June 30, 1942. W. W. PAGET 2,288,542

DRILLING APPARATUS

Original Filed April 19, 1939 2 Sheets-Sheet 1

Fig. 1.

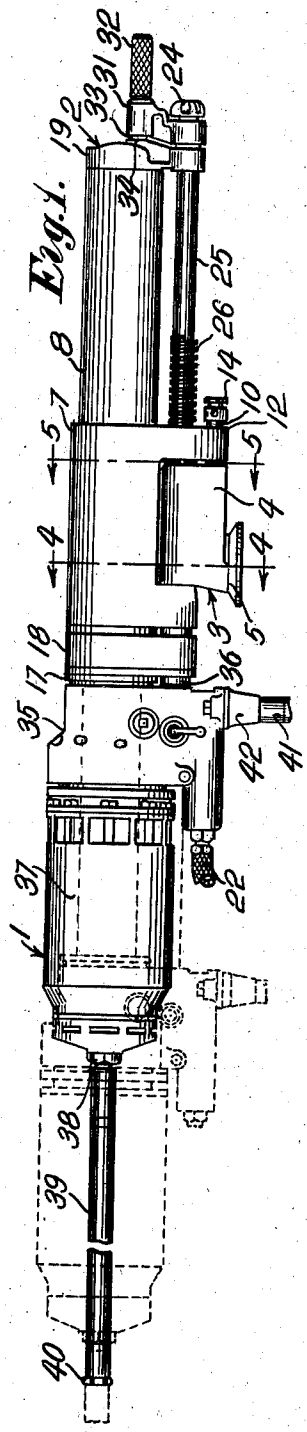
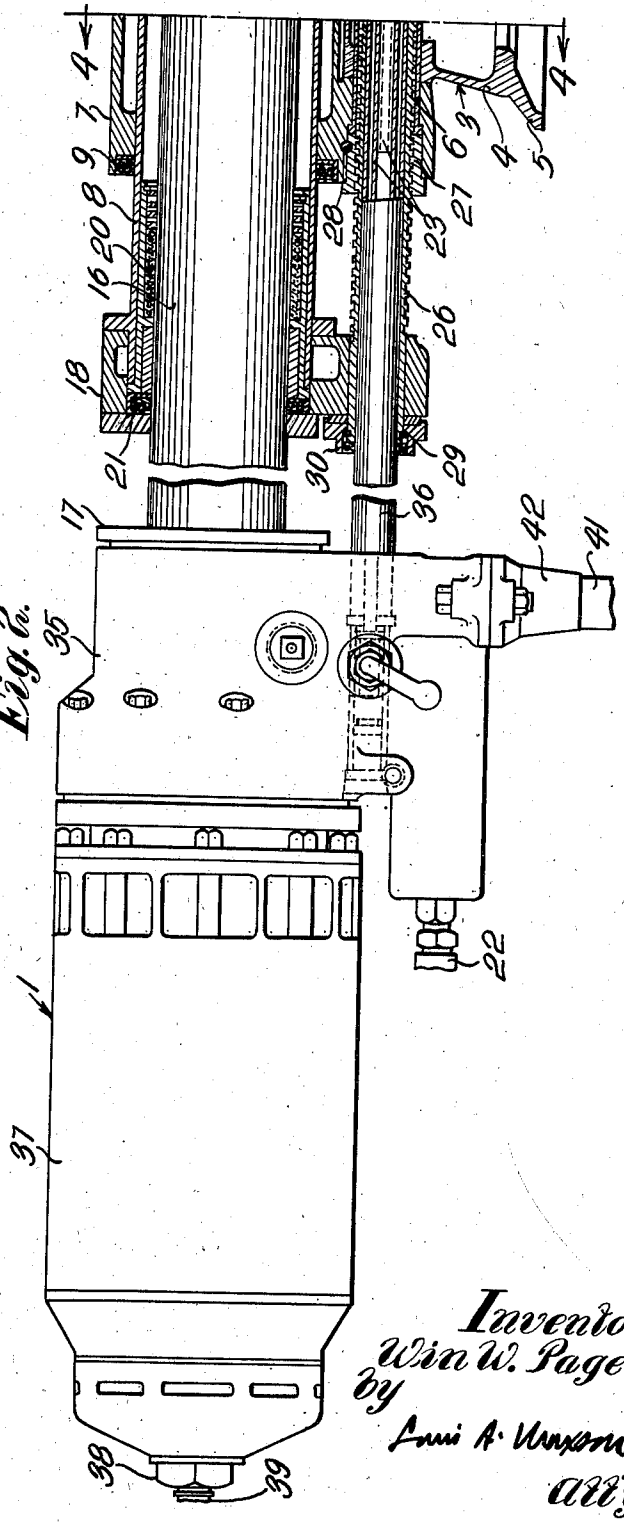


Fig. 2.



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Fig. 3.

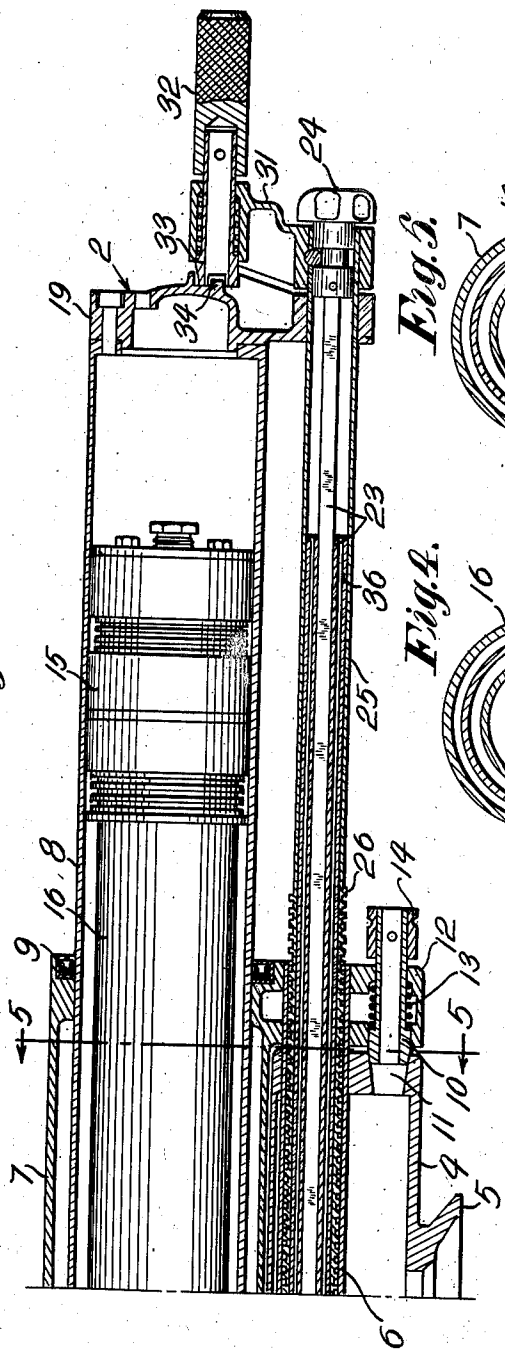


Fig. 5.

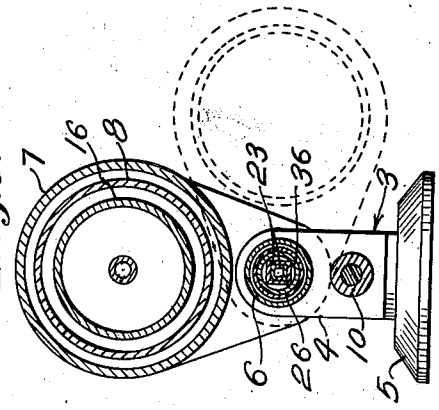
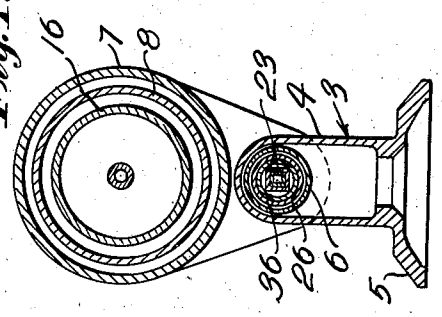


Fig. 4.



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UNITED STATES PATENT OFFICE

2,288,542

DRILLING APPARATUS

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Original application April 19, 1939, Serial No. 268,792. Divided and this application May 25, 1940, Serial No. 337,277

16 Claims. (Cl. 255—47)

This invention relates to drilling apparatus, and more particularly to improvements in the supporting and feeding means of a drilling apparatus of the high speed rotary type.

An object of this invention is to provide an improved drilling apparatus. Another object of this invention is to provide an improved drilling apparatus of the high speed rotary type. Another object is to provide an improved supporting means for a drilling apparatus. A further object is to provide an improved rotary drilling apparatus having improved feeding means for the drill bit. A further object is to provide a novel supporting and guiding structure for the drill and embodying means whereby the drill may be swung laterally on its mounting means to move the same into a position at one side of the drill hole, thereby to facilitate insertion of the drill rods into and withdrawal of the drill rods from the drill hole. Yet another object is to provide an improved fluid actuated feeding means for the drill and having associated therewith improved manual feeding means. These and other objects of the invention will, however, hereinafter more fully appear.

This application is a division of my copending application Ser. No. 268,792, filed April 19, 1939.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings—

Fig. 1 is a side elevational view of a high speed rotary drilling apparatus embodying an illustrative form of the invention.

Figs. 2 and 3, when taken together, constitute a view in longitudinal vertical section through the drilling apparatus shown in Fig. 1, with parts shown in elevation to facilitate illustration.

Fig. 4 is a cross sectional view taken on line 4—4 of Figs. 1 and 2.

Fig. 5 is a cross sectional view taken on line 5—5 of Figs. 1 and 3.

In this illustrative embodiment of the invention there is disclosed a drilling apparatus of the high speed rotary type adapted for use at will with core type or plug type bits and generally comprising drill bit rotation means generally designated 1, drill bit feeding means generally designated 2 and drill guiding and supporting means generally designated 3.

The drill supporting and guiding means 3 comprises a trunnion member 4 having a swivel plate 5 adapted to be clamped in the saddle mounting of a mine column or other suitable support. The trunnion member 4 has a longitudinally extending bore which receives a cylindric tube 6 which is fixed at its ends within a support member 7, the latter in turn having a longitudinally extending parallel bore which slidably receives and guides a feed cylinder 8 of the hydraulic feeding means. The tube 6 provides a swivel mounting for the support member 7 so that the drill may be tilted laterally to one side or the other, thereby to move the drill into a position at one side of the drill hole, for a purpose to be later explained. The support member 7 carries dirt seals 9, 9 at its opposite ends, and these seals sealingly engage the exterior surface of the feed cylinder 8, thereby to prevent access of dirt or other foreign matter to the cylinder guide bore.

As shown in Fig. 3, a plunger lock 10 is insertible in the locking aperture 11 formed in the member 4, for locking the support member 7 in its upright position as shown in Fig. 5. This plunger lock is guided within bores formed within a depending lug 12 integral with the support member 7, and a coil spring 13 constantly urges the plunger lock toward its innermost locking position. A handle 14 is secured to the plunger lock whereby the locking portion thereof may be manually released from the locking aperture against the tension of the coil spring 13. By the provision of this lock the drill may be brought back into a predetermined position and positively held therein, so that alinement of the drill bit with the drill hole is assured.

The feed cylinder 8 of the hydraulic feeding means contains a reciprocable feed piston 15 having a piston rod 16 carrying at its forward end a head plate 17 (see Fig. 2). The feed cylinder 8 has front and rear heads 18 and 19, the former carrying a packing 20 sealingly engaging the exterior periphery of the piston rod. Also arranged within the front cylinder head 18 is a dirt seal 21 sealingly engaging the exterior surface of the feed piston rod. Liquid under pressure may be supplied to the hydraulic feeding means through a usual liquid supply connection 22 connectible through suitable ports and passages with the ends of the feed cylinder under the control of a manual control valve arranged within the control head and operable through telescopically arranged rods 23 extending centrally through the pivot tube 6. These telescopically arranged rods are rotatable to effect valve movement by a control knob 24.

The front and rear cylinder heads 18 and 19

have depending bosses or bearing brackets provided with bores in which is rotatably mounted a cylindrical tube 25 extending centrally through the pivot tube 6 and having formed along a portion of the length thereof screw threads 26 coacting with the threads of a non-rotatable feed nut 27 secured at 28 within the support 7. The forward end of the tube 25 is fixed against axial displacement with respect to the feed cylinder by a split ring 29 seated in external and internal grooves in the tube 25 and in a detachable end plate 30 respectively ,the latter secured to the front cylinder head 18. The tube 25 projects rearwardly through the rear head boss as shown in Fig. 3 and has secured thereto a handle 31 having a grasping portion 32. This grasping portion is fixed to a spring pressed plunger lock 33 engageable with a locking projection 34 integral with the rear cylinder head 19, and the lock holds the feed screw tube 25 against rotation during automatic feeding of the drill. The valve operating rods 23 extend centrally within the feed screw tube 25, and the control knob 24 is conveniently arranged in adjacency to the feed screw handle 31.

As above mentioned, the forward end of the feed piston rod 16 carries the head plate 17, and secured to the plate 17 is a control head 35, and fixed to the control head is a tube 36 extending centrally in telescopic relation within the feed screw tube 25 in the manner shown. The tube 36 has a sliding fit with the walls of the bore of the tube 25 and serves to maintain the feed cylinder 8 against rotation within its bore on the support 7 and, in effect, acts as a lateral sliding guide for the drill.

The drill bit rotating means 1 comprises a rotary motor 37, herein preferably a high speed electric motor, and this motor is supported by the control head 35. Secured to the forward end of the motor shaft is an adaptor nut 38 to which is connectible the rod line 39 which supports the drill bit 40. Motive power may be conducted to the motor 37 through a conductor cable 41 and connector plug 42.

From the foregoing, it will be evident that when the control knob 24 is manipulated to position properly the feed control valve, liquid under pressure may be supplied from the supply connection 22 to the rear end of the feed cylinder 8 at the rear side of the feed piston 15 while the front end of the feed cylinder is connected to exhaust, to effect forward feed of the drill while the drilling motor rapidly rotates the drill bit, thereby to effect a drilling operation. When the manual control valve is moved into a different position, liquid under pressure may be supplied to the front end of the feed cylinder 8 at the front side of the feed piston 15 while the rear end of the feed cylinder is connected to exhaust, thereby to effect reverse feed. When the feed piston 15 reaches its limit of forward feeding travel the operator may grasp the portion 32 of the feed screws operating handle 31, and upon release of the lock 33, 34 the feed screw tube 25 may be rotated relative to the feed nut 27 to effect feeding of the feed cylinder 8 forwardly in its guiding bore on the support 7 until the rear cylinder head 19 engages the support 7, and thereafter the feed screw may be locked against rotation by the lock 33, 34. When liquid under pressure is again supplied to the rear end of the feed cylinder at the rear side of the feed piston the drill may again be fed forwardly under hydraulic pressure. Upon completion of the forward feeding travel of the feed piston, and when the drilling motor assumes its forwardmost position, the drilling motor may be stopped and the feed piston 15 may be retracted in the feed cylinder upon the supply of liquid pressure to the latter, and thereafter the feed cylinder may be retracted in its guide by the feed screw.

The drilling motor, if desired, may be fed solely by the feed screw in the following manner: When the drilling motor is in the full line position shown in Fig. 1, with the feed piston and feed cylinder both retracted, the feed screw tube 25 may be rotated by the handle 31 to effect feed of the drilling motor forwardly with respect to the working face while the drill bit is rapidly rotated to effect the drilling operation. When the feed cylinder reaches its limit of forward travel in its guide and the drilling motor assumes the dotted line position shown in Fig. 1, the drilling motor is again moved rearwardly by the feed screw 26 to its retracted position, and liquid under pressure is supplied to the rear end of the feed cylinder at the rear side of the feed piston to move the latter forwardly into its extended position in the feed cylinder. The feed cylinder is then again fed forwardly in its guide by the feed screw tube 25 to complete the forward feeding operation. The drilling motor is then moved rearwardly by retracting the feed piston within the feed cylinder and moving the feed cylinder rearwardly in its guide by the feed screw.

When the coupling of the bit carrying rod line 39 is released from the adaptor nut 38, the drilling motor may be swung laterally on its pivotal mounting on the trunnion support 4 so that the drill is swung clear of the drill hole, either right or left, as indicated in dotted lines in Fig. 5, so that the drill bit may be removed from the drill hole without disturbing the drill on its mounting means. This may be accomplished simply by releasing the locking plunger 10 from the locking aperture 11 and swing the drill support 7 laterally on the pivot tube 6 relative to the trunnion support 4. This lateral swinging feature of the drill is particularly convenient during the adding or removal of drill rod sections.

As a result of this invention, it will be evident that an improved drilling apparatus is provided having improved supporting and feeding means. It will also be noted that an improved high speed rotary drilling apparatus having improved supporting and feeding means is provided. It will further be evident that by the provision of the manual feeding means associated with the hydraulic feeding means the drill may be fed with respect to the work in an improved manner. It will further be noted that by the provision of the pivotal mounting of the drill on its trunnion support the drill may be swung laterally in either direction with respect to the drill hole, thereby to facilitate insertion of the rod line into and removal of the rod line from the drill hole. By arranging the elements of the feeding and valve control means in the novel manner disclosed with respect to the pivotal mounting for the drill on its trunnion support, an extremely compact structure is attained. Other uses and advantages of the improved drilling apparatus will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that

this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, the combination comprising a support having a bore providing a longitudinal guideway, a drilling motor, feeding means for said motor comprising a feed cylinder guided for longitudinal adjustment in said guideway bore, and manually operable means comprising an adjusting element arranged in parallel side by side relation with said feed cylinder for adjusting the latter in said guideway bore, said adjusting element mounted for longitudinal movement with said feed cylinder as the latter is adjusted longitudinally in said guideway bore.

2. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a feed cylinder, a support providing a longitudinal guideway coacting with the peripheral wall of said cylinder and in which said cylinder is slidably guided, a guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said feed cylinder in its guideway on said support, and means for advancing and retracting said feed cylinder in said guideway including an operating element moving with said feed cylinder in the longitudinal movements of the latter.

3. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a feed cylinder, a support providing a longitudinal guideway on which said cylinder is slidably guided, a guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said feed cylinder on its guideway on said support, and means including an adjusting element arranged coaxially with and surrounding said guide element for adjusting said feed cylinder on said guideway.

4. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor, a support on which said feeding means is guided for longitudinal adjustment, a lateral guide arranged parallel with said feeding means and guided on said support for preventing rotation of said feeding means relative to said support, a bottom support, means for pivotally mounting said first support on said bottom support for swinging movement relative to the latter on an axis coincident with the axis of said lateral guide, and means including an adjusting element arranged coaxially with said lateral guide and with its axis in the same straight line with the pivot of swing of said first support for adjusting said feeding means longitudinally relative to said first support.

5. In a drilling apparatus, the combination comprising a drilling motor and feeding means therefor, a trunnion support having a bottom swivel plate, means for pivotally mounting said motor and feeding means on said trunnion support to swing laterally from a drilling position in either direction with respect thereto, and means including a locking plunger bodily rotatable with said motor and feeding means for locking said motor and feeding means in said drilling position when moved thereto.

6. In a drilling apparatus, the combination comprising a drilling motor and feeding means therefor, a trunnion support having a bottom swivel plate, means for pivotally mounting said motor and feeding means on said trunnion support to swing laterally in either direction with respect thereto, the pivot being arranged in a plane including the longitudinal axes of said motor and said feeding means, and means for automatically centering and for locking said motor and feeding means in a predetermined position with respect to said support when they are moved adjacent thereto.

7. In a drilling apparatus, the combination comprising a drilling motor, feeding means therefor, a trunnion support having a bottom swivel plate, a support pivotally mounted on said trunnion support to swing laterally in either direction with respect thereto, said second mentioned support having a bore surrounding the axis of its lateral swinging and slidingly receiving a feed effecting element of said feeding means, and means for locking said second mentioned support in a predetermined position with respect to said trunnion support.

8. In a drilling apparatus, the combination comprising a drilling motor, feeding means including a feed cylinder for said motor, a trunnion support having a bottom swivel plate, means for pivotally mounting said motor and said feeding means on said trunnion support to swing laterally in either direction with respect thereto, and means for controlling said feeding means including a control element operatively connected to said feed cylinder and extending through the pivot.

9. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a feed cylinder, a support providing a longitudinal guideway on which said cylinder is slidably guided, a guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said feed cylinder on its guideway on said support, and a pivotal mounting for said support coaxial with said guide element.

10. In a drilling apparatus, the combination comprising a support providing a longitudinal guideway, a drilling motor, fluid actuated feeding means for said motor comprising a feed cylinder guided for longitudinal adjustment on said guideway and containing a reciprocable feed piston having a forwardly projecting piston rod, said motor being disposed in advance of said feeding means and supported wholly by said feed piston rod, and manually operable adjusting means comprising an adjusting element arranged in parallel side-by-side relation with said feed cylinder for adjusting the latter on said guideway.

11. In a drilling apparatus, the combination comprising a drilling motor, fluid actuated feeding means for said motor comprising a feed cylinder containing a feed piston, a support providing a longitudinal guideway on which said cylinder is slidably guided, and a reciprocable guide element secured to said motor for movement therewith longitudinally relative to said support, said guide element being arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said feed cylinder on its guideway on said support.

12. In a drilling apparatus, the combination comprising a drilling motor, fluid actuated feeding means for said motor comprising a feed cylinder containing a feed piston, a support providing a longitudinal guideway on which said

cylinder is slidably guided, a reciprocable guide element secured to said motor for movement therewith longitudinally relative to said support, said guide element being arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said feed cylinder on its guideway on said support, and means including an adjusting element arranged coaxially with said guide element for adjusting said feed cylinder longitudinally on said guideway.

13. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a reciprocable feed cylinder containing a feed piston, a support having a cylindric bore providing a longitudinal guideway in which said cylinder is slidably guided, and a reciprocable guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said cylinder in said guideway bore relative to said support.

14. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a reciprocable feed cylinder containing a feed piston, a support having a cylindric bore providing a longitudinal guideway in which said cylinder is slidably guided, a reciprocable guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said cylinder in said guideway more relative to said support, and means including an adjusting element arranged coaxially with said guide element for adjusting said feed cylinder in said guideway bore.

15. In a drilling apparatus, the combination comprising a drilling motor, feeding means for said motor comprising a reciprocable feed cylinder containing a feed piston, a support providing a longitudinal guideway on which said cylinder is slidably guided, a reciprocable guide element arranged parallel to said feed cylinder and guided on said support for preventing rotary movement of said cylinder on its guideway, and means including an adjusting element having telescopic relation with said guide element for adjusting said feed cylinder on said guideway.

16. In a drilling apparatus, the combination comprising a guide support, fluid actuated bit feeding means including relatively reciprocable feed cylinder and piston elements, said feed cylinder element being slidably guided on said support, a bit-rotating motor carried by one of said cylinder and piston elements in coaxial relation with said feeding means, and means for manually feeding said cylinder element relative to said support including a rotatable feeding element arranged parallel with said feed cylinder element, a coacting feeding element on said support, means for rotatably supporting said rotatable feeding element including a bearing bracket depending from the front end of said cylinder element, and an operating member for rotating said rotatable feeding element.

WIN W. PAGET.

CERTIFICATE OF CORRECTION.

Patent No. 2,288,542. June 30, 1942.

WIN W. PAGET.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 19, for the words "and the" read --and this--; line 64, for "screws" read --screw--; and second column, line 43, for "swing" read --swinging--; page 3, first column, line 60, claim 4, after "support" insert a comma; page 4, first column, line 30, claim 14, for "more" read --bore--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of October, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.