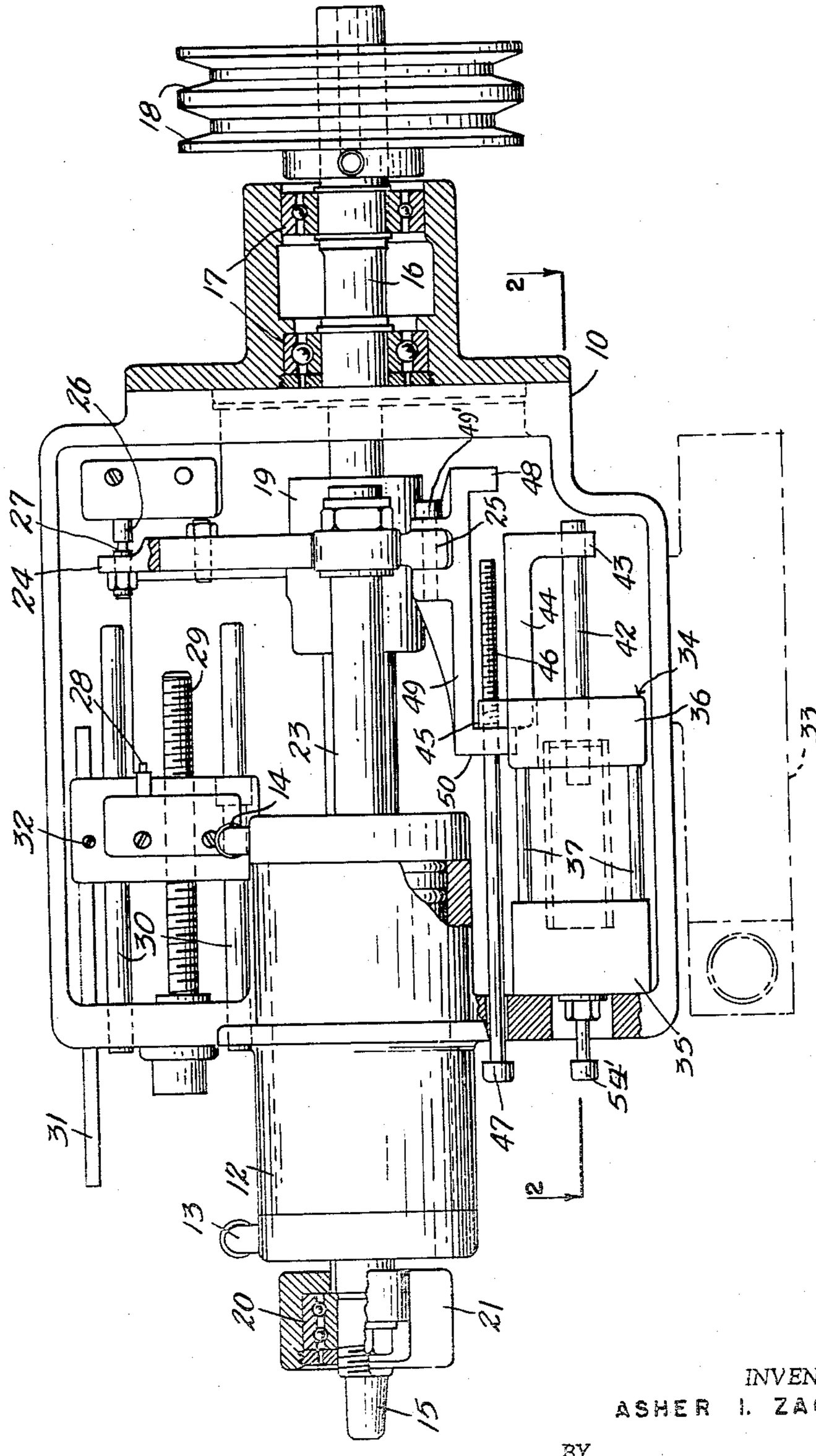
Sept. 20, 1960 A. I. ZAGAR 2,953,122

HYDRAULIC CHECK FOR AIR DRILLING UNITS

Filed Nov. 17, 1958 2 Sheets-Sheet 1

FIG. 1



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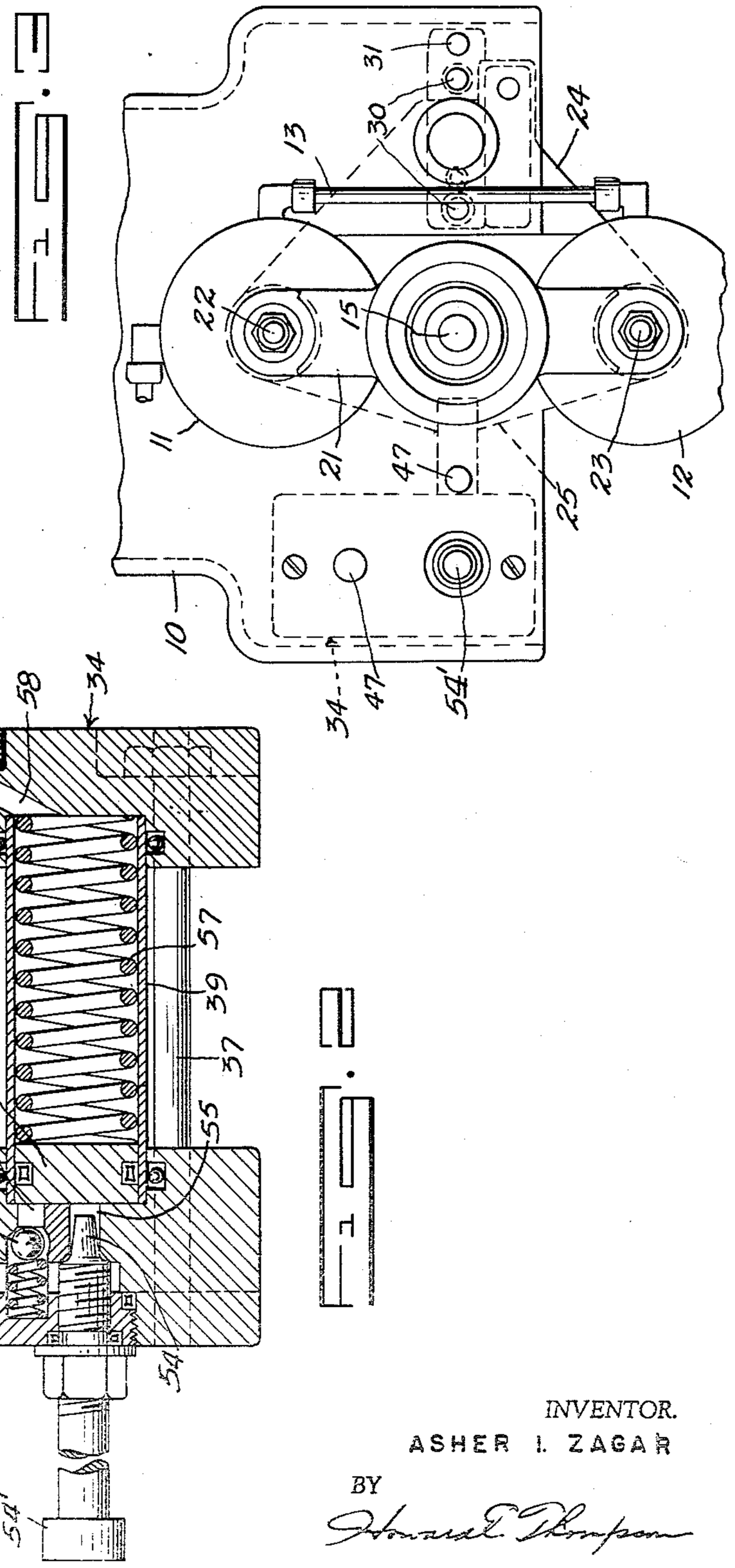

FIG. 2

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HYDRAULIC CHECK FOR AIR DRILLING UNITS

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6 Claims. (Cl. 121—45)

This invention relates to air drilling units of the type and kind more specifically disclosed in application Serial Number 561,542, filed January 26, 1956, now Patent No. 2,863,339. More particularly, the invention deals with what I term a hydraulic check for controlling speed of operation of the tool in its movement into and through a workpiece consistent with the characteristics of the workpiece employed and the speed of operation of the tool which is required.

Still more particularly, the invention deals with a hydraulic check employing two substantially similar cylinders with a bypass from one cylinder to the other for transmission of the hydraulic medium and with an adjustable needle controlling the pressure discharge of the hydraulic medium in definite control of the operation of the tool.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the separate parts are designated by suitable reference characters in each of the views and, in which:

Fig. 1 is a diagrammatic plan view of an air drilling unit, with parts of the construction removed and broken away and illustrating one of my improved hydro-check mechanisms in elevation.

Fig. 2 is an enlarged sectional view substantially on the line **2—2** of Fig. 1 through the cylinders of the hydro-check employed; and

Fig. 3 is an end view of the apparatus, as seen in Fig. 1 of the drawing, and indicating, in dotted lines, the position of the hydro-check in the casing of the unit, with parts of the construction broken away.

Considering Fig. 1 of the drawing, I have indicated at **10** the casing of a drilling unit, substantially as disclosed in the application heretofore identified. Arranged in the casing are two air cylinders **11** and **12**, note Fig. 3, the cylinders having intercommunicating passages, as at **13** and **14**, controlling operations of pistons in the cylinders in the feed of a tool supporting spindle **15** toward and from a workpiece, the spindle **15** being driven from a drive shaft **16** suitably secured in bearings **17** in one end of the casing **10** through the medium of drive pulleys **18**, as noted in Fig. 1 of the drawing.

At **19** is indicated a flexible coupling in the shaft **16** and at **20** is indicated a ball bearing support for the spindle **15** in an adaptor crosshead **21**; note Fig. 3 of the drawing. Supported in the ends of the crosshead **21** are piston rods **22** and **23**, respectively, which are coupled with the pistons in the cylinders **11** and **12**. These rods include ends which protrude beyond inner ends of the cylinders **11** and **12** and are coupled with a bracket **24**, which is generally V-shaped in form, as indicated in Fig. 3, being modified to the extent of including an extension **25** centrally thereof, for purposes later stated.

Supported in the casing **10** is a switch **26** actuated by an adjustable pin **27** on the bracket **24**. Another switch **28** is adjustable on an adjustment screw **29** and guided on

rods **30**, the housing of the switch also adjustably supporting a stop pin **31** through the medium of a screw **32**. The two switches **26** and **28**, respectively, control the forward drive of the spindle **15** and the reverse movement thereof. In this connection, it will be understood that the switch **28** strikes the bracket **24** in operation thereof.

In dot-dash lines I have indicated at **33** in Fig. 1 of the drawing a check valve, which is of standard construction and controls the flow of air to end portions of the respective cylinders **11** and **12** through pipes or communications **13** and **14** and this valve is electrically controlled through actuation of the switches **26** and **28**, which are preferably of the micro switch-type.

The structure just described is generally the same as noted in the application heretofore referred to and is illustrated in order to fully understand the operation of my improved hydro-check mechanism which is substituted for and takes the place of the hydraulic cylinder structure, as noted at **47** and its various connected parts illustrated in said prior application.

One disadvantage or objectionable feature of the structure shown in the early application was the fact that controls for the hydraulic cylinder were seated closely adjacent the crosshead **21** and, at times, adjacent the workpiece operated upon. However, with my improved construction, the hydraulic check is disposed substantially in its entirety within the casing and far remote from the spindle **15** and workpieces, in connection with which the drilling unit is used.

Suitably supported within the casing **10** is a hydraulic check mechanism **34**, note Fig. 2, which comprises a pair of end plates **35** and **36** secured together by bolts **37**, the plates being spaced by a speed control cylinder **38** and bypass cylinder **39**, suitably sealed in the plates **35** and **36**, as indicated diagrammatically at **40**.

Arranged in the cylinder **38** is a piston **41**, the rod **42** of which extends out through the plate **36** and is coupled with one offset **43** of a link **44**, the other offset **45** of which supports a combination adjustable screw and guide rod **46**. The rod **46** has a fingerpiece end **47** protruding through one end of the casing **10**, as clearly noted in Fig. 1.

Adjustment of the screw **46** controls the period of time at which an offset dog **48** on a yoke **49** engages the end of the screw **46** in beginning the feed or operation of the piston **41** in the cylinder **38**. The yoke is pinned or otherwise fixed to the extension **25**, as indicated at **49'** in Fig. 1 of the drawing. The bracket also includes an offset end **50**, which is slidably mounted on the rod **46**.

From the foregoing, it will be apparent that, in the initial operation of the air cylinders, the tool supporting spindle **15** is quickly moved in the direction of the workpiece to be operated upon and, at the time that the tool reaches the workpiece, the dog **48** will engage the rod **46** and begin actuation of the piston **41** in the cylinder **38**. The piston **41** will have suitable seals, as at **41'**, in the cylinder **38** and, in the drive of the piston **41**, the hydraulic medium will be forced through the discharge **51** in the plate **35** into an annular chamber **52** in the plate, the chamber being closed by a sealed plug **53**.

Adjustably supported in the plug **53** is a needle valve **54**, adjustment of which is provided through the medium of a fingerpiece **54'**, the valve controlling passage of the hydraulic medium from the chamber **52** through a port **55** into the cylinder **39**. This operation will advance a suitable piston **56** in the cylinder against the action of a coil spring **57** for discharge of the hydraulic medium through a substantially V-shaped bypass passage **58** in the plate **35** for admission into the cylinder **38** in back of the piston **41**. The passage **58** is controlled by a sealed plug **59**.

It will also appear that exposed to the cylinder **39** and the piston **56** is a passage **60** controlled by a spring actuated ball check **61**, the passage **60** opening into the chamber **52** so that, in the return stroke of the piston **41**, or, in other words, in withdrawal of a tool from a workpiece by actuation of the air cylinders, the hydraulic medium admitted to the cylinder **39** will be discharged by the piston **56**, assisted in this operation by the spring **57** to transfer the hydraulic medium back into the cylinder **38** through the passage **51**. In the first named actuation of the piston **41**, it will be understood that the valve **61** will be in seated position, preventing discharge of the hydraulic medium through the passage **60**.

By adjusting the tapered needle valve **54**, a very fine degree of control can be provided to govern the speed of operation of the tool in performing a drilling or other operation in a workpiece.

It will appear that my improved hydro-check mechanism is simple and economical in construction and, by virtue of its mounting within the casing, will render the entire drilling unit more flexible for use in connection with workpieces of various types and kinds.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A hydraulic check mechanism for air drilling units of the character described, said unit employing a casing with a pair of air cylinders therein, a bracket in said casing and supported upon rods of pistons operating in said cylinders, said mechanism comprising a pair of hydraulic cylinders mounted in said casing, one of said hydraulic cylinders comprising a speed control cylinder and the other a bypass cylinder, a piston in said control cylinder having a protruding rod supporting a link, said link having an offset, in which a stop and guide rod is adjustably supported, a yoke coupled with said bracket and slidable on said guide rod, said yoke including a dog operatively engaging the guide rod in movement of said piston in the control cylinder in pressure discharge of a hydraulic medium in said control cylinder into the bypass cylinder of said mechanism, an adjustable needle valve controlling transmission of the hydraulic medium into said bypass cylinder, a piston in the bypass cylinder actuated by the hydraulic medium introduced into said bypass cylinder, and means for bypassing the hydraulic medium from said bypass cylinder into the control cylinder.

2. A hydraulic check mechanism as defined in claim 1, wherein said cylinders comprise tubes mounted and sealed in end plates bolted together and, wherein, said rod and needle valve include fingerpiece ends disposed externally of said housing.

3. A hydraulic check mechanism as defined in claim 1, wherein said mechanism includes a ball check control passage communicating with the bypass cylinder, and a spring is disposed in the bypass cylinder for actuating the piston in said cylinder in transfer of the hydraulic medium from the bypass cylinder into said control cylinder.

4. A hydraulic control mechanism of the character described, comprising a pair of independent end plates, tubular cylinders supported and sealed in adjacent surfaces of the plates, bolts for securing the plates together in abutment with said cylinders, a piston in one cylinder including a rod slidable in one of the plates, with an end protruding well beyond said plate, a piston in the other cylinder, a spring normally supporting the second named piston in engagement with the opposed plate of said mechanism, said last named plate having a passage communicating with both of said cylinders, an adjustable needle valve controlling transmission of a hydraulic medium from said passage into the second named cylinder, a ball check controlling another passage communicating with the second named cylinder, said first named plate including a bypass passage communicating with ends of both of said cylinders, and means, in operative engagement with the rod of said piston, controlling operation of the piston rod in discharge of a hydraulic medium from the first named cylinder into said second named cylinder.

5. A hydraulic control mechanism of the character described, comprising a pair of independent end plates, tubular cylinders supported and sealed in adjacent surfaces of the plates, bolts for securing the plates together in abutment with said cylinders, a piston in one cylinder including a rod slidable in one of the plates, with an end protruding well beyond said plate, a piston in the other cylinder, a spring normally supporting the second named piston in engagement with the opposed plate of said mechanism, said last named plate having a passage communicating with both of said cylinders, an adjustable needle valve controlling transmission of a hydraulic medium from said passage into the second named cylinder, a ball check controlling another passage communicating with the second named cylinder, said first named plate including a bypass passage communicating with ends of both of said cylinders, means, in operative engagement with the rod of said piston, controlling operation of the piston rod in discharge of a hydraulic medium from the first named cylinder into said second named cylinder, said last named means including an adjustable rod, and an actuated yoke slidable on said adjustable rod and including a dog normally spaced from and operatively engaging the end of said adjustable rod in drive of the piston in said cylinder.

6. A hydraulic control mechanism of the character described, comprising a pair of independent end plates, tubular cylinders supported and sealed in adjacent surfaces of the plates, bolts for securing the plates together in abutment with said cylinders, a piston in one cylinder including a rod slidable in one of the plates, with an end protruding well beyond said plate, a piston in the other cylinder, a spring normally supporting the second named piston in engagement with the opposed plate of said mechanism, said last named plate having a passage communicating with both of said cylinders, an adjustable needle valve controlling transmission of a hydraulic medium from said passage into the second named cylinder, a ball check controlling another passage communicating with the second named cylinder, said first named plate including a bypass passage communicating with ends of both of said cylinders, means, in operative engagement with the rod of said piston, controlling operation of the piston rod in discharge of a hydraulic medium from the first named cylinder into said second named cylinder, said last named means including an adjustable rod, an actuated yoke slidable on said adjustable rod and including a dog normally spaced from and operatively engaging the end of said adjustable rod in drive of the piston in said cylinder, and means for coupling said yoke with a driving means.

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