May 5, 1925. 1,536,697

O. WECHSBERG

GOVERNING DEVICE FOR PUMPS

Filed Aug. 29, 1921

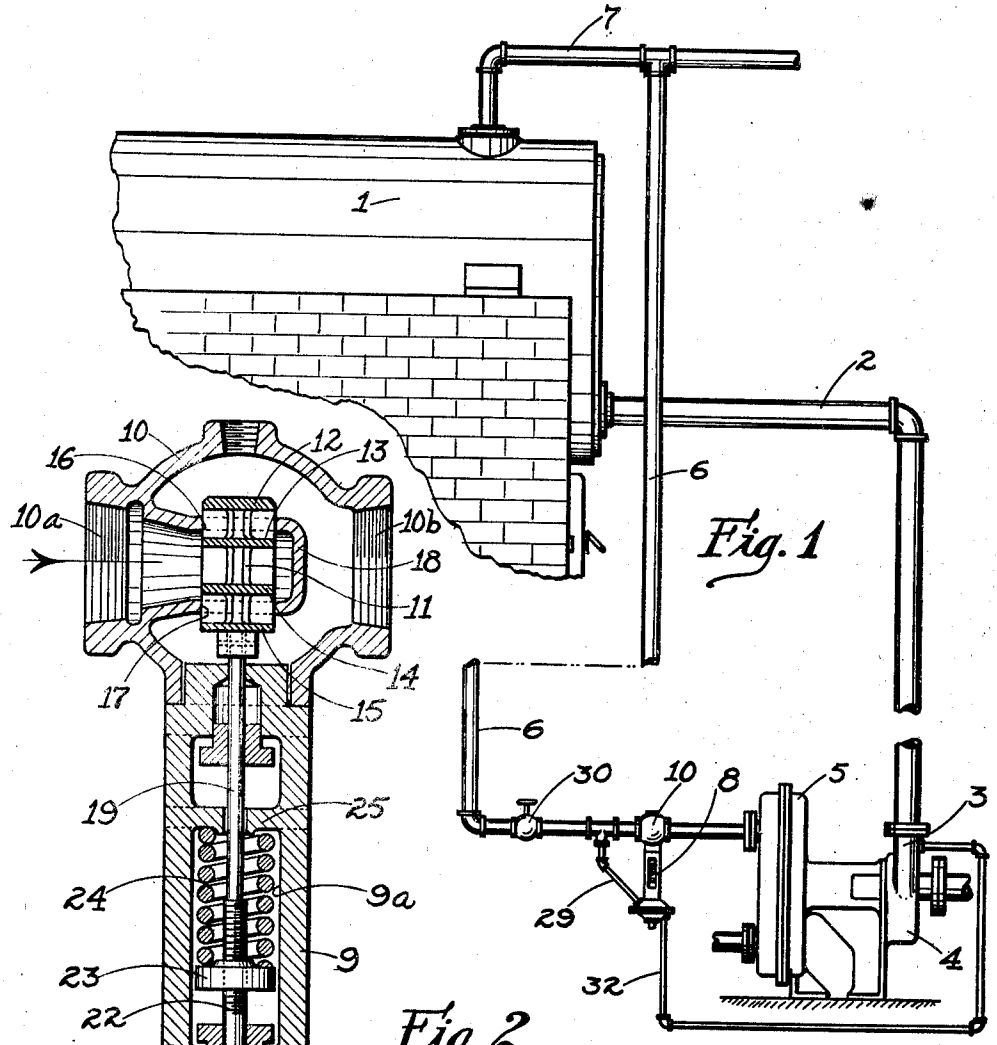
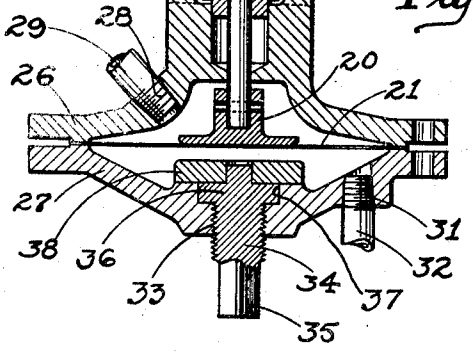


Fig. 1

Fig. 2



Inventor:
Otto Wechsberg
By Geo. F. Kennedy Jr.
Attorney

Patented May 5, 1925. 1,536,697

UNITED STATES PATENT OFFICE.

OTTO WECHSBERG, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO COPPUS ENGINEERING AND EQUIPMENT COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

GOVERNING DEVICE FOR PUMPS.

Application filed August 29, 1921. Serial No. 496,270.

To all whom it may concern:

Be it known that I, OTTO WECHSBERG, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in a Governing Device for Pumps, of which the following, together with the accompanying drawings, is a specification.

My invention relates to governing devices for pumps commonly employed for supplying water to steam boilers and has for its object to provide an improved governing device whereby the pump used in connection therewith is always adapted to deliver feed water to a boiler at a pressure which exceeds the boiler pressure by a predetermined amount.

Such governing devices, as described above, are commonly known as "excess pressure pump governors" and generally comprise a valve operated by a pressure responsive device, such as a diaphragm or plunger, one side of which is subjected to the pressure of the boiler and a spring, and the other side of which is subjected to the pressure of the water delivered to the boiler by the pump. This valve controls the admission of steam to the prime mover driving the pump and so operates as to cause the pump to be driven at such a speed that the pressure of the water delivered to the boiler substantially equals the pressure of the boiler plus the pressure of the spring. In other words, if the boiler pressure is, for instance, one hundred pounds and the spring so adjusted as to give an excess pressure of ten pounds, the pressure of the pump discharge will be one hundred and ten pounds. If the boiler pressure drops to ninety pounds, the feed water pressure will be automatically reduced to one hundred pounds, with the same setting of the spring of the governor.

It has been found that excess pressure governors operating on the above described principle will work satisfactorily as long as the water supply to the pump does not fail and there is no break in the discharge pipe or the pump. It is obvious however that in the event of a failure of the water supply, or breakage of the discharge pipe, the pressure on one side of the pressure responsive device will fall practically to zero, whereupon the valve will open to such an extent that the pump will be driven at a dangerously high speed, inasmuch as it is operating with substantially no load. In order to prevent such occurrences, it has been customary to employ an auxiliary governing device operating in connection with the excess pressure governor, such for example, as a valve which is normally kept open against the pressure of a spring and which is adapted to shut off the steam to the pump should the pressure fall below a predetermined minimum value.

By my invention, I propose to do away with the necessity of using such an auxiliary device in connection with the governor, by so constructing the governor that it will itself automatically shut off the steam supply to the prime mover driving the pump should the pump pressure fall below a predetermined minimum value. These and other advantageous features of my invention will hereinafter more fully appear, reference being had to the accompanying drawings, in which—

Fig. 1 is a view in side elevation of a portion of a steam boiler showing a feed water pump connected thereto and adapted to be controlled by my improved governor.

Fig. 2 is a transverse sectional view of a governor constructed in accordance with my invention.

Like reference characters refer to like parts in the different figures.

Referring to Fig. 1, a steam boiler 1, of any ordinary construction, is adapted to be supplied with water through a feed pipe 2 leading from the discharge outlet 3 of a pump 4. The pump 4 is connected to a prime mover 5 which is adapted to be supplied with steam from the boiler 1 through a supply pipe 6 connected to the steam line 7 of the boiler 1. The pump 4 and the prime mover 5 may be of any suitable type, either reciprocating or rotating, although both are shown for purposes of illustration as being of the centrifugal type.

An excess pressure governor 8 is provided for controlling the admission of steam to the prime mover 5 and, as best shown in Fig. 2, generally comprises a cylindrical body 9, at the top of which is formed a valve chamber 10. The ends of the valve chamber 10 are open and are connected in the steam sup-

ply pipe 6, as shown in Fig. 1. A movable valve member 11 is located in the valve chamber 10 and is provided with a plurality of disks 12, 13, 14 and 15, which are adapted to cooperate with the ports 16 and 17 provided in a wall 18 surrounding the inlet opening 10^a of the valve chamber 10. The valve 11 is mounted on a stem 19 which extends downwardly through an opening 9^a in the body 9 and terminates in a head 20, to which is secured a suitable pressure responsive member, such as a flexible diaphragm 21. A portion of the stem 19 is threaded, as shown at 22, to receive a nut 23 and a spring 24 surrounds the stem 19 between the nut 23 and an annular projection 25 extending inwardly from the wall of the body 9.

A flange 26 is provided at the lower end of the valve body 9, of somewhat greater diameter than the diaphragm 21, and a diaphragm cap 27, removably secured to the flange 26, is adapted to clamp the outer periphery of the diaphragm 21 to the flange 26. An opening 28 is provided in the flange 26 for receiving a pipe 29 which is connected to the steam supply pipe 6 between a manually operated valve 30 and the inlet opening 10^a of the valve chamber 10. The diaphragm cap 27 is provided with an opening 31 for receiving a pipe 32 which is connected to the discharge outlet 3 of the pump 4. The diaphragm cap 27 is further provided with a centrally located threaded opening 33 within which is received a lifting screw 34, provided at one end with a tool receiving portion 35, by means of which it may be turned in the opening 33. The upper end of the screw 34 is provided with an enlarged head 36 which fits tightly in a countersunk portion 37 of the opening 33. A washer 38 preferably composed of some wear resistant material, such as leather or fibre, is secured to the top of the head 36, for the purpose of preventing wear on the lower surface of the diaphragm 21 when the lifting screw 34 is turned into contact therewith.

From the foregoing it is apparent that when the pump 4 is not running, the pressure of the spring 24 will exert sufficient force upon the valve stem 19 to cause the valve disks 12 and 14 to be seated in the ports 16 and 17 and thereby prevent the passage of steam through the valve chamber 10 even if the valve 30 were to be open. Therefore, in order to start the pump, it is first necessary to turn the lifting screw 34 into the cap 27 until the washer 38 engages the diaphragm 21 and lifts the stem 19 enough to move the disks 12 and 14 out of the ports 16 and 17. The valve 30 may then be opened whereupon steam will pass through the ports and the outlet opening 10^b to the prime mover 5 which will then start the pump 4. As soon as the pump starts to build up pressure in the feed pipe 2, the under side of the diaphragm 21 will be subjected to the water pressure, and as the pump speeds up, this pressure will increase and tend to move the stem 19 upwardly against the combined pressure of the steam and the spring 24. If the pressure developed by the pump exceeds that on the upper side of the diaphragm 21, the valve 11 will be moved upwardly far enough to cause the disks 13 and 15 to be seated in the ports 16 and 17 and thereby tend to cut off the steam supply to the prime mover 5. The pump pressure will then fall until it is substantially the same as the combined pressure of the steam and the spring, whereupon the valve will move to a position corresponding to that shown in the drawings, in which the valve ports 16 and 17 are midway between the disks 12 and 13, and 14 and 15, respectively. As long as this balanced condition exists, the diaphragm 21 is substantially horizontal, as shown in Fig. 2. My improved device will then operate as the usual excess pressure pump governor to maintain the pressure of the feed water above the boiler pressure a predetermined amount, which is determined by the pressure exerted by the spring 24. Obviously this pressure may be adjusted by turning the nut 23 on the stem 19.

As soon as the pump is operating normally, as described above, the lifting screw 34 is turned out of the cap 27 to return it to its original position, as shown in Fig. 1, in which case the head 36 is again received in the countersunk opening 37 and prevents leakage of the water under pressure through the opening 33. In case the pump operator should fail to turn out the screw 34 shortly after the pump is in operation, his attention will be called to this fact by the leakage of water through the cap caused by the fact that when the lifting screw 34 is raised, the head 36 moves out of the countersunk opening 37 and water may leak past the screw 34.

If at any time during the operation of the pump 4, the water supply should fail, it is obvious that the pressure in the pipe 32 would fall substantially to zero, whereupon the combined pressure of the steam and of the spring 24 acting on the upper side of the diaphragm 21 would move the spindle 19 downwardly until the disks 12 and 14 are seated in the ports 16 and 17, thereby completely cutting off the flow of steam through the valve chamber 10. The pump will then be stopped immediately and cannot be operated again until the water supply is restored. If, on the other hand, the feed pipe 2 should break during the normal operation of the pump 4, the pressure in the pipe 32 will again fall substantially to zero and the downward movement

of the disks 12 and 14 would again serve to shut off the admission of steam to the prime mover 5, and as this action would occur almost immediately, it would prevent flooding of the boiler room by continuous discharge of the water through the break in the pipe. In other words, by the use of my improved governor, the pump will be caused to normally operate so that the pressure of the feed water is always in excess of the steam pressure in the boiler by an amount determined by the setting of the spring 24, but upon the occurrence of any interruption in the water supply or breakage in the feed pipe, the pump will be automatically stopped before any damage has been done.

The above described automatic stoppage of the pump is believed to be a most advantageous feature, for the reason that in the absence of this feature the pump would be liable to be operated at dangerously high speeds whenever the pressure in the pipe 32 dropped to zero, owing to the fact that the valve would be fully open. This is what has usually occurred with excess pressure governors as heretofore constructed, and as previously pointed out, it has always been necessary to employ some sort of an auxiliary governing device in connection therewith, thereby adding considerably to the complication and cost of such installations. A governing device constructed in accordance with my invention combines all the essential features necessary for normal and safe operation without adding appreciably to the complication of such devices as compared with those previously constructed. While I have shown my invention as applied to a particular type of governing device, it is not so limited, but is susceptible of such modifications as might be necessary to adapt it to other types of governing devices without departing from the spirit and scope of the invention, and I desire that only such limitations be imposed on the invention as come within the scope of the appended claims.

I claim:

1. In apparatus of the class described, the combination with a steam boiler and a pump for supplying water thereto, of a governing device for controlling the operation of said pump so as to automatically maintain the discharge pressure thereof a predetermined amount above the boiler pressure and to stop said pump should the discharge pressure fall below a predetermined amount.

2. In apparatus of the class described, the combination with a steam boiler, a pump for supplying water thereto and a prime mover for driving said pump, of a governing device for automatically controlling the supply of steam to said prime mover so as to maintain the discharge pressure of said pump a predetermined amount above the boiler pressure and to shut off the supply of steam to said prime mover should the discharge pressure fall below a predetermined amount.

3. In a governing device for steam pumps, the combination with a source of steam supply, a steam driven water pump and a valve chamber providing a steam port located between said steam supply and said pump, of a valve member responsive to the steam pressure and the water pressure developed by said pump for closing said valve when the water pressure exceeds the steam pressure a predetermined amount or when the water pressure falls below a predetermined amount.

4. In a governing device for steam pumps, the combination with a source of steam supply, a steam driven water pump and a valve chamber providing a steam port located between said steam supply and said pump, of a valve member provided at one end with a plurality of spaced disks adapted to register with said port and provided at its other end with a diaphragm subjected on opposite sides thereof to the steam pressure and to the water pressure, and means for moving said valve member against the steam pressure in the absence of water pressure.

5. In a governing device for steam pumps, the combination with a source of steam supply, a steam driven water pump and a valve chamber providing a steam port located between said steam supply and said pump, of a valve member provided at one end with a plurality of spaced disks adapted to register with said port and provided at its other end with a diaphragm enclosed in a chamber and subjected on opposite sides thereof to the steam pressure and to the water pressure, the said valve member being acted upon by a spring exerting its force in the same direction as the steam and means for moving said valve member manually against the pressure of said spring.

6. In a governing device for steam pumps, the combination with a source of steam supply, a steam driven water pump and a valve chamber providing a steam port located between said steam supply and said pump, of a valve member provided at one end with a plurality of spaced disks adapted to register with said port and provided at its other end with a diaphragm enclosed in a chamber and subjected on opposite sides thereof to the steam pressure and to the water pressure, and a lifting screw located below said diaphragm and provided with a washer of wear resistant material where it comes in contact with the lower surface of said diaphragm.

7. In a governing device for steam pumps, the combination with a source of steam supply, a steam driven water pump and a valve chamber providing a steam port located between said steam supply and said pump,

of a valve member provided at one end with a plurality of spaced disks adapted to register with said port and provided at its other end with a diaphragm enclosed in a chamber and subjected on opposite sides thereof to the steam pressure and to the water pressure, and a lifting screw located below said diaphragm and adapted to permit the passage of water from the diaphragm chamber when said screw is moved into engagement with said diaphragm.

Dated this 19th day of August, 1921.

OTTO WECHSBERG.