F. M. CARROLL.

GUN BARREL DRILLING MACHINE.

APPLICATION FILED FEB. 9, 1916.

1,208,289.

Patented Dec. 12, 1916.

4 SHEETS—SHEET 1.

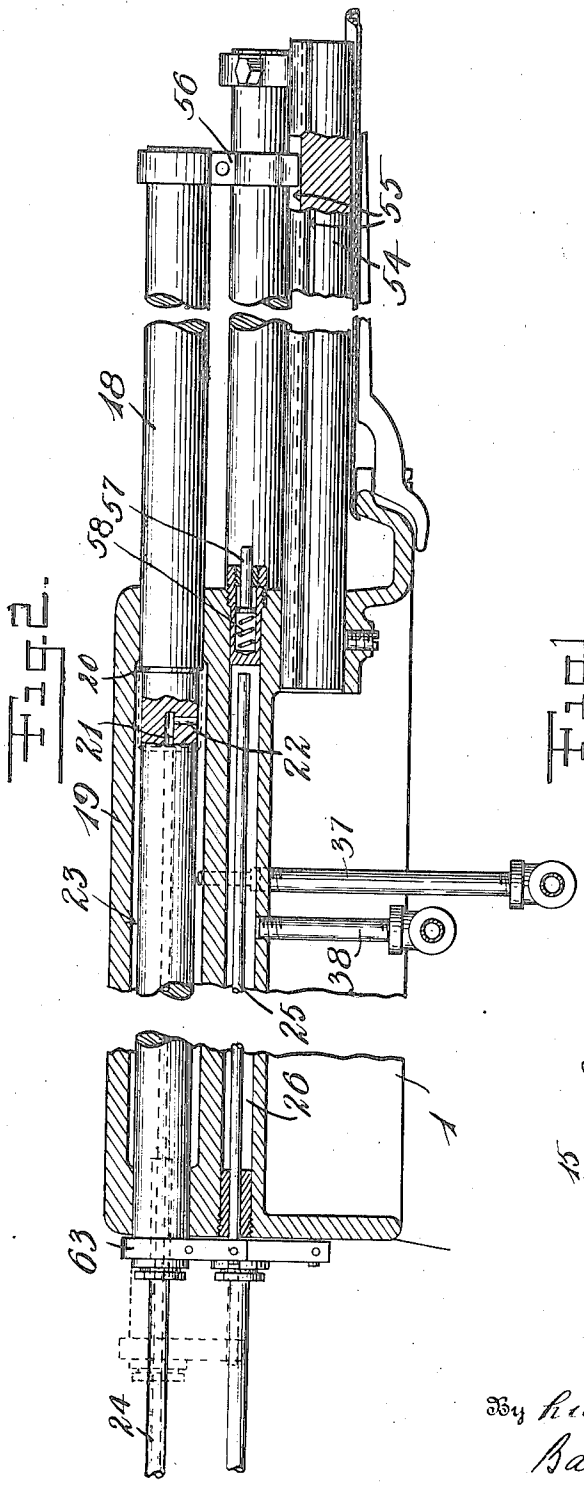


Fig. 2.

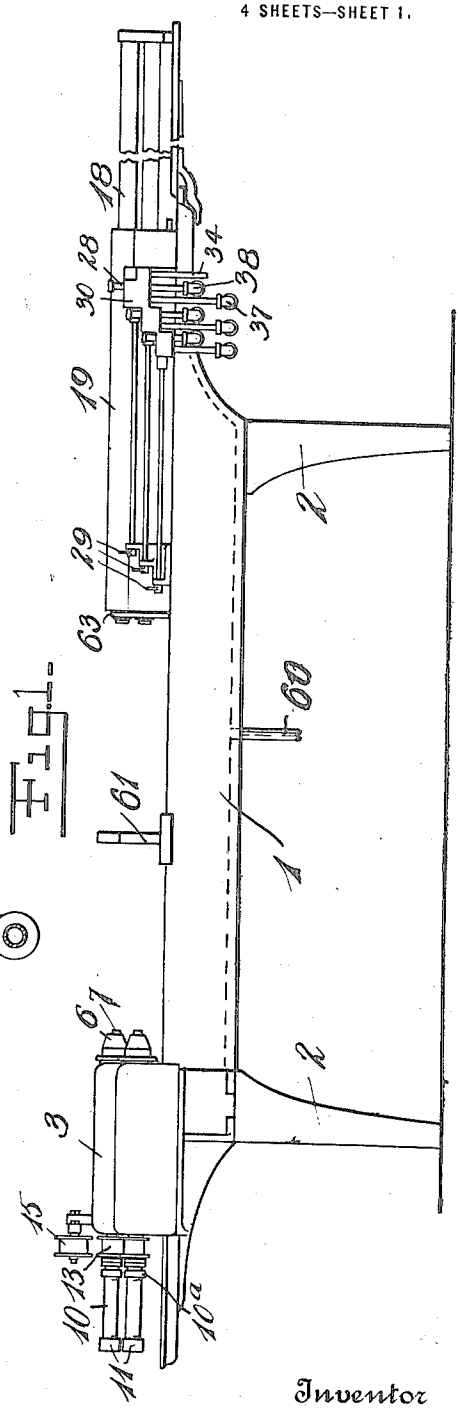


Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 3.

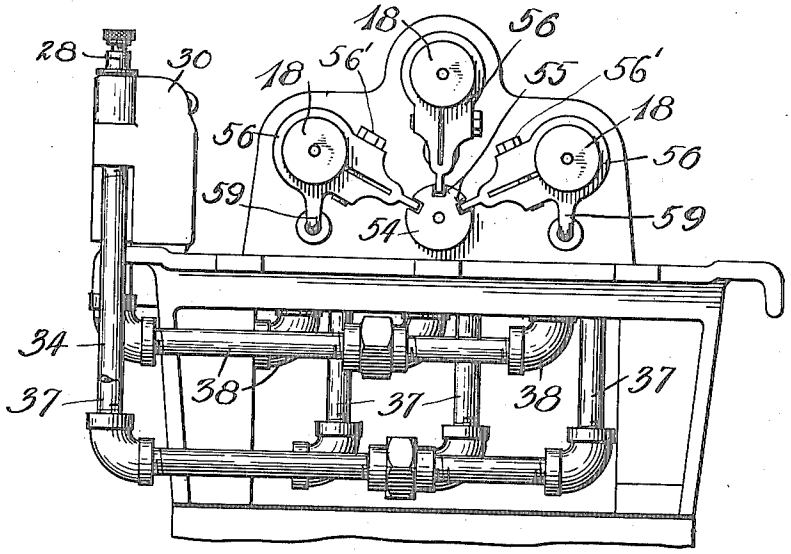
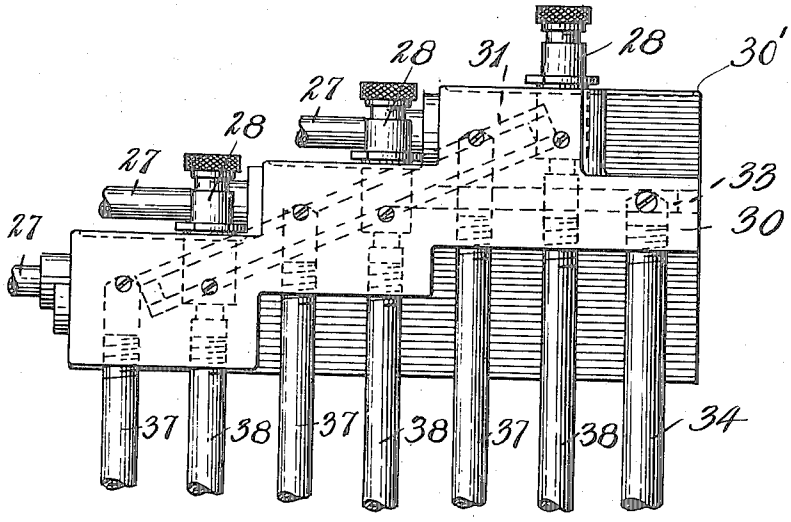


Fig. 4.



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4 SHEETS—SHEET 3.

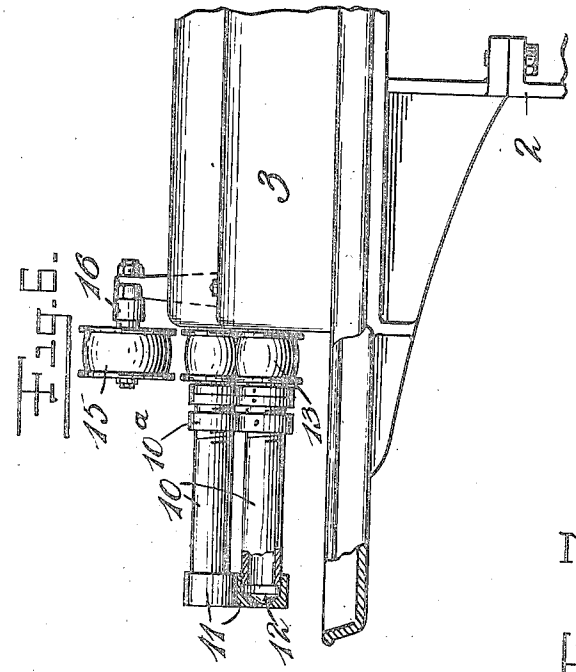


FIG. 6.

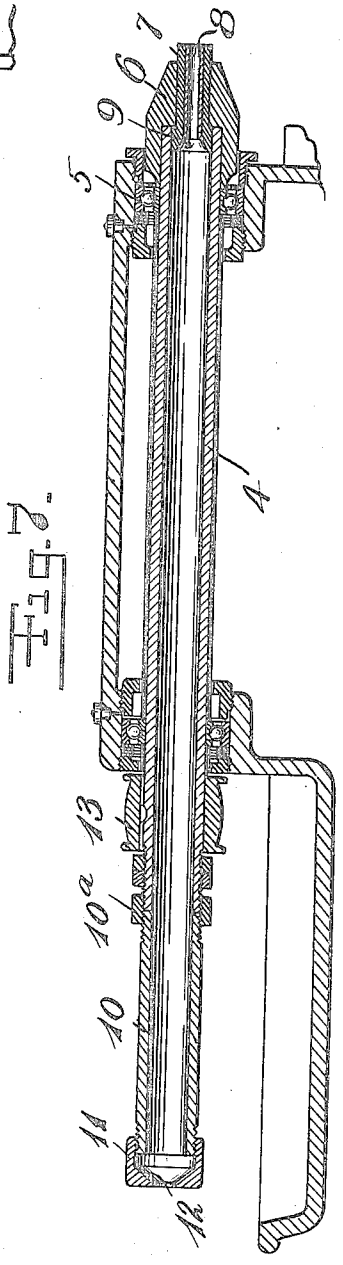


FIG. 7.

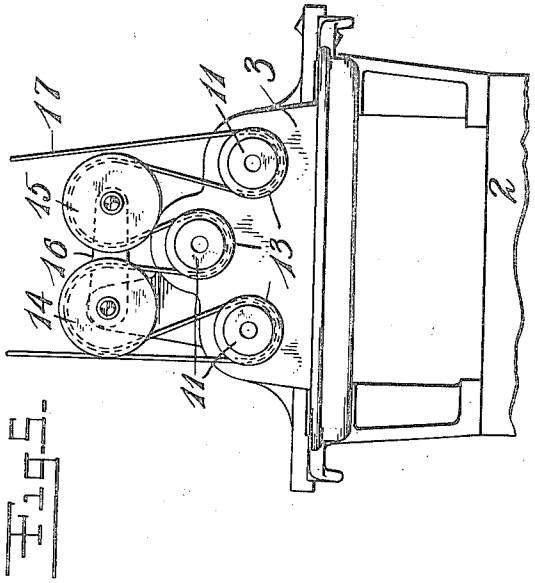


FIG. 5.

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4 SHEETS—SHEET 4.

Fig. 8.

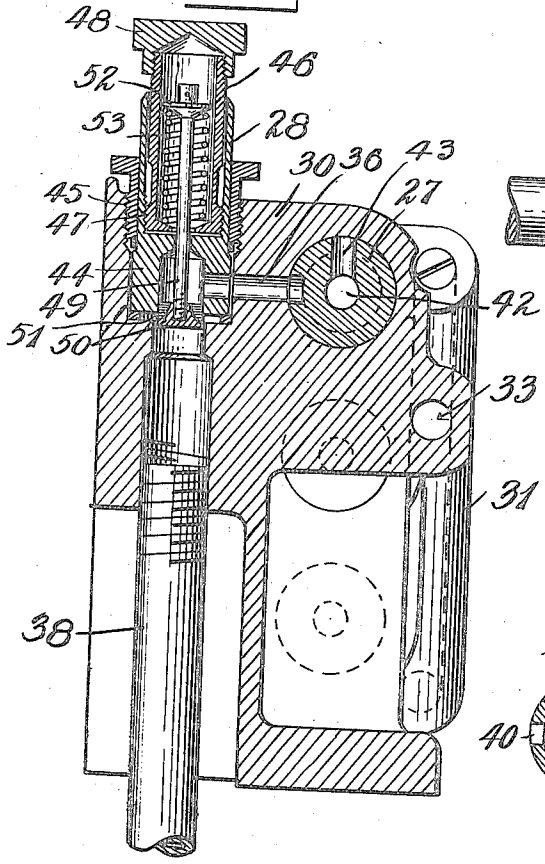


Fig. 9.

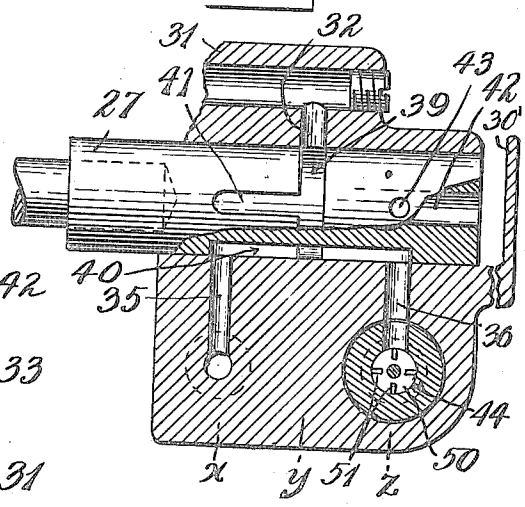


Fig. 10.

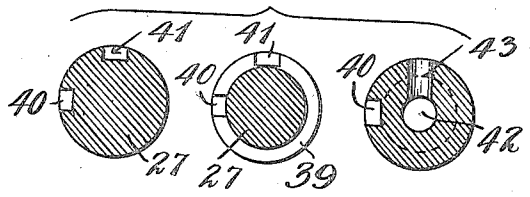


Fig. 11.

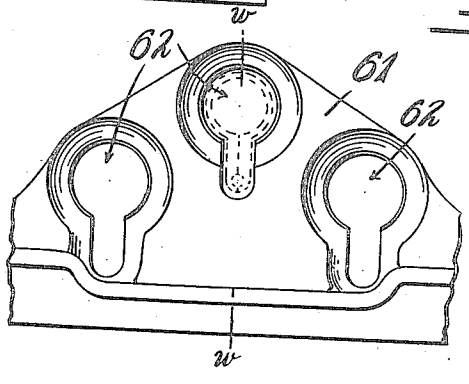


Fig. 12a

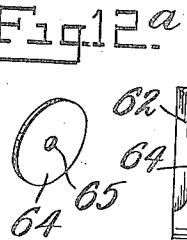


Fig. 12.

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GUN-BARREL-DRILLING MACHINE.

1,208,289. Specification of Letters Patent. Patented Dec. 12, 1916.

Application filed February 9, 1916. Serial No. 77,147.

To all whom it may concern:

Be it known that I, FRED M. CARROLL, a citizen of the United States, residing at Dayton, county of Montgomery, Ohio, have invented certain new and useful Improvements in Gun-Barrel-Drilling Machines, of which the following is a full, clear, and exact description.

My invention relates to improvements in gun barrel drilling machines and has for its object to provide a simple machine for accurately drilling gun barrels.

It further has for its object to provide a machine for drilling a number of gun barrels simultaneously.

It further has for its object to provide a machine in which the feed is due to hydraulic pressure and in which the same pressure which actuates the feed also forces oil through the drill.

It further has for its object to provide a machine in which the drilling devices are both fed forward and withdrawn by hydraulic pressure.

It further has for its object to provide a machine in which the feeding of a plurality of drills is accomplished by the same hydraulic pressure and in which the feeding for drilling a plurality of barrels is independently controllable.

The following is a description of my invention, reference being had to the accompanying drawings, in which—

Figure 1 shows a general side elevation of the complete machine. Fig. 2 shows a partial section of the feeding cylinders and plungers. Fig. 3 is an elevation of the right hand end of the machine. Fig. 4 is a front elevation of the valve mechanism. Fig. 5 is an elevation of the left end of the machine. Fig. 6 is a side elevation of the left hand portion of the machine. Fig. 7 is a sectional view through one of the barrel blank holders and the supporting journal therefor. Fig. 8 is a sectional view on the line *z—z* Fig. 9 showing the automatic pressure controlling valve and a section of the hand controlled valve. Fig. 9 is a section showing one of the hand controlled valves, in side elevation and the casing with the ports controlled thereby. Fig. 10 shows three detail sections of the valve body taken on the lines *x—x*, *y—y* and *z—z* of Fig. 9. Fig. 11 is a detail showing a guide plate support. Fig. 12 is a partial section on the line *w—w* Fig. 11 with the drill support in position, and Fig. 12ª is a perspective view of the drill support removed from the guide.

Referring more particularly to the drawings, 1 is the bed of the machine, the same constituting a tank for catching oil which is discharged.

2—2 are plates supporting the same. Upon the left hand end of the bed is mounted a housing 3 in which are journaled three barrel holding tubes or spindles each consisting of a tubular portion 4 mounted in anti-frictional bearings 5—5 so as to be freely revoluble. The right hand end of each tube is provided with a nose piece 6 securely mounted thereon, in which are mounted two bushings 7 and 8, one within the other, both of hardened steel. The larger bushing 8 has a beveled opening 9 at its inner end and the smaller bushing 7 is straight and calculated to be removed when worn. The rear end of the tubular spindle 4 has a prolongation 10 of like cross section united to it by a threaded collar 10ª. This prolongation 10 carries at its left end a threaded hand nut 11 with an internal bevel 12. By changing the prolongation 10 for a shorter one, a shorter piece of work can be secured within the tubular spindle. Each tubular spindle is provided with a pulley 13. In the same plane as the pulleys 13 are two idler pulleys 14 and 15, the latter being mounted upon adjustable arm 16 so that it can be adjusted to tighten the belt 17. The belt 17 passes around one of the pulleys 13 and around the pulley 14 and then around a second pulley 13, then around the pulley 15 and then around the third pulley 13, and thence passes to a pulley upon the countershaft (not shown), as indicated in Fig. 5.

The barrel blank to be bored is placed inside the spindle 4 and its properly prepared front end thrust into the bevel opening 9 at the nose of the spindle. The hand nut 11 is then screwed in place and tightened against the left hand end of the barrel blank whereby it is centered in the two bevels and tightly held in place ready to be operated on by the drill which enters the small bushing 8 at the nose of the spindle. The ball bearings 5 are of any ordinary type.

At the opposite end of the machine and opposed to each of the revolving tubular spindles 4 and axially in line with each of them are sliding bars 18 mounted in a suit-

able housing 19 arising from the bed of the machine. As these three sliding bars are all alike it will be necessary to describe one only.

The bar 18 has a longitudinal movement somewhat greater than the length of the work to be drilled. Its rear end is of greater diameter than its forward end, thus having a shoulder 20 near its middle. From the front end back to the shoulder 20 it is pierced by a suitable oil feeding hole 21 along its axis, said hole being intersected at its rear extremity by a radial hole 22 connecting it with the surrounding chamber 23. In the nose of the bar 18 the drill 24 is mounted by any suitable means and oil entering the closed chamber 23 around the bar will enter the above described hole 21 and under pressure will flow out through the drill. Pressure will also be exerted against the shoulder 20 on the bar and tend to force the bar 18 toward the right.

In drilling, the bar 18 is forced forward toward the revolving spindle 4. This is accomplished by means of a small piston 25 connected to the bar 18 by the coupling 63 and which enters a chamber 26 in the casing 19, being located below the chamber 23. This small piston 25 has an end area somewhat larger than the area of the shoulder 20 with the result that if the same pressure is applied to both cylinders, the pressure upon the small piston 25 will overcome the pressure upon the shoulder 20 and cause the bar 18 to move toward the tubular spindle with a force proportionate to the differences between the two areas.

Both of the chambers 23 and 26 are supplied with oil under pressure. In order to control the pressure in such a way as to accomplish the movement of the bar 18 in both directions and with varying force and speed in the forward direction, I provide for each cylinder a valve 27 and a pressure plug 28, the valves being manually controlled by handles 29 located at a convenient point. The three valves are formed in one block 30 and being similar in construction and operation it is necessary to describe but one of them.

Figs. 8 and 9 show the details of the valves. The valve casing is formed in the block 30 which is provided with an oblique channel 31 having a port 32, said channel being connected with a conduit 33 to which is connected a supply pipe 34 conducting to it oil under pressure. The valve block is also provided with ports 35 and 36. The port 35 is connected to a pipe 37 which is connected to the large chamber 23 as shown in Fig. 2. The port 36 is connected to a chamber containing the lower end of the pressure regulating plug 28 which is connected to a pipe 38 which is connected to the smaller cylinder 26 as shown in Fig. 2. The valve body 27 is provided with an annular groove 39 opposite the port 32. Pressure is constant at this point and the fluid is distributed therefrom through a channel 40 in both directions. When the channel 40 is in position to register with both the ports 35 and 36, as shown in Fig. 9, pressure is simultaneously exerted within both the cylinders 23 and 26. The valve body is also provided with a channel 41 which is spaced by 90° from the channel 40 and when registering with the port 35 connects that port with the annular groove 39. It is also provided with a central bore 42 which is intersected by a hole 43 in line with the channel 41 which hole 43 registers with the port 36 when the channel 41 registers with the port 35. The end of the bore 42 is uncovered and when the hole 43 registers with the port 36 that port is open to a free discharge, the discharge running down behind the wall 30′ into the pan formed by the base 1. The result is that when the valve 27 is in the position shown in Fig. 9 oil under pressure is fed from the channel 31 to both of the chambers 23 and 26. As before explained, when pressure is so transmitted to these chambers the rod 18 will be moved toward the left because the area of the piston 25 is greater than the area of the shoulder 20. This feeds the drill toward its tubular spindle. The pressure in the chamber 23 acts to force oil through the bore 21 and out through the point of the drill so as to lubricate the drill and wash out the chips during the boring operation. When the valve 27 is turned 45° from the position shown in Fig. 9 both ports 35 and 36 are closed and no action takes place. When, however, it is turned 90° from the position shown in Fig. 9 the large chamber 23 is connected with the port 32 through the channel 41 and port 35, and the port 36 is connected to discharge through the hole 43 and bore 42 with the result that, there being no pressure upon the piston 25, the oil acting upon the shoulder 20 will force the bar 18 to the right, thus withdrawing the drill from the work.

In order to regulate the force of the forward movement of the bar 18 I provide the automatic pressure plug 28 above referred to. This consists of a plug body 44 provided with suitable washers to produce a liquid tight connection between it and the valve body 30, the same being held in place by a screw nut 45. Within this body is an adjusting member 46 provided with engaging screw threads 47 so that it can be adjusted relatively to the plug body 44. It is also provided with knurled cap 48. Carried by the plug body is a valve stem 49, having a valve body 50 provided with saw cuts 51 for permitting the passage of oil under certain conditions. The valve stem 49 is provided with a head 52 against which rests a spring

53, whose lower end bears against an abutment in the adjusting member 46 so as to be adjustable thereby. The valve stem as it passes through the plug body 44 makes a tight fit so as to prevent the passage of oil. When the valve body is in the position shown in Fig. 8 so as to connect the port 36 with the pressure, the valve body 50 is forced downward by such pressure so as to permit the oil to pass through the saw cuts 51. By adjusting the member 46 the tension of the spring 53 can be varied so that the pressure transmitted through the pipe 38 can be increased or diminished, the pressure at the source remaining constant. When the valve body 27 is turned so as to cause the hole 43 to register with the port 36, the port 36 is then connected to the exhaust. Under these conditions the then accumulated pressure beneath the valve body 50 lifts the valve body 50 partly above the port 36 so that this port, which is then connected to exhaust, is partly open to permit the free passage of oil from the small cylinder 26, thus permitting the bar 18 to be freely retracted.

In order to keep the rods 18 from turning I provide a guide bar 54 having grooves 55 as shown in Fig. 3. To the end of each bar 18 is clamped a bracket member 56, said members having projections which engage the grooves 55 in the guide bar and thus act to prevent the bars 18 from turning. The brackets can be clamped at desired points by the screws 56′.

In the end of each small chamber 26 is a spring buffer consisting of a pin 57 engaged by a spring 58. When the bar 18 is near the end of its stroke a portion of the member 56 engages the end of the pin 57 and the movement of the bar 18 is then yieldingly resisted resulting in the slowing down of its movement, this being necessary to properly finish the boring. These small plugs are located directly beneath the large cylinders 23 and on two side members 56 I provide downward extensions 59 for engaging the corresponding spring buffers 57. 60 is a drain pipe extending from the pan 1 to the supply reservoir from which it is again pumped through the pipe 34.

The drills 24 being necessarily long and slender it is necessary to support them when the bars 18 are fully retracted. For this purpose I provide a rest 61 which is provided with a hole 62 for each of the bars 18. This is in the form of a keyhole, there being a round portion with a depending opening. The depending opening is provided to permit the passage of the coupling 63 connecting the bar 18 and its plunger 25, the same being shown in one instance in dotted lines Fig. 11.

64 is a loose disk which fits the round portion of the keyhole slot and is provided with a hole 65 for the drill. This supports the drill at the beginning of the boring and during the first part of its work. When, however, the head of the bar 18 reaches the disk 64 it forces it out of its seat whereupon the disk is carried on the drill, the head of the bar together with the yoke 63 passing through the keyhole opening 62.

The operation of my machine is simple and is readily understood from the foregoing but may be briefly described as follows: A gun barrel blank is first clamped in the tubular spindle 4 which is then revolved by the belt 17, the bar 18 being in retracted position with the disk 64 in its seat. The handle 29 corresponding to the bar 18 opposite the spindle containing the gun barrel just referred to, is then turned upward so as to place the channel 40 in the position shown in Fig. 9 connecting both cylinders 23 and 26 with pressure. This pressure acting upon the plunger 25 feeds the bar 18 forward, oil from the cylinder 23 being discharged through the point of the drill 24. When the boring is nearly completed the clamp 56 engages the spring buffer 57 so as to yieldingly resist the motion of the bar 18. When the drilling operation is completed, the valve 27 is turned to an angle of 90° so as to connect the channel 41 with the large cylinder through the port 35 and so as to connect the small cylinder with exhaust through the hole 43 and bore 42 with the result that the pressure of the oil acting upon the shoulder 20 retracts the bar 18. When the bar 18 has been fully retracted the valve 27 is turned to a neutral position and a new barrel blank is replaced for the one which has just been drilled. During the forward movement of the bar 18 the pressure in the small cylinder is controlled by the pressure plug 28 which has been adjusted to give the desired reduction in pressure and the drill is supported by the disk 64 in the support 61 until such support is no longer necessary, after which the disk 64 is carried along on the drill. Each of the bars 18 is independently controllable by its valve 27. Oil is fed thorugh the drill when the drill bar is moving in both directions acting at all times that the drill is moving to wash out chips that may be in the bore.

As will be evident to those skilled in the art, my invention permits of various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is—

1. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-holding-bar having a longitudinal oil duct therein, of a cylinder surrounding said bar and a source of fluid pressure acting to simultaneously move said bar and feed fluid through said duct to the drill.

2. In a machine for drilling gun barrels

and the like, the combination of a longitudinally movable drill-holding-bar having a longitudinal oil duct therein, of a cylinder surrounding said bar and a source of fluid pressure acting to simultaneously move said bar in one direction and feed oil through said duct to the drill, a second cylinder, a plunger therein connected to said bar and means for causing said fluid pressure to act upon said plunger to move said bar in the opposite direction.

3. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-holding-bar having a longitudinal oil duct therein, of a cylinder surrounding said bar and a source of fluid pressure acting to simultaneously move said bar in one direction and feed oil through said duct to the drill, a second cylinder, a plunger therein connected to said bar and means for causing said fluid pressure to act upon said plunger to move said bar in the opposite direction, a valve controlling ports to both of said cylinders so that the cylinder containing said bar is always subjected to pressure when said bar is moving in either direction, one of said cylinders only being subjected to pressure from the source when said bar is moving in a rearward direction.

4. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-carrying-device, said device having a longitudinal oil duct substantially in line with said drill, and being provided with two piston surfaces facing in opposite directions, of a casing surrounding said device and means for supplying fluid pressure to both of said surfaces when said bar is moving in the forward direction and to one of said surfaces only when said bar is moving in the opposite direction, said pressure when the bar is moving in the forward direction acting to move said bar and simultaneously feed oil to the drill.

5. In a machine for drilling gun barrels, the combination of a longitudinally movable drill-holding-bar, having an oil duct substantially in line with said drill, said bar having a shoulder at its approximate center, a plunger connected to said bar and parallel therewith, cylinders surrounding said bar and said plunger respectively, the end of said plunger facing in the opposite direction from said shoulder, a source of fluid under pressure and means for connecting said source to both of said cylinders simultaneously and at other times with only the cylinder surrounding said bar.

6. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-holding-bar, of a cylinder surrounding said bar and a source of fluid pressure acting to move said bar, a bracket on the rear end of said bar, and a stationary guide rod engaged by said bracket so as to prevent said bar from turning.

7. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-holding-bar, of a cylinder surrounding said bar and a source of fluid pressure acting to move said bar, a bracket on the rear end of said bar and a stationary guide rod engaged by said bracket so as to prevent said bar from turning, said bracket being longitudinally adjustable upon said bar.

8. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-holding-bar, of a cylinder surrounding said bar and a source of fluid pressure acting to move said bar, an extension on the rear end of said bar, means for preventing said bar from turning, and a spring buffer engaged by said extension when near the end of the forward stroke of said bar.

9. In a machine for drilling gun barrels and the like, the combination of a horizontal longitudinally movable drill-holding-bar, a drill carried thereby, a revolving workholder located at a distance from said bar and in line therewith, a support located between said workholder and the forward end of said bar and a removable drill-guiding-member carried by said support and adapted to be removed from its seat when engaged by the forward end of said bar.

10. In a machine for drilling gun barrels and the like, the combination of a longitudinally movable drill-carrying-device, said device having a longitudinal oil duct substantially in line with said drill, and being provided with two piston surfaces facing in opposite directions, of a casing surrounding said device and means for supplying fluid pressure to both of said surfaces when said bar is moving in the forward direction and to one of said surfaces only when said bar is moving in the opposite direction, said pressure when the bar is moving in the forward direction acting to move said bar and simultaneously feed oil to the drill, and a plug for automatically controlling the pressure upon the rearwardly facing surface when acting to feed the bar forward.

11. In a gun barrel drilling machine, the combination of a longitudinally movable drill, a revolubly mounted longitudinal spindle in line with said drill and adapted to hold the blank to be drilled and means for revolving said spindle, said spindle having at its forward end a nose piece provided with a central opening and terminating on its inner surface in a beveled opening and having at its rear end means for forcing the blank against said beveled opening.

12. In a gun barrel drilling machine, the combination of a longitudinally movable

drill, a revolubly mounted longitudinal spindle in line with said drill and adapted to hold the blank to be drilled and means for revolving said spindle, said spindle having at its forward end a nose piece provided with a central opening and terminating on its inner surface in a beveled opening and having at its rear end means for forcing the blank against said beveled opening, said means consisting of a closure having a beveled recess facing the first above mentioned beveled portion.

13. In a gun barrel drilling machine, the combination of a longitudinally movable drill, a revolubly mounted longitudinal spindle in line with said drill and adapted to hold the blank to be drilled and means for revolving said spindle, said spindle having at its forward end a nose piece provided with a central opening and terminating on its inner surface in a beveled opening and having at its rear end means for forcing the blank against said beveled opening, said spindle consisting of forward and rearward tubular portions, bearings for revolubly supporting said forward portion, and means for removably coupling the rear portion to the forward portion.

14. In a gun barrel drilling machine, the combination of a longitudinally movable drill, a revolubly mounted longitudinal spindle in line with said drill and adapted to hold the blank to be drilled and means for revolving said spindle, said spindle having at its forward end a nose piece provided with a central opening and terminating on its inner surface in a beveled opening and having at its rear end means for forcing the blank against said beveled opening, said spindle being provided with a driving pulley.

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