

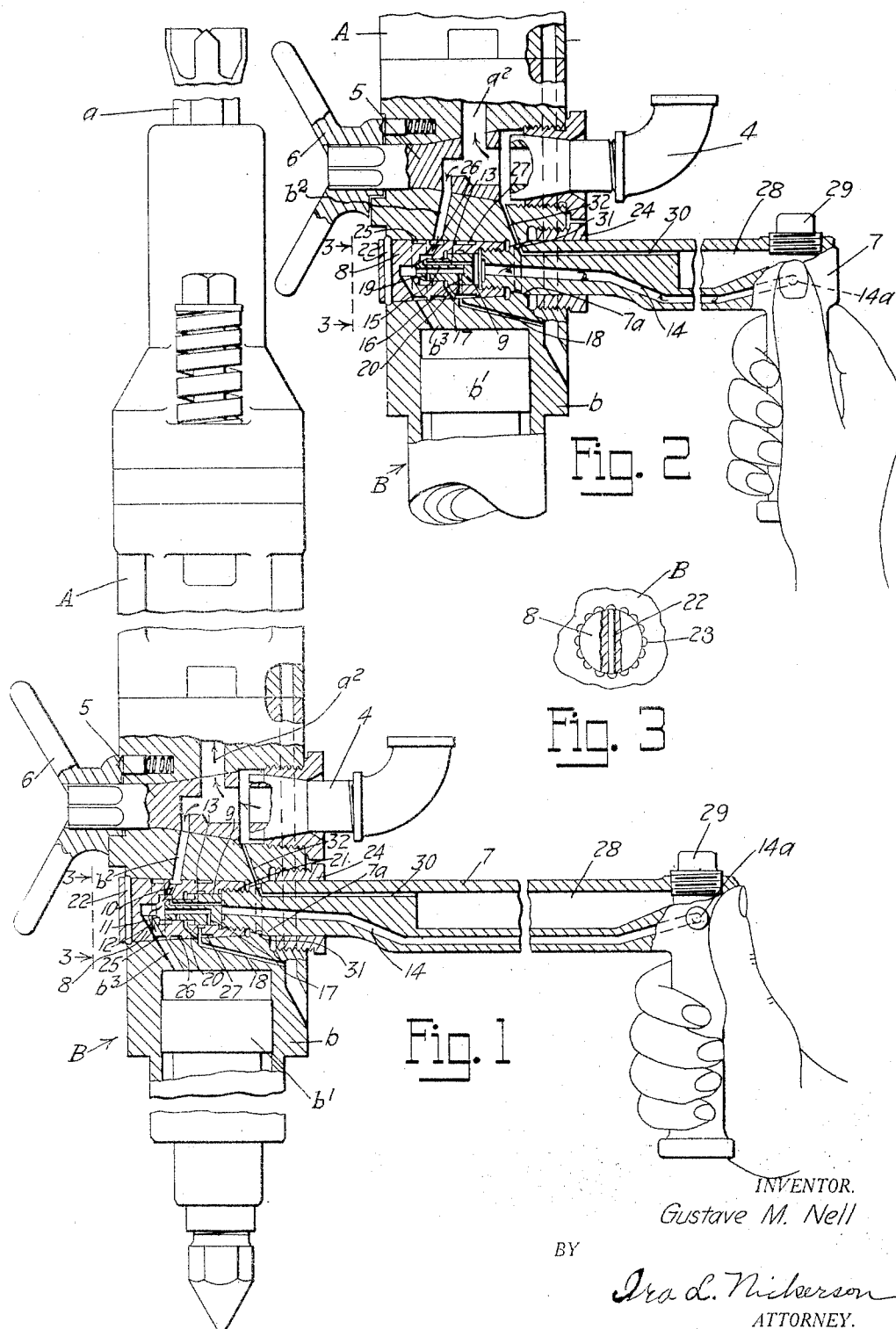
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G. M. NELL

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FEED CONTROLLING APPARATUS

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INVENTOR.

Gustave M. Nell

BY

Ira L. Nickerson
ATTORNEY.

UNITED STATES PATENT OFFICE

GUSTAVE M. NELL, OF DETROIT, MICHIGAN, ASSIGNOR TO CHICAGO PNEUMATIC TOOL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY

FEED CONTROLLING APPARATUS

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This invention relates to feeding devices with particular reference to the control thereof. It directly concerns power driven tools provided with power operated feeding mechanism, particularly fluid pressure percussive drills equipped with pneumatic feed legs and commonly referred to as stopers or stopping drills.

In operating machines of the described type it is highly important to regulate the advancing or feeding of the machine at a rate to suit the conditions encountered such as the character of the formation through which the drill steel is being driven. When the pressure in the feed leg is constant there is a tendency for the drill steel to become stuck if relatively soft material or seamy ground is encountered. Also in starting a hole it is frequently very desirable to have a quickly operated pressure reducing control which is conveniently arranged for the operator. In many instances it is also advantageous to have the percussive motor continue to operate at full power while the pressure on the feed leg is reduced.

One important object of the invention is to provide a simple and effective feed control arrangement which is quite sensitive and quick to respond as well as easy to operate. Another object is to control the feed leg independently of the percussive motor and without loss of power in the latter. Another object is to protect the operating parts of the control arrangement against accidental injury and to reduce the number of moving parts to a minimum. Still another object is to simplify and to facilitate the assembly and adjustment of the control members. Other objects will appear from the detailed description which follows.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawings in which:

Fig. 1 is an elevational view of a stopping drill partly cut away and showing the control means for the motive fluid in section;

Fig. 2 is a fragmentary view of the stoper showing the control apparatus only with the valve for the feed leg in a different position than in Fig. 1;

Fig. 3 is a detail view in elevation but partly in section of the portion of the drill indicated by broken line 3—3 of Figs. 1 and 2.

The embodiment of the invention chosen for the purpose of illustration is a mining machine of the stoper type having a percussive motor A of any desired type adapted to transmit its blows to a drill steel *a*, the percussive motor being fed to the work by a feed leg extension B including a feed cylinder *b* enclosing feed piston *b'*. By preference the percussive motor is of the fluid pressure type and the motive fluid for operating both the percussive motor and the feeding mechanism enters the machine through fluid inlet connection 4, the distribution of the motive fluid being under control of the usual throttle valve 5 which is provided with a manual control handle 6. In both Figs. 1 and 2, the throttle valve is shown in its open position directing motive fluid in full volume to the percussive motor through passage *a*² and toward the feeding mechanism B through a passage *b*² which is interrupted by control means later to be described, but has a continuation *b*³ opening directly into the piston chamber of feed cylinder *b*.

The control apparatus for feeding device B to which the invention directly relates is shown in the present form as contained within the manual rotating and holding means for the machine. Such means comprise a handle proper 7 having a tapered portion 7*a* and a tapered plug 8, both of which are arranged to cooperate with opposed tapered seats provided by a transverse bore in the machine.

Contained within the handle or more specifically within the plug portion of the handle, which forms a valve chest and with the end of the handle proper provides a valve chamber, is a differential valve 9 which controls motive fluid inlet port 10 and has a small end cooperating with a seat 11 over a passage 12 communicating with passage *b*³. In the position shown in Fig. 1 valve 9 permits the motive fluid to pass directly from passage *b*² through the valve chamber in plug 8 to passage *b*³ and into the feed leg chamber. At least a portion of the small end of the valve is continuously subjected to live motive fluid

as indicated in Fig. 2. The valve 9 also has a passage 13 extending axially thereof and always in communication with inlet port 10 for feeding motive fluid in limited amount to the large end of the valve. From the large end of the valve extends a relatively large vent passage 14 through handle proper 7 and terminating in a port 14a conveniently under the control of the thumb or finger of the operator of the machine. By closing vent port 14a pressure accumulates in vent passage 14 and against the large end of the valve, thus overcoming the constant pressure on the small end and shifting the valve to the position shown in Fig. 2, thereby cutting off the passage of motive fluid to the feed leg.

In the last named position of the valve pressure in the feed leg chamber is at least partly exhausted through an axial bore 15 in the valve extending from the small end thereof and communicating with one or more cross ports 16 which register in this position of the valve with an annular vent groove 17 which communicates with a vent passage 18 leading to atmosphere. A small port 19 through the valve at its lower end may be provided to admit motive fluid in limited amount to the axial vent chamber 15 to reduce to any predetermined extent the effective amount of exhaust from the feed leg. If quick relief of pressure in the feed leg is desired port 19 may be omitted. When the operator removes his finger, or thumb, from vent port 14 pressure on the large end of the valve is relieved and the constant pressure on the small end of the valve shifts it back to the position shown in Fig. 1, in which position relief port 16 and limited inlet port 19 are sealed off. The space intermediate the ends of the valve is vented at all times by a passage 20 in communication with passage 18 so that the shifting of the valve may be effected by pressure upon the opposing end areas thereof.

Handle 7 and plug 8 may be drawn into their respective sockets and maintained in engagement with their seats by any desired means. The preferred arrangement, however, is by cooperating threaded portions at 21 which draw the handle and the plug toward each other and into tight contact with their respective seats. Since a particular position of handle proper 7 is generally most desirable for controlling the machine, means are provided for adjusting the handle parts in order to secure this position. To this end the outer portion of plug 8 has a pin 22 extending therethrough with projecting heads arranged to cooperate with an annular series of sockets 23 in the adjacent portion of the machine (see Fig. 3). In assembling the handle on the drill plug 8, with valve 9 therein, is inserted from one side and handle 7 from the other, the threaded portions being engaged and the parts set up tight. The position of the grip handle relative to the machine is then

noted and if not in the most desired position, the parts are loosened and plug 8 is slightly withdrawn so that the ends of pin 22 are not in contact with sockets 23 whereupon plug 8 is angularly adjusted and the handle again set up. A locking sleeve 24 may be provided on handle 7 to lock the handle relative to the machine after it has been set up into tight engagement with plug 8.

The construction of the plug and the handle is such that proper operation of feed leg control valve 9 takes place regardless of the position of the handle parts. To this end plug 8 is provided on its exterior with a series of annular grooves, namely 25, 26 and 27. Groove 25 in communication with inlet port 10 registers with passage b^3 , groove 26 in communication with the seat for the small end of valve 9 registers with passage b^2 , and groove 27 connects with vent passage 18. As is the usual practice handle 7 may be utilized as a receptacle for lubricant for the machine, the handle being hollowed out at 28 to provide the lubricant reservoir which may be filled through an opening sealed by a plug 29. A passage 30 leads from reservoir 28 to an annular groove 31 in the tapered seat of the handle so as to be constantly in register, regardless of the position of the handle, with a passage 32 communicating with the motive fluid inlet. The pulsations of the motive fluid in the inlet serve to feed the lubricant thereto, whence it is carried by the motive fluid to the moving parts of both the percussive motor and the feed leg mechanism.

The feed leg control arrangement herein disclosed gives the operator of the machine instant control of the operation of the feeding means without throttling the machine which is fed, such as a percussive motor, and with a minimum of effort on the part of the operator. He has only to put his thumb or finger upon the vent port, such as 14a, instantly to stop the feeding of the machine. If he keeps the vent port closed, the machine will begin to recede from the work due to the gradual exhausting of the pressure in the feed leg. If the machine is found to withdraw from the work at too high a rate, and it is desired to make a permanent change this can be readily accomplished without modifying the venting passages in valve 9 by providing a port, such as 19, which will admit live air in limited amount to the feed leg connection when the control valve is in the position shown in Fig. 2, or by slightly enlarging the port if one already exists. The herein disclosed handle construction not only provides a secure fastening for the manual rotating and handle means but also permits any desired adjustment of the same without interfering in any way with the manual control means for the feed leg.

Since the invention herein disclosed is obviously capable of varied forms of expression

by reason of its many aspects and features, it is to be understood that the scope of the invention is intended to be expressed by the appended claims rather than in the above description which is merely given by way of illustration and not for limitation.

I claim as my invention:

1. In a mining machine having a percussive motor and a fluid pressure operated feed leg, a handle for guiding the machine, a fluid pressure operated valve for controlling the supply and release of pressure fluid to and from said feed leg, and means for controlling the position of said valve comprising a passage terminating in a normally open port in said handle which is left open so long as the machine is drilling properly, said port being conveniently arranged to be closed by the thumb or finger of the operator of the machine when the feed leg is to be collapsed.

2. In a mining machine having a percussive motor and a fluid pressure operated feed leg, a handle for guiding the machine and having a plug engaging said handle to secure the same in place, said handle proper with said plug providing a valve chamber, a valve within said chamber for controlling the supply and release of pressure fluid to and from said feed leg, means controlling the position of said valve solely by fluid pressure, and a normally open vent port in said handle for manually controlling the position of said valve.

3. In a mining machine having a percussive motor and a fluid pressure operated feed leg, a handle for guiding the machine and having a plug for securing the handle in place, said handle proper with said plug providing a valve chamber, a valve within said chamber for controlling the supply and release of pressure fluid to and from said feed leg, means on said handle and said plug cooperating with said machine for securing the handle in any desired angular position without interfering with the action and function of said valve, and manual means on said handle for controlling the position of said valve.

4. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle projecting from one side of the machine, a hollow plug engaging a socket in the machine on the opposite side to said handle, said plug intersecting a fluid pressure passage extending to said feed leg and having ports connecting therewith extending to the interior of the plug, a valve within said plug arranged to control said ports, and connecting means between said plug and handle.

5. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle ar-

ranged to project from one side of said machine and having a tapered portion to form a seat, a tapered plug, said machine having aligned sockets providing tapered seats for said handle and plug, means for drawing said plug and said handle toward each other into said sockets and against said seats, and means for locking said plug against rotation in its socket in a plurality of positions of angular adjustment.

6. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle arranged to project from one side of said machine and having a tapered portion, a tapered plug, said machine having aligned tapered sockets engaged by said handle and said plug, coacting means on said handle and plug connecting the same and maintaining them within their sockets, and means for holding said plug in any one of a plurality of positions of angular adjustment within its socket.

7. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle arranged to project from one side of said machine and having a tapered portion, a tapered plug, said machine having aligned tapered sockets engaged by said handle and said plug, coacting means on said handle and plug connecting the same and maintaining them within their sockets, and means permitting adjustment of the angular position of said handle relative to said machine and for maintaining the handle in adjusted position.

8. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle arranged to project from one side of said machine and having a tapered portion, a tapered plug, said machine having aligned tapered sockets engaged by said handle and said plug, coacting means on said handle and plug connecting the same and maintaining them within their sockets, cooperating means on said plug and said machine permitting adjustment of the angular position of said handle, and means for clamping said handle in adjusted position.

9. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle projecting from one side of the machine, a plug engaging a socket in the machine on the side opposite to said handle, a valve within said plug, connecting means between said plug and handle, said valve controlling the supply and exhaust of motive fluid to and from the feeding device and means permitting proper functioning of said valve regardless of the posi-

tion of angular adjustment of said plug within its socket.

10. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle, and a plug, said machine providing opposite aligned seats for said handle and plug, cooperating means on said handle and said plug for drawing the same toward each other and against their respective seats, and means for locking said handle against angular movement.

11. The combination with a mining machine of the percussive type having a motive fluid feeding device, of rotating and holding means comprising a handle and a plug, said machine providing aligned seats for said handle and plug permitting longitudinal movement of the same toward each other, means for drawing said plug and handle toward each other, means for angularly locating and adjusting said plug and handle with relation to said seats, and means for clamping said handle in its adjusted position.

12. The combination with a mining machine of the percussive type having a motive fluid feeding device, of manual rotating or holding means therefor comprising a handle and a plug, said machine providing opposite aligned seats for said handle and plug, cooperating means on said handle and said plug for drawing the same toward each other and against their respective seats, and means for angularly locating said handle and plug relative to said seats and for locking said handle against angular movement including a projection on said plug adjacent its outer end and an annular series of sockets on said machine adjacent said plug to receive said projection.

13. The combination with a mining machine of the percussive type having a motive fluid feeding device, of rotating and holding means comprising a handle and a plug, said machine providing aligned seats for said handle and plug permitting longitudinal movement of the same toward each other, means for drawing said plug and handle toward each other, a valve between said plug and said handle for controlling said feeding device, and means for angularly locating said plug and handle with relation to said seats without interfering with the operation of said valve.

14. In a machine having a fluid pressure feeding device and providing a seat adjacent thereto, a valve chest extending within and cooperating with said seat, means engaging the inner end of said chest for maintaining the latter against its seat, a fluid pressure operated valve within said chest for controlling the operation of said feeding device, and means for locking said valve chest against angular rotation with relation to its seat to

permit adjustment of said chest engaging means.

15. In a machine having a fluid pressure feeding device and a motive fluid passage extending thereto, a valve for controlling said passage, said valve being actuated solely by fluid pressure and having opposed pressure areas, one area relatively small and the other relatively large, the small area being continuously subjected to motive fluid and the larger area having motive fluid continuously supplied thereto in limited amount, and means for controlling the pressure on said larger area comprising a vent passage leading from said larger area and terminating in a normally open port arranged for manual control by the operator of the machine.

Signed by me at Detroit, in the county of Wayne and State of Michigan this 8th day of August, 1927.

GUSTAVE M. NELL.

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