

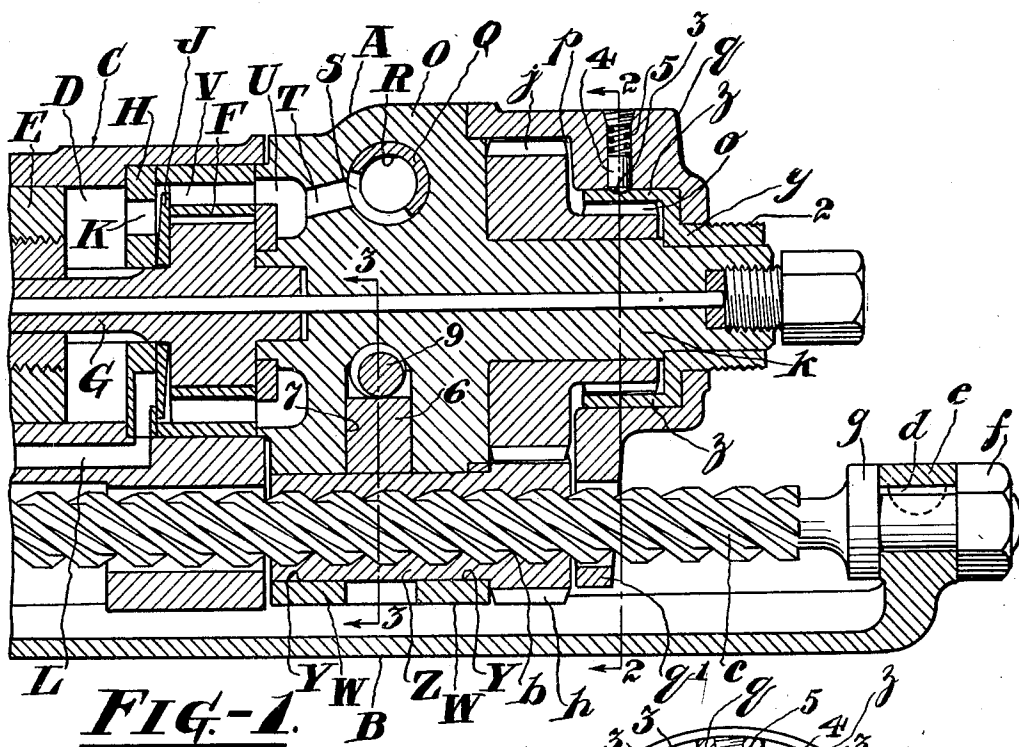
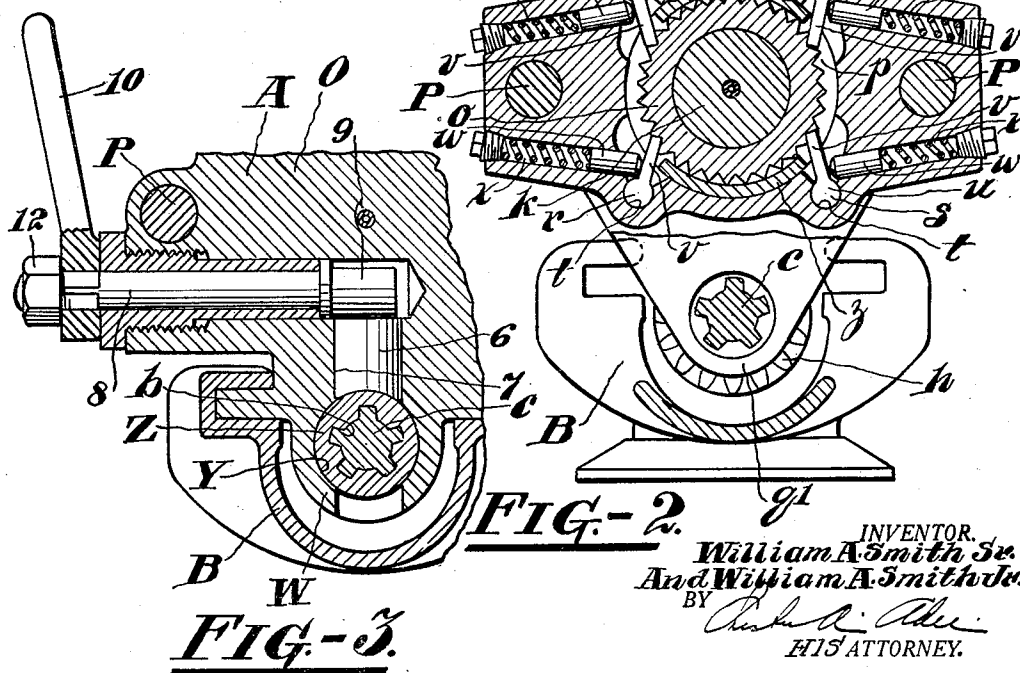
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FEEDING DEVICE

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UNITED STATES PATENT OFFICE

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FEEDING DEVICE

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This invention relates to feeding devices, but more particularly to a feeding device for a percussive motor mounted on a support whereby it is guided with respect to the work.

One object of the invention is to utilize the force of the jar resulting upon reversal of the hammer piston of the motor for actuating the motor towards the work and to retract it therefrom.

Another object is to at all times assure the proper operative position of the motor with respect to the working implement which the hammer piston is adapted to actuate into the work.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings illustrating a preferred form of the invention and in which similar reference characters refer to similar parts,

Figure 1 is a longitudinal sectional elevation of a feeding device constructed in accordance with the practice of the invention and showing it applied to a percussive motor and its support, and

Figures 2 and 3 are transverse views taken on the lines 2—2 and 3—3 of Figure 1 looking in the directions indicated by the arrows.

Referring more particularly to the drawings, A designates a motor and B a support whereon the motor is mounted and with respect to which the motor A is adapted to slide to and from the work.

For the purpose of this invention the motor A is illustrated as a rock drill comprising a cylinder C having a piston chamber D wherein is disposed a reciprocatory hammer piston E for delivering blows of impact to a working implement, such as a drill steel (not shown).

In the rear end of the cylinder C is rotation mechanism of a well known type including a ratchet ring F disposed fixedly in the cylinder and a rifle bar G which extends into the piston and wherewith it is interlockingly engaged to effect rotary movement of the piston and thus also for the working implement in a well known manner.

Other elements for which the cylinder C forms a receptacle are a rear cylinder washer

H which forms a closure for the rear end of the piston chamber D and also a seat for a distributing valve J whereby the distribution of pressure fluid to the piston chamber D is controlled. Such pressure fluid may flow to the ends of the piston chamber D through rear and front inlet passages K and L controlled by the valve J.

A closure is provided for the rear end of the cylinder C in the form of a back head O which may be clamped to the cylinder C by means of side bolts P disposed on opposite sides of the motor A. Among other functions the back head O serves as a housing for a throttle valve Q which may be of the rotary type having a central chamber R into which pressure fluid from a suitable source of supply may be constantly admitted. The throttle valve Q is further provided with a supply port S adapted to register with a supply passage T which opens into a supply reservoir U also in the back head O, and in the ratchet ring H are a series of ports V to convey pressure fluid from the supply reservoir U to the distributing valve J.

In accordance with the practice of the invention means are provided to effect actuation of the motor A along the support B so that the hammer piston E may at all times be maintained within proper striking relation with the working implement against which it strikes. To this end the back head O is provided with a depending lug or lugs W having bores Y to receive a nut Z which is provided with internal threads *b* for the reception of a screw *c*. The screw *c* is disposed within the support B and extends longitudinally thereof and may be supported at its ends by the extremities of the support B.

The screw *c* may be held against rotary movement in any suitable manner, as for instance, by means of a key *d* which interlocks with the end of the screw and also with a bearing *e* arranged at the end of the support B. The screw *c* may be additionally secured against movement with respect to the support by a nut *f* threaded on the end of the screw and seating against the outer or rear end of the bearing *e*, while a collar *g*

forming an integral part of the screw *c* abuts the opposite or inner end of the bearing *e*.

The nut *Z* is of the rotary type and in the present instance carries on its rear end, that is, that portion of the nut extending rearwardly of the back head *O*, gear teeth *h* which mesh with a gear *j* journaled on a cylindrical projection *k* on the rear end of the back head *O* and in this instance forming a portion thereof.

Associated with the gear *j*, as for instance, by forming an integral part thereof, is a ratchet wheel *o* which preferably is also journaled on the projection *k*. The gear *j* and the ratchet wheel *o* are arranged in a chamber *p* of a casing *q* seated against the back end of the back head *O* to which it may also be secured by means of the side bolts *P*. In the present instance the casing *q* carries a depending flange or skirt *q'* which lies across the rear end of the nut *Z* to act as an abutment therefor.

An additional function of the casing *q* is to serve as a bearing for pawls, designated according to pairs, as *r* and *s*. To this end the casing *q* is provided with a series of apertures or bores *t* to receive the trunnions *u* of the pawls. The pawls of each pair are preferably arranged on diametrically opposite sides of the ratchet wheel *o* and acting against the wings *v* of the pawls are spring-pressed plungers *w* to press the pawls into engagement with the teeth of the ratchet wheel *o*. The plungers *w*, together with their springs, may be conveniently arranged in bores *x* in the casing *q*.

Means are provided for controlling engagement of the several pairs of pawls with the teeth of the ratchet wheel *o*. To this end a sleeve *y* is disposed on the cylindrical projection *k* whereon it is rotatable and said sleeve is provided with a pair of wings *z* which lie over the periphery of the ratchet wheel *o* and extend between the pawls so that, upon manipulation of the sleeve *y*, each wing may trip either the pawls *s* or *r*, depending upon the direction in which the sleeve is being rotated. The sleeve projects rearwardly of the casing *q* and the projecting portion of the sleeve may be suitably knurled to form a roughened surface or grip portion 2 whereby the sleeve *y* may be manipulated.

To the end that the sleeve *y* may be held fixedly in either of its limiting positions, that is, to trip either pair of pawls *s* or *r*, or in a neutral position to enable all the pawls to engage the ratchet wheel *o*, one of the wings *z* is provided with a series of depressions, such as those designated by 3, for engagement with a spring pressed plunger 4 operable in an aperture 5 in the casing *q*.

Whenever the sleeve *y* occupies a neutral position all of the pawls *r* and *s* may be in engagement with the ratchet wheel *o* as hereinbefore indicated. In such case, of

course, the motor *A* will be held against any form of movement with respect to the support *B*. There are instances during the operation of apparatus of this type, however, where it may be desirable to merely retard the movement of the motor relatively to its support. The motor is accordingly provided with a suitable braking device illustrated in this instance as a brake shoe 6 slidable in a bore 7 in the back head *O*.

The means whereby the brake shoe 6 may be forced into frictional engagement with the nut *Z* consists of a shaft 8 in the back head *O* wherein it is journaled and having an eccentric portion 9 adapted to be forced into engagement with the brake shoe 6 upon rotation of the shaft 8. The shaft 8 is accordingly provided with a lever 10 which interlocks with the shaft 8 and is clamped securely in position on the shaft by means of a nut 12.

The operation of the device is as follows: Let it be assumed that it is intended to enable the motor *A* to be actuated in a forwardly direction towards the work and that the hammer piston *E* is in operation to deliver its blows against the working implement. In order to effect such movement of the motor, the sleeve *y* is rotated to trip the pawls *r* out of engagement from the ratchet wheel *o*.

During the subsequent operation of the hammer piston the jar resulting from the act of reversal of the hammer piston in the front end of the cylinder *E*, and which jar will be imparted to the motor *A*, will act to move the motor in the direction of the work. The nut *Z* being journaled in the back head will then be caused to rotate on the stationary screw *c* and the rotary movement of the nut will be transmitted through the pinion *h* and the gear *j* to the ratchet wheel *o* which will turn in a counterclockwise direction as Figure 2 is viewed.

Upon partial rotation of the ratchet wheel, the pawls *s* will be tripped thereby. As the teeth in the ratchet wheel pass over the ends of the pawls *s* said pawls will be actuated by their respective spring-pressed plunger *w* to assume positions for engaging the teeth on the ratchet wheel and thus act as abutments to prevent rotation of the nut *Z* in a counter direction at the instant of reversal of the hammer piston *E* in the rear end of the piston chamber *D*.

Continued operation of the hammer piston, during which time, of course, the working implement is being driven into the work, will result in a gradual advancement of the motor *A* in the direction of the work so that the hammer piston *E* will at all times be maintained in a position relatively to the working implement in which the most effective force of the blows of the hammer piston may be obtained.

After the drilling operation is completed or after the motor has advanced in a forwardly direction along the support to the limit of its extent, the sleeve *y* may be oscillated to its other limiting position. In the new position of the sleeve *y* the wings *z* will be removed from contact with the pawls *r*. The pawls *r* will then be actuated by their plungers *w* so that the said pawls may act as abutments for the teeth on the ratchet wheel *o* and the pawls *s* will then be tripped out of engagement from the teeth on the ratchet wheel.

With the hammer piston continuing its operation, only the jar imparted thereby to the motor by the hammer piston in the rear end of the piston chamber D will be effective to move the motor A relatively to the support B. At the opposite end of the stroke of the hammer piston E, the motor will be held against movement with respect to the support by the train of elements comprising the nut Z, the screw *c* and the ratchet and pawl devices, together with the gear train interposed between the ratchet wheel and the nut Z. In this way the motor A may be rapidly retracted by the vibrations resulting from operation of the hammer piston E until the motor has reached its rearmost limiting position in the support B, whereupon the sleeve *y* may be rocked to a new position and the supply of pressure fluid to the piston chamber D may be cut off by means of the throttle valve Q.

We claim:

1. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor longitudinally of the support, of recoil resistance means for the motor comprising a fixed member supported independently of the motor and a rotatable member carried by the motor and being in threaded engagement with the fixed member, said rotatable member being rotated upon movement of the motor relatively to the support, and means for controlling the direction of rotation of the rotatable member.

2. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor longitudinally of the support, of recoil resistance means for the motor comprising a fixed member secured immovably to the support and a rotatable member journaled in the motor and being in threaded engagement with the fixed member, said rotatable member being rotated by the motor upon movement thereof with respect to the support, and abutment means carried by the motor to control the direction of rotation of the rotatable member.

3. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor longitudinally of the support, of recoil resistance means for the motor comprising a fixed member secured immovably to the support and a rotatable member journaled in the motor and being in threaded engagement with the fixed member, said rotatable member being rotated by the motor upon movement thereof with respect to the support, abutment means for the rotatable member, and means for controlling the abutment means to control the direction of rotation of the rotatable member.

4. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being rotated by the motor upon movement thereof relatively to the support, a ratchet wheel connected to be rotated by the nut, abutment means movable into and out of engagement with the ratchet wheel, and means for controlling the abutment means to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support.

5. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being rotated by the motor upon movement thereof relatively to the support, a pinion on the nut, a ratchet wheel journaled in the motor and having a gear to mesh with the pinion, abutment means movable into and out of engagement with the ratchet wheel, and means for controlling the abutment means to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support.

6. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being ro-

tated by the motor upon movement thereof relatively to the support, a ratchet wheel, means for transmitting the movement of the nut to the ratchet wheel, abutment means movable into and out of engagement with the ratchet wheel, and means for controlling the abutment means to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support.

7. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being rotated by the motor upon movement thereof relatively to the support, a ratchet wheel, means for transmitting the movement of the nut to the ratchet wheel, a plurality of pawls carried by the motor and being arranged in pairs about the ratchet, means for pressing the pawls into engagement with the ratchet wheel, and means for tripping the pawls in pairs out of engagement from the ratchet wheel to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support.

8. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being rotated by the motor upon movement thereof relatively to the support, a ratchet wheel, means for transmitting the movement of the nut to the ratchet wheel, a plurality of pawls carried by the motor and being arranged in pairs about the ratchet, means for pressing the pawls into engagement with the ratchet wheel, a rotatable sleeve on the motor having wings extending between the pawls to trip the pawls in pairs, thereby enabling either pair of pawls to be tripped out of engagement from the ratchet wheel thus allowing another pair of pawls to act as abutments for the said ratchet wheel to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support.

9. In a feeding device, the combination with a motor and a support whereon said motor is slidably mounted, a reciprocatory hammer piston in the motor imparting jars thereto for moving the motor with respect to the

support, of recoil resistance means for the motor comprising a screw supported in fixed position independently of the motor and a nut carried by the motor and in threaded engagement with the screw, said nut being rotated by the motor upon movement thereof relatively to the support, a ratchet wheel connected to be rotated by the nut, abutment means movable into and out of engagement with the ratchet wheel, means for controlling the abutment means to determine the direction of rotation of the nut and thus also the direction of movement of the motor with respect to the support, and brake means acting on the nut to retard the movement of the motor with respect to the support.

In testimony whereof we have signed this specification.

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