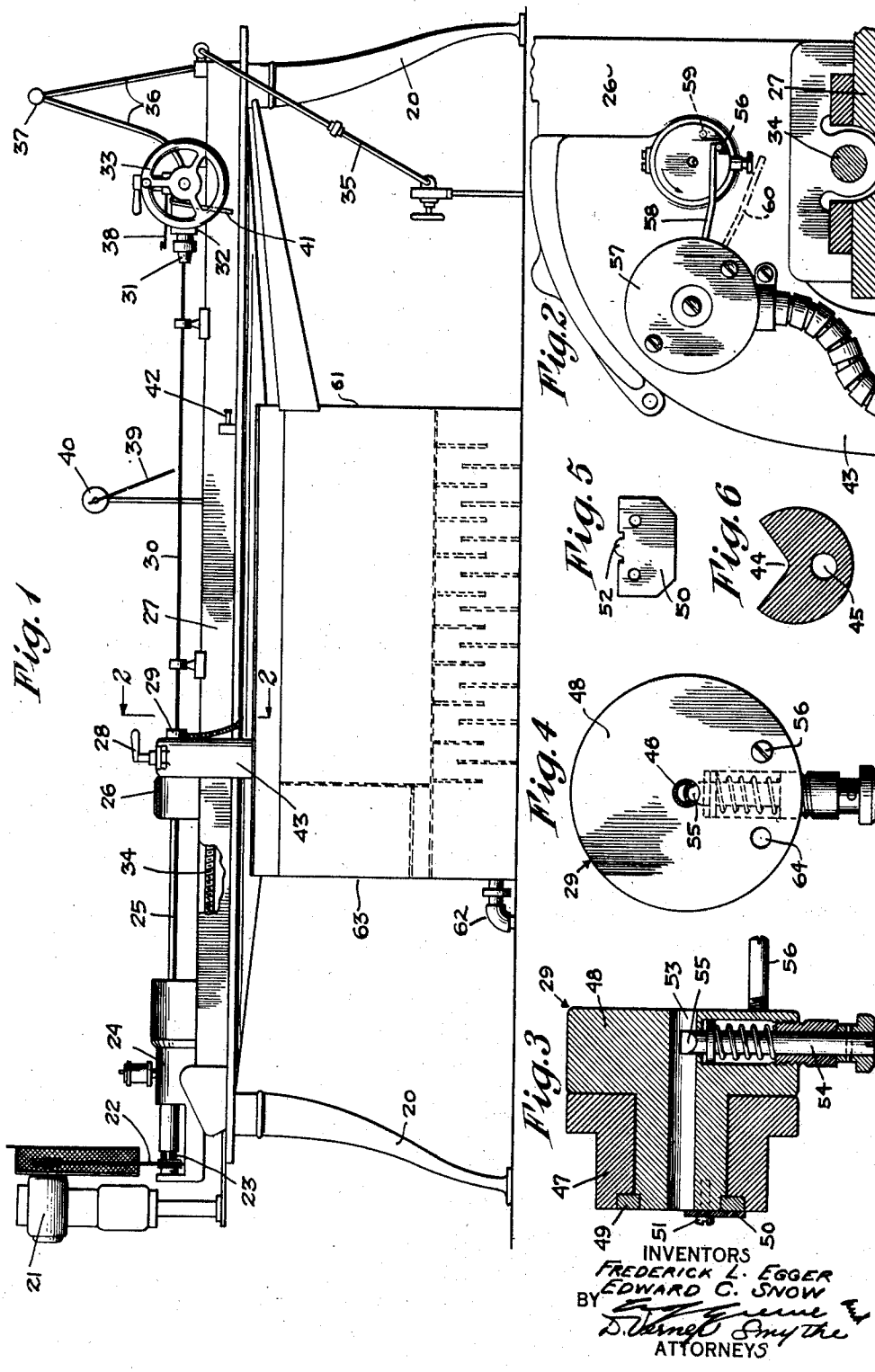
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MACHINE STOP

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MACHINE STOP

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This invention relates to improvements in drilling or similar machines, and particularly to an automatic stop and oil control means therefor.

The invention will be described in connection with a gun barrel drilling machine of the shoulder weapon type, but it is to be understood that this is merely for purposes of illustration.

A gun barrel of this type may be and frequently is as long as 34". The drilling of the hole of the gun barrel with a small size drill such as that used in a .22 caliber rifle, for example, presents many difficult problems. The drill and its shank must be as long or longer than the hole to be bored, and it is evident that such a long small diameter drill cutting in a high grade of steel will be subject to breakage, particularly when hard spots are encountered in the metal or when the necessary cooling and cutting oil does not flow properly.

The drill and its shank are usually hollow so as to conduct the oil to the cutting edge of the tool under high pressure. The oil serves as a coolant, lubricant and a means to carry the chips and cut metal out of the bore. Breakage of the drill or its shank means a consequential large loss of oil and a usual wide spraying of the oil, because of the high pressure. As the drills are expensive, it is obviously desirable to prevent breakage as well as to save the scrapping of the piece being drilled, which was usually necessary when a drill broke.

In the drawing:

Fig. 1 is a side elevational view.

Fig. 2 is a detail view partially in section looking in the direction 2—2 of Fig. 1, showing the automatic stop means.

Fig. 3 is a sectional view of the automatic stop collar.

Fig. 4 is a sectional view looking from the drilled end of the stop collar.

Fig. 5 is a detail view of the plate at the end of the collar.

Fig. 6 is a sectional view of the drill.

As has been previously stated, the invention will be described in relation to a machine for boring the hole through a gun barrel. In such type of drilling, the hole is comparatively long and of small diameter, requiring a drill that is liable to break. Oil must be fed under high pressure to such an exceedingly small drill in order to prevent too short a life of the drill point or breakage thereof. The drills are very accurately made, and are quite expensive. It is inevitable, however, that at times the oil feed will become clogged or that hard or uneven spots will occur in the metal which is being bored, and this will cause breakage of the drill or the shank.

20 is the main support or frame of the drilling machine, having a driving motor, such as 21, which operates belt 22 to turn the spindle 23. The spindle 23 extends through the head 24 and may be suitably supported in ball bearings, if desired, so as to more accurately position the spindle. The gun barrel 25 is mounted in a suitable chuck (not shown) carried by the spindle 23. The other end of the barrel may be supported in a steady rest 26 and may rotate in a suitable bushing therein. The steady rest 26 is reciprocable upon the bed 27 of the machine, and is clamped in place by means of the locking handle 28. A collar 29 is provided in one end of the steady rest 26, which collar is a part of the automatic stop means and will be described in detail at a later point. The drill 30 passes through the collar 29 and is held at its other end in a means 31 which is supported upon the tail stock 32. The tail stock 32 is also reciprocable upon the bed 27 of the machine, and may be manually traversed by means of the wheel 33. In the normal operation of the machine, it is moved by a lead screw 34 which cooperates with a conventional gear wheel located in the tail stock. Oil is fed under pressure through the oil supply line 35 to the oil supply line 36 which has a swivel joint 37. The oil is fed to the hollow shank of the drill in a manner which will be described presently, and is fed to the point of the drill so that the cutting point is suitably lubricated and that the chips, as the drill cuts, will be carried away. The drill is carried into the work as the barrel rotates until the index arm 38 engages the stop arm 39, and operates switch 40 at the point at which the drill has completed its travel through the barrel, which thereby stops the machine. At the same time, the arm 41, which controls a valve in the oil supply line to the drill, contacts stop 42, shutting off the oil at the same time, and prevents undue spraying of the oil through the end of the barrel. The stop 42 may be adjustably positioned so that it can be set at the proper position. There may be a suitable oil drain and chip pan 61 located underneath the machine to collect the chips and oil as they emerge from the barrel. An oil pump takes the oil from the pan through pipe 62, and returns it to the oil supply line under a pressure which may be in the vicinity of 1,000 pounds per square inch, the oil being suitably removed from the extraneous matter before it enters the pump for re-circulation. The oil coming back from the

hole being cut in the barrel is deflected through the steady rest **26**, through the spout **43**, and into the pan. A compartment **63** may be provided into which the barrel may be placed after drilling to allow drainage of oil back into the chip pan and thereby prevent waste. The oil is led from pipe **36** into the tail stock and through the hollow yieldable means at **31**. This is in the form of a screw threaded attachment, a suitable oil seal ring being provided to prevent the escape of oil past the screw threads. This will insure that all of the oil will pass through the drill shank, the seal being necessary because of the high pressure at which the oil is supplied to the drill.

Drill

For a long boring operation, such as shown, the drill itself may be from three to five inches in length, as compared to a barrel, for example, of twenty to thirty-four inches in length. The drill portion may have a single V-shaped open flute or groove **44** (Fig. 6) for the return of the oil and chips backwardly from the cutting edge of the drill. A passage **45** is provided for the supplying of the cooling oil to the cutting edge. A hollow drill shank of a shape such as that at **46** (Fig. 4) may be brazed onto the end of the drill away from the cutting point. This shank may be of any desired length and is made hollow to carry the cooling oil from the tail stock **32** to the hole **45** in the drill. The drill may be supported in the tail stock by a yieldable means, which has sufficient restraining force so as to hold the drill stationary while the work rotates and the drill is normally cutting. In the event that the oil fails or the flow is impeded or a hard or uneven spot is reached in the metal, the additional torque will be sufficient to cause the yielding means to yield, and the drill to turn before breakage occurs. This yieldable means may take the form of a screw threaded connection at **31** to the tail stock **32**. It is to be understood that other types of yieldable means may be employed.

Automatic stop

This turning of the drill in the yieldable means is used to stop the machine and thereby prevent breakage of the drill or shank. A collar **47** of steel, for example, may be mounted with a press fit into the steady rest **26**. An inner sleeve **48**, which may be made of brass or any suitable material, is mounted with a rotating fit in the collar **47**. A retaining ring **49** may be employed to keep the inner sleeve in position relative to the collar **47** and a plate **50** fastened to the inner sleeve by means of screws **51**. The plate **50** may have a projection **52** adapted to fit into the hollow side of the drill shank, which will prevent the oil and chips from passing into the passageway **53**, and will cause the oil and chips to be deflected downwardly into the steady rest, and thence into the oil pan **61**. A spring pressed plunger **54** may be located near the other end of the inner sleeve. The plunger point **55** may be so shaped as to also fit the groove of the drill shank and serve to further stop the oil from coming out of the opening **53**. A stud or lug **56** is screw-threadedly engaged in the outer face of the inner sleeve **48**. An electric switch **57** (Fig. 2), such as a standard mercury switch, may be located upon the steady rest **26**. This switch may be provided with a trip lever **58**, which rests upon the lug **56**, as shown in Fig. 2. The switch **57** may be placed in the circuit to the main driving motor, so that it must be closed in order for the machine to run, and which will stop the machine when it is opened. It can be seen, therefore, that when the stop means is in the position shown in Fig. 2 with the machine operating, that the trip lever **58** will be held and the switch closed, and that in the event that the torque exerted by the work upon the drill shank overcomes the friction of the screw threads in the connection **31** at the tail stop, that the inner sleeve **48** of the automatic stop will be rotated in the direction shown by the arrow, and that the lug **56** will take the position shown in dotted lines at **59**, thereby moving out from underneath the trip lever **58**. The trip lever **58** will then fall by gravity or under spring urgence to the dotted line position of **60** (Fig. 2), thereby opening the machine circuit and stopping the machine before the drill or drill shank becomes damaged. An additional tapped hole **64** may be provided into which the stud **56** can be placed in accordance with the design and direction of rotation.

Summary

A barrel is first placed in position with the one end raised by the chuck and the other end resting in the bearings of the steady rest **26**. The machine is then started, and the oil flow started from supply pipes **35** and **36** to the drill shank through the hole **45** to the tip of the drill, the drill having been inserted through the opening **53** and being engaged by the plunger **54** and plate **50**. The turning of the lead screw moves the tail stock toward the work and carries the drill into the rapidly rotating barrel. The oil passing through the shank and the hole **45** lubricates the cutting edge of the drill and carries the chips outwardly through the groove **44** of the drill and into the steady rest **26** from where it is deflected downwardly by the plate **50** and automatic stop collar **47** to the spout **43** into the oil and chip pan **61**. This operation continues until the stop index **38** contacts arm **39**, shutting off switch **40** and the machine, at which time also the oil supply is cut off by engagement of index **42** with the arm **41**. In the event that the oil supply fails, or for some other reason excessive pressure is placed on the drill shank, the drill shank will rotate, carrying with it the automatic stop, thereby releasing trip lever **58** and shutting off the machine. It is evident that it is also possible to rotate the drill and to hold the work yieldably stationary in a similar manner with an automatic stop means surrounding the work and arranged to engage the switch in a similar manner, so that if excessive torque is exerted upon the work by the drill the work will turn a slight amount and stop the machine.

By this invention a means to prevent breakage of drills and spoilage of work has been provided. The drawing and description are for the purposes of illustration, and the scope of the invention is not to be limited except by that of the appended claims.

What is claimed is:

1. In a drilling machine, in combination, means for rotating the work; a drill having a cutting point; yieldable means to hold the drill from rotation; means to feed oil to the drill adjacent the cutting point, said means comprising a tubular member having an open groove; means to feed the drill into the work; automatic means operated by said drill feeding means to shut off the oil being supplied to said tubular member; and automatic means to stop the machine upon

rotation of the drill due to excessive torque being exerted upon the drill, said stop means including an oil deflecting finger projecting into the open groove of sai dtubular member.

2. In a drilling machine, in combination, means for rotating the work; a drill tip; a hollow drill shank, said drill tip having an oil passage therethrough cooperating with the hollow drill shank; yieldable means to hold the drill shank from rotation; means to feed oil to the drill shank; automatic means to shut off the oil being supplied to said hollow shank; and automatic means having an oil deflecting plate cooperating with the hollow shank to stop the machine upon yielding of the yieldable means.

3. In a machine, a rotating part; yieldable means to normally hold a second part from rotation; automatic means for stopping the machine on rotation of the second part, including a pin substantially parallel to and rotatable with said second part; a switch controlling the machine; and a finger between said switch and pin to operate the switch and stop the machine upon rotation of the second part.

4. In a drilling machine, a rotating part, yieldable means to normally hold a second part from rotation; and an automatic means for stopping the machine upon excessive torque being applied to the second named part, said automatic means including a pin substantially parallel to and rotatable by said second part, said means being supported in a steady rest for the rotating part; a switch controlling the machine; and a finger projecting from said switch to form an operative connection between said switch and pin to operate the switch and stop the machine upon rotation of the second part.

5. In a gun barrel drilling machine, means for rotating the gun barrel; a drill; yieldable means to hold the drill from rotation; automatic means to stop the rotation of the gun barrel upon rotation of the drill due to excessive torque being exerted upon the drill; a disc adapted to be rotated by the drill; a pin projecting perpendicular to the face of said disc; a switch controlling the machine; a finger between the switch and said pin adapted to be released by the pin upon rotation of the disc to thereby control the switch to stop the machine.

6. In a drilling machine, means for rotating the work; a drill having a cutting point; means to feed oil to the cutting point of the drill; means to carry the oil away from the cutting point of the drill; yieldable means to hold the drill from rotation; automatic means to stop the machine upon rotation of the drill due to excessive torque being exerted upon the drill, said automatic means cooperating with the drill to deflect the return oil to a reservoir.

7. In a drilling machine, means for rotating the work; a drill having a cutting end and a shank for said drill; yieldable means to hold the drill and shank from rotation, said drill and shank having an internal passage; means to feed oil to said internal passage and to the cutting end of said drill; an open groove in said drill and shank through which the oil and chips are carried from the cutting end; a support for the free end of the work adjacent the initial cutting position of the drill; automatic means to stop the machine, including means carried by the support and rotatable with the drill and shank to stop the machine upon rotation of the drill due to excessive torque being exerted thereupon, said last named means also having a portion fitting into the groove of the drill and shank to deflect the oil and chips coming from the work along the groove.

8. In a drilling machine, in combination, means for rotating the work; a tubular drill having a cutting point; means to feed oil to the cutting point of the drill, said means comprising a tubular member suitably secured to the rear end of said drill and in axial alignment therewith; yieldable means to hold the tubular member from rotation; means to stop the machine upon rotation of the tubular member due to excessive torque being exerted upon the drill, said stop means including a hub member having an axially drilled hole; means to feed the tubular member through said axial hole into the gun barrel; means to key said hub member to said tubular member; and automatic means operated by said tubular member feeding means to shut off the oil being supplied to said tubular member and to stop the movement of said tubular member through said hub on completion of the drilling operation.

9. In a gun barrel drilling machine, in combination, means for rotating the gun barrel; a drill having a cutting point and an open groove; means to feed oil to the cutting point of the drill, said means comprising a tubular member having an open groove cooperating with the open groove of said drill to carry the oil and chips away from the cutting point of said drill; yieldable means to hold the tubular member from rotation; automatic means to stop the machine upon rotation of the tubular member due to excessive torque being exerted upon the drill, said stop means including a hub member having an axially drilled hole and a radially drilled hole; means to feed the tubular member longitudinally through said axial hole into the gun barrel; a finger resiliently fitted in said radial hole and projecting into the open groove of said tubular member to key said hub member to said tubular member; and automatic means operated by said tubular member feeding means to shut off the oil being supplied to said tubular member and to stop the longitudinal movement of said tubular member through said hub on completion of the drilling operation.

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