J. P. Frizell. Sheet 1, 2 Sheets.

Mach. for Drilling Stone.

No. 94,097. Patented Aug. 24, 1869.

Fig. 1.

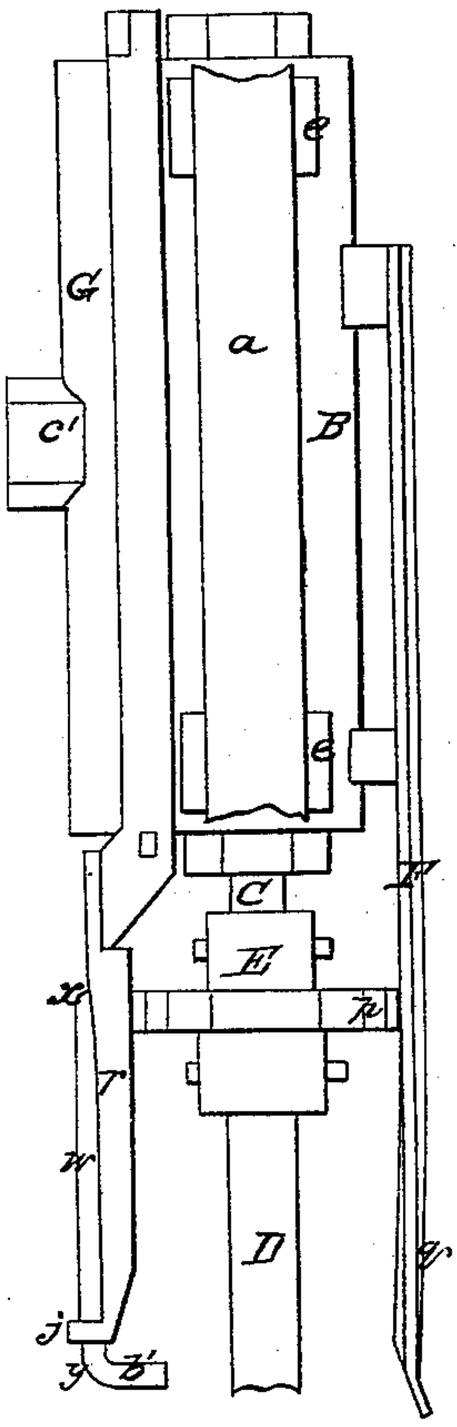


Fig. 4.

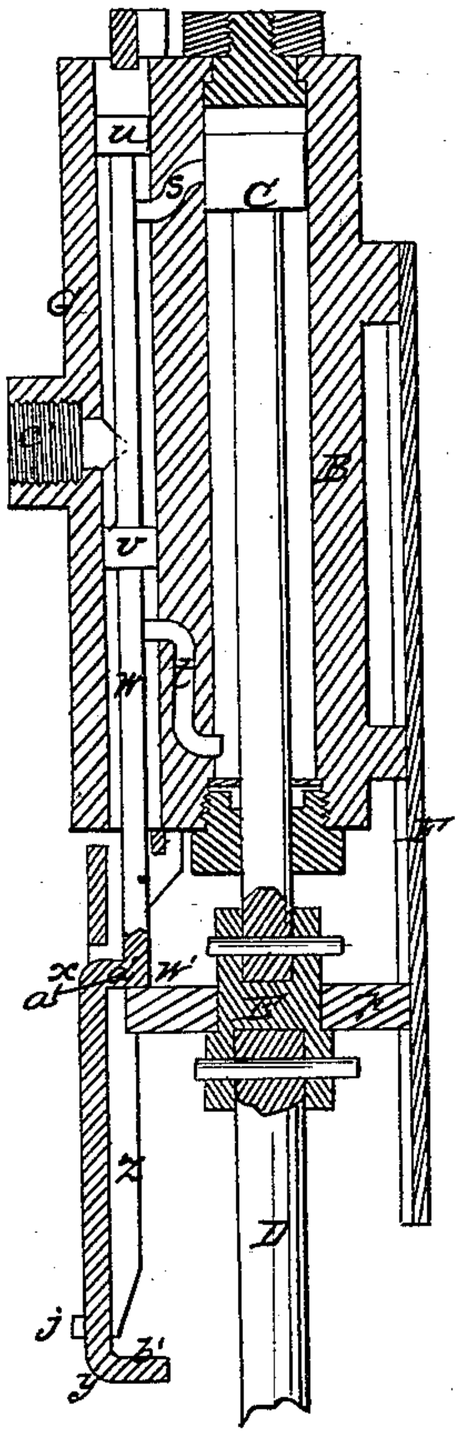


Fig. 2.

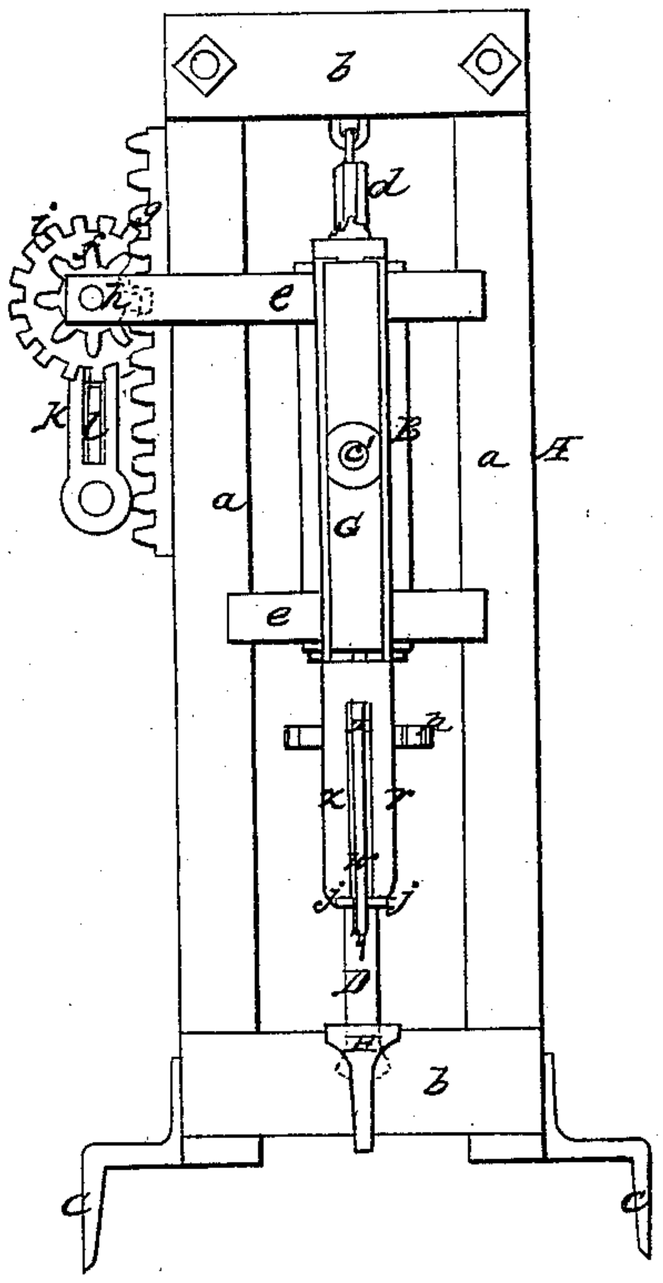
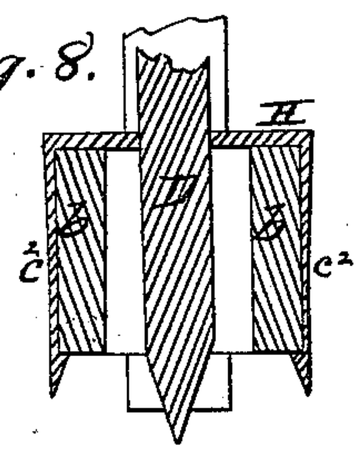
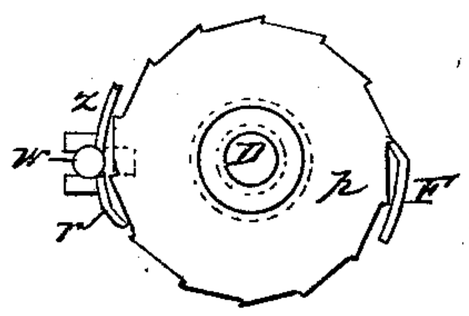


Fig. 3.

Fig. 8.





Witnesses.

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Inventor.

Joseph P. Frizell,

by his attorney

R. Wilby

J. P. Frizell Sheet 2, 2 Sheets.

Mach. for Drilling Stone.

No. 94,097. Patented Aug. 24, 1869.

Fig. 5.

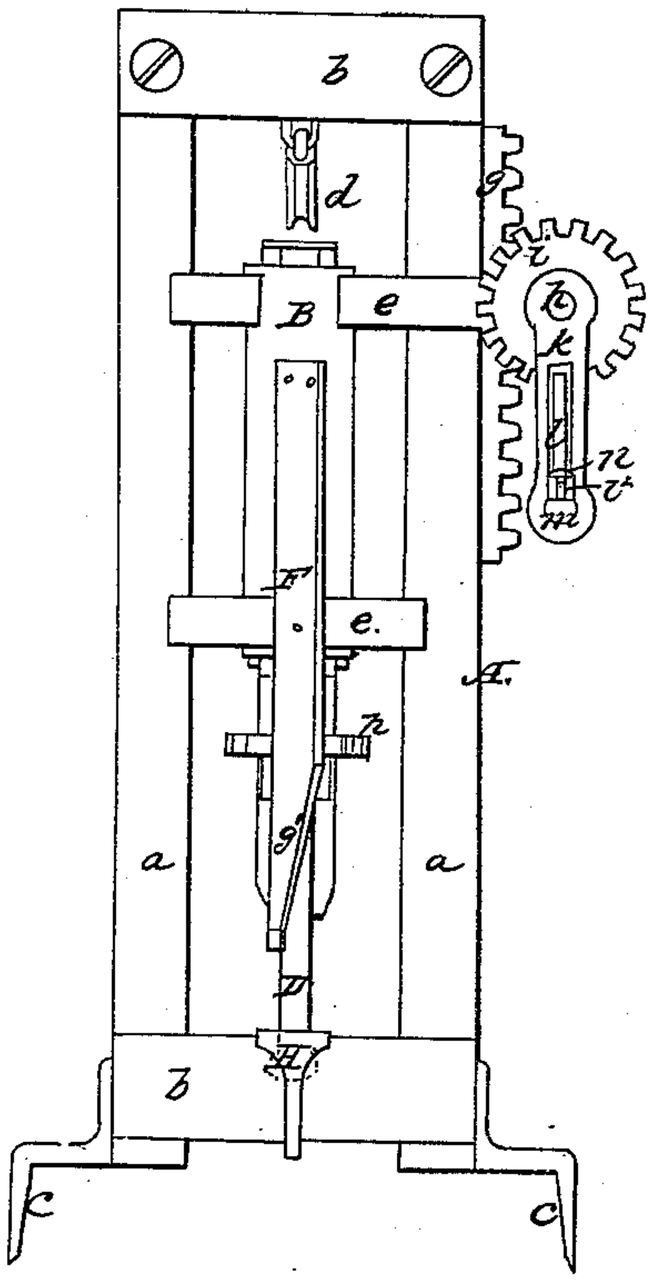


Fig. 6.

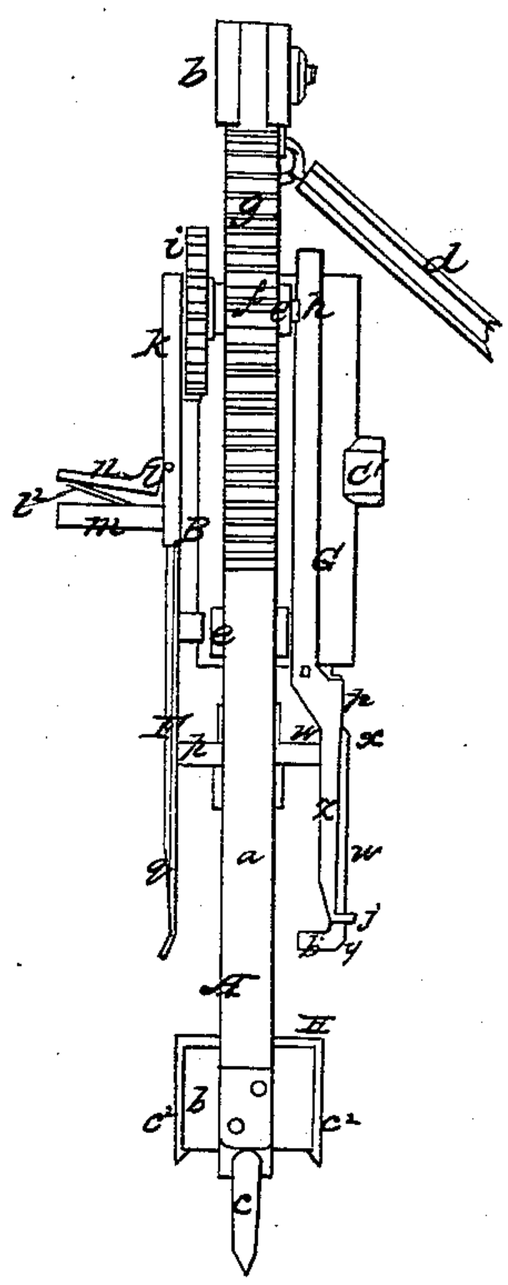
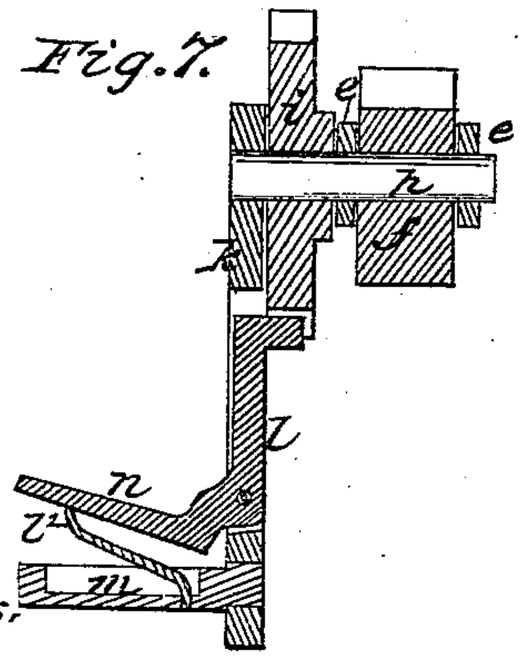


Fig. 7.



Witnesses.

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United States Patent Office.

JOSEPH P. FRIZELL, OF KEOKUK, IOWA.

Letters Patent No. 94,097, *dated August* 24, 1869.

IMPROVED STONE-DRILLING MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all persons to whom these presents may come:

Be it known that I, JOSEPH P. FRIZELL, of Keokuk, of the county of Lee, and State of Iowa, have made a new and useful invention, having reference to Automatic Machinery for Drilling Stone; and do hereby declare the same to be fully described in the following specification, and represented in the accompanying drawings, of which—

Figure 1 is an elevation of the steam-engine cylinder and its appendages, with the drill-ratchet, and a portion of the drill.

Figure 2 is a rear elevation of the machine.

Figure 3 is a top view of the drill-head and ratchet.

Figure 4 is a vertical section, taken through the engine-cylinder, and the valves thereof.

Figure 5 is a front elevation of the machine.

Figure 6 is a side elevation of it.

The frame of the machine is shown at A, as composed of two parallel bars, *a a*, united at their upper and lower ends by two pairs of cross-bars or connections, *b*.

This frame, at its lower end, is provided with two spurs or pointed feet, *c c*, to support it on a rock or surface while the machine may be in operation. It also has a pointed brace-bar, *d*, jointed to its upper part, such serving to maintain the frame either at any desirable inclination, or in a vertical position, as circumstances may require.

A steam-engine cylinder, B, provided with a piston, C, is applied to the frame A by furcated guides, *e e*, so as to be capable of being moved lengthwise and rectilinearly within it. One of the forked guides *e e* of the cylinder carries a pinion, *f*, to engage with a rack, *g*, or range of teeth, fixed to the outer side of one of the longer bars of the frame A.

The shaft *h* of such pinion is supported in bearings in the forked guide, and goes through a toothed wheel, *i*, fixed to one side of the said guide.

A crank, *k*, fastened on the said shaft, has a rectangular lever or pawl, *l*, pivoted to it, and arranged, with respect to it, in manner as represented, particularly in Figure 7, which denotes a section of the crank, the pawl, and the wheel. The pawl plays through the crank, and is held in engagement with the wheel by means of a spring, l^2, affixed to the handle *m* of the crank, and bearing against the handle *n* of the pawl. By firmly grasping both handles by the hand, the pawl may be moved out of engagement with the wheel; but, while the two are in engagement, the cylinder will be held from descending or being moved within the frame A.

The drill, shown at D, is arranged in a straight line with the piston, and is connected therewith by means of the drill-head E, keyed both to the piston and drill, and provided with a ratchet, *p*.

During the up-stroke of the piston, the drill will be partially revolved by means of a long spring-cammed bar, F, extending down from the cylinder, and sprung against the periphery of the ratchet.

While the ratchet may be rising with the piston, a tooth of the ratchet will be borne against the cam-part *g'* of the spring-cammed bar F, which will cause the ratchet to turn a little, and thus simultaneously turn the piston and the drill.

A straight elastic guide or ratchet-retainer, *r*, (see figs. 2 and 6,) extending down from the cylinder, is sprung against the ratchet, and serves as a retaining-pawl, to prevent it from turning backward. It also allows the free up-and-down movements of the ratchet.

The cam *g'* should be made the hypothenuse of a triangle, having a base longer than the length of a tooth of the ratchet, the same being so as to enable the cam, during a descent of the ratchet, to slip off the tooth against which it may be forced, and to come into a position to act against the front edge of the tooth during the next or upward movement of the ratchet.

The part E is to press as a spring against the ratchet. The same may be said with reference to the retainer *r*. Alongside of the cylinder, is a valve-case, G, which consists simply of a tube, open at each end, and communicating with the cylinder by two passages or ports, *s t*, each of which opens into the cylinder at a short distance from its next adjacent head. The valves are shown at *u* and *v* as being simple piston-heads, affixed to a rod, *w*, and having a diameter corresponding with the bore of the valve-case.

The valve-rod, below the case, has three bends, w^1 *x y*, and extends between the retainer *r* and a parallel guide, *z*, arranged as represented. The lower parts *j j*, of such retainer and guide, are made as jaws, to grasp the valve-rod with a sufficient force to keep it from dropping downward by its own weight, and the weight of its valves. To this end, the retainer and guide are to be made sufficiently elastic to compress the jaws with the proper degree of force, on the valve-stem.

The parts a^1 b^1 of the valve-rod constitute shoulders for the ratchet *p* to act against, in order to give motion to the valve-rod, to cause it to carry each of the valves both above and below its next adjacent port.

There is an induction-opening, c^1, leading into the middle of the valve-case. This opening is to be connected with a steam-generator, by a flexible hose or pipe, provided with a stop-cock.

The drill works through a guide, H, which rests on the lower bars of the frame A, and is held thereto by spring-catches, C^2 C^2, extending downward from it, and applied to the two bars, in manner as represented

in Figure 8, which is a transverse section of the bars and the guide, with the drill going through the latter.

The mode of operation of the machine may be thus explained:

If we suppose each of the two valves *u v* to be raised above its co-operative part, and the piston-head of the cylinder to be a little below the entrance of the upper port into the cylinder, steam will flow into the upper part of the cylinder and depress the piston. During the descent of the piston, the valves will be moved downward to their lowest positions, and the steam will flow into the lower part of the cylinder, and elevate the piston, the exhaust steam escaping through the upper port, and out of the upper end of the valve-case.

During the ascent of the piston, the valves will be raised, and each will pass beyond its co-operative port before the piston-head gets by the upper port. This will let into the upper end of the cylinder a quantity of steam, which will serve to cushion the piston, as well as to subsequently drive it back past the port. The steam entering the cylinder will operate on the piston and depress it.

When the machine is at work, performing the operation of drilling into a rock, the piston will not be cushioned at the terminus of its down-stroke, it being arrested in its descent by the drill striking the rock; but, when the piston is not so arrested, the cushioning at the terminus of the down-stroke takes place, as before, with the up-stroke. Ordinarily, the drill commences to strike the rock just after the ratchet may have struck the lower shoulder of the valve-rod. The concussion between the ratchet and shoulder will cause the valves to be thrown into the position for the steam to effect the up-stroke of the piston.

Thus, it will be seen that I have a peculiar valve-mechanism, by which the waste or exhaust steam is discharged at opposite ends of the valve-case, and the piston is cushioned at the terminus of each stroke.

I would remark that I make no claim to the combination of a drill with the piston of a steam-engine, and with mechanism for revolving such drill, the whole being so as to cause the drill to be moved rectilinearly by the piston, and to be revolved more or less in the mean time.

What I claim as my invention, with reference to an automatic drilling-machine of such kind, is as follows:

The arrangement and combination of the friction-jaws *j j* with the valve-rod, its valves, and operative mechanism applied to it, and the cylinder and piston, as specified.

Also, the combination and arrangement of the elastic retainer *r*, and cammed bar F, with the cylinder, and the ratchet of the piston, and drill-shaft, as set forth.

Also, the arrangement and combination of the bent lever, pawl *l*, the spring l^2, and the stationary gear *i*, with the crank *k*, its shaft *h*, and the pinion *f*, and the rack *g*, for effecting the longitudinal movement of the steam-engine within the frame of the machine.

JOSEPH P. FRIZELL.

Witnesses:

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E. W. HASKETT.