

No. 637,809.

Patented Nov. 28, 1899.

A. E. W. MEISSNER.
RECIPROCATING DRILL.

(Application filed Dec. 8, 1897.)

(No Model.)

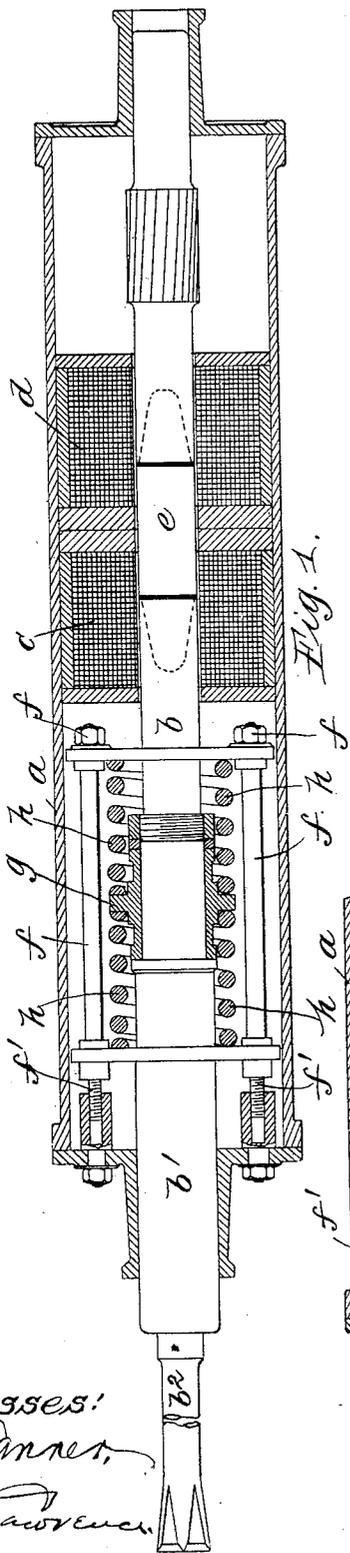


Fig. 1.

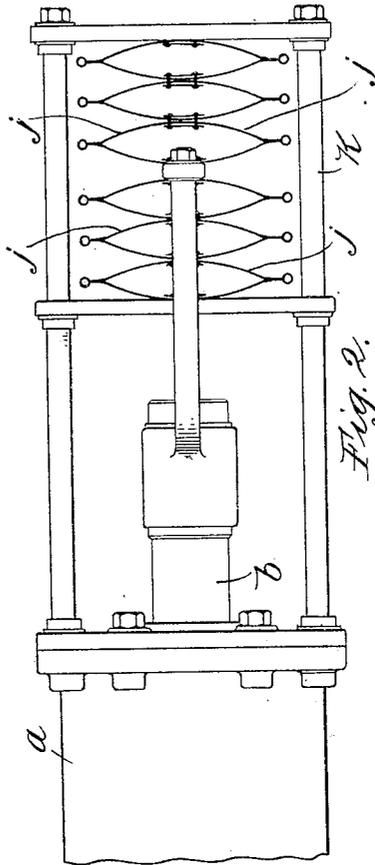


Fig. 2.

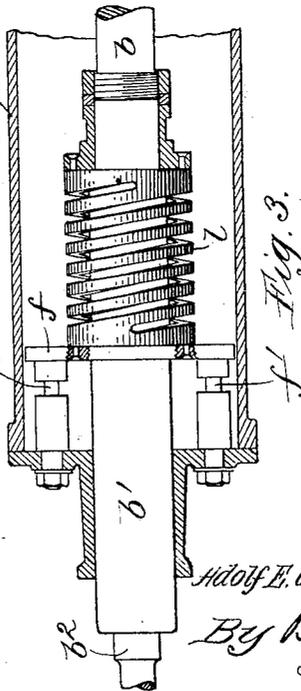


Fig. 3.

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UNITED STATES PATENT OFFICE.

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RECIPROCATING DRILL.

SPECIFICATION forming part of Letters Patent No. 637,809, dated November 28, 1899.

Application filed December 8, 1897. Serial No. 661,185. (No model.)

To all whom it may concern:

Be it known that I, ADOLF EMIL WALDEMAR MEISSNER, a subject of the Emperor of Germany, residing at Charlottenburg, Germany, have invented new and useful Improvements in Reciprocating Drills, (Case No. 95,) of which the following is a specification, reference being had to the accompanying drawings, forming a part of this specification, and for which Letters Patent have been granted in Germany, No. 92,345, dated May 12, 1896; in Norway, No. 5,733, dated December 22, 1896, and in the South African Republic, No. 1,318, dated February 2, 1897.

My invention relates to improvements in percussion or reciprocating drills, and has for its object the provision of means for securing the impact of a drill with less strain upon the machine and also a structure affording means for withdrawing the drill from its position within the hole, and thus preventing said drill from sticking or becoming cramped therein.

I am aware that it is not novel to provide in drills of this type a buffer-spring which is adapted to receive the excessive throw of the drill-rod and break the force of the blow or to employ springs as yielding connections between the actuating part and the drill-rod, my invention consisting in so mounting the drill-rod within its casing by means of springs that an even reciprocating or vibrating movement of the drill is secured without the useless expenditure of power in compressing a spring or springs operating in opposition to the actuating force of the drill.

The improvement of my invention may be briefly described as consisting in providing a spring or springs associated with the reciprocating drill-rod, whereby the motion of said drill-rod to either extremity of its stroke serves to act upon a spring and store sufficient energy to assist in returning said rod to the other extremity of its stroke.

My said invention will be more readily understood by reference to the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view of a drill mounted in accordance with my inven-

tion. Fig. 2 is a modification thereof, and Fig. 3 is a view of a special form of spring which I have found advantageous in its application to the above structure.

Like parts are indicated by the same letters of reference in the several figures of the drawings.

I have illustrated in the accompanying drawings only the drill-casing and associated parts, inasmuch as my invention relates solely to the mounting of the reciprocatory drill-rod, and the drawings are thereby made more clear.

In Fig. 1 I have illustrated a reciprocatory drill provided with a casing *a*, wherein are mounted the drill-rod *b*, actuating-solenoids *c d*, and a paramagnetic core *e*, forming a portion of the drill-rod and adapted to secure the reciprocatory movement of the same as the magnets are alternately energized. Upon said drill-rod *b* are provided the drill-stock *b'* and drill *b²*. My invention, however, is as readily applicable to other forms of this type of drill wherein the movement is imparted by means of a piston and compressed air or other mechanical equivalents.

In the front portion of the casing is rigidly but adjustably mounted the spring-carriage *f* by means of threaded adjusting-bolts *f'*, engaging corresponding threaded parts upon said carriage. This carriage may consist of two transverse heads rigidly connected by parallel rods, which latter are continued beyond one head to form said bolts *f'*. Upon the reciprocating drill-rod and within said carriage is mounted a collar having an annular shoulder *g*, which collar is removably held to the rod by threads in any suitable manner and which shoulder is engaged by the inner ends of opposing springs *h h*, secured at their outer ends in and to the heads of the spring-carriage, preferably under some tension.

The ordinary buffer-spring I do not consider necessary and have not shown the same in the above device, although, if desired, a buffer-spring may be employed in connection with my improved spring-mounting for the drill-rod above described. The said buffer-spring, however, as ordinarily used is adapted to break the force only of an abnormal or ex-

cessive impact of the reciprocating part, and my improved structure ordinarily subserves the same function.

When the electromagnets are alternately energized, the core *e* is rapidly drawn first within onesolenoid and then within the other, imparting a powerful vibratory motion to the drill-rod *b* and its connections and alternately compressing the springs *h h*. Thus on the outward movement of the drill by the push of the farther electromagnet the forward spring *h* is compressed and sufficient energy is stored therein to withdraw the drill from the hole when acting in conjunction with the pull of the rear electromagnet. The movement of the said drill-rod may accordingly be likened to that of a pendulum, the same playing against the alternate tension of the two springs, which gives said drill-rod an elasticity of motion not otherwise obtainable. It will be seen, however, that when the device is in action no unnecessary expenditure of power is involved in thus accomplishing the compression of the springs, inasmuch as said springs are preferably made of approximately equal strength, and the energy stored in one of said springs upon the outward stroke will serve to force the drill-rod inward and secure approximately a corresponding tension in the other spring upon the reverse movement of said drill-rod.

I have indicated the preferred structure in the description above, but for various purposes other modifications of this may be found desirable. For example, when the reciprocation of the drill-rod exceeds a certain velocity the several helices of this type of spring are apt to strike one another at each extremity of the throw, and thus deaden or partially nullify the free vibratory effect secured by my improved construction. Accordingly I have shown in Fig. 2 a modification of my device adapted particularly for quarry-drills or those working vertically, wherein a plurality of opposing elliptical springs *j* are substituted for the helical springs of the preferred type. This structure cannot, however, well be made as compact, since the elliptical springs are preferably mounted without the casing in a special spring-carriage *k*, provided at one extremity of the drill-frame or casing, yet which carriage is rendered adjustable, as shown.

For a drill having a short throw or when a very compact structure is desired I have employed a double helical spring *l*, (illustrated in Fig. 3,) which is preferably formed by cutting double parallel spirals from a steel tube capable of being suitably tempered. This spring when employed is firmly attached both to the spring-carriage or corresponding part within the casing and to the reciprocating drill-rod and serves alternately as an expansion and compression spring, thus accomplishing the functions of the double springs shown in the other two forms of my improved mounting for drills. By thus providing springs to

store and redirect an excess of energy at either extremity of the throw of the reciprocating parts of a drill I am enabled to materially reduce the strain upon the drill itself, while in no wise lessening the force of the impact imparted by the driving power, and I also furnish means for withdrawing the drill from the hole.

It is obvious that other modifications than those specifically described herein may be made without departing from the spirit of my invention, and I do not desire to be understood as thus limiting the same.

Having now described and shown a reciprocating drill equipped according to my invention, what I claim as new, and desire to secure by these Letters Patent, is—

1. In a drill, the combination with the casing, a drill-rod, and a collar removably held by threads on the latter; of a spring adjustably connected at one end to the casing and attached at its other end to said collar, and an electric motor devoid of springs and entirely independent of said spring for reciprocating the drill-rod, as and for the purpose set forth.

2. In a drill, the combination with the casing, a spring-carriage therein, and threaded connections between these parts for permitting the adjustment of the carriage bodily; of a reciprocating drill-rod moving through the casing and carriage, a spring attached at one end to said carriage, connections between its other end and the drill-rod, and means entirely independent of the spring for reciprocating said rod through a predetermined path, as and for the purpose set forth.

3. In a drill, the combination with the casing, a spring-carriage rigidly connected therewith, and the reciprocating drill-rod; of a shoulder connected with the rod, opposed springs whose inner ends constantly engage said shoulder and whose outer ends are attached to the heads of said carriage, and means entirely independent of the spring for reciprocating said rod, as and for the purpose set forth.

4. In a drill, the combination with a spring-carriage, a reciprocating drill-rod, and opposed springs under tension within said carriage, their outer ends being attached to its heads and their inner ends connected to said rod at a point normally midway between such carriage-heads; of means entirely independent of the spring for reciprocating said rod, as and for the purpose set forth.

5. In a drill, the combination with a spring-carriage having two heads, a reciprocating drill-rod, a collar removably mounted on the rod within the carriage and having a shoulder, and opposed springs under tension with their outer ends attached to the heads of the carriage and their inner ends constantly engaging said shoulder; of means entirely independent of the spring for reciprocating said rod, as and for the purpose set forth.

6. In a drill, the combination with the cas-

ing, a spring-carriage therein, adjustable connections between them, a reciprocating drill-rod moving through the casing and carriage, and a shoulder carried by the rod within the carriage; of opposed springs within the carriage having their outer ends attached to its heads and their inner ends engaging said shoulder, and an electric motor within the casing for reciprocating the drill-rod entirely independent of the springs, as and for the purpose set forth.

7. In a drill, the combination with the casing, a spring-carriage therein having two rigidly-connected and separated heads, adjustable connections between the casing and

carriage, a reciprocating drill-rod moving through the casing and carriage, and a shoulder carried by the rod within the carriage; of opposed springs under tension within the carriage having their outer ends attached to its heads and their inner ends engaging said shoulder, and an electric motor for reciprocating the drill-rod entirely independent of the springs, as and for the purpose set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

ADOLF EMIL WALDEMAR MEISSNER.

Witnesses:

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PAUL ROEDIGER.