Dec. 1, 1931. H. C. GUSTAFSON 1,834,701

TOOL FEEDING APPARATUS

Filed July 11, 1927 3 Sheets-Sheet 1

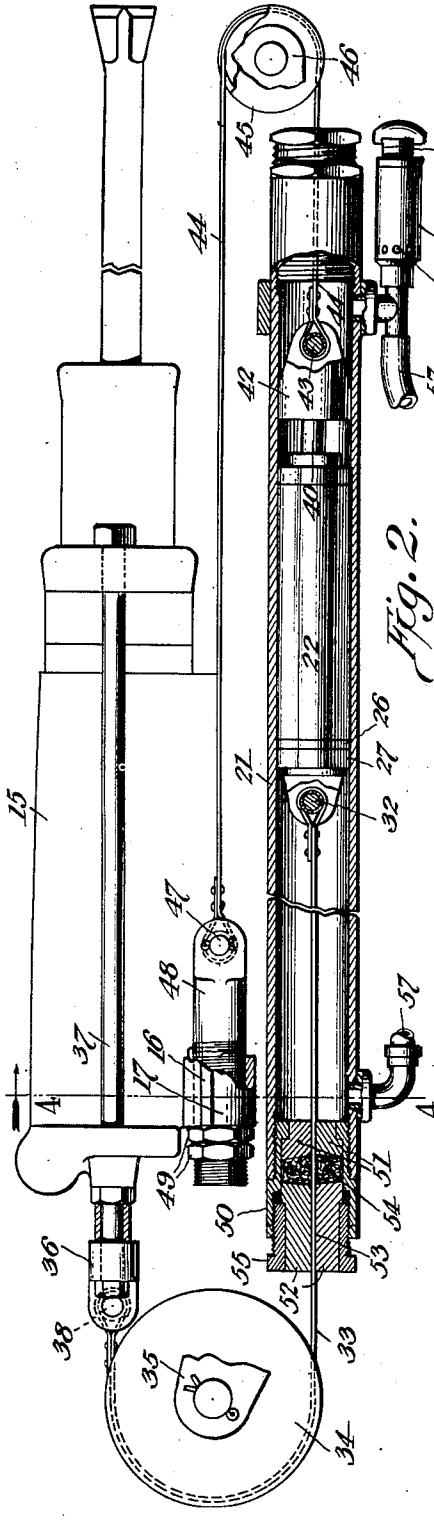

Fig. 2.

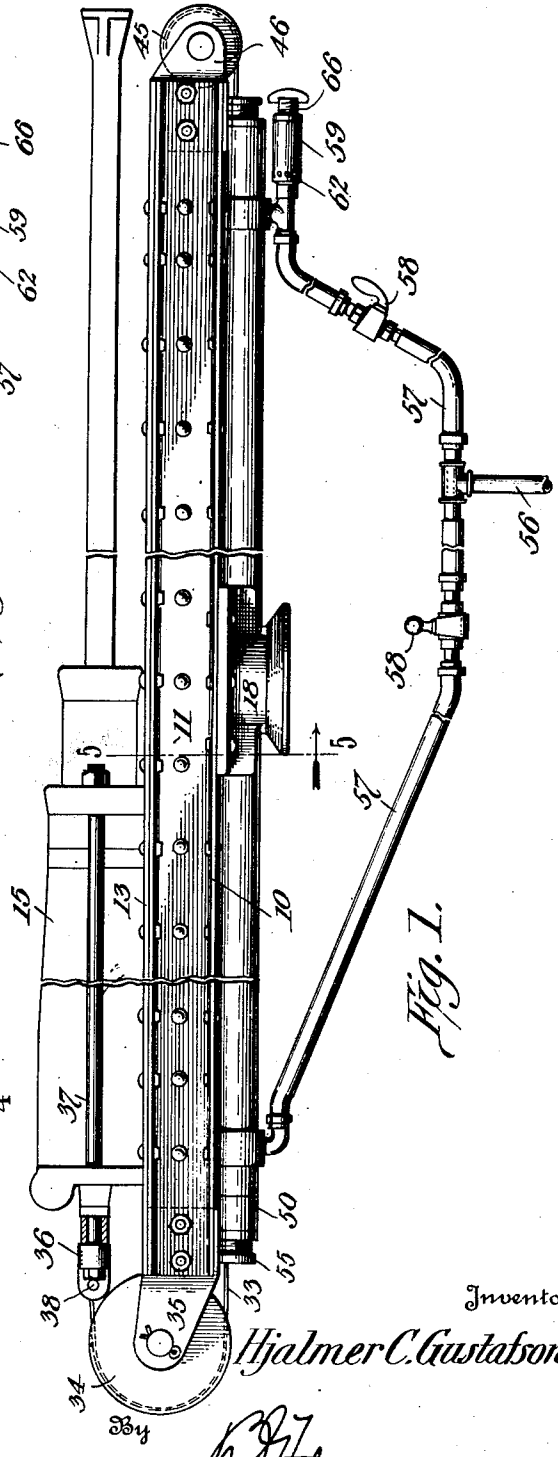

Fig. 1.

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TOOL FEEDING APPARATUS

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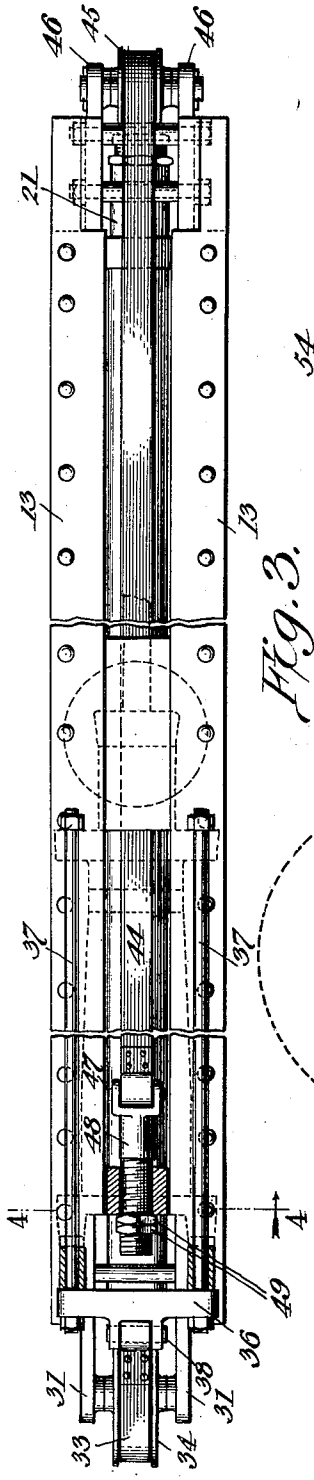

Fig. 3.

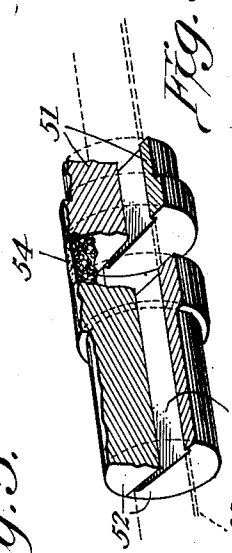

Fig. 9.

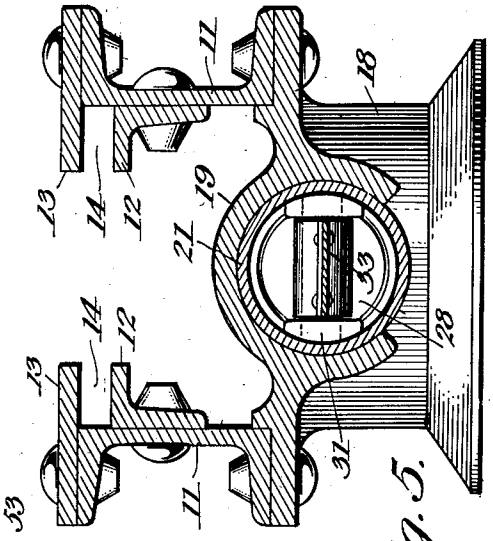

Fig. 5.

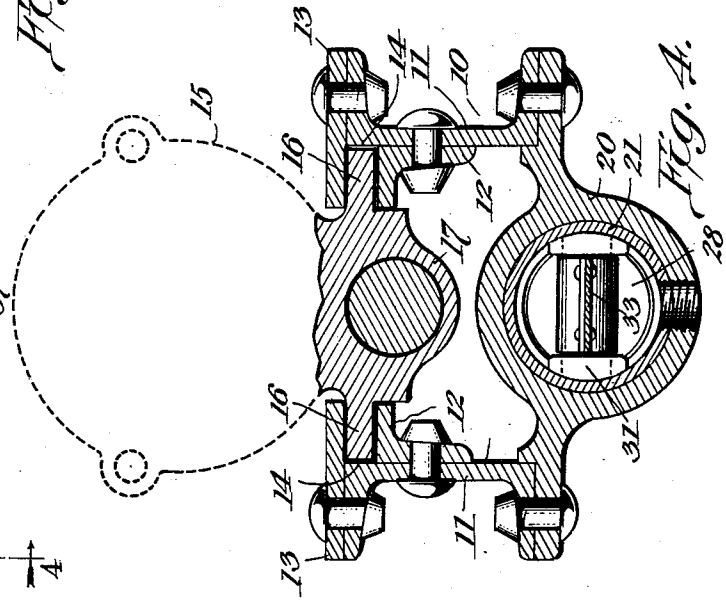

Fig. 4.

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TOOL FEEDING APPARATUS

Filed July 11, 1927 3 Sheets-Sheet 3

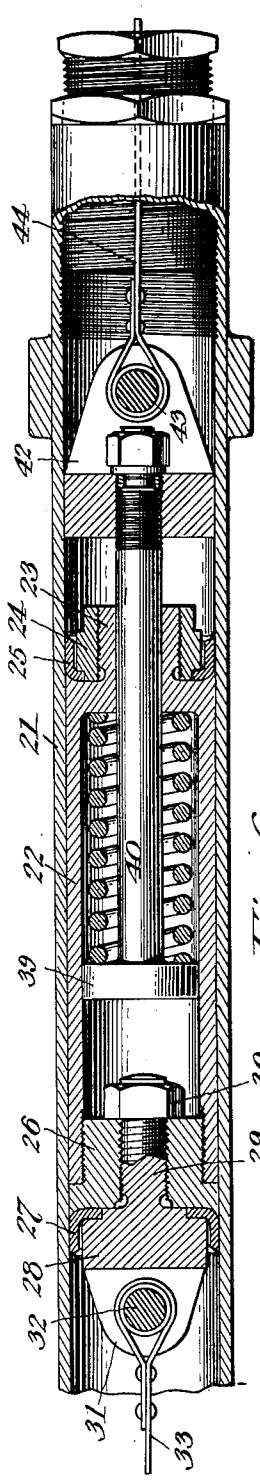

Fig. 6.

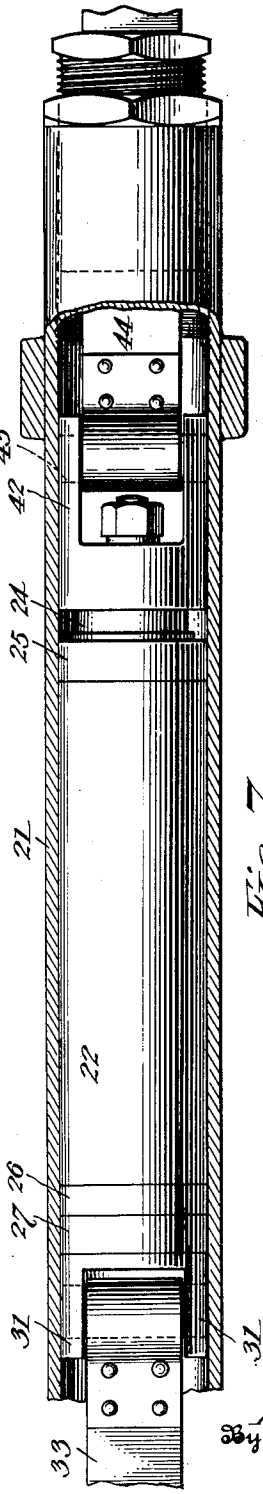

Fig. 7.

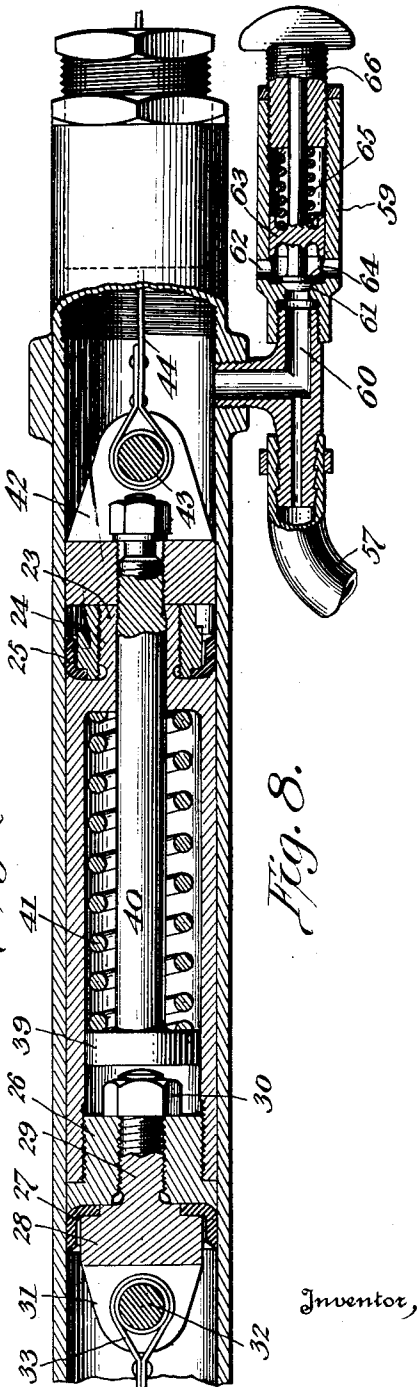

Fig. 8.

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Patented Dec. 1, 1931 1,834,701

UNITED STATES PATENT OFFICE

HJALMER C. GUSTAFSON, OF DENVER, COLORADO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GARDNER-DENVER COMPANY, OF QUINCY, ILLINOIS, A CORPORATION OF DELAWARE

TOOL FEEDING APPARATUS

Application filed July 11, 1927. Serial No. 204,910.

The present invention relates to feeding mechanism for tools, and while particularly intended for rock drilling apparatus, may be employed for other machines of an analogous character. The object is to provide compact fiuid operated means of a novel and effective character for feeding the tool to and withdrawing it from its work.

In the accompanying drawings:

Figure 1 is a side elevation of the preferred embodiment of the invention,

Figure 2 is a longitudinal sectional view with the supporting frame removed,

Figure 3 is a top plan view with the tool illustrated in dotted lines,

Figure 4 is a cross sectional view taken on the line 4—4 of Figures 2 and 3,

Figure 5 is a cross sectional view on the line 5—5 of Figure 1,

Figure 6 is a horizontal longitudinal sectional view through the feed motor,

Figure 7 is a similar view, but showing the piston in elevation,

Figure 8 is a view similar to Figure 6, but illustrating the position of the parts when the draft tape has stretched,

Figure 9 is a perspective view partly in section of the members of one of the cylinder packing glands.

In the present embodiment, a support is employed in the form of a frame 10. This frame is preferably built up of standardized commercial units. Spaced channel bars 11 are employed, to the inner sides of which are riveted angle bars 12, while the upper flanges have secured to them plates 13. These form longitudinal ways 14.

A tool 15, which may be a pneumatic hammer or rock drill, is provided with guide flanges 16 slidable in the ways 14. As is well known, these tools are ordinarily fed by a feed screw engaged with a nut that is mounted in a collar 17 formed on the underside of the tool 15. This collar is made use of for connecting the feed mechanism hereinafter described.

Riveted to the central portion of the frame is a mounting cone 18 having a yoke portion 19, and correspondingly riveted to the end portions of the frame are collars 20. In these collars 20 and yoke portion 19 is mounted the cylinder 21 of a feed motor that is thus disposed longitudinally of the frame on the underside thereof between the lower portions of the side bars 11. In this cylinder 21 is a reciprocatory piston, preferably comprising a tubular body 22, from one end of which projects a threaded stem 23. On this stem is threaded a nut 24 holding in place a packing cup 25. Threaded into the other end of the tubular body 22 is a plug 26, against which bears an oppositely disposed packing cup 27 held in place by a head 28. The head 28 has a threaded stem 29 passing through the plug 26 and secured by a nut 30. The head 28 terminates in outwardly projecting spaced ears 31 connected by a cross pin 32. A draft tape 33 has one end secured to the cross pin 32. This draft tape 33 passes through the rear end of the cylinder 21 and around a pulley 34 that is mounted on a bracket 35 secured to the rear end of the supporting frame. A yoke 36 is mounted on the rear ends of the side bolts 37 of the tool 15, and said yoke is provided with a cross pin 38 to which the other end of the draft tape 33 is secured.

Mounted in the tubular body 22 of the feed motor piston is a plunger, comprising a head 39 having a stem 40 that passes through the end of the piston opposite to that containing the plug 26. A coiled spring 41 is interposed between said end of the piston and the head 39 and serves to urge the plunger 39—40 inwardly. On the projecting end of the stem 40 is mounted a yoke 42 carrying a cross pin 43 to which is secured a second draft tape 44. This tape 44 extends through the front end of the cylinder 21 and around a pulley 45 that is journaled on a bracket 46 mounted on the front end of the supporting frame. The tape 44 is secured around a cross pin 47 carried by a bolt 48 that is adjustably mounted in the feed nut-receiving collar 17 of the tool. To this end the bolt is threaded and has mounted on its rear end adjusting and locking nuts 49.

In order to prevent leakage through the ends of the cylinder, the heads of said cylinder are preferably constructed as follows,

and as shown particularly in Figures 2 and 9. A tubular bushing 50 is threaded into the end of the cylinder and contains a rear abutment plug composed of shouldered sections 51 that are slotted to permit the passage of the draft tape 33 or 44. The outer compression plug is formed of sections 52, also slotted as shown at 53 to permit the passage of the draft tape. Between the opposing inner ends of the plugs is placed packing 54, and said adjacent ends are preferably recessed so as to urge the packing inwardly against the tape. A compression screw plug 55, surrounding the plug sections 52 and threaded into the bushing 50, serves to move the plug sections 52 inwardly to effect the proper compressing action on the packing. The structure is preferably the same at both ends of the cylinder.

Suitable means are employed for delivering motive fluid, such as air, to the cylinder 21 on opposite sides of the piston and exhausting it therefrom. In the embodiment disclosed a supply hose 56 has branches 57 leading to the ends of the cylinder and in said branches are ordinary supply-controlling and exhaust valves 58. Thus when one valve 58 is turned to open position as shown at the right in Fig. 1, motive fluid will be supplied through the branch 57, in which it is located to one end of the cylinder, the other being shut off from motive fluid as shown at the left in Figure 1, will allow the exhaust on the opposite side and vice versa.

Inasmuch as the tool is sometimes used in a downwardly inclined position and the weight thereof supplements the air pressure, there is preferably provided means by which reduced pressure may be maintained in the front end of the cylinder. To this end the branch pipe 57 leading to the front end of the cylinder is provided with a pressure-regulating valve, shown in detail in Figure 8. This valve consists of a casing 59 having communication, as shown at 60 with the front branch 57, and therefore with the interior of the front end of the cylinder. The casing is provided with a valve seat 61 and vent ports 62. A plunger 63, slidably mounted in the casing, carries at its inner end a valve 64 that is movable into and out of cooperation with the seat 61 and is held seated by a coiled spring 65. The tension of this spring can be varied by a bearing plug 66, threaded into the front end of the casing and abutting against the spring.

In using this device when it is desired to feed the tool to its work, motive fluid is admitted from the supply hose 56 through the front branch 57 to the front end of the cylinder 21, and this, acting on the piston urges the same rearwardly. The amount of pressure or force exerted in the feeding action can be varied and maintained by means of the relief valve 64, it being only necessary to vary the tension on the spring 65 by adjusting the plug 66. In withdrawing the tool, it is only necessary to turn the motive fluid through the rear branch 57 and relieve the pressure in the front end of the cylinder.

In order to prevent "whipping" of the tape a tension is maintained at all times on the tape by means of the plunger 39—40 and the coiled spring 41. As the tape will stretch in time the spring 41 is under relatively great compression as illustrated in Figure 6 but stretching is accommodated by the movement of the plunger to a position as indicated in Figure 8. Moreover this tension and stretching can be taken up by adjusting the bolt 48 in the collar 17 of the sleeve.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In apparatus of the character set forth, the combination with a supporting frame comprising spaced side bars having longitudinal ways, of a fluid operated tool located longitudinally of the bars and having guides slidable in the ways, a motor comprising a cylinder member mounted longitudinally between and along the undersides of the side bars, a piston member in the cylinder member, one of the members being movable longitudinally of the side bars, a pulley mounted at one end of the supporting frame, and a flexible tape connecting the movable member of the motor and the tool and passing around the pulley, said tape having a yielding mounting in the movable member of the piston.

2. In apparatus of the character set forth, the combination with a support and a fluid operated tool movably mounted thereon, of a cylinder mounted on the support, a piston mounted in the cylinder, and a flexible draft element between the tool and piston, extending into the cylinder and having a yielding mounting in the piston.

3. In apparatus of the character set forth, the combination with a support and a fluid operated tool movably mounted thereon, of a cylinder mounted on the support, a tubular piston in the cylinder, a spring pressed head in the piston, and a flexible draft connection between the head and the tool and extending into the cylinder.

4. In apparatus of the character set forth, the combination with a support and a tool movably mounted thereon, of a cylinder mounted on the support, a tubular piston in

the cylinder, a spring-pressed head in the piston, a pulley on the support, and a draft tape connected to the tool, said tape passing around the pulley into the cylinder and being connected to the head.

5. In apparatus of the character set forth, the combination with a support, of a fluid operated tool slidably mounted thereon and having a collar, a bolt adjustably mounted in the collar, a motor mounted in the support and comprising a cylinder and a piston, a spring-pressed bolt in the piston, and a flexible draft connection between the piston bolt and tool bolt.

6. In apparatus of the character set forth, the combination with a supporting frame having a guideway, of a fluid operated tool slidable on the guideway, a motor comprising a cylinder mounted on the frame and a piston in the cylinder, pulleys on the frame at opposite ends of the guideway, flexible draft members passing around the pulleys and connected to the tool and to the piston, and a yielding mounting for one end of one of the draft members mounted in the piston.

7. In apparatus of the character set forth, the combination with a supporting frame comprising spaced bars having ways, of a tool having guides slidable in the ways, and having a collar and side bolts, a yoke mounted on the side bolts, a cylinder mounted longitudinally between the spaced bars, a piston in the cylinder, pulleys journaled on the ends of the frame, a draft tape, said tape passing around one of the pulleys and connected to the yoke, a second draft tape passing around the other pulley, a bolt in the tool collar to which the second tape is connected, and means for connecting the tapes to the piston, said means including a spring-pressed plunger mounted in the piston and having one of the tapes attached thereto.

In testimony whereof, I affix my signature.

HJALMER C. GUSTAFSON.