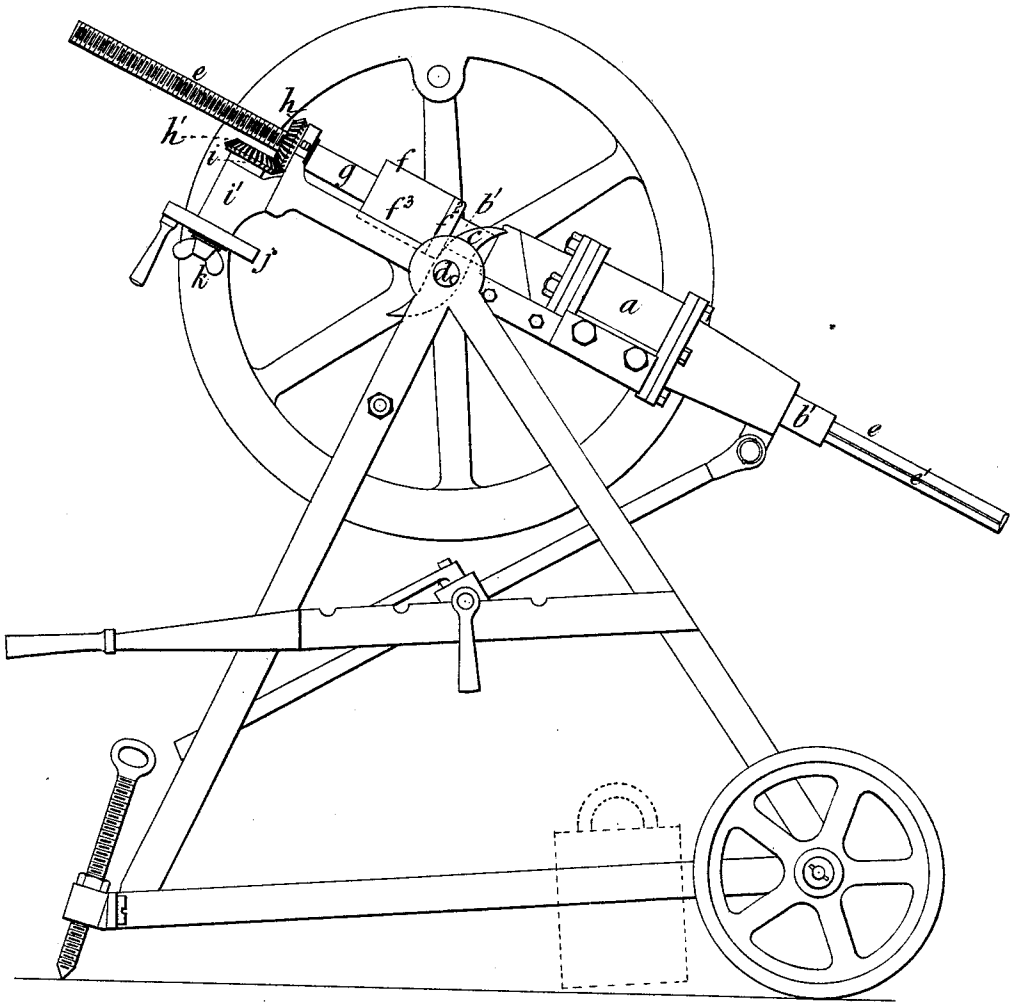
3 Sheets—Sheet 1.

T. B. JORDAN.

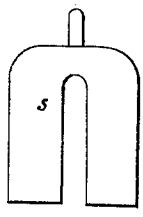
Machine for Drilling or Boring Rocks.

No. 201,017. **Patented March 5, 1878.**

Fig. 1.



Witnesses:
Floyd Norris.
D. P. Cowl



Thos. Brown Jordan
Inventor.
by Johnson & Johnson
Atty's

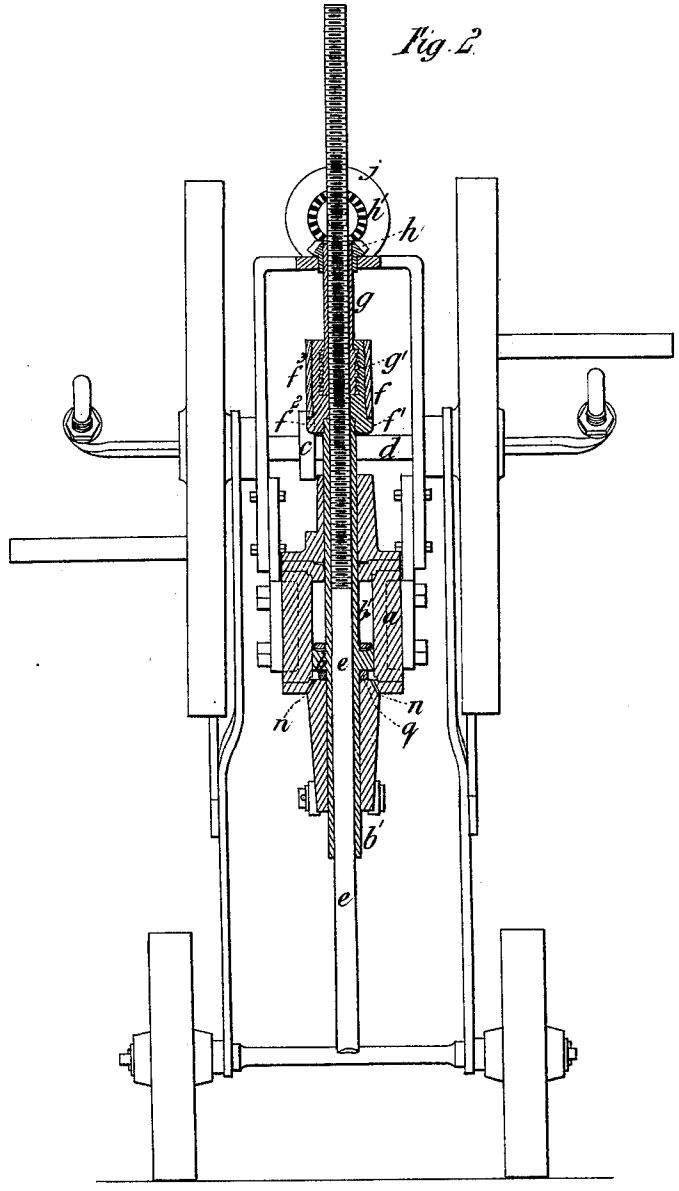
3 Sheets—Sheet 2.

T. B. JORDAN.

Machine for Drilling or Boring Rocks.

No. 201,017. **Patented March 5, 1878.**

Fig. 2.



Witnesses:
Floyd Norris.
D. P. Cowl

Thos Brown Jordan
Inventor.
by Johnson & Johnson
Attys

3 Sheets—Sheet 3.

T. B. JORDAN.

Machine for Drilling or Boring Rocks.

No. 201,017. **Patented March 5, 1878.**

Fig. 3.

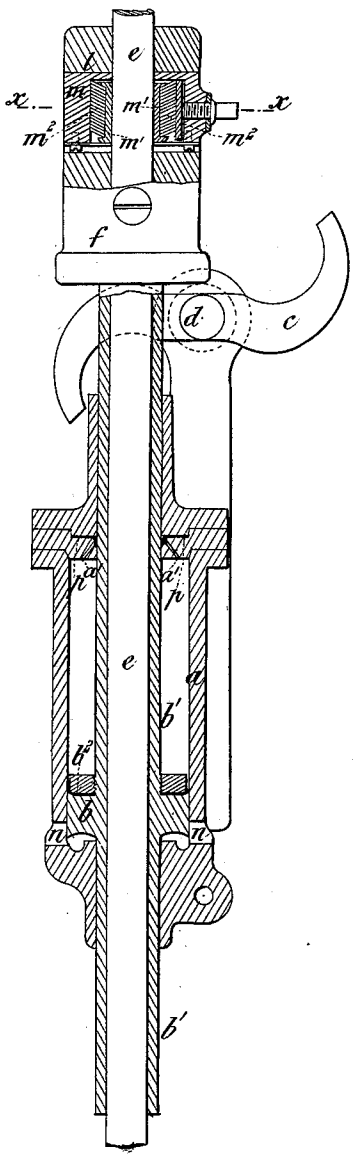


Fig. 4

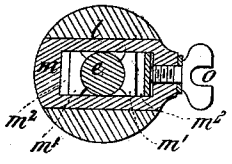
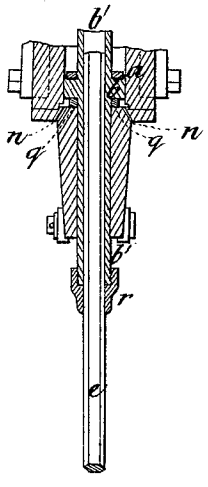


Fig. 5



Witnesses:

Floyd Norris

D. P. Lowe

Thos Brown Jordan

Inventor,

by Johnson & Johnson

Atty's

UNITED STATES PATENT OFFICE.

THOMAS BROWN JORDAN, OF LONDON, ENGLAND.

IMPROVEMENT IN MACHINES FOR DRILLING OR BORING ROCKS.

Specification forming part of Letters Patent No. **201,017**, dated March 5, 1878; application filed December 28, 1877; patented in England, February 2, 1877, for fourteen years.

To all whom it may concern:

Be it known that I, THOMAS BROWN JORDAN, of the firm of Thomas B. Jordan, Son & Meihé, engineers and contractors, of London, England, have invented an Improved Machine for Drilling or Boring Rocks and other hard substances, of which the following is a specification:

My invention relates to an improved machine for drilling or boring rocks and other hard substances.

The said machine comprises the employment of a pneumatic cylinder fitted with a piston which is drawn toward the top of the cylinder by the action of a revolving cam or cams fixed on a shaft, which may be rotated by hand-power applied to a winch, or by gearing with any first mover. The said piston is packed by a cup-leather or otherwise, so that it becomes a perfectly air-tight partition between the portions or volumes of air on each side of it when it is rising, but permits air to pass by it in its descending stroke to compensate for any small amount of leakage which may occur. The said piston is fitted with a tubular rod, which works through a stuffing-box or leather collar in the top cover of the cylinder, or in both covers. If in the top cover only, I provide holes in the bottom cover or lower part of the cylinder to allow a free passage for the air to the under side of the piston—that is to say, I prefer this construction; but I do not confine myself to the same, as it is obvious that my invention may be carried into practice with a vacuum on the under side and a plenum on the upper side of the piston; or the vacuum only may be used with substantially the same result. When the said piston is drawn up by the action of the revolving cam the whole of the air above it will be compressed into the space between its top side and the under side of the cylinder-cover; and as this space may bear any determined proportion to the whole contents of the stroke, it is obvious that the machine may be made to work under any required pressure, so as to utilize to the best advantage the power at command.

The requisite turning of the drill is effected by the action of the said cam on the under side of a device termed the "lifting-block;" and in combination with the said block and cam I use a peculiar device for feeding forward the drill or tool in the said machine, as hereinafter described.

In order that the construction and operation of my said invention may be fully understood, I refer to the accompanying drawings, in which—

Figure 1 is a side elevation of a machine intended for drilling vertical or slightly-inclined holes. Fig. 2 is a view looking in the direction of the arrow, Fig. 1, with the cylinder, piston, and its hollow rod shown in section. Fig. 3 is a longitudinal section, showing various modifications in the said machine. Fig. 4 is a horizontal section on the line $x\,x$, Fig. 3. Fig. 5 shows portions of the said machine, and illustrates a modification in the form of the drill-bar and device for insuring the turning of the same with the piston-rod.

Similar letters indicate corresponding parts throughout the drawings.

a is the cylinder; b, the piston; b', the tubular rod. c is the cam. d is the cam-shaft; e, the drill-bar; f, the lifting-block, which is screwed on the top of the tubular piston-rod, and is so constructed as to hold the drill-bar in connection with it by the means hereinafter described.

The said improvements, relating to the feed of the drill, are carried into practice by cutting a screw on the upper part of the drill-bar e and fitting on the latter a long nut, g, which is free to turn in the lifting-block f, but is kept in place endwise therein by the interior collars g', or by other suitable means. The said block is preferably constructed in two halves or parts, $f^1\,f^2$, secured together upon the nut by the external screwed sleeve f^3. The upper part of this nut g slides longitudinally through a miter or bevel wheel, h, a distance equal to the length of the drill's stroke; but the said nut g is connected with the wheel h by a groove and key or feather, so that the nut g cannot turn without turning the wheel h with it—that is to say, the said long nut g is capable of longitudinal motion independently of the wheel h, but is not capable of rotation or axial movement independently of the said wheel. The connection between the tubular piston-rod and the drill-bar in such a manner as to

permit the drill-bar to slide through the piston-rod, while insuring their turning together, is in the machine shown in Fig. 1 effected by means of a longitudinal groove, *e'*, in the drill-bar and a key or feather projection from the piston-rod into the said groove.

The miter-wheel *h* is geared with another miter-wheel, *h'*, on a short shaft or journal, *i*, which is fitted to turn in a suitable bearing, *i'*, and is provided with a hand-wheel, *j*, arranged in combination with a friction device, whereby the said wheel may be held or released, as desired. This device consists of a nut, *k*, fitted on a screw-thread on the end of the shaft *i*, and which may be screwed tightly against the face of the wheel *j*, thereby causing sufficient friction to stop or retard the movement of the wheels and shaft *j*, *h'*, and *i*; but, instead of this nut *k*, I may use a friction-strap or other suitable contrivance.

When the machine is at work the lifting-block *f* and tool-bar *e* are turned or revolved by the action of the cams *c* on the block, as above described. If the wheels *h h'* are held or clamped by the said device *k*, the action of the cams on the block and through the medium of the piston-rod will turn the screwed tool-bar *e*, so that it works through the nut and feeds forward the drill or tool; but if the said wheels and nut are not held or restrained by the said clamp or holding device *k*, there will be nothing to prevent the turning of the nut with the bar *e*, and therefore the feed movement will be more or less diminished. It will therefore be seen that the rate of feed or advance of the tool may be readily controlled by the said holding device or clamp, and can be regulated or adjusted to suit the quality or character of the rock or other substance being drilled or perforated. By means of the hand-wheel *j* the feed may also be effected by hand when desired.

In the modification of this device illustrated in Figs. 3 and 4, the lifting-block is mortised, as shown at *l*, to receive the clamping-frame *m*. m^1 m^1 are two pieces of gun-metal or other suitable material, fitted to the bar *e* on one side and made flat on the back or other side. m^2 m^2 are steel plates, the back edges of which are on one side in contact with the end of the said frame, and on the other side with a pressing-piece adjustable by the screw *o*.

It will be seen that from the position of these plates, when the lifting-block is struck upward by the aforesaid cam, there will be a tendency to give them greater inclination, and to relax their hold or pinch on the bar *e*; but when the block *f* is released, and the pressure in the cylinder brings down the piston to deliver its blow, the tendency is to decrease the inclination of the plates and increase the tenacity of the hold or pinch of the said plates on the bar; hence I have a clamp which is easily moved upward on the bar, but can only be moved downward with great difficulty, so that I get the whole force of the blow on the rock without griping the bar so positively or rigidly as to prevent the self-adjustment of the feed according to the hardness of the rock. To permit this adjustment to be obtained as nearly as possible by hand, I use the screw *o*, by which any desired amount of constant friction can be put on the bar.

In Fig. 3, *n n* are the holes in the lower part of the cylinder *a*, for permitting the free access of air to the under side of the piston *b*.

In some instances I may form a small hole, or any desired number of such holes, through the body of the piston and through the top cover of the cylinder, and fit these holes with valves acting in such a manner that when the piston is depressed to the bottom of the said cylinder all the air will pass to the top or upper portion of the cylinder, which will then, by the action of the said valves, be full of air; or I may accomplish this object by forming a portion of the piston-rod taper or conical, and fitting the piston *b* with a capability of sliding a short distance, so that in certain positions of the said piston there will be a space between the same and the rod on this taper or conical portion. The said piston is in this case provided with leather or other suitable packing material on its upper side. This device forms a valve, and allows the air to pass from one side of the piston to the other side at the proper times; but I prefer the construction above described, wherein the cup-leather b^2 serves the purpose of a valve, and allows the air to pass up through a small space around the periphery of the piston *b* during the down ward stroke of the latter, as above specified.

p is the leather collar in the top cover. *q* is a cushion of india-rubber or other like material at the bottom of the cylinder.

In some instances I dispense with this cushion. *a' a'* are holes to permit the compressed air in the cylinder to have free access to the packing *p*, to assist in making it tight around the piston-rod.

In Fig. 5, I have shown a drill-bar which is hexagonal in transverse section, and whose connection with the tubular rod b^1, in such a manner as to permit it to slide through the said rod while insuring its turning with it, is effected by a screw-nut, *r*, which is made hexagonal in the part that fits the said bar, and which nut is screwed upon the end of the piston-rod, as shown.

The frame or stand shown in Figs. 1 and 2 is a very convenient one for supporting the aforesaid machine and permitting its adjustment into various positions; but I may use any other suitable frame or stand. *s* is a weight, which is hung upon any convenient part of the frame or stand for steadying the machine when in operation.

What I claim is—

1. In a rock-drilling machine, a hollow piston-rod, b^1, driven forward by compressed air, combined with the drill-rod *e*, the cylinder *a*, a lifting-block carried by said hollow piston-rod, and a long nut, *g*, carried by said lifting-block, and having a rotary movement inde-

pendent thereof, for operation substantially as herein set forth.

2. The combination, in a drilling-machine, of the air-compressing cylinder *a*, the piston *b*, its tubular rod b^1, and screw-threaded drill-bar *e* with the lifting device *c f*, the feed device *g h h'*, and the stopping or retarding device *i j k*, all constructed for operation substantially as herein set forth.

3. In a rock-drilling machine, the lifting-block *f* of the tubular piston-rod b^1, united to the long nut *g* by means of the annular collars *g'*, for the purpose stated.

4. The combination, in a rock-drilling machine, of the air-compressing cylinder *a* and the opposite piston tubular extensions *b* with the tubular lifting-block *f*, carried by one of said piston tubular extensions, and a drill-carrying rod having a longitudinal feed movement within and through said piston tubular extensions and the tubular lifting-block, substantially as herein specified.

5. The holes *a'* in the upper end of the air-compressing cylinder *a*, in combination with the packing *p*, to assist in packing the tubular piston-rod, as specified.

6. The cup-packing b^2 on the upper side of the piston, in combination with the air-compressing cylinder *a* and said piston, whereby the air is allowed to pass up around the periphery of said piston during its downward stroke, and to close said space during the ascent of the piston, as specified.

7. The lifting-block *f*, constructed of the parts $f^1 f^2$, and combined with the long nut *g*, and the external screwed securing-sleeve f^3, as set forth.

THOS. B. JORDAN.

Witnesses:
LEWIS SANDERSON,
JOHN DEAN.