

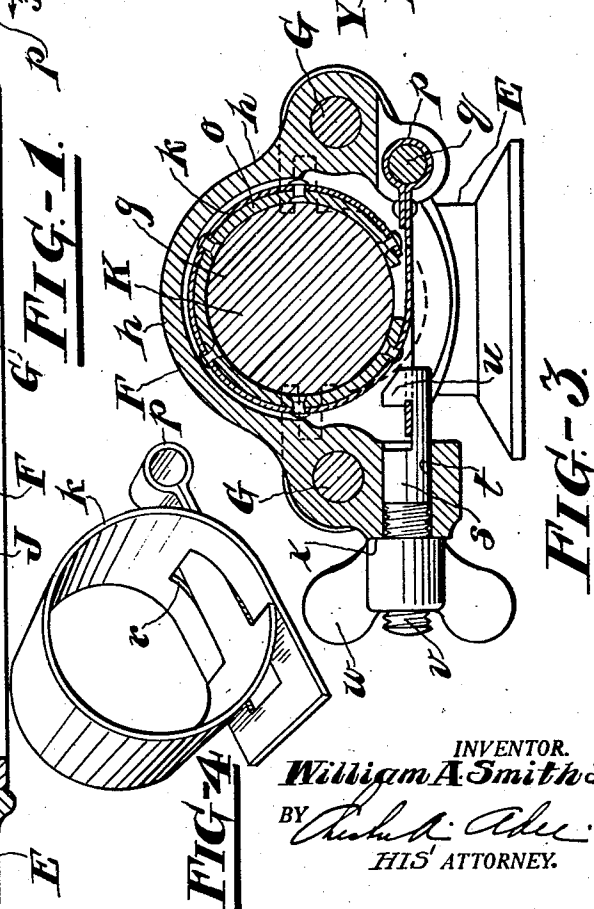
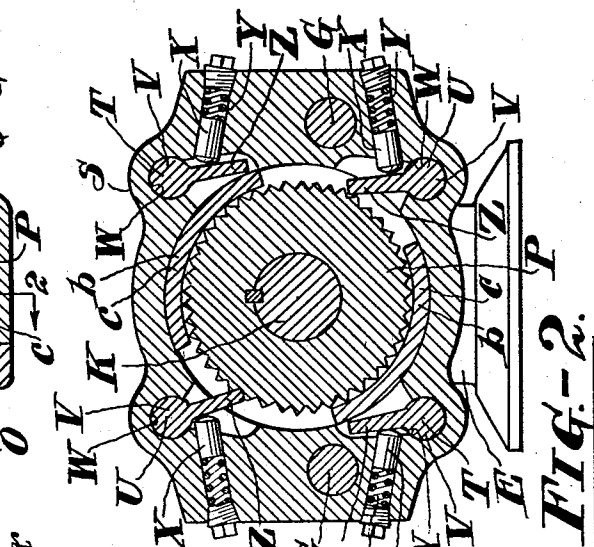
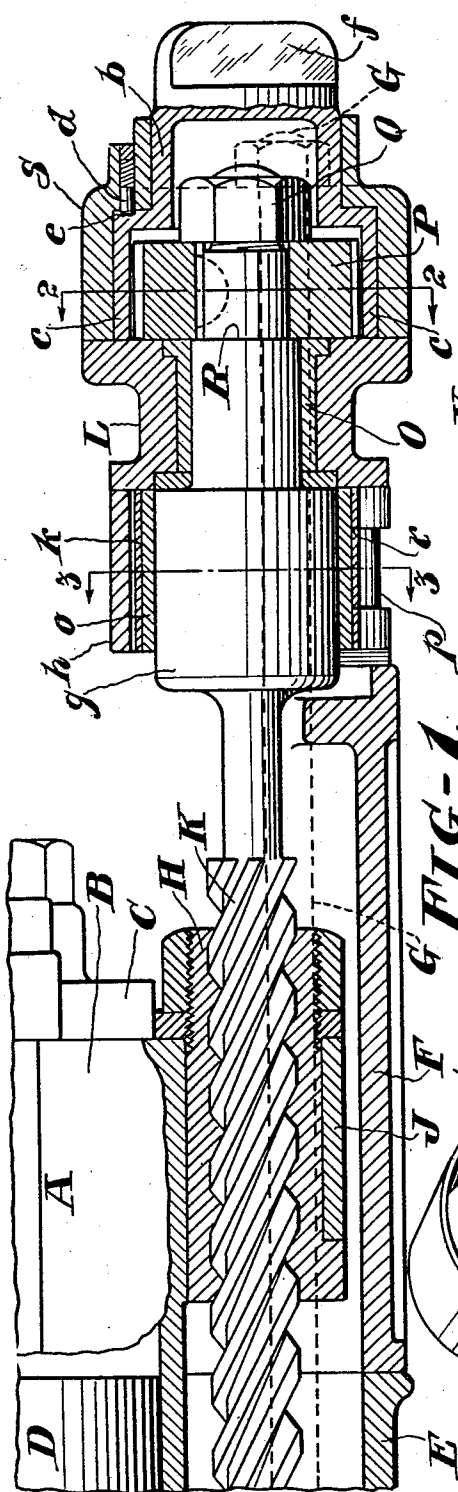
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FEEDING DEVICE

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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 percussive motors, such as rock drills and the like, of the type mounted on supporting devices relatively to which they move to assure the proper operative relationship between the motor and the working implement which the motor is intended to actuate.

One object of the invention is to actuate the motor relatively to its support by the force of the jars imparted to the motor by its hammer piston upon reversal of the hammer piston at the ends of its stroke.

Another object is to assure the continuous actuation of the motor in one direction for moving the motor in the direction of the work or to retract it therefrom.

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

In the accompanying drawing illustrating the invention and in which similar reference characters refer to similar parts,

Figure 1 is a longitudinal elevation, partly in section of the feeding device showing it operatively connected to a reciprocatory motor and its support,

Figures 2 and 3 are transverse views taken through Figure 1 on the lines 2—2 and 3—3 looking in the direction indicated by the arrows, and

Figure 4 is a perspective view of a detail.

Referring more particularly to the drawing, A designates a motor illustrated in this instance as a rock drill and of which only a portion of a cylinder B and a back head C are shown. Within the cylinder B is a reciprocatory hammer piston D to deliver blows of impact to a working implement, such as a drill steel (not shown).

A suitable support is provided for the motor A in the form of a cradle or shell E provided in this instance with a rearward extension F which may be secured to the cradle in a well known manner, as for instance, by side rods G disposed on opposite sides of the shell.

In accordance with the present invention, means are provided to effect the actuation of the motor A longitudinally of the supporting shell E by the jars or shocks to which the

motor is subjected upon reversal of the hammer piston D in the extremities of the cylinder B. To this end a nut H is disposed fixedly within a hollow lug J carried in this instance by the cylinder B. The nut H is internally threaded to receive a correspondingly threaded screw K, only a portion of which is shown, but the front end of which may be supported by the corresponding end of the shell E in the usual manner, that is, rotatably.

The arrangement of the nut H and the screw K is such that in the absence of retarding or restraining means acting upon the screw K, longitudinal movement of the motor A along the support E will cause rotation of the screw K.

A support is provided for the rear end of the screw K in the form of a cross head or bearing L seated in this instance against the rear end of the extension F and being retained in position by the side rods G. Preferably a bushing O is disposed within the cross head L to provide a renewable bearing surface for the cross head.

Means are provided to selectively assure continuous rotation of the screw K in only one direction and thus also to assure continuous movement of the motor A in one direction to either enable the motor to be actuated in the direction of the work or to be retracted therefrom. To this end a toothed ratchet wheel P is disposed on the rear end of the screw K on which it may be keyed or otherwise secured and a nut Q threaded on the extreme end of the screw K serves to clamp the ratchet wheel against a shoulder R on the screw K to maintain said ratchet wheel against longitudinal movement relatively to the screw.

Seated against the rear end of the cross head L is a hollow casing S which forms a protective covering for the ratchet wheel P and also supports a plurality of pawls designated, according to pairs, by T and U. The pawls of each pair are disposed on diametrically opposite sides of the ratchet wheel P and each pawl has a cylindrical portion or trunnion V which is journaled in a correspondingly shaped recess W in the casing S.

To the end that the pawls may at all times be placed under pressure in readiness to engage the teeth of the ratchet wheel P, spring-pressed plungers X are arranged in apertures Y in the casing to act against the outer surfaces of the wings Z of the pawls.

In order to enable the several pairs of pawls to be selectively moved out of engagement from the teeth of the ratchet wheel P so that the other pair of pawls may act as abutments for the ratchet wheel and thus prevent recoil of the motor A when the piston D reverses its direction of travel in one end of the cylinder B, a sleeve b is arranged in the casing S coaxially with the ratchet wheel P and said sleeve is provided with a pair of arcuate wings c which lie over the periphery of the ratchet wheel P and extend between the pawls T and U. The sleeve is rotatable in the casing and upon rotation thereof either pair of pawls may be moved out of engagement from the ratchet wheel P or may be released to enable their respective spring-pressed plungers to press the said pawls into engagement with the ratchet wheel P. The wings c are of such width that in the neutral or intermediate position of the sleeve b the wings c will be out of contact from the pawls so that all of the pawls may simultaneously engage the teeth on the ratchet wheel P. A rib or projection f on the sleeve b affords a convenient grip portion whereby the said sleeve may be rotated.

In the casing S may be arranged a spring-pressed plunger d to engage depressions e in the sleeve b for maintaining the sleeve in either of its limiting positions or in the neutral position.

During certain stages in the operation of devices of this character it is at times desirable that the movement of the motor A relatively to its support may be to some extent retarded. This is particularly the case when first starting a drill hole and also whenever soft rock is encountered and in which latter case the working implement would be rapidly driven through the rock so that only a rifled drill hole would be formed. This is of course objectionable. In order, therefore, to assure against a too rapid advancement of the motor A on its support the screw K is provided with an enlarged cylindrical portion g, preferably located at a point forwardly of the cross head L and, as illustrated, within a guard h which may form an integral portion of the extension F.

Encircling the cylindrical portion g is a brake band k to which is secured a friction band o of suitable braking material. The brake band k is of the resilient expansible type so that when released it will expand to remove the friction band o out of contact from the surface of the cylindrical portion g.

One end of the brake band k, which may be in the form of a loop p, is anchored over

a pin q inserted in the guard h and in this instance extends through a slot r in the opposite end of the band k, thus serving to maintain all portions of the bands k and o in substantially the same transverse plane.

Convenient means are provided to effect contraction of the bands k and o. To this end a bolt s is disposed slidably in an aperture t of the guard h, and said bolt has a hook u which extends into the slot r to engage that end of the band k. The bolt s is disposed slidably in the aperture t and on the threaded portion v of the bolt is a threaded thumb nut w which seats against a surface x of the guard h.

The operation of the device is as follows: Let it be assumed that the motor is in operation, that is, that the hammer piston D is reciprocating within the cylinder B to deliver blows against the working implement. With the motor thus operating it is of course essential that it be kept within the proper operative position relatively to the working implement so that the force of the hammer piston may be effectively applied to the working implement for driving it into the work.

In order to assure this desirable position of the motor, the sleeve b may be rotated in a clockwise direction, as Figure 2 is viewed, to trip the pawls T out of engagement from the ratchet wheel P. Only the pair of pawls designated by U will then remain in the engaging positions to act as abutments for the teeth of the ratchet wheel P.

During the subsequent operation of the motor A and at the end of each forward stroke of the hammer piston a jar will be imparted to the motor of sufficient force to move the motor bodily in the direction of the work. Upon each forward movement of the motor the screw K will be rotated somewhat by the force transmitted through the nut H, and the motor will therefore be gradually advanced towards the work in accordance with the degree of penetration of the working implement into the work.

During the return or rearward stroke of the hammer piston D a similar jar or shock is, of course, also imparted to the motor, but inasmuch as the screw K is held against rotation in a counter direction by the pawls U, the motor A will be effectively held against retractive movement at this point in the cycle of movement of the hammer piston D.

The gradual advancement of the motor A will thus continue until the working implement has been driven into the work to the limit of its extent or until the operation is completed, whereupon the sleeve b may be rotated in a counter-clockwise direction. The wings c will then release the pawls T which will be actuated into engagement with the teeth on the ratchet wheel P by the plungers acting thereagainst.

Upon continued rotation of the sleeve b

in this direction the pawls U will be tripped out of engagement from the ratchet wheel P. Meanwhile the hammer piston D may continue its reciprocations and in the new positions of the pawls, the pawls T will then act as abutments to prevent counterclockwise rotation of the screw K. In consequence, when the hammer piston D reverses its direction of travel in the rear end of the cylinder B, the screw K will be rotated in only a clockwise direction and will be held by the pawls T against counter movement when subjected to the shock imparted to the motor by the hammer piston D upon the reversal of its stroke at the front end of the cylinder B.

Continued operation of the hammer piston D will then cause the motor A to be retracted to its starting position. After the motor reaches its rearmost limiting position, the sleeve b may be rotated to the neutral position to enable all the pawls T and U to engage the ratchet wheel and thus hold the motor against any form of movement relatively to the support until the sleeve b is again rotated to trip one or the other of the pair of pawls out of engagement from the ratchet wheel P.

If, during the operation of the apparatus, it may be found desirable to retard the movement of the motor A relatively to its support, the braking device, such as the bands k and o, may be retracted into frictional engagement with the cylindrical portion g of the screw by turning the nut w on the screw k. As will be readily apparent, variable degrees of braking pressure may thus be applied to the screw K to check the progress of the motor relatively to the support.

I 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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a pair of members in threaded engagement with each other and one of which members is adapted to be rotated by the motor upon movement of the motor on the support, and brake means adapted to contract on the rotatable member for controlling rotation thereof.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a pair of members in threaded engagement with each other and one of which members is adapted to be rotated by the motor upon movement of the motor on the support, brake means encircling

the rotatable member, and means for contracting the brake means to retard 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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a pair of members in threaded engagement with each other and one of which members is adapted to be rotated by the motor upon movement of the motor on the support, a friction band encircling the rotatable member, a resilient band secured to the friction band and being expandible to remove the friction band from contact with the rotatable member, and means for contracting the bands on the rotatable member to control rotary movement thereof.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a stationary member and a rotatable member in threaded engagement with the stationary member, said rotatable member being rotated by the motor upon movement of the motor on the support, a ratchet affixed to the rotatable member, a plurality of pairs of abutment means arranged radially about the ratchet, the abutment means of each pair lying on diametrically opposite sides of the ratchet springs for actuating the abutment means into engagement with the ratchet, and means arranged coaxially with the ratchet for controlling the abutment means to permit engagement thereof in pairs with the ratchet for controlling the direction of rotation of the rotatable member and thus also the direction of movement of the motor relatively 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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a stationary member and a rotatable member in threaded engagement with the stationary member, said rotatable member being rotated by the motor upon movement of the motor on the support, a ratchet affixed to the rotatable member, a plurality of pawls arranged in pairs and the pawls of each pair being arranged on opposite sides of the ratchet, springs for pressing the pawls into interlocking engagement with the ratchet, and means rotatable about

the ratchet wheel for selectively tripping either pair of pawls out of engagement from the ratchet thereby enabling another pair of pawls to control the direction of rotation of the rotatable member.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a stationary member and a rotatable member in threaded engagement with the stationary member, said rotatable member being rotated by the motor upon movement of the motor on the support, a ratchet affixed to the rotatable member, a sleeve rotatable relatively to the pawls and having wings to trip the pawls in pairs, whereby upon rotation of the sleeve either pair of pawls is selectively tripped out of engagement from the ratchet and the ratchet abuts against the other pair of pawls to prevent rotation of the rotatable member upon reversal of the piston in one end of the motor.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a stationary member and a rotatable member in threaded engagement with the stationary member, said rotatable member being rotated by the motor upon movement of the motor on the support, a ratchet affixed to the rotatable member, a plurality of pawls arranged in pairs about the ratchet, the pawls of each pair being disposed on diametrically opposite sides of the ratchet, springs for pressing the pawls into engagement with the ratchet, and means for selectively tripping either pair of pawls out of engagement from the ratchet to control the direction of rotation of the rotatable member.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a pair of members in threaded engagement with each other and one of which members is adapted to be rotated by the motor upon movement of the motor on the support, brake means adapted to contract on the rotatable member for controlling rotation thereof, and means for controlling the direction of rotation of the rotatable member.

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 to move the motor relatively to the support, of recoil resistance means operatively connected to the motor and the support and comprising a pair of members in threaded engagement with each other and one of which members is adapted to be rotated by the motor upon movement of the motor on the support, brake means adapted to contract on the rotatable member for controlling rotation thereof, abutment means for the rotatable member, and trip means to control the abutment means for controlling the direction of rotation of the rotatable member.

In testimony whereof I have signed this specification.

WILLIAM A. SMITH, SR.