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E. D. DICKINSON

EMERGENCY GOVERNOR FOR ELASTIC FLUID TURBINES AND THE LIKE

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Fig. 1.

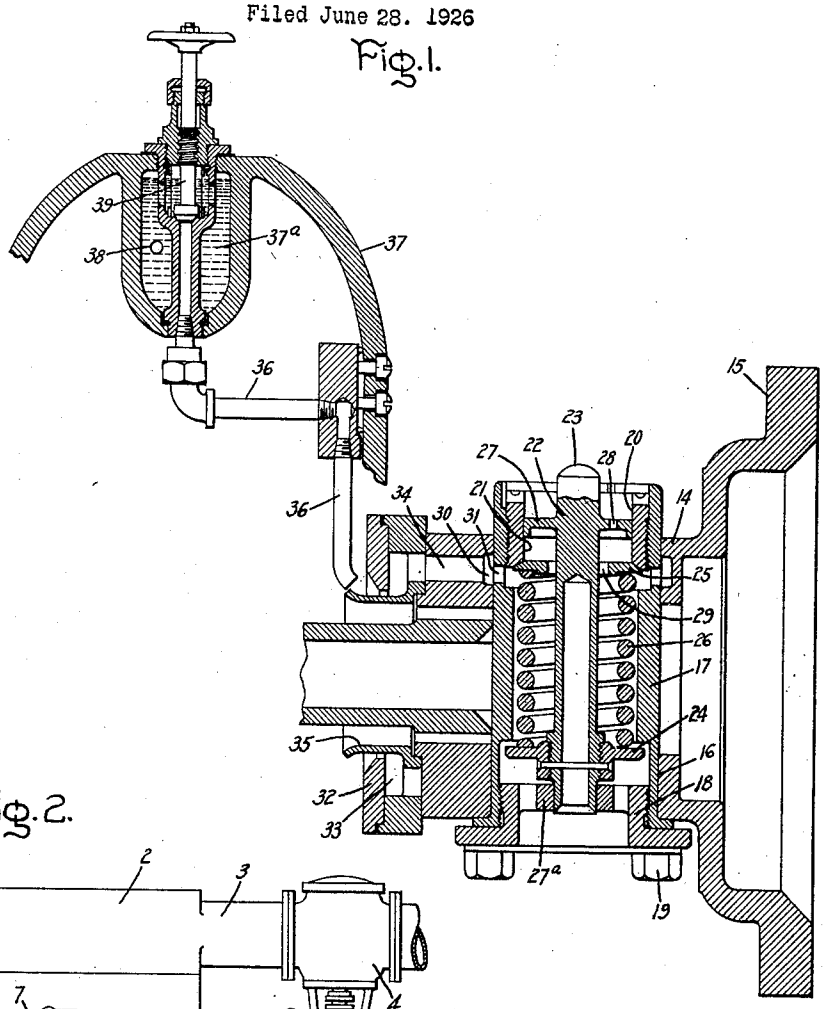
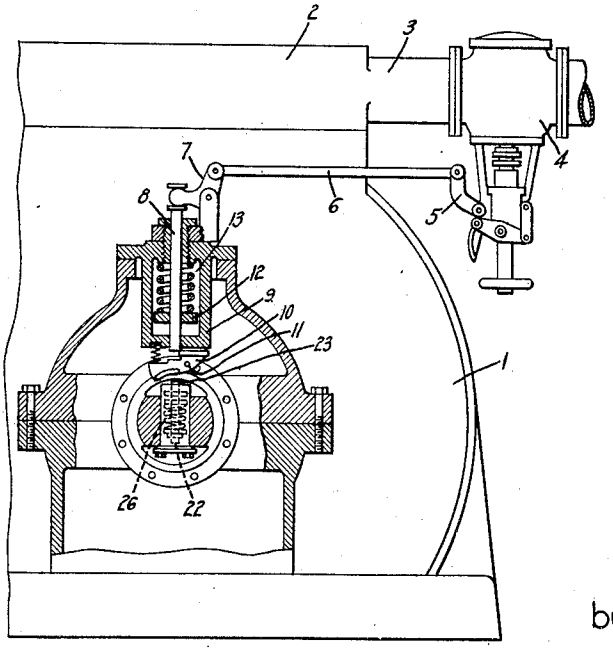


Fig. 2.



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UNITED STATES PATENT OFFICE.

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EMERGENCY GOVERNOR FOR ELASTIC-FLUID TURBINES AND THE LIKE.

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The present invention relates to emergency governors for elastic fluid turbines or similar machines which governors are utilized to effect a shutting off of the supply of actuating fluid to the machine in case of excessive speed. The invention relates especially to emergency governors of the so-termed bolt or plunger type which comprise a bolt or plunger eccentrically mounted in an opening which extends transversely of the shaft and is normally held against movement by a governor spring, the plunger or bolt flying outward by centrifugal force in case of excessive speed to engage a trip finger which in turn controls the emergency valve mechanism.

The object of the invention is to provide an improved construction and arrangement whereby an emergency governor mechanism of this type may be tested without overspeeding the machine or without disturbing the setting of the emergency governor, and for a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing, Fig. 1 is a sectional view with certain parts shown diagrammatically of an emergency governor of the bolt or plunger type embodying my invention, and Fig. 2 shows diagrammatically its application to an elastic fluid turbine.

Referring to the drawing, 1 indicates an elastic fluid turbine of any suitable type and provided with a fluid chest 2 to which elastic fluid is admitted by a conduit 3. In conduit 3 is a combined trip and throttle valve 4, a well known type being indicated. Valve 4 is biased toward closed position but is held open normally by a catch controlled by a link 5 which is connected by a rod 6 to bell crank lever 7. Connected to the free end of bell crank lever 7 is a plunger rod 8 which extends down through a housing 9 to a point in proximity to a trip finger 10. Trip finger 10 is suitably pivoted at 11 and presents a flat surface upon which the lower end of plunger rod 8 normally rests. On plunger rod 8 is a collar 12 between which and the top of casing 9 is a spring 13. Spring 13 acts to force plunger rod 8 downward but is normally held under compression by trip finger 10 upon which the plunger rod rests as is shown in Fig. 2 of the drawing. When trip finger 10 is moved on its pivot from beneath plunger rod 8, spring 13 forces the plunger rod downward thereby turning crank lever 7 and through rod 6 and link 5 releasing the catch for valve 4. Valve 4 then closes automatically, the same being biased toward closed position as is well understood.

The emergency valve mechanism above described is a well known arrangement and one in common use. It is shown more or less diagrammatically and is to be taken as typical of any suitable arrangement for effecting closing of an emergency valve.

Carried by and forming a part of the turbine shaft so that it rotates therewith, is a shaft extension 14 having a flange portion 15 for use in bolting it to the turbine shaft. In shaft extension 14 is a transversely-extending opening 16 in which is arranged a sleeve 17. Sleeve 17 is fastened in place by a flanged head 18 held by bolts 19. In one end of sleeve 17 is a liner 20 which provides a guide surface 21. In sleeve 17 is a bolt or plunger 22 having a head 23 adapted to engage trip finger 10. At its end opposite head 23 is arranged a shoulder 24 between which and a plate 25 resting on one end of liner 20 is located an emergency governor spring 26. Carried by plunger 22 is a flange 27 which slides on guide surface 21. The other end of plunger 22 slides in a guide 27ª which forms also a stop for limiting the inward movement of the plunger. In flange 27 is an opening 28 and between plunger 22 and plate 25 is an annular opening 29. In shaft extension 14 is an annular chamber 30 which communicates with the interior of sleeve 17 through one or more openings 31. At the outer end of shaft extension 14 is a wall 32 which forms an annular chamber 33 connected to annular chamber 30 by a passage 34. In wall 32 is an opening through which projects a sleeve 35, such sleeve being flared outwardly at its outer end to form a sort of trough which communicates with annular chamber 33 through an annular space between the sleeve and the adjacent edge of the opening in wall 32. The emergency governor construction just described all rotates with the turbine shaft. Liner 20, flange 27 and plate 25 form an annular pocket which surrounds the head of bolt or plunger 22.

Adjacent to sleeve 35 is a stationary pipe 36 carried by a fixed wall 37 of the turbine

structure. The end of pipe 36 terminates in a chamber 37ª which is normally filled with a liquid, such as oil, under pressure. Cham- 37ª may be connected with the lubricating system for the turbine, 38 indicating a pipe leading into a chamber. 39 is a valve which is normally closed and which when closed cuts off communication between pipe 36 and chamber 37ª. When valve 39 is opened, liquid can flow from chamber 38 down through pipe 36. Pipe 36 and valve 39 represent any suitable means for supplying liquid to the trough formed by sleeve 35.

Bolt or plunger 22 is mounted eccentrically in the opening through shaft extension 14, the center of mass of the bolt or plunger being above the center of rotation in the position of the parts shown in Fig. 1. Thus when the turbine shaft is rotating it has a tendency to fly outward due centrifugal force. Spring 26 is set so that at normal speeds the bolt or plunger is held stationary. However, in case of a certain overspeed, for example 10 per cent overspeed, then centrifugal force will overcome spring 26 and bolt or plunger 22 will fly outward. When this occurs, its head 23 strikes trip finger 10 knocking it from under rod 8 and effecting closing of valve mechanism 4, as referred to above. This is the usual operation of an emergency governor of the bolt or plunger type.

When it is desired to test the emergency governor to see if it is in proper working condition valve 39 is open. This permits liquid to flow out through pipe 36 such liquid being discharged into the annular trough formed by sleeve 35. From here the liquid flows through passages 34 and 31 to the interior of sleeve 17, a part of such liquid finding its way through annular passage 29 to the pocket formed by liner 20, flange 27 and plate 25. This serves then to increase the weight of plunger 22 because of the liquid trapped in such pocket and due to this increased weight the plunger will move outwardly at a normal turbine speed, thereby effecting tripping of the emergency governor mechanism. After the valve mechanism has tripped, valve 39 is closed. The liquid in the pocket then escapes through opening 28. This then reduces the weight of the plunger to its normal value whereupon spring 26 will restore it to its normal position. The emergency valve 4 may be then reset in the usual manner.

With the above described arrangement, it will be seen that I provide a means whereby an emergency governor of the bolt or plunger type may be tested without overspeeding the turbine or without disturbing the adjustment of the emergency governor spring 26. As pointed out above, the liquid supplied to the pocket surrounding the head of the bolt or plunger serves to add weight to the heavy end of the bolt or plunger. The liquid therefore need not be supplied under pressure, it being sufficient that the arrangement be such that the liquid flows into the trough formed by sleeve 35. Also, it will be seen that as soon as the valve 39 is closed, the liquid in the pocket leaks out through opening 28 so that the device automatically resets itself.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but 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. The combination with an emerency governor comprising a shaft member having a transverse opening, an eccentrically mounted plunger in the opening, and a governor spring for holding the plunger against movement, of means providing a pocket surrounding the plunger, and means for supplying liquid to said pocket.

2. In an emergency governor mechanism, the combination of a shaft, means providing an opening extending transversely of the shaft, a plunger in the opening, said plunger having its center of mass to one side of the center of rotation of the shaft, a governor spring which normally holds said plunger stationary, a flange carried by the plunger which defines with the adjacent wall of the opening a pocket surrounding the plunger, and means whereby a liquid may be supplied to said pocket.

3. In an emergency mechanism, the combination of a shaft, means providing an opening extending transversely of the shaft, a plunger in the opening, said plunger having its center of mass to one side of the center of rotation of the shaft, a governor spring which normally holds said plunger stationary, a flange carried by the plunger which defines with the adjacent wall of the opening a pocket surrounding the plunger, means whereby a liquid may be supplied to said pocket, and means for permitting the escape of liquid from said pocket.

In witness whereof, I have hereunto set my hand this 24th day of June, 1926.

EDGAR D. DICKINSON.