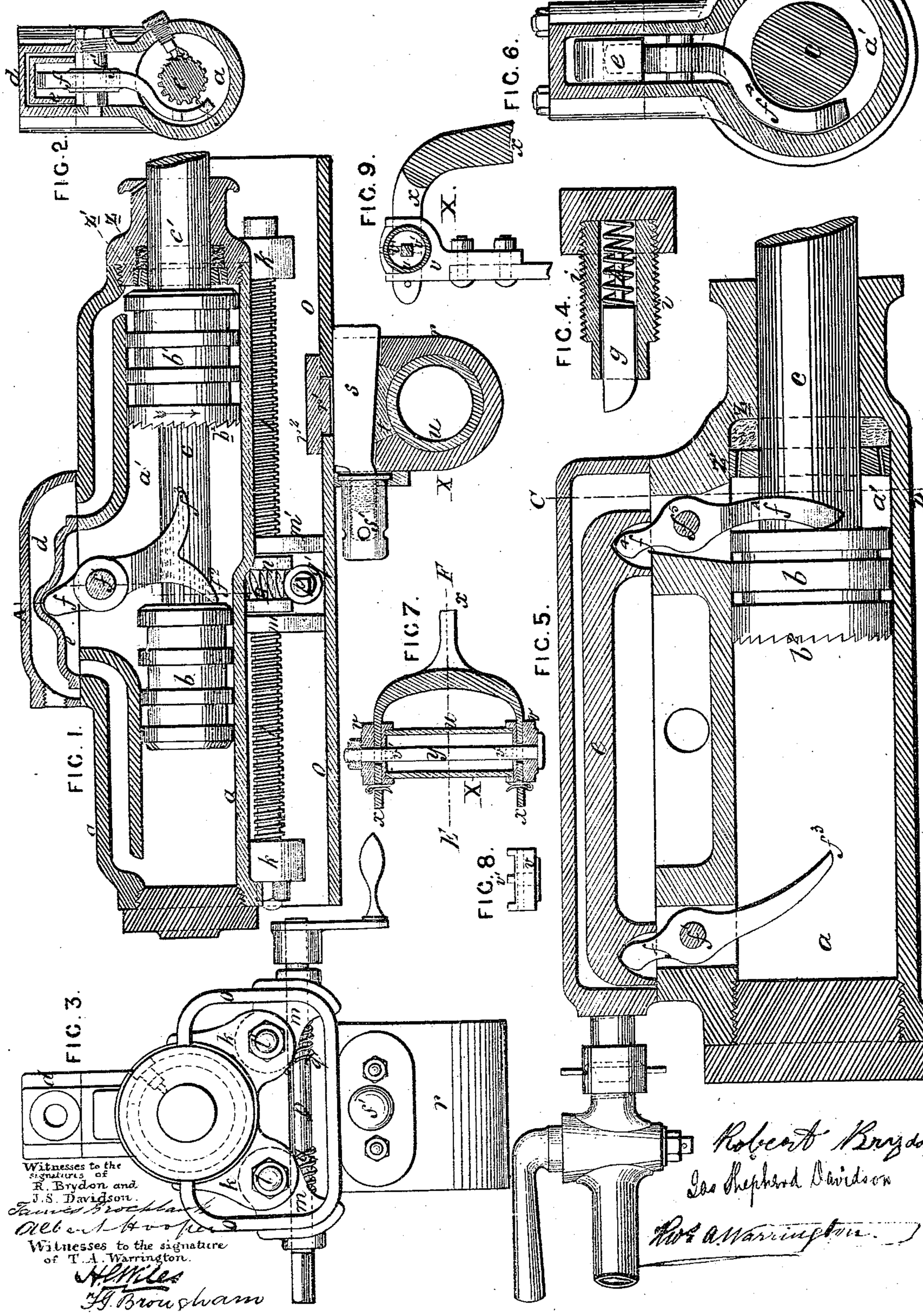
R. BRYDON, J. S. DAVIDSON & T. S. WARRINGTON.

Rock-Drilling Machines.

No. 148,924. Patented March 24, 1874.



UNITED STATES PATENT OFFICE.

ROBERT BRYDON AND JAMES S. DAVIDSON, OF WHITEHAVEN, AND THOMAS A. WARRINGTON, OF LEWISHAM, GREAT BRITAIN.

IMPROVEMENT IN ROCK-DRILLING MACHINES.

Specification forming part of Letters Patent No. **148,924**, dated March 24, 1874; application filed December 31, 1873.

To all whom it may concern:

Be it known that we, ROBERT BRYDON and JAMES S. DAVIDSON, of Whitehaven, in the county of Cumberland, England, and THOMAS A. WARRINGTON, of Lewisham, in the county of Kent, England, have invented certain Improvements in Rock-Drilling Machines, of which the following is a specification:

Our invention relates to certain improvements, fully described hereafter, in that class of rock-drilling machines in which the cutting or boring tool or drill is attached to and actuated by a reciprocating piston-rod, the object of our invention being to render such machines more simple and efficient in construction and operation, and less liable to derangement than usual.

In the accompanying drawing, Figure 1 is a longitudinal section of a rock-drilling machine with our improvements; Fig. 2, a transverse section of a portion of the machine on the line A B, Fig. 1; Fig. 3, an end elevation; Fig. 4, a detached sectional view drawn to an enlarged scale; Figs. 5 and 6, longitudinal and transverse sections of a modified form of machine; Fig. 7, a sectional plan of part of the base or tripod on which the machine is supported; Fig. 8, a detached view of part of said base; and Fig. 9, a sectional elevation on the line E F, Fig. 7.

The interior of the steam-cylinder, shown in Fig. 1, instead of being of uniform diameter throughout, as usual, is of greater diameter at the end a', which is lowermost, when the machine is in working position, than at its upper end a, and to these two portions of the cylinder are adapted corresponding pistons b and b^1, both attached to the piston-rod c, to the end c^1 of which the cutting tool or drill is secured in the usual manner. Our object in thus constructing the cylinders of two different diameters is to permit the tool to be drawn back quickly on the return stroke, and to compensate for the loss of piston area due to the presence of the piston-rod. d is the steam-chest, within which slides the valve e. We dispense entirely with the usual external valve-rods, stuffing-boxes, &c., and actuate the valve e from within the cylinder through the medium of a lever, f, having its fulcrum at f^1, and formed with branches f^2 and f^3, as shown, which are struck alternately by the two pistons, in order to operate said lever and valve.

As shown in Fig. 1, the return stroke has commenced, the enlarged lower end a' of the cylinder being open to the steam, and the reduced upper end a being open to the exhaust. The valve e will remain in the position shown until the arm f^3 of its lever f is struck and turned by the inner face of the advancing piston b^1, when the said valve will be reversed or moved sufficiently to open the upper end a of the cylinder to the steam, and the lower end a' to the exhaust, and so on alternately. The face b^2 of the piston b^1 has ratchet-teeth formed upon it, with which the point f^3 of the lever f engages, and thus, owing to the curvilinear movement of said lever, causes the piston, and consequently the piston-rod and drill, to be turned in the direction of the arrow, Fig. 1, during their rearward movement. We prevent the accidental rotation of the piston-rod and drill during the forward stroke by means of a bolt, g, beveled at one edge, and forced against the longitudinally grooved or channeled portion c of the piston-rod by a spiral spring, h, contained in a tube, i, which is screwed into the cylinder between the two pistons, as shown in Figs. 2 and 4. The beveled end of the spring-bolt enters one of the longitudinal grooves of the piston-rod and effectually prevents its accidental rotation during the forward stroke without interfering with its positive rotation by the lever f during the rearward stroke. We dispense with the usual external stuffing-box in the cylinder-head for the passage of the piston-rod, and substitute in place of the same the arrangement shown in Figs. 1 and 5, which consists of packing material z, introduced into an internal recess on the inner side of the cylinder-head, and retained therein by a perforated washer or ring, z', which permits free access of the steam to the packing. Two parallel screw-rods, l and l', are attached to lugs $k\,k$ at the opposite ends of the exterior of the cylinder, and each passes through two brackets, $m\,m'$, of a casing or jacket, o, which partially surrounds the cylinder, and which so

guides and supports the latter as to permit it to be longitudinally adjusted thereon, for the purpose of feeding or withdrawing the drill. (See Figs. 1 and 3.) Each screw-rod is adapted to a correspondingly-threaded nut, *n*, retained between the brackets *m m'* of the jacket, and the said nuts have worm-teeth cut upon their exterior curved surfaces into which gear worms *q* and *q'* on a transverse shaft, *p*, adapted to bearings on the jacket, and provided with an operating handle or handles, by turning which both nuts *n* may be operated simultaneously and in either direction, as the cylinder and the tool carried by the same are to be advanced or retracted. The jacket *o* is connected to the base or main supporting frame X of the machine by a universal joint, which permits the said jacket to be adjusted to and retained at any required position or angle.

The construction of this joint is as follows: A boss, *r*, Figs 1 and 3, turns on a horizontal bar, *u*, carried by the stand X, and to this boss is attached a headed pivot, r^1, slotted, as shown, so as to receive a wedge, *s*. A loose bearing-plate, *t*, is interposed between the bar *u* and the wedge, and when the latter is tightened up by its nut *s'*, the jacket *o* will be prevented from turning on the pivot r^1 by being tightly clamped between the head r^2 of the said pivot and the wedge, and the boss *r* will, in like manner, be prevented from turning on the bar *u* by the plate *t*, which will be forced tightly against said bar by the wedge.

The base or stand X (see Figs. 7, 8, and 9) has three legs, *v v* and *x*, the two former of which are enlarged at their upper ends to form cheek-pieces, through slots in which pass the forked ends of the leg, *x*. The cheek-pieces have projections *v'* on their inner sides, to which are adapted corresponding notches in the opposite ends of the tubular bar *u*, and the whole of said parts is rigidly secured together by a binding-screw, *y*, as best observed in Fig. 7.

The portion of our invention which relates to the operation of the slide-valve from within the cylinder, thereby dispensing with external appliances, is applicable to single-piston cylinders of an uniform diameter throughout, as well as to those having two pistons; but in such case it is necessary to employ two levers, *f*, as shown in the modification of Figs. 5 and 6—one to operate the valve when the piston has reached the limit of its movement in one direction, and the other when it has reached the limit of its movement in the opposite direction.

We claim as our invention—

1. In a rock-drilling machine, a piston, b^1, adjoining the drill-rod, a smaller piston, *b*, and a rod connecting the two pistons, in combination with a cylinder common to both pistons, all as set forth.

2. The combination of the lever *f* with a piston having ratchet-teeth b^2, adapted to the pointed end of said lever, as set forth, for the purpose specified.

3. The combination of the longitudinally-grooved or channeled piston-rod with a beveled spring-bolt, *g*, for the purpose described.

4. The combination, substantially as described, of the internal packing *z*, and perforated ring or washer *z'*, with the cylinder and piston-rod.

5. The combination of the cylinder and jacket *o* with the screws *l l'*, nuts *n*, shaft *p*, and worms *q q'*, all arranged and operating substantially as and for the purpose described.

6. The combination of the threaded wedge *s*, its nut *s'*, the headed pivot r^1, boss *r*, and bearing-piece *t*, with the jacket *o* and cross-bar *u* of the base, all constructed and operating substantially as and for the purpose set forth.

7. The stand or tripod X, consisting of legs *v*, *v*, and *x*, tubular cross-bar *u*, and binding-screw *y*, all constructed and combined substantially in the manner described.

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