

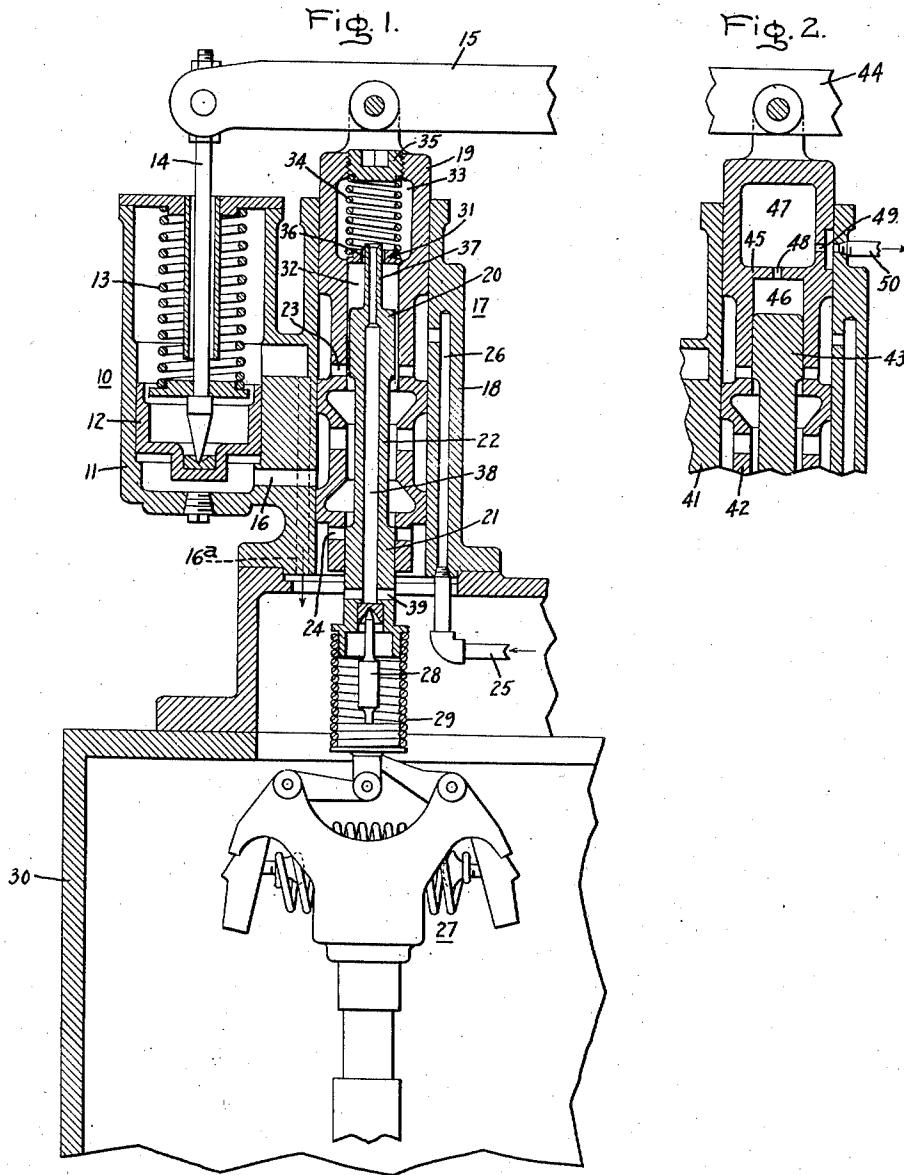
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HYDRAULIC GOVERNING MECHANISM

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HYDRAULIC GOVERNING MECHANISM

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The present invention relates to hydraulic governing mechanisms comprising a hydraulic motor and a pilot valve for controlling the flow of operating fluid to the motor. In arrangements in which the pilot valve is connected to a speed governor, it is often subject to continuous vibrations known as "bobble." This causes frequent slight movement of the pilot valve and is transmitted through the hydraulic fluid to other parts of the governing mechanism which is undesirable as it may lead to excessive wear of governor and relay parts.

The object of my invention is to provide an improved construction and arrangement of hydraulic governing mechanisms whereby the bobble effect on the pilot valve is substantially reduced. This is accomplished in accordance with my invention by the provision of a pilot valve which has a valve head forming together with its housing or bushing a small dashpot. In a preferred arrangement this dashpot is supplied with operating fluid in the form of leakage from the pilot valve chamber.

For a better understanding of what I consider to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing Fig. 1 illustrates a sectional view of a hydraulic governing mechanism embodying my invention, and Fig. 2 is a modification of a part of Fig. 1.

The arrangement comprises a hydraulic motor 10 having a casing 11 with a piston 12 movably disposed therein and biased downward by a compression spring 13. The piston 12 has a stem 14 connected to a governor lever 15. Operating fluid, such as oil, is admitted to the lower portion of the cylinder and leakage fluid may be drained from the upper portion of the cylinder through a drain channel 16a. The flow of operating fluid to the cylinder and the draining of fluid therefrom is controlled by a pilot valve 17 which has a casing 18 integrally formed with the casing 11 and enclosing a pilot valve bushing 19 which in turn encloses pilot valve heads 20, 21 connected to and integrally formed with a stem 22. The pilot valve bushing 19 forms ports 23 and 24 which in the present instance are covered by the pilot valve heads. Operating fluid, such as oil under pressure, is conducted to the pilot valve by a pipe 25 connected to a channel 26 in the casing 18.

If the pilot valve heads are moved upwards, oil under pressure may flow from the channel 26

through the port 23 of the pilot valve and the port 16 of the hydraulic motor into the lower portion of the cylinder 11. If the pilot valve heads 20, 21 are moved downward, oil may be drained from the hydraulic cylinder through its port 16 and the port 24 of the pilot valve.

The bushing 19 of the pilot valve is pivotally connected to the governor lever 15 and the pilot valve heads 20, 21 are connected at their lower ends to a speed governor 27 by means including a link 28 and a spring 29. The governor 27 may be driven by the shaft of a steam turbine, not shown, and in the present instance the governor is enclosed in an oil tank 30.

As stated before, during operation the weights of the speed governor may be subject to continuous slight movements known as bobble and this bobble is transmitted to the pilot valve, thereby causing continuous movement of the latter. To eliminate or dampen such movements I provide in accordance with my invention a dashpot between the pilot valve head 20 and the bushing 19. In the present instance such dashpot is partly formed by the bushing 19 and the head 20. The space formed in the bushing 19 above the head 20 is divided by a disk or partition 31 into two chambers 32 and 33. The disk 31 is biased towards a shoulder formed by the bushing 19 by a spring 34, which latter bears at its upper end towards a plug 35 screwed into an opening in the upper end of the bushing. The disk 31 has a central opening 36 forming a small clearance with a reduced extension 37 of the valve head 20. The extension projects somewhat beyond the disk 31 into the chamber 33. The pilot valve heads 20, 21 and the extension 37 have a central bore 38 connecting at its lower end to lateral ports 39 through which fluid may be drained from the chamber 33. The chamber 32 forms a dashpot chamber. Operating fluid, such as oil, is supplied to the chamber, in the present instance in the form of leakage from the supply channel 26 along the small clearance formed between the adjacent surfaces of the valve head 20 and the bushing 19. During operation the dashpot chamber 32 fills completely with leakage fluid and the chamber 33 fills with fluid up to the upper end of the extension 37, excess fluid being drained from the chamber 33 through the bore 38 and the ports 39 in the valve heads 20, 21. The body of fluid, contained in the dashpot chamber 32 reduces or dampens slight vibratory movements of the valve head 20. During slight upward movement of the valve head 20, fluid from the chamber 32

is forced through the small clearance formed between the extension 37 and the disk 31, excess fluid in the chamber 33 passing through the overflow formed by the hollow extension 31 into the bore 38. The small clearance between the extension 37 and the disk 31 offers a resistance to sudden changes of flow of fluid therethrough and thereby causes an increase in pressure in the chamber 33 which retards or dampens upward movement of the head 20. Likewise, downward movement of the head 20 creates a vacuum in the dashpot chamber 32 because of the resistance formed by the small clearance to the flow of fluid from the chamber 33 into the chamber 32.

During normal operation of the mechanism, increase in speed causes downward movement of the valve head 21, thus permitting the draining fluid from the cylinder 11, causing downward movement of the piston 12 by the action of the spring 13 which in turn causes turning movement of the governor lever 15. The governor lever 15 effects downward movement of the bushing 19, thereby restoring the latter to its original relative position to the pilot valve head 21.

The normal operation of the mechanism is little affected by the provision of the dashpot above the pilot valve head 20. As soon as the pilot valve starts to move in either direction the response of the piston 12 causes the bushing to move in the same direction. Thus, on a normal speed change the pilot valve only moves a few thousandths of an inch before the bushing starts to follow at the same rate. Whenever the pilot valve and bushing are moving at the same rate, no damping of the pilot valve movement takes place since there is no relative motion between the pilot valve head and the bushing. During normal speed change the pilot valve head is slowed up for only the first few thousandths of an inch by the dashpot and thereafter the movement of the valve head is no longer affected because of the simultaneous movement of the bushing in the same direction.

The bobble usually occurs at a frequency equal to the running speed of the governor which in many cases is about 600 R. P. M. While the piston 12 of the hydraulic motor can follow this frequency it cannot do so exactly in phase with the pilot valve, thus causing relative motion between the pilot valve head and bushing and damping of the movement of the pilot valve head by the dashpot action.

The modification of Fig. 2 comprises a pilot valve casing 41 corresponding to the casing 18 of Fig. 1 and enclosing a bushing 42 which in turn encloses a pilot valve head 43 corresponding to the valve head 20 of Fig. 1. The upper end of the bushing is pivotally connected with a governor lever 44 corresponding to the lever 15 of Fig. 1. In order to dampen bobble of the head 43, the upper portion of the bushing 42 is provided with a partition 45 dividing the space formed by the bushing and the head 43 into two chambers communicating through a small opening 46 in the partition 45. During operation, the chamber 46 fills completely with leakage fluid passing along the valve head 43 and the chamber

47 fills with leakage fluid up to a port 48 from which fluid is drained into a drain pipe 50. The operation of this arrangement is similar to that described in connection with Fig. 1. The chamber 46 constitutes a dashpot chamber. Movement of the valve head 43 causes displacement of fluid between the chambers 46 and 47. This displacement is retarded due to the restriction of flow of fluid offered by the small opening 48, thus dampening sudden vibratory movements of the pilot valve head 43, or from another viewpoint, reducing or dampening the transmission of bobble from a governor to the pilot valve head 43.

Having described the method of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Hydraulic governing mechanism comprising a hydraulic motor, a governor subject to vibration during operation, a pilot valve having a valve head connected to the governor for controlling the flow of operating fluid to the motor and a bushing connected to the motor, the bushing and the valve head defining a space, and means including a stationary disk having an opening located in the space and separating the space into two chambers communicating through the opening to form a dashpot to reduce the transmission of vibration from the governor to the pilot valve.

2. A pilot valve comprising a casing, a bushing having ports enclosed in the casing, a valve head for connection to a governor enclosed in the bushing in cooperative relation with the ports, means including the valve head and the bushing and a stationary disk with a small opening to form a dashpot for reducing the transmission of vibration from such governor to the valve head.

3. A pilot valve comprising a pilot valve head for connection to a governor, a bushing enclosing the head and forming a space therewith, means including a disk having a central opening located in the space and defining a dashpot chamber and a drain chamber, the head having a hollow extension projecting through an opening in the disk into the drain chamber and forming a small clearance with the opening to reduce vibration of the head due to bobble of such governor.

4. A pilot valve including a valve head, a bushing enclosing the valve head and having ports controlled by the head, the bushing having a partition with a small opening to form two chambers, one chamber being partly defined by the head and constituting a dashpot chamber and the other chamber being completely defined by the bushing and having a drain port, a small opening in the partition restricting the displacement of fluid between the two chambers during operation and thereby dampening vibration of the head.

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