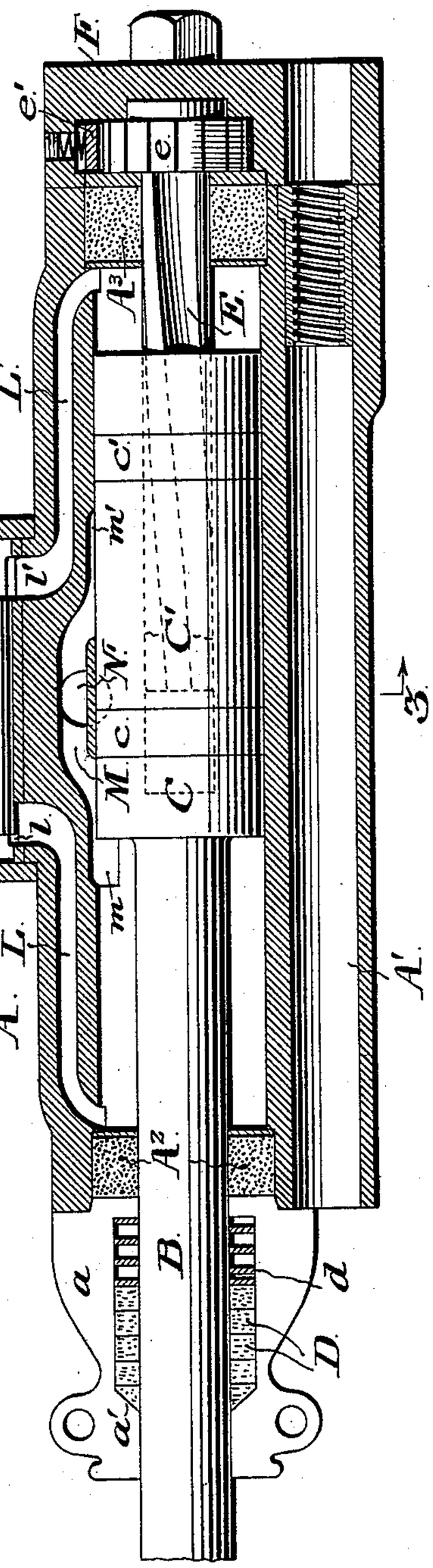
(No Model.) 3 Sheets—Sheet 1.

J. DUNCAN.

ACTUATING DEVICE FOR ROCK DRILLS.

No. 539,251. Patented May 14, 1895.

FIG. 1.



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(No Model.) 3 Sheets—Sheet 2.

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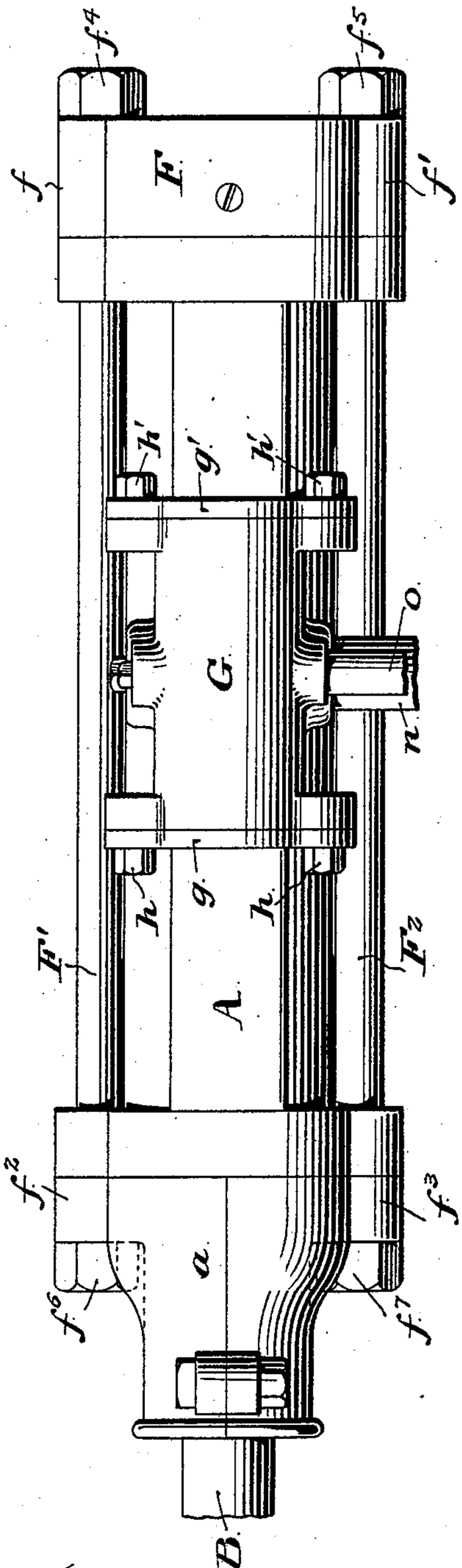
FIG. 2.



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(No Model.) 3 Sheets—Sheet 3.

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ACTUATING DEVICE FOR ROCK DRILLS.

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FIG. 3.

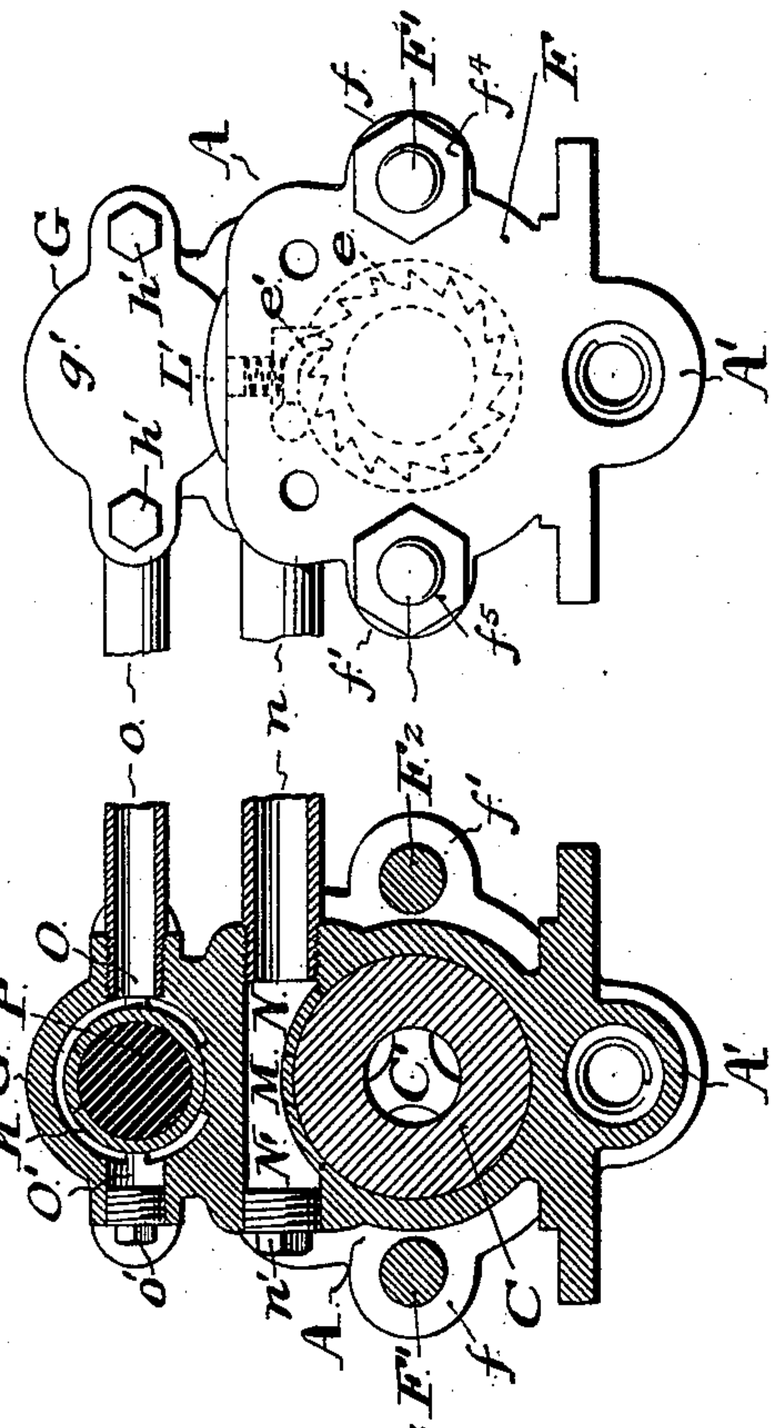
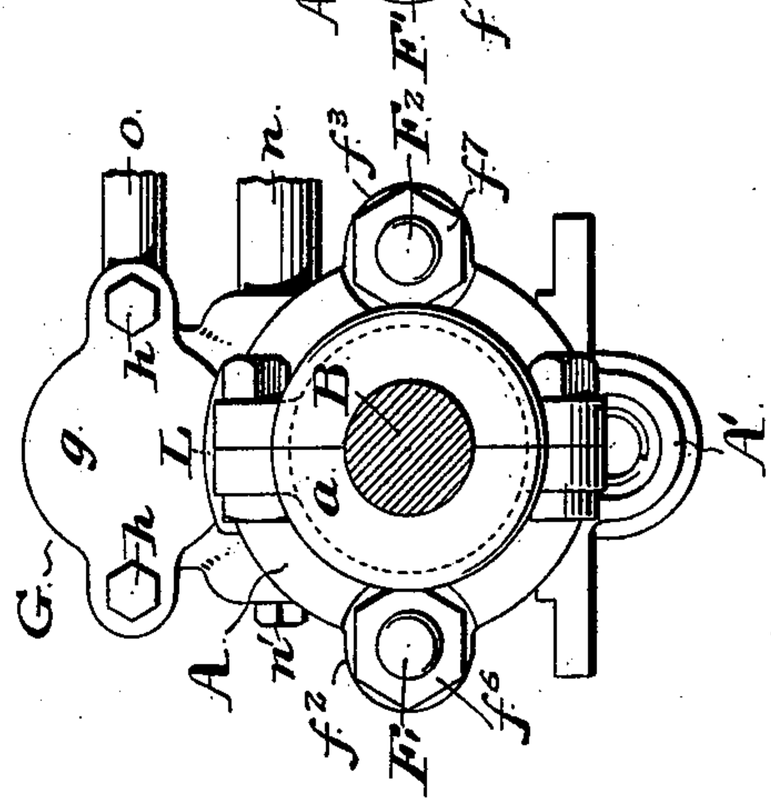


FIG. 4.



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UNITED STATES PATENT OFFICE.

JOSEPH DUNCAN, OF LYKENS, PENNSYLVANIA.

ACTUATING DEVICE FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 539,251, dated May 14, 1895.

Application filed March 11, 1895. Serial No. 541,344. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH DUNCAN, of Lykens, in the State of Pennsylvania, have invented certain new and useful Improvements in Actuating Devices for Rock-Drills, &c., whereof the following is a specification, reference being had to the accompanying drawings.

In said drawings, Figure 1 represents a longitudinal central section through the cylinder and valve-chest of the drill, showing the drill-piston and a portion of the drill-shank in elevation. Fig. 2 is a top or plan exterior view of the said cylinder and valve-chest. Fig. 3 is a vertical transverse section on the line 3 3 of Fig. 1. Fig. 4 is a front end view of the cylinder, showing the drill-shank in transverse section. Fig. 5 is a rear view of said cylinder, showing certain of the internal mechanism in dotted lines.

A indicates the actuating cylinder of the drill piston. The shank of the drill is represented at B, and extends out through a stuffing box in the head, *a*, at the front end of the cylinder, said stuffing box containing packing rings, D, which are maintained in position by means of a coiled spring, *d*. Said spring tends to force the packing rings toward the converging front end, *a'*, of the stuffing box and thus maintain a close joint about the shank, B.

The piston, C, may be formed integral with the shank, and consists of a cylinder having packing rings, *c*, *c'*, and fitting snugly within the interior of the cylinder, A. This piston is preferably provided with a longitudinal hole, extending inward from its rear end, and indicated by the dotted lines at C', the inner surface of which is "rifled" or provided with a thread of very steep pitch, to engage with the correspondingly threaded portions of a rifle-bar, E, rotatably mounted in the cap, F, at the rear end of the cylinder, and provided with a ratchet, *e*, and spring-pawl, *e'*, which maintain said bar, E, against rotation in one direction, while permitting it in the other. This device, which is common in this class of apparatus to effect a slight rotary movement of the drill after each stroke, need not be further described, as it forms no part of my invention.

At each end of the cylinder is a gum ring, or buffer, indicated at A^2, A^3, respectively, which serve to guard against accidental shock from the striking of the piston at either end of the stroke.

The head, *a*, at the front end of the cylinder, and the cap, F, at the rear end thereof, may be conveniently secured in position by means of longitudinal bolts, F', F^2, extending longitudinally with the cylinder on each side thereof and passing through lugs, *f*, *f'*, upon the cap, F, and similar lugs, f^2, f^3, upon the head, *a*. Said bolts are provided with nuts, f^4, f^5, f^6, f^7, whereby the proper tension may be produced upon the bolts, F', F^2.

Upon the under side of the cylinder is preferably cast a longitudinal sleeve, A', to receive the usual hand feeding spindle to advance or withdraw the drill and its cylinder, but which need not be described, as it forms no part of my invention.

Upon the top of the cylinder, A, is mounted the valve chest, G, which may be approximately cylindrical in form, having two heads, *g*, *g'*, secured in position by means of bolts and nuts, *h*, *h'*, engaging through lugs formed upon the heads and end portions of the valve-chest body on each side, or maintained in position in any convenient manner. The interior of said valve-chest is provided with a tubular bushing, K, extending from end to end, as shown, but having an annular space between its exterior surface and the interior surface of the valve-chest, extending throughout the whole of the length and nearly all of the periphery thereof. Segmental ports, *k*, *k'*, are formed in the upper portion of this bushing at a short distance from the ends thereof, and somewhat larger ports, *l*, *l'*, are formed in the lower portion of the bushing, in correspondence with the inlet passages, L, L', extending along in the wall of the cylinder, A, and communicating with the interior thereof at each end, as shown. Said passages constitute the inlet ports of the cylinder, and will hereinafter be so termed.

The central portion of the cavity within the cylinder, A, is provided with a lateral offset, or enlargement, M, terminating at the points, *m*, *m'*, respectively, from which exhaust ports, N, N', lead out through the wall of the cylinder on each side. The valve-chest, G, is provided on each side with inlets,

O, O′, respectively, communicating with the annular space between the bushing, K, and the inner wall of the chest. These inlets and the exhaust ports just referred to, are provided in duplicate, in order to accommodate the drill to working in various positions, the opening on one side being closed by means of a screw plug, or otherwise, as indicated at *o′* and *n′*, while suitable inlet and exhaust pipes, shown at *o* and *n*, are connected with the respective openings upon the other side, as shown in Fig. 3.

The valve, P, is a sliding cylinder, fitting snugly within the bushing, K, and of such length as that when in one extreme position it shall close one port, as *k*, leaving the other port, as *k′*, fully open. In such position it extends partly over, but does not close, the port, *l*, which is below the port, *k*, and it entirely opens the corresponding port, *l′*, which is below the port, *k′*. The extreme positions of the valve, P, are defined by lugs, *p*, *p′*, respectively, extending inward to the proper distance from each head of the valve-chest.

The length of the piston, C, is such that when it is in one extreme position, as for instance, at the rear end of the cylinder, there is a free communication between the interior of the cylinder at the front portion of the piston and the exhaust offset, M, and exhaust port, N, and vice versa.

The operation of the device is as follows: Assuming the parts to be in the position shown in Fig. 1, compressed air or other fluid under pressure entering by the pipe, *o*, and port, O, will escape into the annular space between the bushing, K, and the inner surface of the valve-chest, G, and will pass freely down through the port, *l′*, into and through the inlet port, L′, at that end of the cylinder, thereby forcing the piston forward. During a portion of the forward stroke of the piston, the outlet through the offset, M, and exhaust port, N, is open, and the air from the front of the piston is exhausted thereat; but after the front end of the piston passes the point, *m*, the remaining air is compressed during the continuation of the stroke, the compression taking place in the front end of the cylinder, A, the port, L, and the interior part of the bushing, K, behind the valve, P, whose end is at that moment abutting against the projection, *p*. When this compression has reached a certain degree of tension, it will shift the valve, P, to the other end of the valve-chest, thus cutting off further access of air through the port, *k′*, and opening the port, *k*, and consequently bringing the inlet port at that end of the cylinder into communication with the source of compressed air. Thereupon the return stroke of the piston, C, will occur and partial exhaustion and subsequent partial compression of the contents at rear end of the cylinder will recur. When the necessary degree of tension has been reached at this end, the valve, P, will be shifted in a manner similar to that described, so as to again open communication with the inlet for compressed air to the rear end of the cylinder and cut it off from the front end thereof. A reciprocating motion of practically any required speed and force may be thus obtained by proper regulation of the air blast entering at the inlet pipe, *o*.

The actuating device has been described in connection with a rock drill, but obviously could be utilized for other purposes where a reciprocating motion is desired, and hence I do not limit my claim to this particular application thereof; nor do I deem it necessary to enlarge upon the obvious features of advantage which are embodied in my invention, beyond pointing out the great simplicity thereof, the small number of working parts, and the solidity of those parts which are most liable to accident in devices of this character.

Having thus described my invention, I claim—

1. The combination with a cylinder having inlet and exhaust ports, substantially as set forth, of a piston arranged in the described manner with reference to said exhaust ports; a valve-chest communicating with the inlet ports of the cylinder and provided with individual inlet ports near each end; a reciprocating valve arranged within said valve-chest and adapted in its extreme positions to entirely open one inlet port of the cylinder and the other inlet port of the valve-chest, while entirely closing the other inlet port of the valve-chest and partly closing the other inlet port of the cylinder, whereby a communication between the interior of the valve chest and the interior of the cylinder, at each end thereof, at all times exists, but communication between the air or other inlet and the interior of the valve-chest at either end thereof is alternately completely cut off and opened, substantially as set forth.

2. The combination of the cylinder having inlet ports communicating with the respective ends thereof, and an exhaust offset and exhaust at its central portion; a valve-chest having a bushing forming an annular space therein, said bushing being provided with ports in correspondence with the inlet ports of the cylinder and also with individual inlet ports near each end of the valve-chest; a reciprocating valve arranged within said bushing and adapted in one extreme position to entirely close one of the individual inlet ports of the valve-chest while opening the other, and vice versa, but not closing the inlet ports of the cylinder, said valve-chest being provided with an air inlet communicating with said annular space, substantially as set forth.

JOSEPH DUNCAN.

Witnesses:
HOOD MCKAY,
OTTO LONG.