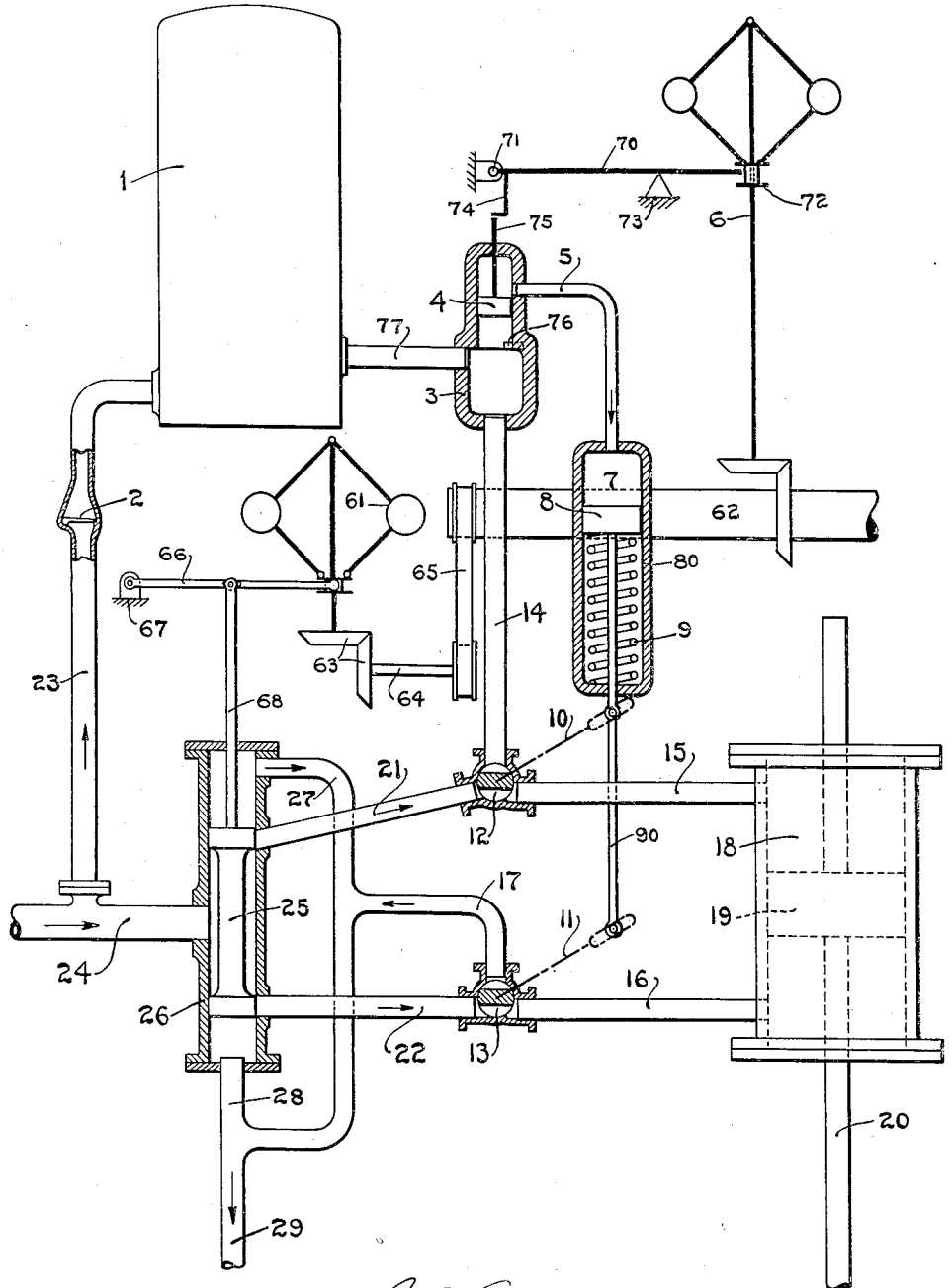
J. E. ENGLESSON.

SPEED LIMITING DEVICE.

APPLICATION FILED JUNE 27, 1912.

1,127,977. Patented Feb. 9, 1915.



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SPEED-LIMITING DEVICE.

1,127,977. Specification of Letters Patent. Patented Feb. 9, 1915.

Application filed June 27, 1912. Serial No. 706,307.

To all whom it may concern:

Be it known that I, JOHN ELOV ENGLESSON, a subject of the King of Sweden, residing at Karlskrona, Sweden, have invented a certain new and useful Improvement in Speed-Limiting Devices, of which the following is a specification.

This invention relates to improvements in the construction of devices for limiting the speed of prime movers.

The object of the invention is to provide a speed limiting device for prime movers which is simple in construction and efficient in operation.

In power systems, such as, for instance, hydraulic turbine installations, there are generally three conditions which necessitate the operation of a safety speed limiting device. The first of these conditions is the case where the driving connection between the main shaft of the prime mover and the speed regulator breaks. If this break of the belt occurs when the gates of the prime mover are nearly closed, the effect will be the same as releasing the load entirely and the governor will open the admission gates wide thereby causing the speed of the prime mover to increase beyond the safe limit. Second, if an oil pressure governor is used and the oil pressure fails at a time when a very light load is being carried by the prime mover, the gates may open wide enough to cause the prime mover to speed up beyond its safe limit. Third, if the regulating valve or the main governor in general fails to operate, and the load is decreased, the speed of the prime mover may increase above the safe speed.

It is the object of the present invention to provide a means for preventing overspeeding of the prime mover in case any of the above described conditions are had.

A clear conception of an embodiment of the invention can be had by referring to the drawing accompanying and forming a part of this specification in which like reference characters designate the similar parts.

The single figure of the drawing discloses diagrammatically and partly sectionally a speed limiting device applied to a hydraulic turbine installation.

The main governor 61, which may be of any of the well-known types, is connected to the prime mover shaft 62 by means of gearing 63, a counter-shaft 64 and a belt 65. The lever 66 of the governor 61 has a stationary fulcrum 67 at one end thereof and is connected at its mid portion to the upper end of the regulating valve stem 68 which carries the regulating valve 25. The regulating valve 25 is adapted to control ports in the valve casing 26.

The servo motor 18 having the actuating piston 19 carried by the gate rod 20 has pipes 15, 16 connected to its upper and lower piston chambers respectively. The valve 12 admits fluid to the pipe 15 during normal operation of the device from a pipe 21 and during the actuation of the safety device from a pipe 14. The valve 13 admits fluid to the pipe 16 during normal operation from the pipe 22 and permits discharge of fluid from the pipe 16 through the pipe 17 during actuation of the safety device. The inlet to and discharge from the pipe 21, 22 is controlled by the valve 25. The main fluid supply pipe 24 enters the mid portion of the casing 26 and is adapted to be brought into direct communication with the pipes 21, 22 by the actuation of the valve 25. The discharge pipe 27 connects with the upper chamber of the valve casing 26 and connects with a common discharge 29 which also drains the lower chamber of the valve casing 26 through a pipe 28.

The pipe 23 having the non return check valve 2 connects the storage reservoir 1 with the main supply pipe 24. The secondary governor 6 is direct-connected to the prime mover shaft 62. The lever 70 is mounted to swing about a stationary pivot 71 and has its free end projecting into the circumferential recess of the governor collar 72. During normal operation of the governor the collar 72 does not contact with the free end of the lever 70. The free end of the lever 70 is supported on a stop 73. An arm 74 projecting downwardly and formed in one with the lever 70 is adapted, when in normal position to co-act with the upper end of the rod 75 carried by the piston 4. The piston 4 is adapted to reciprocate within the cylinder 3, the downward travel of the piston 4 being limited by a stop 76. The pressure reservoir 1 is connected through a pipe 77 with the lower chamber formed in the cylinder 3. The lower chamber or cylinder 3 is connected to the pipe 14. The upper end of the cylinder 3 is connected through a pipe 5 with a chamber 7 formed in the

upper end of a secondary cylinder 80. The piston 8 is adapted to reciprocate within the cylinder 80, being normally held in its uppermost position by means of a spring 9. The piston rod 90 is connected by means of cranks 10, 11 to the valves 12, 13 respectively.

During normal operation of the device fluid under pressure, preferably oil, is admitted through the pipe 24 to mid portion of the piston 25 and through the pipe 23 and check valve 22 to the storage reservoir 1. The fluid pressure established within the tank 1 is transmitted through the pipe 77 to the chamber of the cylinder 3 below the piston 4. The establishment of pressure below the piston 4 causes this piston to rise until the end of the stem 75 co-acts with the arm 74 of the lever 70. The valves 12, 13 during normal operation are in the positions shown in the drawing. If the speed of the prime mover increases, the main governor 61 raises the end of the lever 66, thereby raising the valve 25 and permitting fluid under pressure to pass through the pipe 21, valve 12 and pipe 10 to the upper piston chamber of the servo motor 18 thereby closing the inlet gates to the prime mover. An upward motion of the valve 25 establishes communication between the lower piston chamber of the servo motor 18 and the exhaust pipe 29 through the pipes 16, 22, 28 and the valve 13. With the decrease in speed of the prime mover the governor 61 lowers the end of the lever 66, thereby causing the valve 25 to move downwardly. This downward motion of the valve 25 causes the fluid under pressure to pass through the pipe 22, valve 13 and pipe 16 to the lower piston chamber of the servo motor 18 to open the prime mover inlet gates. During this downward motion of the valve 25 communication is established between the upper piston chamber of the servo motor and the discharge pipe 29 through the pipes 15, 21, 27 and the valve 12. If, however, the governor 61 should, for any of the reasons above described, fail to operate, and the speed of the prime mover 62 is increased above the desired safe speed, the collar 72 of the secondary governor 6 will rise until it comes in contact with the end of the lever 70. Further increase in the speed of the prime mover will cause the collar 72 to raise the end of the lever 70 and swing the arm 74 out of engagement with the upper end of the rod 75. This motion of the arm 74 permits the piston 4 to rise above the end of pipe 5 permitting fluid under pressure to pass from the storage reservoir 1 through the pipe 5 into the chamber 7. The establishment of pressure within the chamber 7 causes the piston 8 and rod 90 to move downwardly compressing the spring 9. The downward motion of the rod 90 causes the valves 10, 11 to close off communication between the pipes 15, 16 and the pipes 21, 22 respectively and to open communication from the pipes 15, 16 to the pipes 14, 17 respectively. This shifting of the valves 12, 13 automatically establishes full reservoir pressure in the upper piston chamber of the servo motor 19 and permits the exhaust of fluid from the lower chamber of the servo motor 18 through the pipes 16, 17 to the discharge pipe 29. The full reservoir pressure is admitted through the pipe 77, cylinder 3, pipe 14, valve 12 and pipe 15 to the upper servo motor piston chamber. It will thus be seen that if, for any reason, such as the breaking of the governor belt 65, the failure of the oil pressure supply through the pipe 24 or the failure of the operation of the valve 25 or of the governor 61, the speed of the prime mover becomes very high, the safety device will automatically stop the prime mover.

It should be understood that it is not desired to be limited to the exact details herein shown and described for obvious modifications will appear to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. In a speed limiting device for prime movers, a primary governor, a servo-motor adapted to control the inlet of motive fluid to said prime mover, means actuated by said governor for controlling said servo-motor, normally inactive means for storing fluid under pressure, a secondary governor for said prime mover, and means controlled by said secondary governor for automatically controlling the supply of fluid pressure from said fluid storage means to said servo-motor upon abnormal speed conditions of said prime mover.

2. In a speed limiting device for prime movers, a main governor, a servo-motor for actuating the inlet gates of the prime mover, means actuated by said governor for controlling said servo-motor, normally inactive means for storing fluid under pressure, a secondary governor, and means controlled by said secondary governor for automatically controlling the supply of fluid pressure from said fluid storage means to said servo-motor upon abnormal increases in the speed of the prime mover.

3. In a speed limiting device for prime movers, a primary governor, a servo-motor adapted to control the inlet of motive fluid to said prime mover, means actuated by said governor for controlling said servo-motor, a secondary governor for said prime mover, and means controlled by said secondary governor for automatically controlling the supply of fluid pressure to said servo-motor upon abnormal speed conditions of said prime mover, said last mentioned means comprising a normally inactive fluid pressure supply, means for per-

mitting passage of fluid pressure from said supply to said servo-motor upon an abnormal increase in speed, and means operable by said secondary governor for controlling said passage-permitting means from said fluid pressure supply to said servo-motor.

4. In a speed limiting device for prime movers, a primary governor, a servo-motor, a fluid pressure supply system, means for admitting fluid from said supply system to said servo-motor, said means being controllable by said governor, a secondary governor, a secondary fluid pressure system controllable by said secondary governor and adapted to operate said servo-motor under abnormal conditions of operation of the prime mover, means for replenishing the pressure in said secondary system from said fluid supply system, and a non-return pressure permitting means in said fluid supply means to said secondary system.

5. In a speed limiting device for prime movers, a primary governor, a servo-motor, a fluid pressure supply system, means for admitting fluid from said supply system to said servo-motor, said means being controllable by said governor, a secondary governor, a secondary fluid pressure system controllable by said secondary governor and adapted to operate said servo-motor under abnormal conditions of operation of the prime mover only, and means for replenishing the pressure in said secondary system from said fluid supply system.

In testimony whereof, the signature of the inventor is affixed hereto in the presence of two witnesses.

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Witnesses:
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