Sept. 11, 1956 J. S. SCHROEDER 2,762,339

HYDRAULIC DRILL

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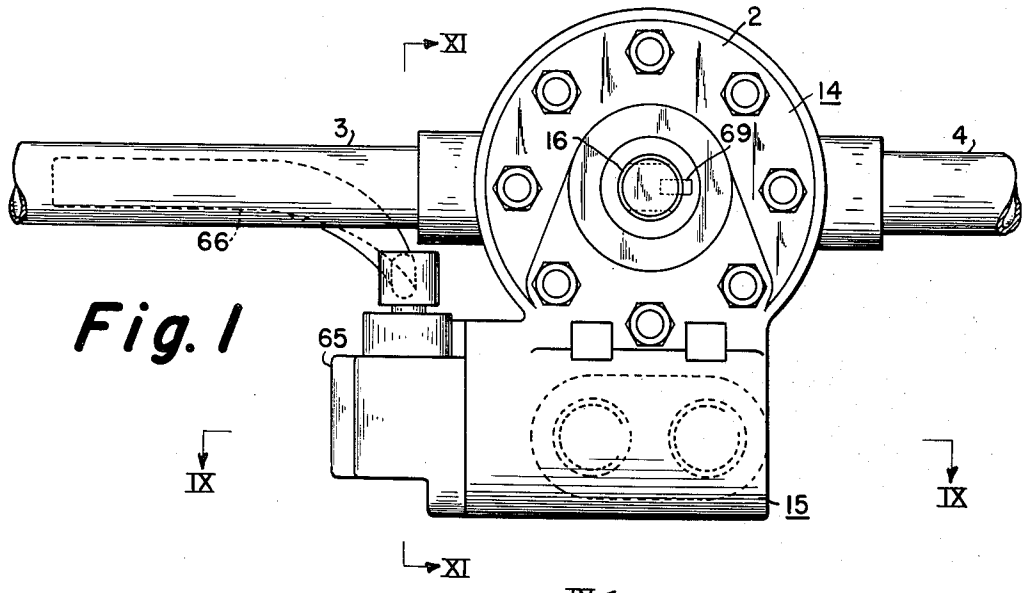


Fig. 1

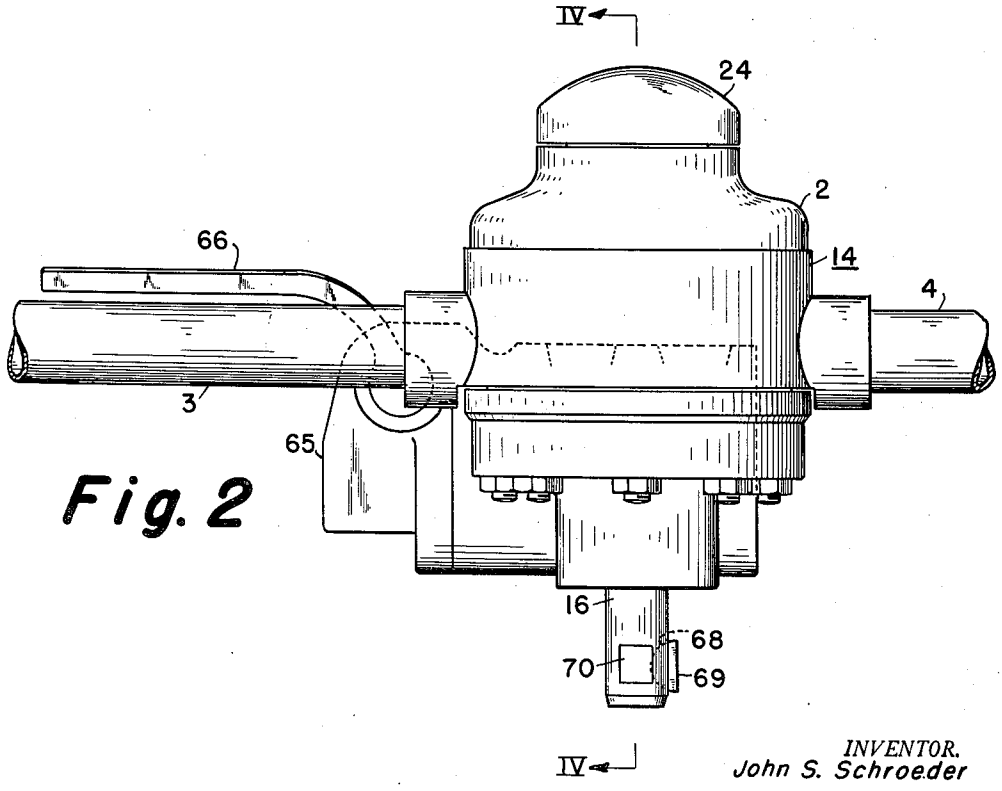


Fig. 2

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HYDRAULIC DRILL

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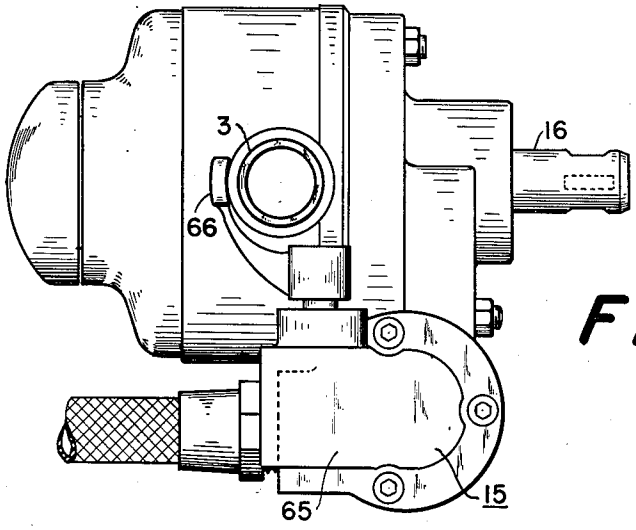


Fig. 3

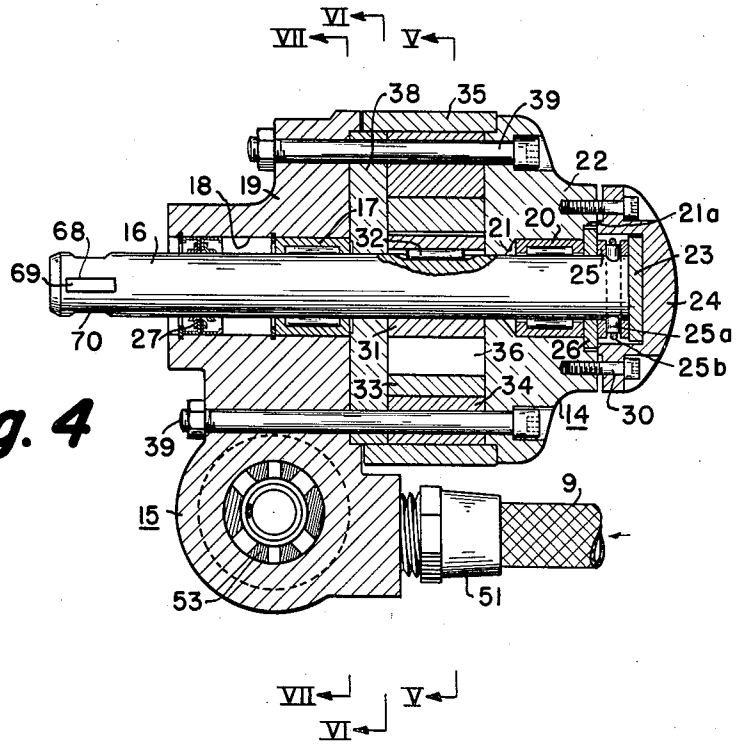


Fig. 4

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HYDRAULIC DRILL

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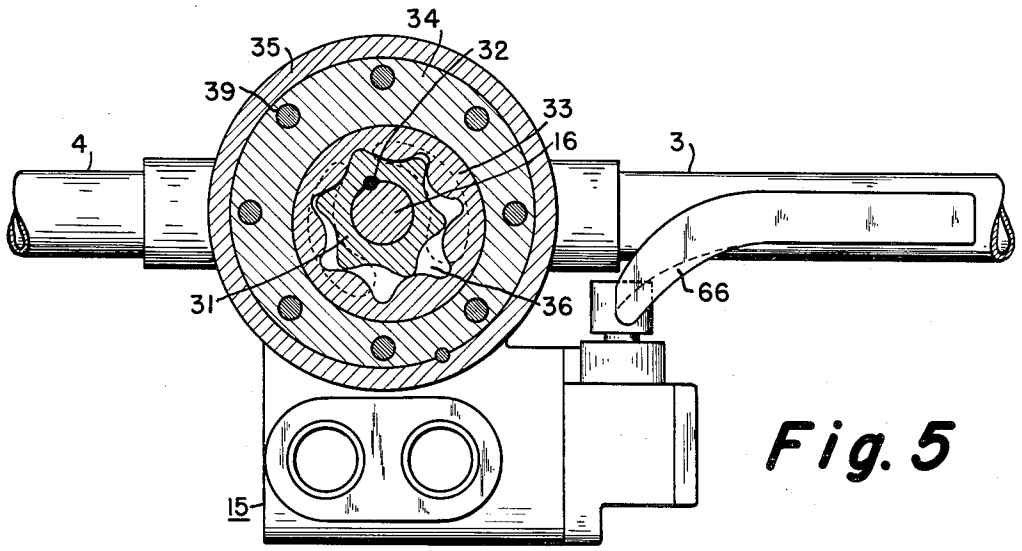


Fig. 5

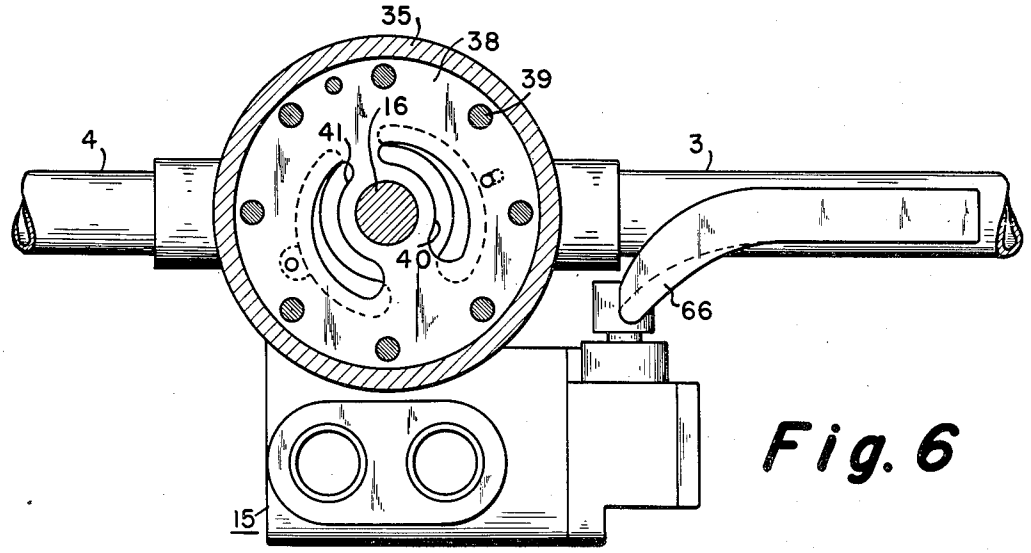


Fig. 6

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HYDRAULIC DRILL

Filed Dec. 4, 1952 5 Sheets-Sheet 4

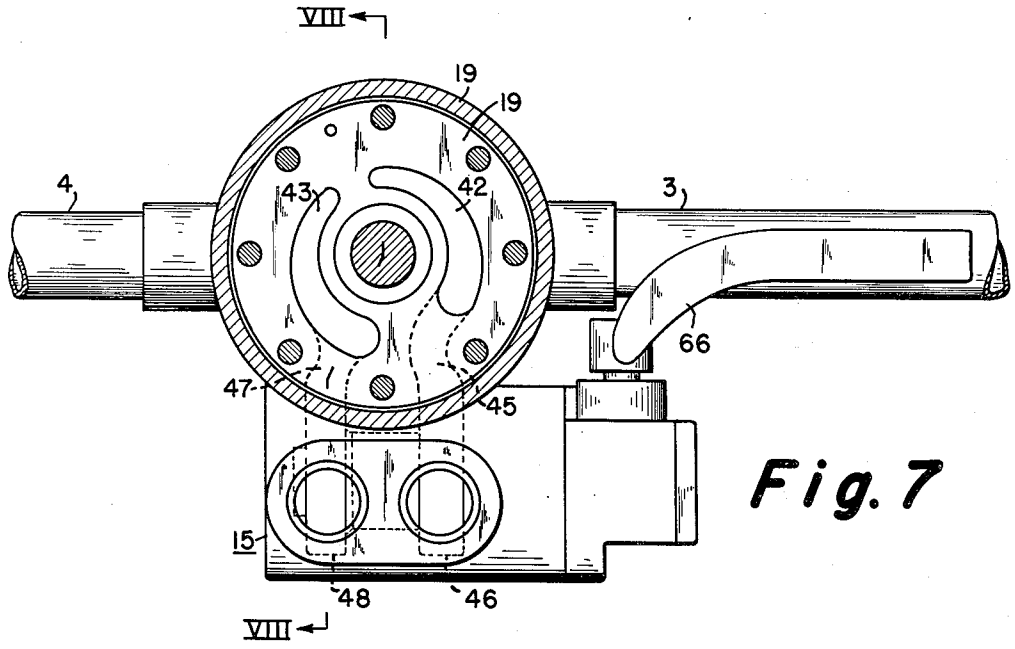


Fig. 7

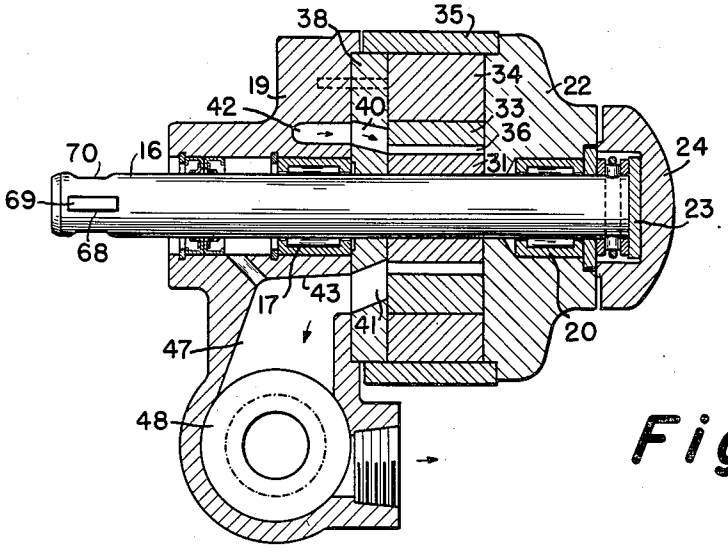


Fig. 8

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HYDRAULIC DRILL

Filed Dec. 4, 1952 5 Sheets-Sheet 5

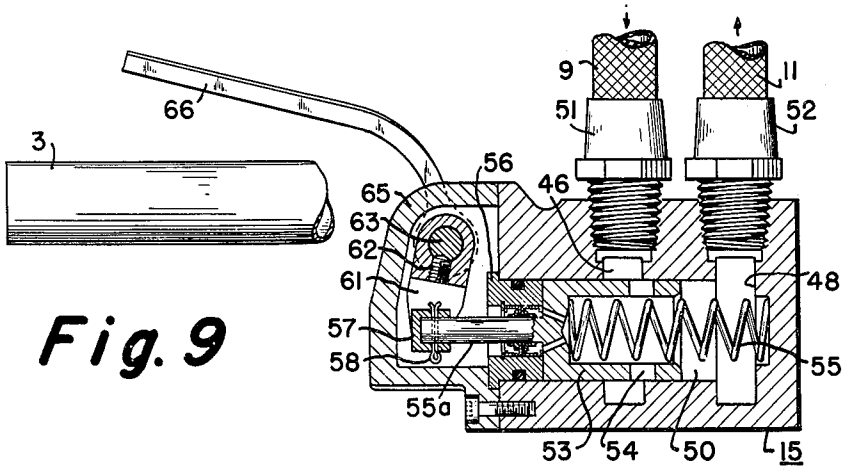


Fig. 9

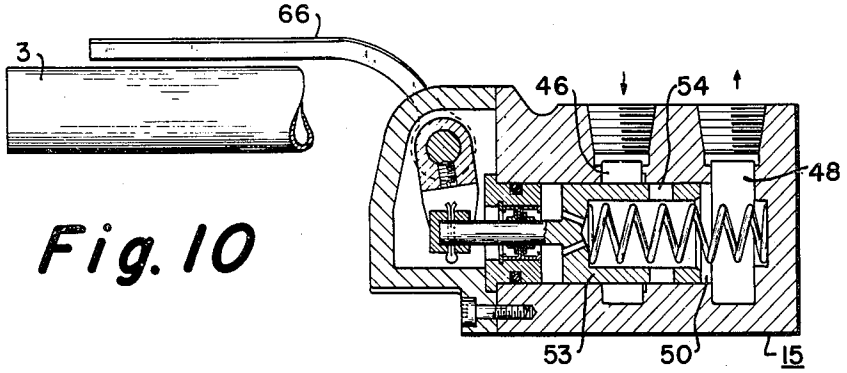


Fig. 10

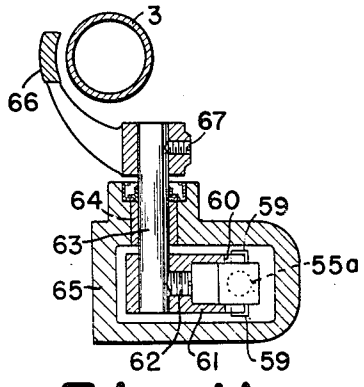


Fig. 11

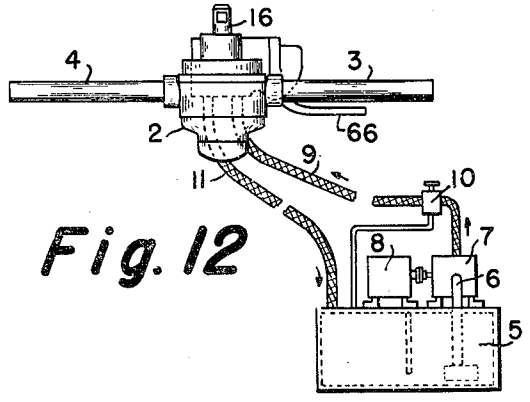


Fig. 12

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United States Patent Office 2,762,339 Patented Sept. 11, 1956

2,762,339

HYDRAULIC DRILL

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Application December 4, 1952, Serial No. 324,015

1 Claim. (Cl. 121—34)

This invention relates to an hydraulic drill in which the drill proper is driven by an hydraulic motor having a rotor located in a rotor chamber. The invention relates particularly to hydraulic drills for drilling holes into coal or other material for receiving an explosive charge.

Heretofore it has been the general practice to drive coal drills by the use of an electric motor. This practice has several disadvantages which are overcome by the employment of an hydraulic drill in accordance with the present invention. Electric motor-driven drills are likely to cause sparks and thereby set off an explosion. There is also the danger of the operator receiving an electric shock. Furthermore, when a drill operated by an electric motor and gears is stalled due to the drill sticking in the coal or other material, it subjects the operator to a mechanical kick or vibration due to the sudden stopping of the drill. All of these disadvantages are overcome by the present invention.

My hydraulic drill is relatively simple in construction and although powerful enough for rapidly drilling holes, is sufficiently light so that it can be easily held by one man even when it is stalled due to sticking of the drill in the material being bored.

In the accompanying drawings which illustrate a preferred embodiment of my invention.

Figure 1 is a front elevation of the hydraulic drill;

Figure 2 is a plan view of the hydraulic drill;

Figure 3 is a side view of the hydraulic drill;

Figure 4 is a longitudinal vertical section taken on the line IV—IV of Figure 2;

Figure 5 is a transverse section taken on the line V—V of Figure 4;

Figure 6 is a transverse section taken on the line VI—VI of Figure 4;

Figure 7 is a transverse section taken on the line VII—VII of Figure 4;

Figure 8 is a longitudinal section taken on the line VIII—VIII of Figure 7;

Figure 9 is a horizontal section taken on the line IX—IX of Figure 1, the valve for controlling the flow of actuating fluid to and from the rotor chamber being in inoperative positon so that the fluid does not flow through the rotor chamber;

Figure 10 is a view similar to Figure 9 except that the valve is in operative position, causing the oil to flow through the rotor chamber so as to operate the rotor and the drive shaft and drill operated by the rotor.

Figure 11 is a vertical section taken on the line XI—XI of Figure 1; and

Figure 12 is a diagrammatic illustration of means for supplying oil or other motive fluid under pressure to the hydraulic motor and returning it to a tank for recirculation.

Referring first to Figure 12, the hydraulic drill designated generally by reference numeral **2** is provided with handles **3** and **4** adapted to be gripped by the operator Oil in tank **5** is withdrawn through pipe **6** by pump **7** driven by an electric motor **8**, and is passed under pressure through a conduit **9** controlled by relief valve **10** to the rotor chamber of the hydraulic drill **2**. After passing through the rotor chamber, thereby actuating the rotor and the drive shaft and drill connected thereto, the oil returns to the tank **5** through conduit **11** for recirculation. The present invention does not relate to the means for supplying oil under pressure to the hydraulic motor. The description thereof is given merely for purposes of explaining the operation of the invention.

Referring now more particularly to the other figures, the invention comprises an hydraulic motor, indicated generally by reference numeral **14**, and a control valve operating in a valve chamber in a valve casing **15** for controlling the flow of oil through the motor as explained hereafter.

The hydraulic motor **14** comprises a drive shaft **16** mounted in a bearing **17** located in a bore **18** formed in a front head **19**. The shaft also is mounted in a bearing **20** located in a bore **21** formed in a rear head **22**. The right-hand end of the shaft (as viewed in Figure 4), bears against a thrust bearing **23** located in a bore in an end cap **24**. A collar **25** secured to the shaft **16** by a pin **25***a* transmits any thrust of the shaft towards the front of the drill against a thrust bearing **26** which is held in an enlargement **21***a* of the bore **21** adjacent its open end. A spring **25***b* holds the pin **25***a* in place. A gland **27** is provided at the left-hand end of the shaft to seal the shaft. Bolts **30** secure the cap **24** to the rear head **22**.

The drive shaft **16** is keyed to an inner gear rotor **31** by a key **32** so as to allow sliding movement between the shaft and the rotor **31**. The rotor **31** is gear shaped and fits within an outer-gear shaped rotor **33**, the number of teeth on the inner rotor **31** being one less than the number of teeth on the outer rotor **33**. The outer rotor **33** fits within an eccentric ring **34**, which in turn fits within an outer ring **35**. The inner gear rotor **31** and the outer gear rotor **33** are located eccentrically to each other and when oil under pressure is introduced into the space **36** between the inner and outer rotors, which space forms a rotor chamber for the inner rotor, both the inner and outer rotors rotate in the same direction but at different speeds. The construction and operation of rotary hydraulic motors having an inner and an outer gear rotor similar to the rotors **31** and **33** herein described is shown per se and therefore need not be described in further detail.

A bearing plate **38** is located within the ring **35** and between the front head **19** and the inner rotor **31**, the outer rotor **33**, and the eccentric ring **34**. Bolts **39** secure the front head **19**, the bearing plate **38**, the eccentric ring **34** and the rear head **22** together. As shown in Figure 6, the bearing plate **38** is provided with an inlet port **40** and an outlet port **41**, each extending through the bearing plate. As shown in Figure 7, the front head **19** is provided with an inlet port **42** and an outlet port **43**, the ports **40** and **42** communicating with each other and the ports **41** and **43** communicating with each other. An inlet passage **45** connects port **42** with a valve chamber **46** formed in valve casing **15**. An outlet passage **47** connects outlet port **43** with a valve chamber **48** in valve casing **15**.

Referring now to Figures 9, 10 and 11, the valve casing **15** has a main valve chamber **50**, an inlet valve chamber **46** and an outlet valve chamber **48**. Oil under pressure is supplied through conduit **9** and fitting **51** to the inlet chamber **46**. A fitting **52** connects the outlet valve chamber **48** with the return conduit **11**. A hollow valve **53** is slidable within the valve chamber **50** and is provided with ports **54**. A spring **55** urges the valve **53** to the left, as viewed in Figure 9. A valve stem **55***a* passes through a gland **56** and at its outer end is received in a cup **57** and is secured to the cup by a cotter pin **58**. The cup has trunnions **59** which are received in slots **60** formed in

the ends of a forked arm **61** which is secured by a screw **62** to a shaft **63**. The shaft is mounted for rotation in a bearing **64** carried by a housing **65** secured to the valve casing **15**. A lever **66** is secured to the shaft **63** by a screw **67**.

When the lever **66** is in the position shown in Figure 9, the spring **55** forces the valve **53** to the left so that oil under pressure in chamber **46** flows through ports **54** into the interior of the valve and then flows through outlet chamber **48** and return conduit **11** without passing through the rotor chamber **36**. This is due to the fact that the pressure in the return pipe **11** is less than that in the rotor chamber **36**. When the parts are in the positions shown in Figure 9, the rotor **31** does not rotate, nor does the drive shaft **16**.

When the lever **66** is moved to the operative position shown in Figure 10, the valve **53** is moved to the right so that ports **54** are cut off from inlet chamber **46**. The oil flows from chamber **46** through passage **45**, port **42**, port **40**, into the rotor chamber **36**, and rotates the rotors **31** and **33** and the drive shaft **16**. Oil flows out from the rotor chamber **36** through port **41**, port **43**, passage **47**, valve chamber **48**, and through the return conduit **11**.

It will be noted that the lever **66** which controls valve **53** is located adjacent to the handle **3** which, together with handle **4**, are used by the operator to hold the hydraulic drill. It will be seen that the position of the handle **66** is such that it can be operated by the same hand which grips the handle **3** without releasing the grip on the handle. This greatly facilitates operation of the drill.

The outer end of the drive shaft **16** is provided with a notch **68** adapted to receive a key **69** and with flats **70** for securing a chuck to the drive shaft. The chuck receives and supports the drill proper in a known manner.

The invention is not limited to the preferred embodiment but may be otherwise embodied or practiced within the scope of the following claim.

I claim:

A hydraulic drill comprising a housing, a hydraulic motor having a rotor located in a rotor chamber in the housing, a drive shaft adapted to be connected at one end to a drill and extending through one side of the housing and the rotor to the opposite side of the housing, the shaft being slidably connected to the rotor, a thrust bearing at the end of the shaft away from the drill, a cap on the housing forcing the thrust plate against the end of the shaft so that the end of the shaft absorbs the thrust developed in forcing the drill into the work, a thrust collar on the shaft and secured against movement along the shaft towards said thrust bearing end, a thrust plate surrounding the shaft and supported in the housing against the thrust collar so that the thrust plate and thrust collar withstand thrust developed in withdrawing the drill from the work.

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