No. 849,506. PATENTED APR. 9, 1907.

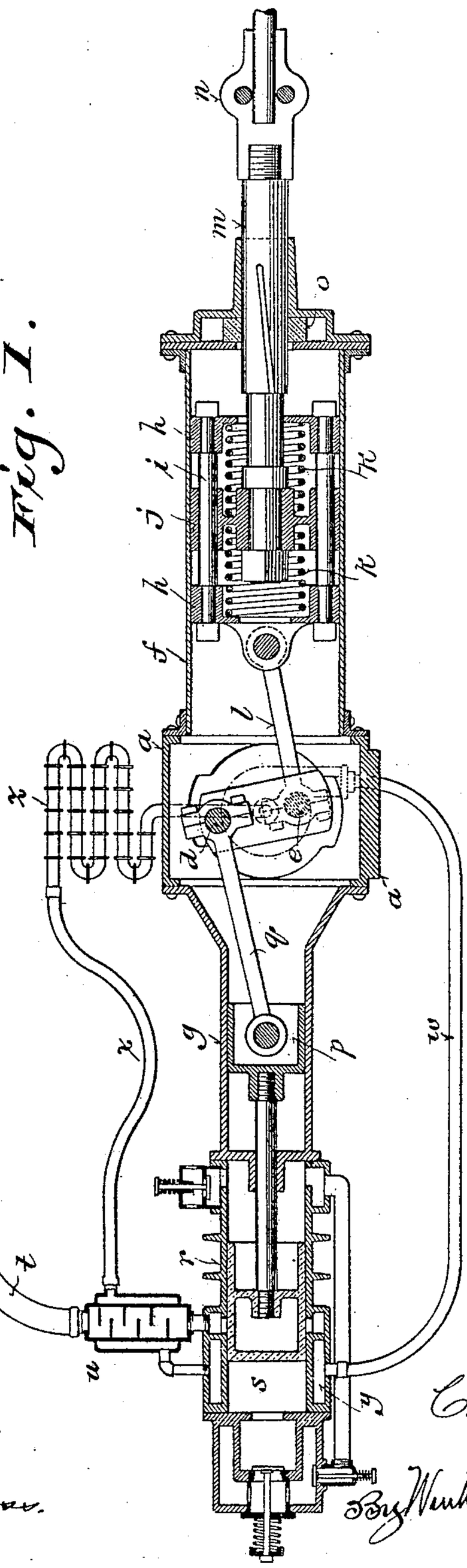
C. E. SHADALL.

ROCK DRILL.

APPLICATION FILED MAR. 31, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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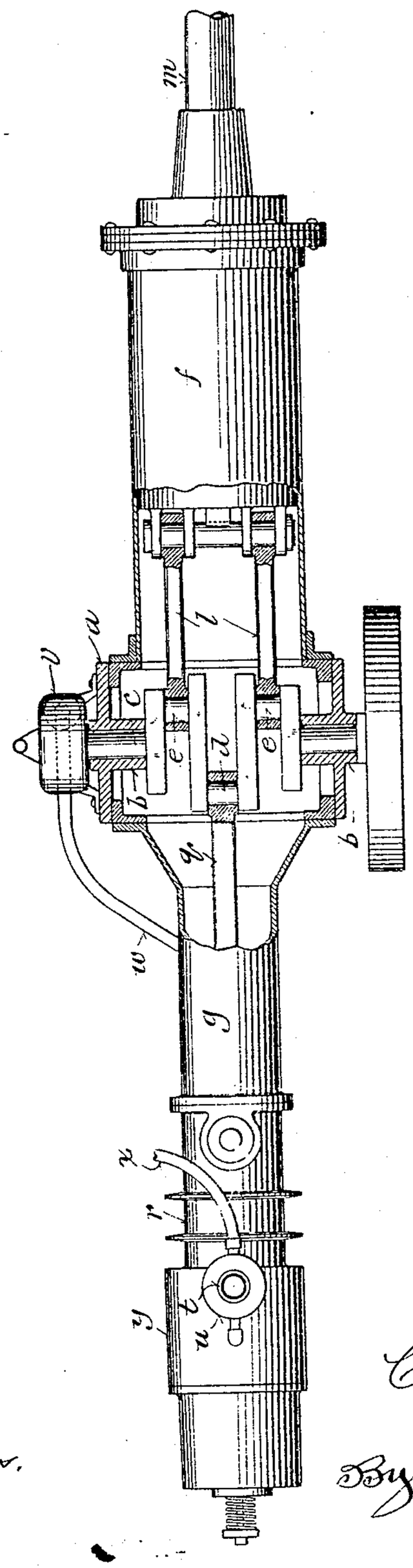
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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ROCK-DRILL.

No. 849,506. Specification of Letters Patent. Patented April 9, 1907.

Application filed March 31, 1905. Serial No. 253,018.

To all whom it may concern:

Be it known that I, CHARLES E. SHADALL, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The main objects of this invention are to produce a balanced portable machine furnished with a motor and suitable for mining or prospecting operations, and generally to improve the construction and operation of machines intended for this class of work.

It consists in certain novel features of construction and in the peculiar arrangement and combinations of parts hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in both figures.

Figure 1 is a vertical longitudinal section of a rock-drill embodying my invention. Fig. 2 is a plan view of the same, the crank-case and inner ends of the cross-head guides being broken away and shown in horizontal section.

a designates the crank-case, formed or provided in the ends with journal-bearings *b*, in which the crank-shaft *c* is mounted. The crank-shaft has three cranks *d* and *e e*, the middle crank *d* being opposite and somewhat longer than the cranks *e*. To opposite sides of the crank-case are attached at right angles to the crank-shaft and in line with each other cylindrical guides *f* and *g*. In the guide *f* is fitted a reciprocating cross-head composed of end pieces *h*, connected by guide-rods *i*, an intermediate thrust-bearing *j*, movably mounted on said rods, and spiral springs *k*, interposed between the thrust-bearing and the end pieces of the cross-head and normally holding said thrust-bearing midway between the end pieces. This cross-head is connected by two rods or pitmen *l* with the cranks *e e*.

m is the drill-shaft, fitted to turn at its inner end in a central sleeve or box of the thrust-bearing, in which it is held against endwise movement by a collar and nut. It is provided at its outer end with a drill holder or chuck *n* and has a guiding bearing in the head of the guide *f*. It is formed with spiral grooves engaged by a nut *o*, which is confined in the head of said guide and is like or similar to those employed in this class of drills for turning the drill a part of a revolution every time it is withdrawn.

In the guide *g* a reciprocating cross-head *p* is fitted, and it is connected by a rod or pitman *q* with the crank *d*. To the outer end of the guide *g* the cylinder *r* of a reciprocating explosive-engine is attached, and the piston *s* of the engine is directly connected by its rod with the cross-head *p*. The cross-head *p* and piston *s* are made to counterbalance the cross-head at the other end of the machine to which the drill is attached.

Other forms of explosive-engines or motors may be employed to turn the crank-shaft and may be arranged and connected with the crank-shaft in various ways. In case the engine or motor is not attached to the end of the guide *g* and connected with the crank-shaft through the cross-head *p* the weight of said cross-head will be correspondingly increased to counterbalance the cross-head on the opposite side of the crank-shaft.

To prevent fouling the air in a mine, shaft, tunnel, or the like, for work in which this machine is specially designed, and to admit of the employment of a gas or oil engine for operating the drill, the hot spent gases discharged from the engine are conducted from the engine to a waste-pipe leading to the mouth of the mine, shaft, or tunnel through a rubber hose or flexible pipe *t*, which permits the machine to be advanced or changed in position as the work progresses without disturbing the exhaust connection of the engine.

To admit of conducting off the exhaust from the engine through a rubber hose without destroying or injuring the hose, the spent gases have to be cooled down as they are discharged from the engine, and for this purpose a cooler *u* is interposed between the hose *t* and the exhaust-port of the engine. This cooler is provided inside with alternating baffle-plates and on the outside with a jacket through which water or other suitable cooling medium is circulated.

A rotary pump *v*, mounted on one end of the crank-case *a* and driven by the crank-shaft, is connected by hose or pipes *w* and *x* with the cooling-jacket *y* of the engine-cylinder and with the jacket of the cooler *u*, which

is connected in turn with the jacket *y*, so that the pump will cause the water or other cooling medium to flow through and from one jacket to and through the other. To reduce the temperature of the water or other cooling medium in case it is continuously circulated through the pump by means of connections like or similar to those shown in the drawings, a coil or other form of radiator is interposed between the pump and the return-pipe or hose *x*.

It will be understood that the machine is to be mounted on a tripod or supporting-frame provided with a screw for advancing it to and withdrawing it from its work, like or similar to those employed with this class of drills.

The machine operates as follows: The motor, which in the present case is a two-cycle gas or oil engine, being started, the crank-shaft is turned, and the cross-heads connected therewith are moved simultaneously in opposite directions, alternately approaching and receding from each other, so that the equilibrium or balance of the machine which is centrally supported on the tripod or frame is preserved while the machine is in action. The shock of the blows struck by the drill with the outward strokes of the shaft *m* or the recoil of the drill is received by the spring between the inner end piece *h* and the thrust-bearing *j*, and thus prevented from breaking or injuring the machine. The springs between the end pieces and thrust-bearing of the cross-head with which the drill is connected also allow for variation in the stroke of the drill.

While the machine is at work, the pump *v* circulates the water or other medium used to cool the engine-cylinder and the spent gases discharged therefrom through the jacket *y*, the jacket of the cooler *u*, and the radiator *z*, so that such spent gases may be conducted off through the flexible hose *i* without injury thereto and without contaminating the air in the vicinity of the machine.

Various changes in the details of construction and in the arrangement of the component parts of the machine may be made without materially affecting its operation and without departing from the principle and intended scope of the invention.

I claim—

1. In a rock-drill the combination of a frame provided with journal-bearings and with guides arranged transversely to said bearings, a crank-shaft mounted in said bearings and provided with oppositely-directed cranks, reciprocating cross-heads connected with opposite cranks and tending to counterbalance each other as they are moved simultaneously in opposite diections, and a drill-operating shaft connected with one of said cross-heads, substantially as described.

2. In a rock-drill the combination of a frame provided with journal-bearings and with guides arranged transversely to said bearings, a crank-shaft mounted in said bearings and having oppositely-directed cranks, counterbalancing heads carried by said guides and connected with said cranks, and a drill-holder movably mounted in said frame in line with one of said heads which is adapted to impart endwise impulses thereto, substantially as described.

3. In a rock-drill the combination of a crank-case provided at the ends with journal-bearings and on opposite sides with guides arranged in line with each other, a crank-shaft mounted in said bearings and having oppositely-directed cranks, reciprocating cross-heads carried by said guides and connected with said cranks, a drill-operating shaft revolubly connected with one of said heads, and means for turning said shaft in said head when it is reciprocated therewith, substantially as described.

4. In a rock-drill the combination of a crank-case provided with journal-bearings and with guides projecting from opposite sides thereof; a crank-shaft mounted in said bearings and having opposite cranks; a cross-head carried by one of said guides and connected with one of said cranks, said cross-head comprising end pieces connected by guide-rods, a thrust-bearing mounted on said guide-rods, and springs interposed between said end pieces and thrust-bearing; a drill-operating shaft connected with said thrust-bearing; and a counterbalancing cross-head carried by the other guide and connected with the other crank, substantially as described.

5. In a rock-drill the combination of a crank-case provided with journal-bearings and with guides projecting in opposite directions therefrom; a crank-shaft mounted in said bearings and provided with opposite cranks; a cross-head carried by one of said guides and connected with one of said cranks, said cross-head comprising end pieces connected by guide-rods, a thrust-bearing movable on said rods, and springs interposed between said end pieces and thrust-bearing; a drill-operating shaft revolubly connected at one end with said thrust-bearing and provided at the other end with a drill-holder; a nut confined in the associated guide for turning said drill-shaft; and a counterbalancing cross-head carried by the other guide and connected with the other crank, substantially as described.

6. In a rock-drill the combination of a crank-case provided in the ends with journal-bearings and on opposite sides with cylindrical guides; a crank-shaft mounted in said bearings and having three cranks, the middle crank being opposite the other two; cross-heads fitted in said guides and connected one with the middle crank and the other with the two outer cranks; and a drill-operating shaft

connected with one of said cross-heads which the other tends to counterbalance, substantially as described.

7. In a rock-drill the combination of a crank-case provided with journal-bearings and on opposite sides with guides; a crank-shaft mounted in said bearings and having opposite cranks; cross-heads carried by said guides and connected with said cranks; a drill-operating shaft revolubly connected with one of said cross-heads which the other tends to counterbalance; and a motor mounted with said crank-case and guides for turning said shaft, substantially as described.

8. In a rock-drill the combination of a crank-case provided with journal-bearings and on opposite sides with guides at right angles to said bearings; a crank-shaft mounted in said bearings and provided with opposite cranks; cross-heads carried by said guides and connected with said cranks; a reciprocating motor comprising a cylinder attached at one end to the outer end of one of said guides and a piston connected with the associated cross-head; and a drill-operating shaft connected with the other cross-head, substantially as described.

9. In a rock-drill the combination of a frame provided with journal-bearings and with guides arranged transversely to said bearings, a crank-shaft mounted in said bearings and provided with oppositely-directed cranks, counterbalancing-heads mounted on said guides and connected with said cranks, a drill-holder movably mounted in said frame in line with one of said heads which is adapted to impart endwise impulses thereto, and a motor mounted on said frame and connected with said crank-shaft, substantially as described.

10. In a rock-drill the combination of a frame provided with journal-bearings and with guides arranged transversely to said bearings, a crank-shaft mounted in said bearings and provided with oppositely-directed cranks, counterbalancing-heads mounted on said guides and connected with said cranks, a drill-holder revoluble and movable endwise in said frame in line with one of said heads which is adapted to impart endwise impulses thereto, means for intermittently turning said drill-holder, and a motor mounted on said frame and connected with said crank-shaft, substantially as described.

11. In a rock-drill the combination of a frame provided with crank-bearings and with guides arranged transversely to said bearings, oppositely-directed cranks journaled in said bearings, counterbalancing-heads mounted on said guides and connected with said cranks, and a reciprocating drill-holder mounted in said frame in line with one of said heads which is adapted to impart endwise impulses thereto, substantially as described.

In witness whereof I hereto affix my signature in presence of two witnesses.

CHARLES E. SHADALL.

Witnesses:
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BERNARD C. ROLOFF.