(No Model.) 2 Sheets—Sheet 1.

J. GRANDMAISON.

ROCK DRILL ENGINE.

No. 587,575. Patented Aug. 3, 1897.

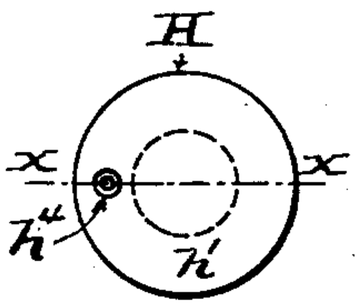
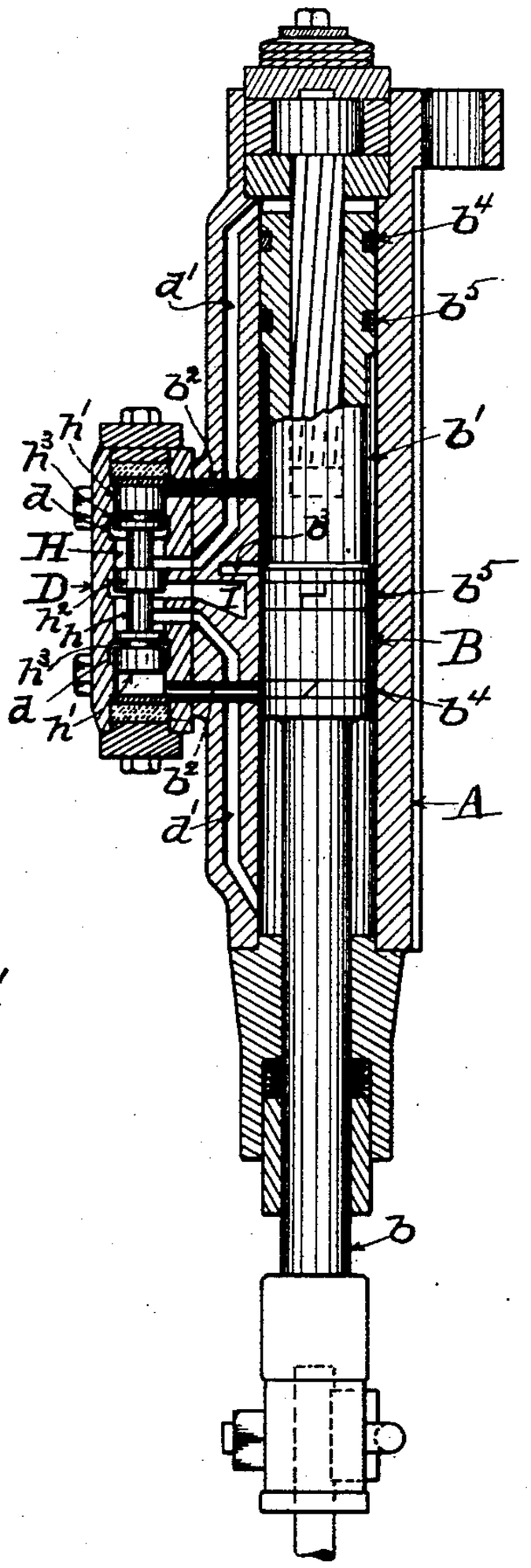


FIG. 2.



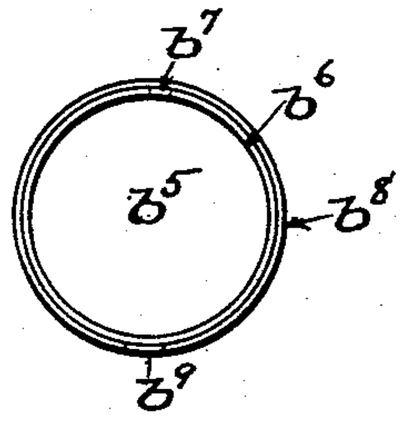


FIG. 4.

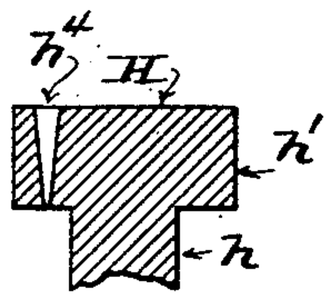


FIG. 3.

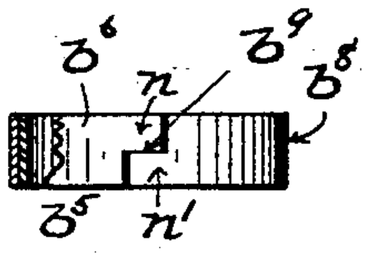


FIG. 5.

FIG. 1.

WITNESSES.

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INVENTOR.

Joseph Grandmaison
By his Attorney
Benjamin Philips

(No Model.) 2 Sheets—Sheet 2.

J. GRANDMAISON.

ROCK DRILL ENGINE.

No. 587,575. Patented Aug. 3, 1897.

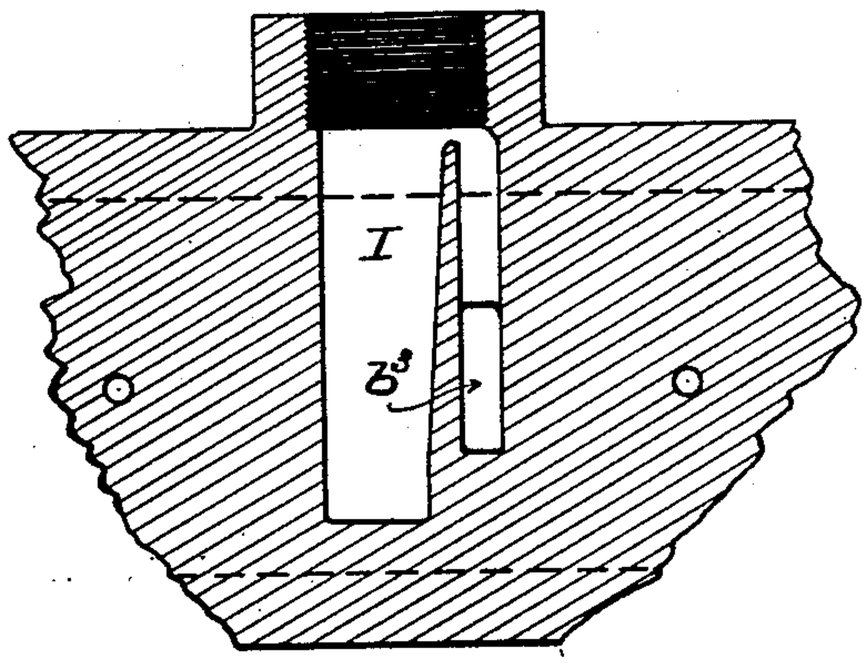

FIG. 6.

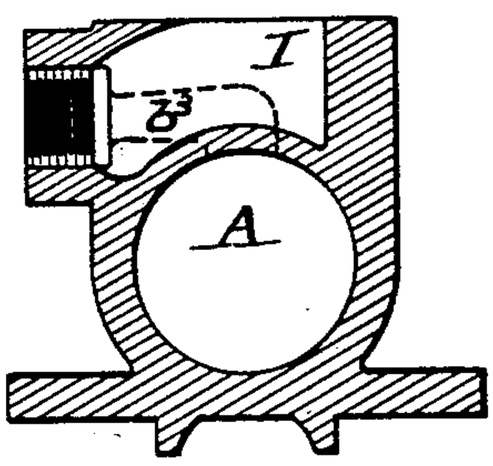

FIG. 8.

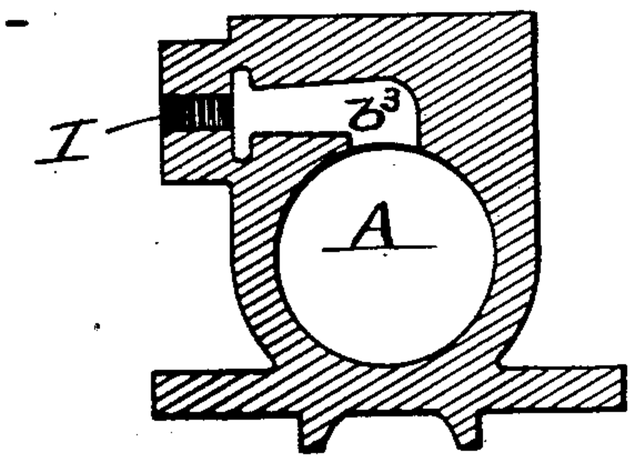

FIG. 9.

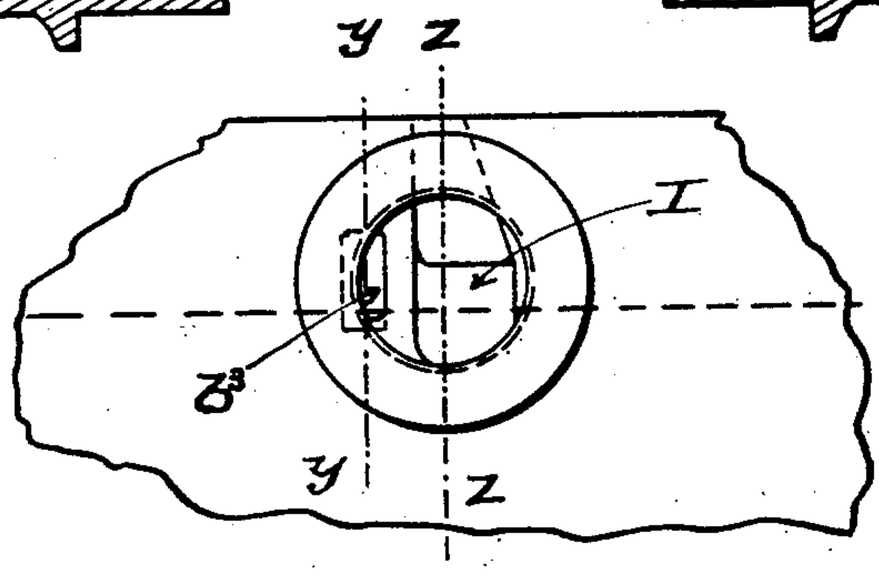

FIG. 7.

WITNESSES.

Fred C. Hart.
A. E. Hyde.

INVENTOR.

Joseph Grandmaison
By his Attorney
Benjamin Philips

UNITED STATES PATENT OFFICE.

JOSEPH GRANDMAISON, OF LYNN, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO FREDERICK D. MAYO, OF SAME PLACE.

ROCK-DRILL ENGINE.

SPECIFICATION forming part of Letters Patent No. 587,575, dated August 3, 1897.

Application filed June 4, 1896. Serial No. 594,309. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH GRANDMAISON, a subject of the Queen of Great Britain, residing at Lynn, in the county of Essex and Commonwealth of Massachusetts, have invented a new and useful Improvement in Rock-Drill Engines, of which the following, taken in connection with the accompanying drawings, is a specification.

The present invention relates generally to improvements in devices of the above-mentioned class, but more particularly to that type of rock-drill engine in which the operation of the regulating-valve is secured by means of an internal exhaust-chamber, commonly formed by an annular recess upon the piston, which communicates by suitable passages with the opposite ends of the steam-chest and with the main exhaust.

The present invention consists of improvements in the form and arrangement of the regulating-valve, the exhaust-ports, the packing of the piston, and other details of mechanism hereinafter more specifically set forth and claimed.

The present invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section, through the cylinder, of a rock-drill engine embodying the present invention. Fig. 2 is an end view of the regulating-valve. Fig. 3 is a partial sectional view of regulating-valve, taken on line X X, Fig. 2. Figs. 4 and 5 are details of one of the packing-rings detached. Fig. 6 is a partial section through the main exhaust, showing the exhaust-passage communicating with the internal exhaust-chamber. Fig. 7 is a side view looking directly into the main exhaust-port. Figs. 8 and 9 are transverse sectional views taken, respectively, on lines Z Z and Y Y, Fig. 7.

Similar letters of reference refer to similar parts throughout the several views.

In the drawings, A represents the cylinder of a rock-drill engine, B represents its piston, and *b* its piston-rod, all of which parts, except as hereinafter specified, are or may be of a form well known in the art and form no part of the present invention.

D represents the steam-chest, which the live steam enters through the annular ports *d d*, and which communicates with opposite ends of the cylinder through the passages *d' d'*, leading from ports at opposite sides of the center of the steam-chest D.

The steam-chest D is connected by a substantially centrally-located port with the exhaust I.

H represents the regulating-valve, which, in accordance with the present invention, is cylindrical in form and consists of a stem *h*, which carries at opposite ends the disks or pistons *h' h'* and at or near its center the disk or piston h^2. In each of the disks *h' h'* is formed an annular groove or chamber h^3.

The position and width of the ports *d d* are so determined with reference to the width and position of the ports communicating with passages *d' d'* and with the exhaust I and the width and position of the disks *h'*, *h'*, and h^2 are relatively such that when the valve H approaches one end of its stroke one of the passages *d'* is in communication with a live-steam port *d*, while the other port *d* is cut off from the other passage *d'*, and said other passage *d'* is in communication with the exhaust I. A reverse result is secured as the valve H approaches the opposite end of the stroke. It is important to note in this connection, and I regard the same as a new and important feature, that the relative position and width of the ports *d d* and annular chambers h^3 h^3 are such that for any position of the valve H both of the chambers h^3 h^3 are in communication with the ports *d d*, and consequently said chambers h^3 h^3 are always taking live steam. Each of the chambers h^3 is connected by a steam-passage h^4 with the end of the steam-chest D. The passages h^4 are not of the same diameter throughout their length, but flare outwardly, (see Fig. 3,) a feature to which I also desire to call attention as facilitating the rapid reversal of the valve H, and hence the successful operation of the engine.

In the piston B is formed the usual annular recess *b'*, which forms an internal exhaust-chamber communicating with opposite

ends of the steam-chest D through the exhaust-passages b^2 b^2 and with the main exhaust I through the exhaust-passage b^3.

It will be noted that the exhaust-passage b^3 does not communicate directly with the main exhaust I, but passes up alongside of the same, and is turned to enter it in such a manner that as it approaches its point of connection therewith it has substantially the same direction as the main exhaust I, thus entirely removing the back pressure from the main exhaust to the internal exhaust-chamber, which has heretofore existed in this class of engines and greatly impeded their successful operation. It will be further noted that when arranged as herein shown and described an injector action is produced which tends to keep the internal exhaust-chamber free from water, which is of the greatest advantage in engines of this type.

The exhaust-passages b^2 b^2 are alternately closed by the piston B, as usual in this type of engine.

On each side of the chamber b' the piston B is provided with two packing-rings b^4 and b^5, the ring b^4 being preferably located adjacent to the outer end of the piston and the ring b^5 adjacent to the chamber b'.

The ring b^4 may be of any suitable construction, but I prefer to construct the ring b^5 as follows:

Referring more particularly to Figs. 4 and 5, b^6 represents an elastic packing-ring divided at b^7 preferably by a diagonal division, as usual in devices of this class. The ring b^6 forms the inner section of the packing-ring b^5, the outer section of which is formed by another ring b^8, which is divided at b^9 along a broken line to form the interlocking shoulders or projections n and n'. The interlocking shoulders n and n' effectually prevent any leakage of steam through the ring b^8 along its line of division. It is to be further noted that the point of division b^7 of the ring b^6 and the point of division b^9 of ring b^8 are upon opposite sides of the ring b^5, which tends also to prevent leakage of steam by the ring b^5.

The advantage which I claim for the hereinbefore-described arrangement of the packing-rings b^4 and b^5 is that any steam leaking by the packing-ring b^4 cannot pass into the exhaust-chamber b' and by its presence there impede the operation of the machine, but is held between the two rings b^4 and b^5 and, passing through one of the passages b^2, helps to throw the valve H, thus facilitating the operation of the machine. It is also to be noted that by adapting the construction to a valve H, having a center piston and two end pistons and forming two steam-chambers in the end pistons, I am enabled to throw the valve H with much less steam than is required in constructions heretofore proposed.

The operation of my invention has already been sufficiently described in connection with the foregoing description of the form and arrangement of its parts.

I therefore claim as novel and desire to secure by Letters Patent—

1. In a rock-drill engine the combination of a cylinder, a piston working therein, an internal exhaust-chamber formed on the piston, a steam-chest, suitable steam-passages connecting the steam-chest with the cylinder and internal exhaust-chamber, a valve working in the steam-chest comprising a stem carrying pistons located substantially at its center and at its opposite ends and forming two steam-chambers on the valve, and annular steam-grooves formed in the pistons at opposite ends of the valve, arranged to take live steam at all positions of the valve, and communicating with opposite ends of the valve-chest, substantially as described.

2. In a rock-drill engine, the combination of a cylinder, a piston working therein, an internal exhaust-chamber formed on the piston, a steam-chest, suitable steam-passages connecting the steam-chest with the cylinder and internal exhaust-chamber, a valve working in the steam-chest, packing-rings on the piston adjacent to opposite ends of the internal exhaust-chamber, and packing-rings on the piston adjacent to its opposite ends, said rings being positioned upon said piston with reference to said steam-passages to allow steam passing the outer rings to enter said passages to assist in the operation of the valve when the exhaust takes place at either end, substantially as described.

3. In a rock-drill engine the combination of a cylinder, a piston working therein, an internal exhaust-chamber formed on the piston, a steam-chest, a main exhaust, steam-passages connecting the internal exhaust-chamber with the steam-chest, and an exhaust-passage connecting the internal exhaust-chamber with the main exhaust and arranged to discharge into the main exhaust in substantially the direction of the flow of steam through the main exhaust, substantially as described.

In testimony whereof I have hereunto set my hand, in the presence of two attesting witnesses, this 3d day of June, 1896.

JOSEPH GRANDMAISON.

Witnesses:
BENJAMIN PHILLIPS,
A. E. WHYTE.