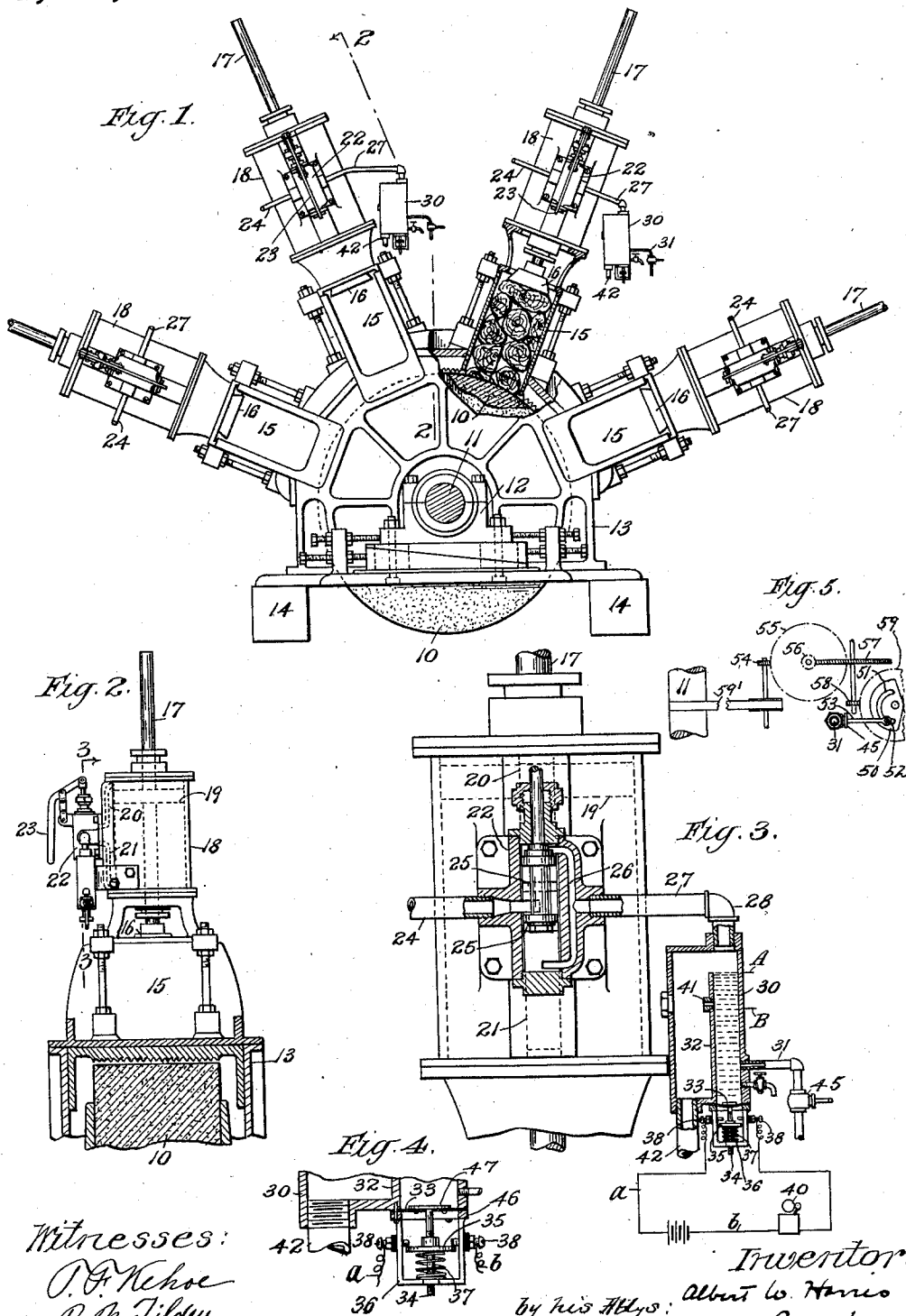


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HYDRAULIC MACHINE.
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Patented Nov. 5, 1912.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC MACHINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALBERT W. HARRIS, a citizen of the United States, temporarily residing at Grand Mere, Province of Quebec, Canada, have invented certain new and useful Improvements in Hydraulic Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in hydraulic machinery, and has been designed especially for use in hydraulically operated wood grinding machinery, though if desired it may be used in other relations.

It is one object of the present invention to provide a device, the operation of which is controlled by the fluid escaping from a hydraulic cylinder of such machines which will indicate whether the cylinder is normally operating, this indication being given, for example, by the sounding of an audible alarm. The invention, however, is not limited to an indicating device of this character, but includes any other suitable for the purpose.

It is a further object of the invention, when the invention is used with hydraulically operated wood grinding machinery, to provide a device for the operation of which is controlled by the fluid escaping from a hydraulic cylinder of the machine, which will cause an indication to be given if the operator shall take more than a predetermined time in filling the grinding pocket of the cylinder of such machine with the wood blocks to be ground, or in arranging the wood blocks in the pocket.

A further object of the invention is to provide a device for accomplishing these results which may be readily attached to the hydraulic cylinder with which it is intended to be used.

A full description of the device and its operation will now be given as used with a hydraulically operating wood grinding machine, one type of such machine which has been chosen to illustrate the invention, and the device operatively connected therewith, being shown in the drawings, in which—

Figure 1 is a diagrammatic front elevation partly in section and partly broken away of a wood grinding machine in which

a plurality of hydraulic cylinders is employed to force the wood blocks into grinding relation with a grinding agency, and showing two of the indicating devices connected to two of the cylinders; Fig. 2 is a section taken on line 2—2 of Fig. 1; Fig. 3 is a section taken on line 3—3 of Fig. 2; showing the controlling valve of one of the hydraulic cylinders and one form of the device operatively connected therewith; Fig. 4 is an enlarged detail view of the indicating mechanism; and Fig. 5 is a diagrammatic plan view of a means for gradually closing the outlet of the indicating device and a train of gearing for operating the same.

Referring now to these drawings, the wood grinder shown is a usual type of hydraulically operated machine. In Fig. 1 the grinding stone is indicated at 10, being a rotary stone carried by a shaft 11 driven from any suitable source of power (not shown), the shaft 11 being mounted in adjustable bearings indicated generally at 12, suitably supported by framing 13 on supports 14. With this type of machine, a plurality of pockets 15 are employed suitably mounted in the frame of the machine in which the blocks of wood to be ground are arranged. The blocks of wood are forced into grinding engagement with the grinding cylinder 10 by plungers or followers 16, one of these plungers being provided for each pocket. The plungers 16 are carried on piston rods 17 of the hydraulic cylinders 18 which are suitably supported above the pockets 15. The piston rods 17 are operated by pistons 19 working in the cylinders 18, ports 20, 21 (dotted lines, Fig. 2) being provided for the admission of fluid above and below the pistons 19. The admission of fluids to the cylinders is controlled by any suitable valve, such as the piston valve shown in Figs. 2 and 3, and indicated generally by the numeral 22, a valve being provided for each cylinder, these valves being manually operated by handle 23, the valves, when in one position, acting to admit fluid above the pistons 19, and when reversed admitting fluid behind the pistons to reverse the movement thereof. Fluid is supplied to the valves by supply pipe 24 connected to a suitable source of fluid under pressure (not shown) and

from the valves to the cylinder by ports 25 (Fig. 3). There are two of these ports 25 for each valve, which act alternately as inlet and outlet ports, depending on the position of the valve piston. The fluid escapes from one of these ports 25 and passage 26 to outlet 27. This valve construction shown is a usual type employed with hydraulic cylinders and a more detailed description of the same is unnecessary for an understanding of the present invention.

In the operation of the type of hydraulic wood grinder above briefly described, the operator, assuming the piston 19 is at the bottom of the cylinder, moves the valve and admits fluid under pressure below the piston, raising the piston to the upper limit of its stroke. This upward movement of the piston carries with it the plunger or follower 16, leaving the pocket 15 clear, which the operator then fills with the blocks of wood which are to be ground and reverses the valve. The reversal of the valve admits fluid under pressure above the piston 19, and the piston is slowly forced downwardly, acting through the follower to force the blocks of wood against the grinding cylinder. As the piston is forced down, the fluid below it is gradually forced out through the outlet of the valve, the fluid escaping with a rapidity proportional to the downward movement of the piston. The flow of fluid from the valve when the piston is properly operated is regular. If, however, the wood blocks become wedged against the sides of the pocket so that the piston no longer is properly operated by the fluid pressure, or if for any other reason the cylinder fails to normally operate, the flow of liquid from the cylinder through the controlling valve will diminish or cease altogether. By the present invention, the flow of fluid from the cylinder is utilized to indicate the operation of the cylinder, and a suitable device has been provided for this purpose, which will now be described.

The specific construction of the device may be widely varied, but it will be of such a character that a diminution or cessation of flow of fluid from the controlling valve will cause an indicating means to be operated. The indicating means shown and now to be described is one which gives an audible alarm, and is electrically operated, but the invention, broadly considered, is not limited to indicating means of the audible alarm type nor to indicating means which is electrically operated, though for some purposes and in some situations indicating means of this type and so operated is preferred.

The construction which has been chosen to illustrate the invention is shown in detail in Fig. 3. In this figure the device is shown as including a casing 30 which is in communication with the outlet 27 of the con-

trolling valve, so that the fluid therefrom passes through the casing. The casing 30 may be located in any convenient position about the machine, and is connected with the outlet in any suitable manner. As illustrated, the casing is supported by the outlet pipe 27 being connected thereto by an elbow 28. The fluid escaping from the controlling valve is delivered to this casing and when the cylinder is normally operating there is maintained in the casing a column of fluid adapted to exert a predetermined pressure, this pressure being maintained by drawing off the normal amount of fluid from the casing at the same rate at which it is received therein, the column of fluid being maintained in the device illustrated at the level indicated at B, (Fig. 3), which may be termed the working level. Suitable means for drawing off the fluid is provided, as a draw-off pipe 31, this draw-off being normally open, and proportioned to draw off the fluid at the rate it is received when the normal amount is flowing from the cylinder. If there be a diminution or cessation of the flow from the cylinder to the casing, the draw-off 31 being open, the level of the column of liquid will be lowered, and the pressure of the column will be reduced and the indicating device operated as hereinafter described. For reasons hereinafter referred to, the casing is divided into two compartments by a partition 32, the column of fluid which controls the operation of the alarm device being maintained in the right hand compartment shown in Fig. 3. The specific construction by which the reduction below normal of the fluid pressure in the casing causes the indicating device to be operated may be varied. One efficient construction, however, for this purpose includes a diaphragm 33, which is secured in the bottom of the right hand compartment of the casing by a ring 46. The diaphragm 33 has secured to it a plate 47 which is fast to a rod 34 passing through a bracket 36 integral with the ring 46. This sliding rod is provided below the diaphragm 33 with a collar 35 between which and the lower part of the bracket 36 is a spring 37. The diaphragm is held depressed by the pressure of the fluid in the casing, against this spring, the tension of which is so proportioned relatively to such pressure that if the level of the fluid in the casing falls below the working level B, the spring will cause the diaphragm to rise. When the diaphragm rises, it carries with it the collar 35 which in rising engages with suitable contacts 38, making an electrical circuit indicated diagrammatically by the wires *a*, *b*, and through such circuit operates the indicator which in the case shown is an alarm bell 40. The ring of this alarm affords to the foreman or other person in personal charge of the mechanism and its

operator an indication that the particular cylinder is either not working at all, or is not working normally. It is further desirable in this type of machinery that the operator shall not take longer than a predetermined time to fill or rearrange the wood pockets of the cylinder, and the present invention provides means whereby the foreman or other person in personal charge may be notified if he takes longer than such predetermined time to fill or rearrange the pocket, the device being of such construction as to afford this result. As shown, this result is provided for by increasing the height of the partition 32 in the casing, so that the height of the column of fluid in the chamber when required may be raised from the normal working level B to the higher level indicated at A in Fig. 3. The partition is provided just above the working level B with a draw-off 41, this draw-off and the draw-off 31 cooperating to draw the column of fluid from level A to level B in, say, two minutes, thus allowing the operator two minutes within which to fill the pocket of the cylinder. If a longer time be taken, the draw-off 31 being open, will draw the level of the column below the level B and cause the alarm to sound as above described. The left hand compartment of the casing serves as an outlet for waste fluid, when there is a large excess of such fluid, as when the cylinder is suddenly reversed to enable the pocket to be refilled or rearranged, this excess of water escaping through an outlet pipe 42.

In woodgrinding machines of the type hereinbefore referred to, as the grinding operation proceeds the grinding surface of the grinding stone becomes dull. This dulling of the surface causes a slowing up in the operation of the machine, and the quantity of water escaping from the hydraulic cylinders gradually decreases until the surface becomes so dull that it ceases to grind properly and has to be resharpened. This decrease in the water supplied to the indicating device thus takes place when the machine is normally operating. It is desirable when the device is used with woodgrinding machines to compensate for this gradual decrease and means are provided for so doing. In the construction illustrated there is provided a valve as 45 in the outlet or draw-off 31 by which the amount of fluid drawn off may be regulated. This valve is operated so that as the amount of fluid entering the casing of the indicating device decreases, owing to the dulling of the grinding surface, the valve is gradually shut off to decrease the fluid drawn off from the casing proportionately. The valve may be so operated in various ways. In the construction illustrated there is provided a cam plate 50 suitably mounted on the machine provided with a cam slot 51 in which works a pin 52 on the

end of the valve spindle 53 of valve 45. By rotating the cam plate the valve is closed, the cam slot causing this closing to be gradual. The plate is rotated in any suitable manner, as by train of worm gears 54, 55, 56, 57, 58, 59, indicated diagrammatically, the train of gears being actuated through a belt 59' from the shaft 11 of the machine. Assuming the grinding stone to wear down so as to require resharpening in six hours, the train of gearing is proportioned to throw the valve spindle through, say, one-half of its play in that time, this throw being gradual, the rate of flow of liquid from the cylinder being decreased, say, one-half, in such time, and when the stone has been resharpened the operator moves the cam plate back to its original position.

The operation of the device is obvious in view of the foregoing description, but may be briefly recapitulated as follows: Assuming a grinder pocket of any one cylinder to be empty, the plunger or follower 16 and the piston 19 of the hydraulic cylinder are at their lowest positions. The operator then operates the valve 22, admitting fluid under pressure below the piston 19. The piston 19 rises very rapidly, and the liquid above it is discharged through the valve 22 into the casing 30. The right hand or working column of the casing is filled with fluid to the level A, the excess fluid escaping through escape pipe 42. The operator now proceeds to fill the pocket and the draw-offs 31, 41 operating, draw the column of fluid in the casing from the level A to the level B in a predetermined time, at which time the operator is assumed to have the pocket filled. He then reverses the valve 22, admits liquid above the piston 19, which immediately begins its downward movement, slowly forcing out the liquid below it through the valve and into the casing. The liquid at this time in the casing is at the working level, or level B, draw-off 31 being open and being proportioned to draw off the liquid as fast as it is received, maintains the level of the liquid in the casing at level B as long as the cylinder is properly operating. Now, if the cylinder ceases to operate, or operates slower than it should through the blocks of wood becoming disarranged, draw-off 31 draws down the liquid in the casing below the working level B, thus permitting the diaphragm to be forced upward by the spring 37 and the alarm to be sounded.

It is understood that while the invention has been shown and described as applied to hydraulically operating wood grinding machinery, it is not limited to such use, but may be applied equally well where the necessity may arise with other hydraulically operating cylinders. It is further understood that the construction shown and described for carrying out the invention is a preferred

able one, but that other constructions might be devised which would be within the scope of the invention and the claims hereunto appended.

5 What I claim is:—

1. The combination with a hydraulic cylinder and a controlling valve therefor, of a device for indicating the operation of the cylinder, and means controlled by the fluid
10 flowing from the valve for causing the indicating device to operate.

2. The combination with a hydraulic cylinder and a controlling valve therefor, of a device for indicating the operation of the cylinder, and resilient operating means controlled by the fluid flowing from the valve
15 for causing the indicating device to operate.

3. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, means for maintaining a normal predetermined fluid pressure in the chamber, a device for indicating the operation of the cylinder and means controlled by
20 the pressure of the fluid whereby a lessening of the pressure in the chamber causes the indicating device to operate.

4. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, means for maintaining a normal predetermined fluid pressure in the chamber, a device for indicating the operation of the cylinder, an electric circuit for
25 said indicating device, and means controlled by the pressure of the fluid whereby a lessening of the pressure in the chamber closes the circuit and causes the operation of the indicating device.

5. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, a normally open outlet proportioned to draw off the fluid from the
30 chamber as it enters therein when the cylinder is normally operating, whereby fluid may be maintained in the chamber at a predetermined working level, a device for indicating the operation of the cylinder, and
35 means whereby drawing off the water below such working level will cause the indicating device to operate.

6. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, a device indicating the operation of the cylinder, a normally open outlet proportioned to draw-off the fluid
40 from the cylinder as it enters therein when the cylinder is normally operating, whereby fluid may be maintained at a predetermined working level in the chamber, a diaphragm held in normal position by the pressure of the fluid when at such predetermined level,

a spring adapted to move the diaphragm
65 from such position when the fluid falls below such level, and connections operated by such movement of the diaphragm for causing the indicating device to operate.

7. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the chamber is delivered, an indicating device operative when the water in the chamber falls below a predetermined working level, 75 means for holding a column of water in the chamber at a level above such working level, and means for drawing down the water from the higher level to the working level in a predetermined time, and below the working level in longer time than a predetermined time, whereby the indicating device is caused to operate.

8. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, an indicating device operative when the water in the chamber falls below a predetermined working level, means for holding a column of water in the chamber at a level above the working level, two draw-offs coöperating to draw down the water from the higher level to the working level in a predetermined time, one of the draw-offs operating to draw down the water
85 below the working level in longer than a predetermined time to cause the indicating device to operate.

9. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, an outlet proportioned to draw off the fluid from the chamber as it enters therein when the cylinder is normally operating, a valve in the outlet, means
90 for gradually closing said valve to compensate for a normal gradual decrease in the fluid delivered to the chamber, whereby fluid may be maintained in the chamber at a predetermined working level, a device for indicating the operation of the cylinder, and means whereby drawing off the liquid below such working level will cause the device to
95 operate.

10. The combination with a hydraulic cylinder and a controlling valve therefor, of a chamber to which the fluid from the cylinder is delivered, an outlet proportioned to draw off the fluid from the chamber as it enters therein when the cylinder is normally operating, a valve in the outlet, a movable cam plate having a slot in which works a pin operatively connected to the valve, a train of worm gears and means for operating them to gradually move the cam plate and gradually close the valve to compensate for a normal gradual decrease in the fluid delivered to the chamber, whereby fluid
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may be maintained in the chamber at a pre-determined working level, a device for indicating the operation of the cylinder, and means whereby drawing off the liquid below
5 such working level will cause the device to operate.

In testimony whereof, I have hereunto set

my hand, in the presence of two subscribing witnesses.

ALBERT W. HARRIS.

Witnesses:

P. M. TILDEN,
J. A. GRAVES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."