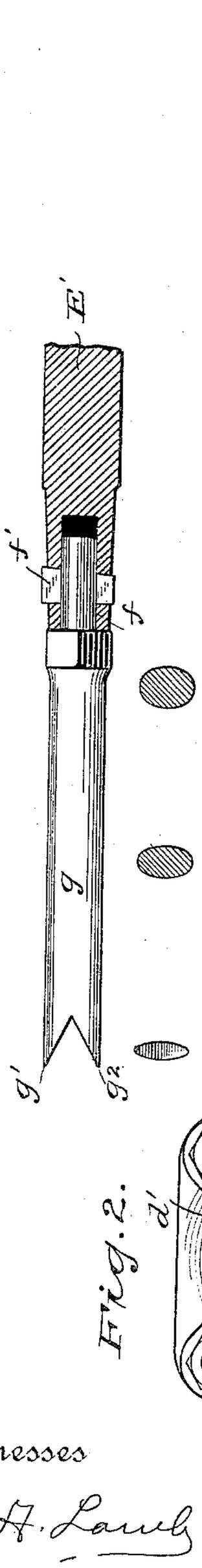

Fig. 3.

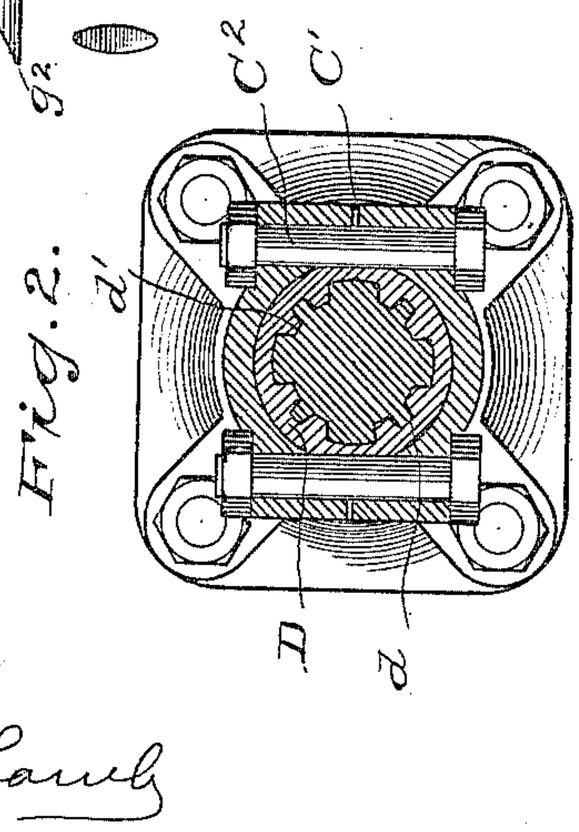

Fig. 2.

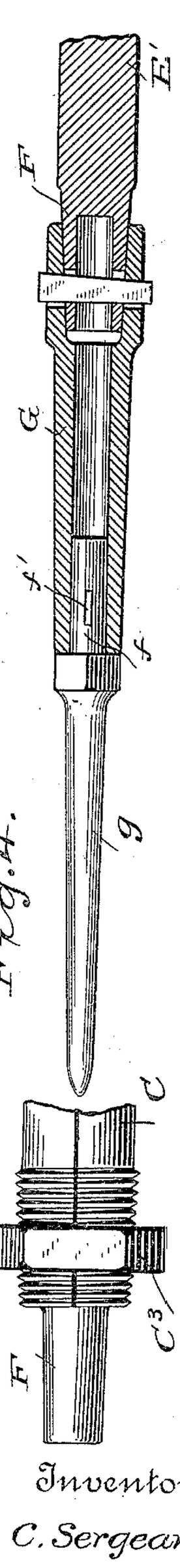

Fig. 4.

Fig. 1a.

Witnesses

H. A. Lamb

Joseph Baker

Inventor

Henry C. Sergeant

By his Attorney

Frankland Jarman

(No Model.)

3 Sheets—Sheet 2.

H. C. SERGEANT.

COAL MINING MACHINE.

No. 411,305. Patented Sept. 17, 1889.

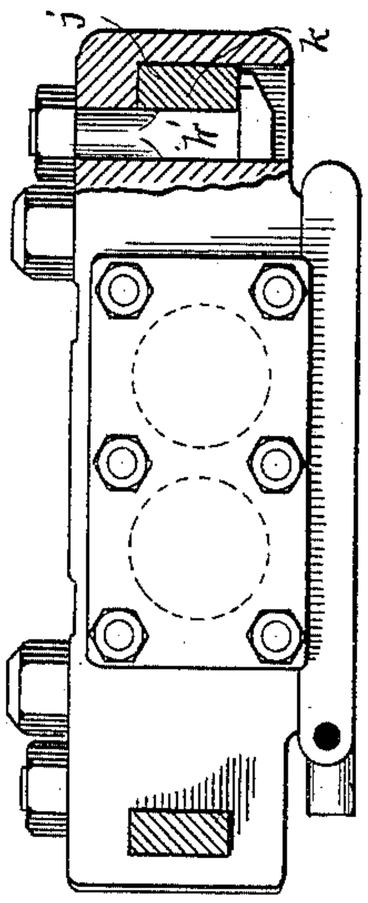

Fig. 8.

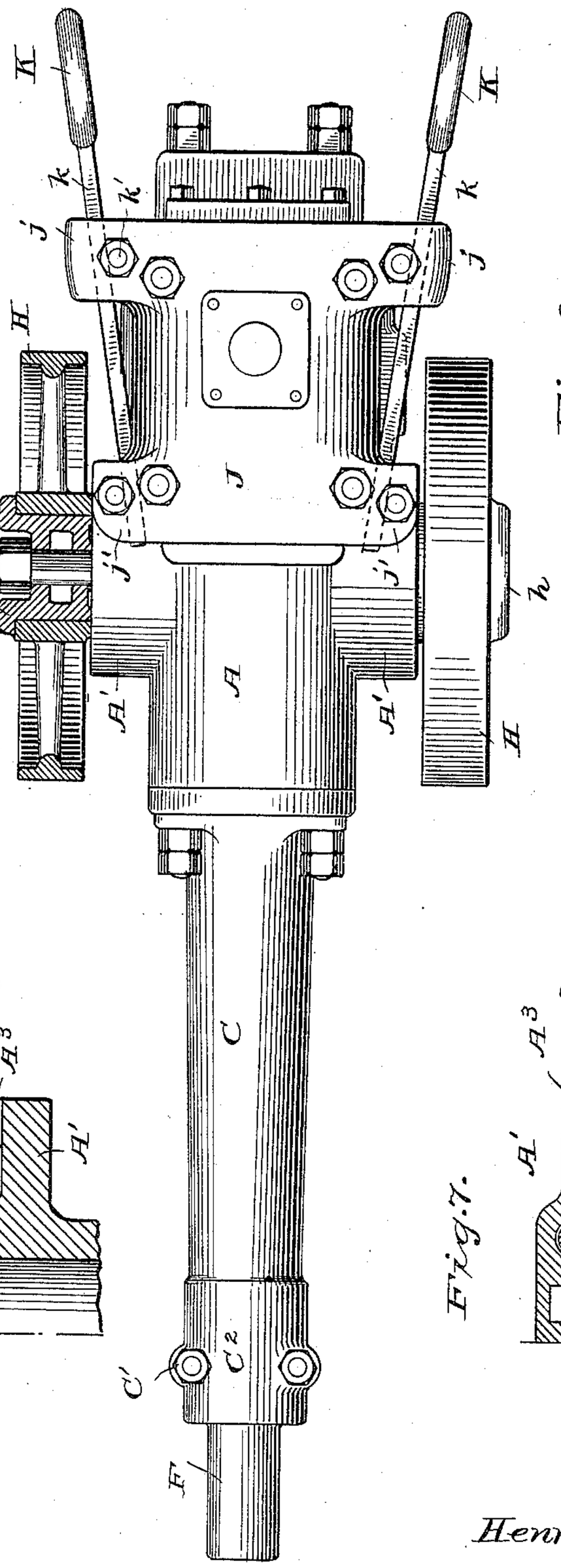

Fig. 5.

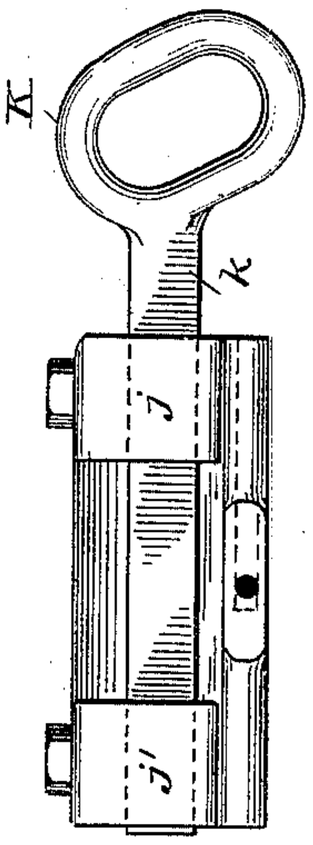

Fig. 9.

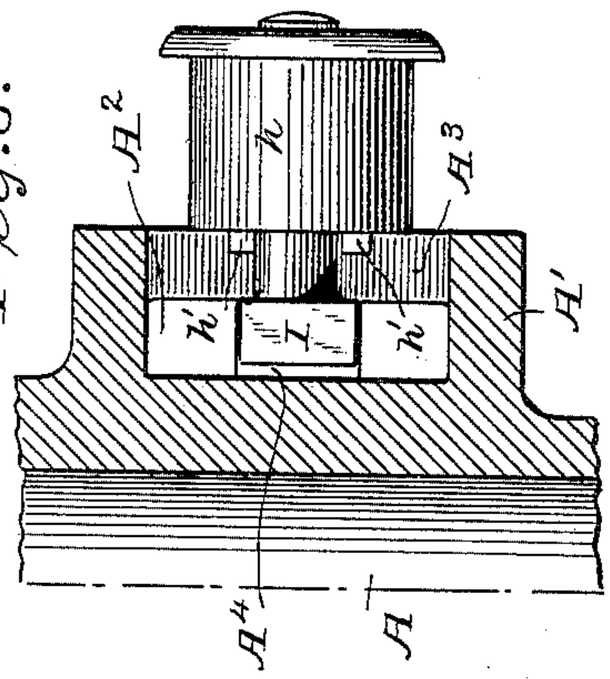

Fig. 6.

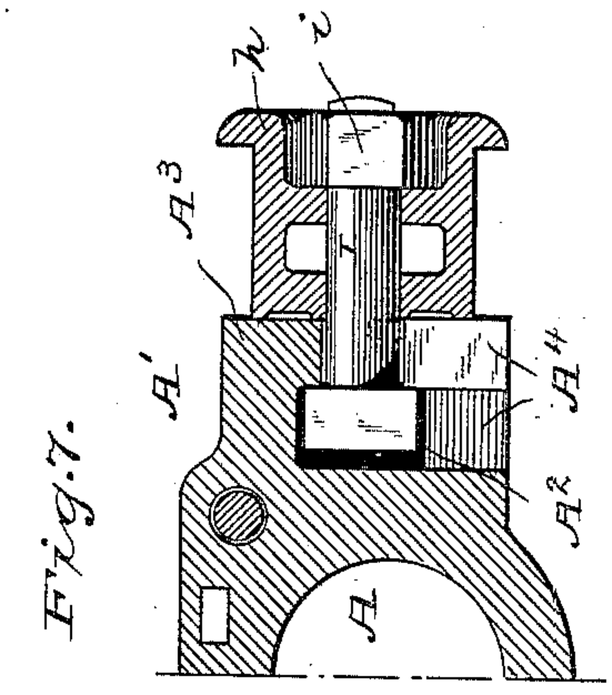

Fig. 7.

Witnesses

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(No Model.)

3 Sheets—Sheet 3.

H. C. SERGEANT.

COAL MINING MACHINE.

No. 411,305. Patented Sept. 17, 1889.

Fig. 11.

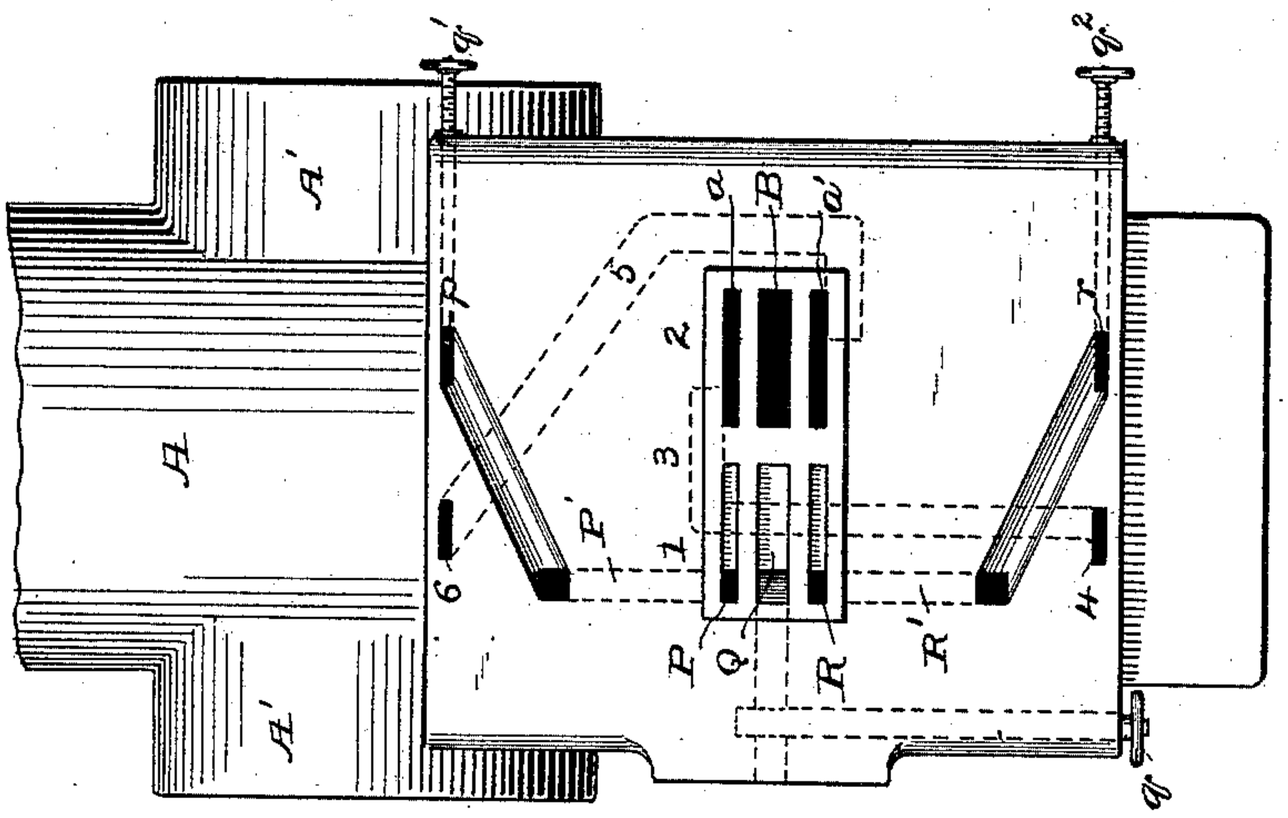


Fig. 12.

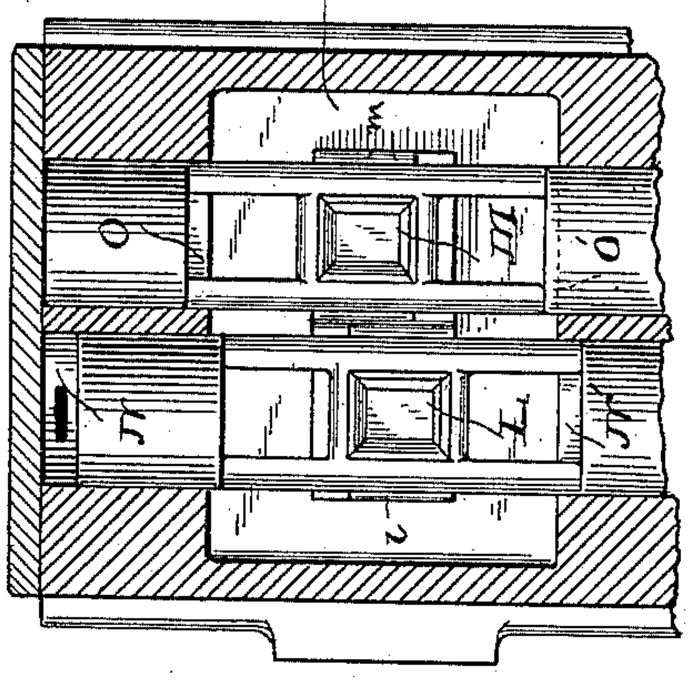
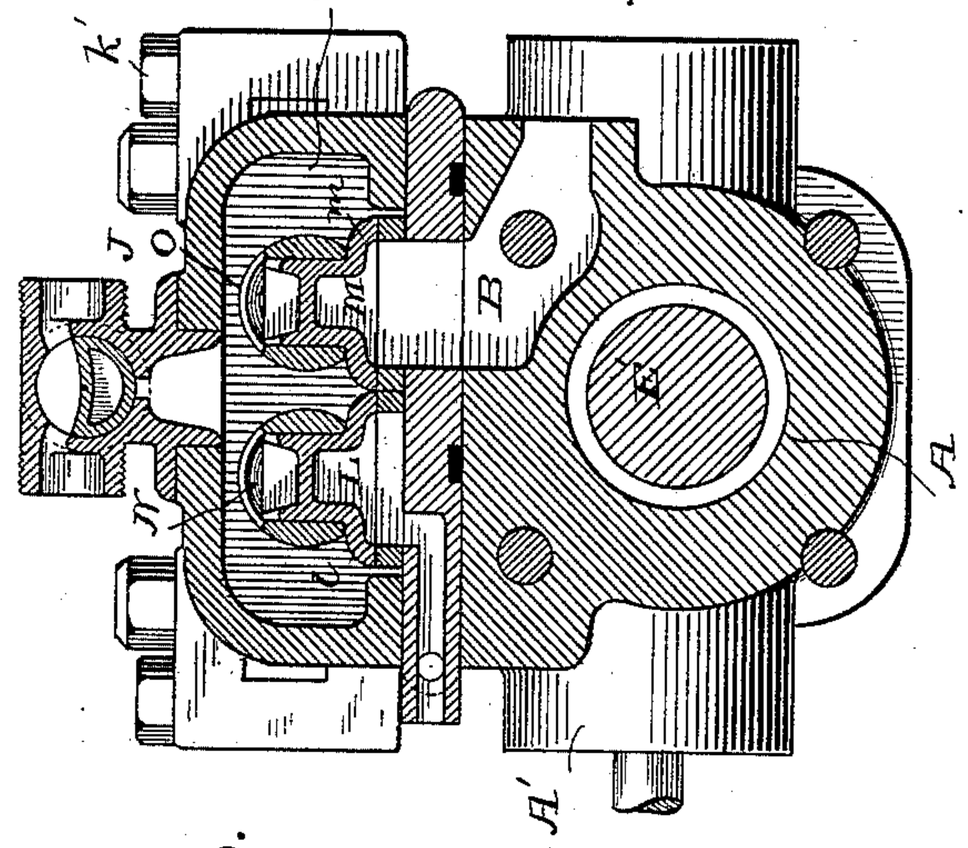


Fig. 10.



Witnesses

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By his Attorney

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UNITED STATES PATENT OFFICE.

HENRY CLARK SERGEANT, OF NEW YORK, N. Y., ASSIGNOR TO THE INGERSOLL-SERGEANT ROCK DRILL COMPANY, OF NEW YORK.

COAL-MINING MACHINE.

SPECIFICATION forming part of Letters Patent No. 411,305, dated September 17, 1889.

Application filed August 10, 1888. Serial No. 282,419. (No model.)

To all whom it may concern:

Be it known that I, HENRY CLARK SERGEANT, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Coal-Mining Machines, of which the following is a description.

My invention relates to improvements in that class of reciprocating drilling-engines known as "mining-machines," the same being mounted upon a pair of wheels to enable the cutting-tool to operate in horizontal, vertical, and oblique claims, for undercutting and cutting around bodies of coal and the like, and to facilitate the transportation of the machine from point to point, and to enable the direction of the cutting-tool to be determined by the operator to produce desired results.

My improvements comprise a novel means of mounting the drilling-engine upon its supporting-wheels, whereby the axes of the latter may be shifted longitudinally of the machine in order to balance its weight, and thereby facilitate its manipulation by the operator—as, for example, when a longer or shorter tool or tool-holder is employed.

It also comprises an extension tool-holder, novel means for attaching and adjusting the handles by which the machine is manipulated, and, furthermore, the piston-rod is formed with spiral grooves passing through a rifled nut, whereby a twisting or prying motion is imparted to the drill, which adds greatly to its breaking effect upon the coal, and also renders it much less liable to stick. I have also provided a pick of improved form specially adapted to the work of coal-cutting.

My improved mining-machine also comprises a novel construction and arrangement of valves for controlling the ingress and egress of the steam, air, or other fluid by means whereof the piston is propelled, the valves being duplex and operating to open and close the steam and exhaust ports entirely independent of the movement of the piston, so that even if the pick be stuck in the coal the valves will move and continue to open and close the ports of the engine, so that a slight shake or jar of the machine by the operator will free the pick and permit it to at once resume operations.

An important advantage incident to my improved valve-motion is due to the fact that the travel of the valves being independent of the length of stroke made by the piston when the machine is moved up close to the work in commencing the cut the stroke of the piston is very short and the valves and piston may be caused to operate more rapidly and accomplish more in a given time than would be the case if the valves and piston had to wait for the completed revolution or movement of some impelling mechanism.

My improved valve-motion while herein shown and described for the purpose of illustration is not herein claimed, since it forms the subject-matter of a separate application for Letters Patent.

In the accompanying drawings, Figure 1 is a transverse sectional elevation of a mining-machine embodying my improvements. Fig. 1ª is a detail showing a modified form of clamping device. Fig. 2 is a sectional end view on the line 2 2 of Fig. 1. Fig. 3 is a detail view showing my improved pick in elevation, and also the extremity of the piston-rod, to which said pick is attached. Fig. 4 is a view similar to Fig. 3, but showing in addition thereto an extension-piece fitted to the extremity of the piston-rod and carrying the pick. Fig. 5 is a top plan view partly in section. Fig. 6 is an enlarged detail, partly in sectional plan, showing the manner of adjustably securing one of the wheel-carrying trunnions. Fig. 7 is an enlarged detail showing in transverse sectional elevation the parts illustrated in Fig. 6. Fig. 8 is an end view of the steam-chest, on an enlarged scale, showing means for securing the handles; and Fig. 9 is an elevation of the parts shown in Fig. 8. Fig. 10 is a transverse sectional end view showing the steam-chest and the positions of the valve-actuating mechanism. Fig. 11 is a fragmentary top plan view showing the valve-ports and passages below the steam-chest. Fig. 12 is a fragmentary view showing the location of the valve-actuating ports and passages with respect to the steam-chest and valves.

Similar letters and figures denote like parts throughout.

As illustrated in the drawings, A is the cylinder of the drilling-engine, which is provided with the usual steam-ports *a a'* at opposite ends and an exhaust-passage B. To the outer end of the main cylinder A is attached a supporting and guiding sleeve C, which is divided by cuts C' at its outer extremity, and provided with clamping-bolts C^2, passing transversely through the divided portions for the purpose of contracting them upon and securing a bushing D.

It will be obvious that other means may be employed for contracting the extremity of the sleeve C to secure the bushing in position. For example, the exterior of the divided part may be made tapering, as seen in Fig. 1^a, and screw-threaded upon its exterior and provided with a screw-threaded collar C^3 for contracting the divided ends of the sleeve upon the bushing.

E is the piston, and E' the piston-rod, which works through suitable packing in the forward end of the cylinder A, and is made long enough to project beyond the end of the sleeve C when fully retracted. One or more buffer-springs E^2 are located in the forward end of the cylinder to cushion the piston and assist its rearward movement. The projecting extremity F of the piston-rod E' is tubular in form to receive the shank *f* of the pick, which is secured in position by a wedge *f'* passing through the piston-rod and the shank of the pick. In order to provide for the cutting of deep channels and for the operation of the machine in places where the machine could not conveniently be moved close up to the work, I provide an extension G, which is formed to fit over the extremity F of the piston-rod, and is adapted to receive at its outer extremity the shank of the pick, which is secured in position by a wedge, as described with reference to the part F of the piston-rod E'. The extension G may be tubular for lightness and portability, and is made in various lengths to adapt it to any desired work or position. By reason of its extremely simple adjustment it can be readily attached or detached.

If desired, the piston-rod can be provided with one or more straight grooves engaging similar projections in the end bushing D for the purpose of preventing undesired radial movement of the piston and pick; but I find that a limited twisting movement is extremely useful and a material aid to the action of the chisel-shaped pick in dislodging the material operated upon. As a separate and important improvement, I form in the end portion of the piston-rod a number of spiral grooves *d*, which engage corresponding projections *d'* in the rifled bushing D, which latter is prevented from turning, being tightly clamped in the contracted extremity of the sleeve C, and will impart a twisting movement to the pick. As the pick strikes the coal, the shock of impact will cause its twisting effect to be re-enforced by whatever looseness or play may exist between the piston-rod and bushing, thereby producing a greatly-increased breaking force and adding to the effect of each blow.

My improved pick is in the form of a tapering oval chisel *g*, the end of which is provided with a V-shaped notch having a round sharp edge and cutting-points *g' g²*. This form is very easily sharpened, and will remain sharp and do more work than the thin, flat, sharp edge so frequently employed. H H are the carrying-wheels upon which the machine is supported, and *h h* are adjustable trunnions upon which the said wheels are mounted.

The trunnions *h* are much larger than it is usual to make the axes of carrying-wheels, and their increased size is for the purpose of developing friction between the wheel and its axles, and thereby adding stability to the machine when in operation—that is, to oppose to the recoil of the machine at each blow the friction between the wheels and their axles in addition to the inertia of the weight of the machine, thereby diminishing the recoil and increasing the effective force of each stroke.

On each side of the central portion of the cylinder A is formed an extension A', which extension is provided with a transverse slot or recess A^2, leaving a narrower exterior opening, so that the front inner walls of the slot form shoulders A^3. The slot A^2 has a downwardly-extending opening A^4, through which is inserted a short headed bolt I. The head of the bolt is retained in the slot A^2 by the shoulders A^3 and the bolt capable of longitudinal movement. The inner end of the trunnion *h* fits against the projection A', against which it is firmly held by the bolt I, which passes centrally therethrough, and is provided with a locking-nut *i* at its outer extremity, which nut bears against and holds the trunnion firmly in position. The trunnion *h* is further provided with small projections *h'*, which extend into the outer portion of the slot on each side of the bolt I, and serve to prevent the bolt I dropping out through the downward opening A^4 while being adjusted—that is, when the adjustment happens to bring the bolt directly over said downward opening, for when the bolt is in any part of the slot away from said opening the walls of the slot will themselves retain it in position. To adjust the wheels with respect to the weight of the machine, the nut *i* is loosened, when the bolt can be moved longitudinally in the slot A^2, carrying with it the wheel H and trunnion *h*, which latter is firmly locked in the desired position by tightening the nut *i*.

J is the steam-chest, which is formed with lateral extensions *j j'*, themselves formed with longitudinal apertures to receive the shanks *k* of handles K. The openings in the projections *j j'* may be formed by cores when the steam-chest is cast, and are sufficiently large

to receive the shanks *k*, which may be rough forgings. The handles are secured in position by toe-bolts *k'*, which are inserted from below in the apertures for the handles and project upward through the extensions *j j'*, where they are provided with screw-threaded nuts. The attachment of the handles is therefore extremely simple, it being only necessary to loosen the bolts *k'* when the handles can be adjusted, after which a few turns of the nuts will draw up the bolts *k'* and firmly lock the handles in position.

My improved valve comprises two air-driven piston-valves L M, the end portions of which work in single-acting cylinders N O N' O', formed in the respective ends of steam-chest J. The central portions of the pistons L M are desirably reduced in size, in order to allow the free passage of steam or air around and between them to the main and auxiliary sets of ports 1 2, located side by side transversely of the central portion of the steam-chest, and both of same external dimensions, so as to render the valves interchangeable, if desired. The pistons L M are each provided with a slide-valve *l m*, moving upon and controlling the two sets of ports 1 2. Set 1 of the ports comprises inlet-port P, exhaust-port Q, and inlet-port R, the port P communicating by passage P' with inlet-port *p*, located on the opposite side of the steam-chest and extending up into the cylinder O. The port R also passes across the steam-chest by passage R', issuing at outlet *r* into cylinder O. The exhaust Q extends laterally to the exterior, and adjustable throttling-valves *q q' q²* are provided for increasing or diminishing the area of the exhaust-passage and of the ports *p r*, and thereby controlling the speed of movement of the valve-actuating pistons. Set 2 of the ports comprises ports *a a'* leading to the respective ends of the main cylinder, and exhaust-port B, leading to the exterior of the machine. From port *a* extends an auxiliary passage 3, which crosses the steam-chest and issues at opening 4 into cylinder N'. From the port *a'* extends a similar passage 5, which likewise crosses the steam-chest and issues at opening 6 into cylinder N. The valve-actuating passages just described are smaller than the main ports, being about one-third their area. When the valves are in position, the compressed air in the steam-chest will find passage alternately through the ports and passages shown, which will cause them to move alternately and independent of the movement of the main piston so long as air is supplied and the exhaust *g* is open. The passages crossing each other without communication, as shown in Fig. 11, each piston is alternately the valve of the opposite one, and their speed can be regulated by throttling the exhaust Q to a greater or less extent.

The specific operation of the valves in the positions shown in Fig 12 is as follows: Piston M being in its forward position, piston L will exhaust through passage 5 and receive air at its opposite end through passage 3. Simultaneously piston M will receive steam through passage P' and exhaust through passage R, and so on, vice versa, as long as steam or compressed air is supplied.

It will be understood that while for purposes of illustration I have described my improvements specifically I do not limit myself to the constructions or precise forms shown, since they may be modified in many respects without departing from the spirit or scope of the invention.

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

1. The combination, with a drilling-engine, of carrying-wheels independently supported against the sides of the cylinder thereof, and separate longitudinal adjustable supports therefor for adjusting the positions of the carrying-wheels against the cylinder, substantially as described.

2. The combination, with a drilling-engine, of extensions formed on the sides of the cylinder thereof and having longitudinal slots or recesses therein, headed bolts separately secured in and longitudinally adjustable in said slots, independent trunnions secured upon the bolts, and carrying-wheels rotatably mounted upon the trunnions, substantially as described.

3. A drilling-engine having lateral extensions or enlargements upon the cylinder thereof, said extensions formed with longitudinal recesses A^2, said recesses provided with downward openings A^4, headed bolts I, longitudinally adjustable in the recesses, and wheel-supporting trunnions *h*, securely held in the desired position against the sides of the engine-cylinder by the bolts I, substantially as described.

4. A drilling-engine having lateral extensions or enlargements formed with longitudinal recesses A^2, said recesses provided with downward openings A^4, headed bolts I, longitudinally adjustable in the recesses, and wheel-supporting trunnions *h*, securely held in the desired position against the sides of the engine by the bolts I, and supporting projections *h'* on the inner face of the trunnion, to prevent the bolt dropping down when moved past the vertical slot, substantially as described.

5. In a drilling-engine, a tool-carrying piston-rod having a limited twisting axial movement during both its forward and backward movement, substantially as described.

6. A drilling-engine provided with a non-rotating tool-carrying piston-rod and means for imparting thereto a limited twisting movement during its forward and backward movement, the twist being in one direction on the outward stroke and in the reverse upon the return.

7. A drilling-engine provided with a forwardly extending sleeve, a ribbed bushing adjustably secured in said sleeve and held stationary

therein, and a piston-rod formed with grooves registering with the ribs of the bushing and guided therein, whereby a limited twisting movement is imparted to the piston during its forward and backward movement, the twist being in one direction on the outward stroke and in the reverse upon the return.

8. A drilling-engine the cylinder of which is provided with a forwardly-extending sleeve divided at its outer end and provided with an adjustable clamp for contracting said outer end, a piston-rod, and a bushing, as D, exterior to the piston-rod and arranged to be inserted in the divided extremity of the sleeve and to be firmly secured therein by the clamp, substantially as described.

9. The tapering oval pick *g*, made tapering toward its front end and formed with a transverse **V**-shaped notch at its outer extremity, substantially as described.

10. The tapering oval pick *g*, made tapering toward its front end and formed with round sharp edges at its cutting extremity, substantially as described.

In testimony whereof I hereto affix my signature in presence of two witnesses.

HENRY CLARK SERGEANT.

Witnesses:
M. B. W. BOMGEIRS,
C. H. SERGEANT.