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AUTOMATIC SAFETY STOP FOR AIR COMPRESSOR ENGINES.

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994,396. Patented June 6, 1911.

Fig. 1.

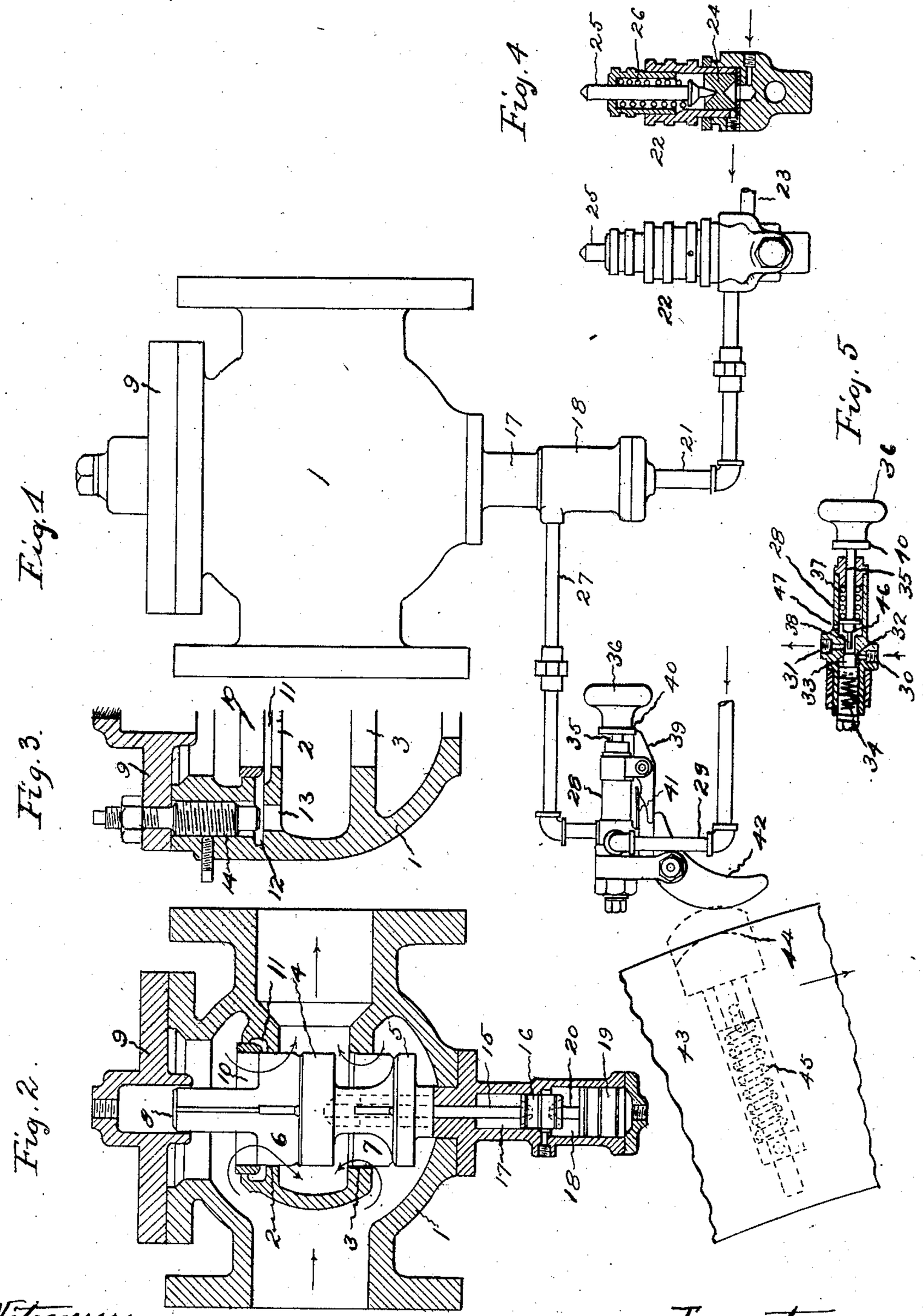

Fig. 2.

Fig. 3.

Fig. 4

Fig. 5

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AUTOMATIC SAFETY-STOP FOR AIR-COMPRESSOR ENGINES.

994,396. Specification of Letters Patent. **Patented June 6, 1911.**

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To all whom it may concern:

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at Norwalk, in the county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Automatic Safety-Stops for Air-Compressor Engines, of which the following is a specification.

Under certain conditions it is desirable to control steam engines used for driving air compressors, by the air pressure rather than by a centrifugal governor. At times, however, as a result of accident, an engine thus controlled is liable to run away and cause trouble.

This invention relates to an apparatus which is designed to be applied to an air compressor engine for the purpose of controlling it, without the aid of a centrifugal governor.

The object of the invention is to provide means operated by the air pressure for controlling the throttle valve so that the engine speed will be proportional to the demand for air, and also to provide means which will be so actuated from the fly-wheel should the engine commence to race, that the steam pressure will close the throttle valve and stop the engine.

Figure 1 of the accompanying drawings shows a side view of a throttle valve, a controller by means of which the throttle valve is regulated by the air pressure, a trip valve by means of which the throttle valve is closed by the steam pressure under certain conditions, and a portion of the engine fly-wheel which operates to actuate the trip valve when the engine speed becomes abnormal. Fig. 2 shows a longitudinal section of the steam throttle valve. Fig. 3 shows a section of a part of the throttle valve casing on a plane at right angles to the plane of Fig. 2. Fig. 4 shows a section of the air controller. Fig. 5 shows a section of the trip valve.

The throttle valve 1 is designed to be connected in the main steam line from the boiler to the engine. The casing of this valve in the interior has two ports, 2 and 3. Movable in these ports is a double piston or spool valve having closing disks 4 and 5. This piston valve is arranged in the ports so as to be balanced and is guided by the wings 6 and wings 7, which engage the walls of the ports 2 and 3, and by the stem 8 which extends into the opening in the casing-cover 29. In the upper part of the section of the casing containing the port 2, is a bushing 10. The interior diameter of this bushing is the same as the exterior diameter of the piston disk 4. This bushing does not completely fill the space above the port 2—a circular chamber 11 is left around its lower end above the port 2, as seen in Fig. 2. This chamber communicates with a chamber 12 at one side, and through the casing from this latter chamber is a by-pass opening 13, as shown in Fig. 3. A screw plug 14 is turned through the casing for the purpose of regulating the amount of opening through this by-pass.

Extending through the valve casing into the piston valve is a spindle 15. The upper end of this spindle is shown as engaging an inner wall of the upper piston disk 4, while the lower end is shown as engaged by the piston 16 that moves in the cylinder 17. In the cylinder 18, below the cylinder 17 is a piston 19 which has a stem 20 that engages with a piston 16. These cylinders 17 and 18 are desirably in a single casting that is secured to the lower end of the valve casing.

Communicating with the lower end of the cylinder 18 is a pipe 21 leading from the air controller 22. Leading into the air controller is a pipe 23 from the reservoir or other source of storage of air compressed by the machine. In the chamber of the controller shown, between the entrance from the inlet pipe 23 and the exit to the outlet pipe 21, is a valve 24 that is normally held down against the air pressure by a spindle 25 under the pressure of the spring 26. When the air pressure reaches the predetermined degree, the valve 24 is lifted, allowing that pressure to pass through the controller and pipe 21, to the lower end of the cylinder 18. This lifts the piston 19 to the top of the cylinder 18 and through the piston 16 and spindle 15 lifts the piston-throttle-valve sufficiently far for the disk 5 to close the port 3, and the disk 4 to close the port 2, thus cutting off the main flow of steam. When the air pressure drops below the fixed amount, the air controller valve is closed and the pressure in the pipe and lower end of the cylinder relieved, allowing the piston 19 to drop and the throttle valve to open. The movement of the piston 19 is such as to carry the throttle valve only far enough to close the main ports 2 and 3—the disk 4 is not carried sufficiently far to close the chamber

11. When this condition exists, some steam can flow through the chamber 11 into the chamber 12 and through the by-pass 13 and thus keep the engine running slowly until the throttle valve is again opened wide.

Communicating with the upper end of the cylinder 18 or the lower end of the cylinder 17 in which moves the piston 16, is a pipe 27 that is in communication with the interior of the trip valve casing 28. Opening into the trip valve casing is a pipe 29 that leads from the boiler or from the main steam pipe. Between the entrance opening 30 and the exit opening 31 in the trip valve casing is a port 32. This port is normally closed by a valve 33 that is held to its seat by a spring 34. Thus, under ordinary conditions, steam cannot pass through this trip valve.

In the trip valve casing is a plunger 35 provided with a handle 36. A spring 37 is arranged in such manner as to tend to push the plunger inward and cause its tip 38 to engage and push open the valve 33. Pivoted to the outside of the trip casing is a latch 39, one end of which is adapted to engage with the flange 40 at the inner end of the handle that is attached to the plunger. A spring 41 tends to retain this latch in engagement with the flange so as to hold the handle out and the plunger tip away from the valve 33. A rocker lever 42 is also pivoted to the trip valve casing. One end of this lever is arranged adjacent to one end of the latch, while the other end is located adjacent to the periphery of the fly-wheel 43 of the engine to be controlled. Loosely mounted in the rim of the fly-wheel is a plunger 44. This plunger is normally retained withdrawn by a spring 45. Should the engine race and the speed of the fly-wheel increase above safety, the plunger will by centrifugal action be thrown out against the tension of the spring which normally holds it retained. When the plunger is thus thrown out it will engage the trip lever and rock it in such manner as to cause the latch to release the handle. Then the spring in the interior throws the plunger inward so that its tip will open the valve which closes the steam passage. When this trip valve is opened in this manner, steam pressure passes through it into the cylinder 18 below the piston 16 and forces that piston upwardly. This piston has such an amount of movement that when it is forced up by the steam pressure the throttle valve disks are moved sufficiently far to not only close the ports 2 and 3, but also shut off the chamber 11 and consequently prevent the flow of steam through the by-pass, thus causing the engine to stop. After the throttle has been completely closed and it is desired to start the engine, the handle of the trip valve is first pulled out and engaged by the latch so that valve will close the steam passage. This cuts off the pressure beneath the piston 16, allowing that to drop and the engine to be regulated by the air controller. When the handle is free and the spring thrusts the plunger inward, it seats itself and closes the opening at the end of the port 32 so that steam cannot escape. With the handle pulled out and held by the latch so that the steam valve in the trip device may seat and close the port, the end 46 of the plunger is drawn away from its seat so that the steam in the pipe 27 may escape through the opening 47 and thus relieve the pressure beneath the piston 16.

By this simple apparatus, the speed of the engine is controlled by the air pressure according to the demand for air, and the engine is prevented from running away in case of accident, without the employment of a centrifugal governor.

The invention claimed is:

1. In a compressor engine controlling apparatus the combination of, a steam throttle valve provided with a steam passage, means adapted to be actuated at a predetermined air pressure for causing the partial closing of said steam passage, and means adapted to be actuated at a predetermined engine speed for causing the complete closing of said steam passage through the throttle valve.

2. In a compressor engine controlling apparatus the combination of, a steam throttle valve provided with a main port and a by-pass, means adapted to be actuated at a predetermined air pressure for causing the closing of the main port of the throttle valve, and means adapted to be actuated at a predetermined engine speed for causing the closing of the main port and the by-pass of the throttle valve.

3. In a compressor engine controlling apparatus the combination of, a steam throttle valve, means for closing the throttle valve, an air valve adapted to be opened at a predetermined pressure for allowing the air to act upon the throttle closing means, and a steam valve adapted to be opened at a predetermined engine speed for allowing the steam to act upon the throttle closing means.

4. In a compressor engine controlling apparatus the combination of, a steam throttle valve, means for closing the throttle valve, an air valve adapted to be opened at a predetermined air pressure for allowing the air to act upon the throttle closing means, a normally closed steam valve, normally retracted means for opening said steam valve, and means adapted to be actuated by the fly-wheel for releasing the opening means and allowing said means to open the steam valve and permit the steam pressure to act upon the throttle closing means.

5. In a compressor engine controlling apparatus the combination of, a steam throttle

valve provided with a main port and a by-pass, two pistons connected with the throttle valve, an air controlling valve adapted to be opened at a predetermined air pressure to allow the air to act upon one of said pistons and effect the closing of the main port of the throttle valve, and a steam controlling valve adapted to be opened at a predetermined engine speed to allow the steam to act upon the other of said pistons and effect the closing of the main port and the by-pass of the throttle valve.

6. In a compressor engine controlling apparatus the combination of, a steam valve having two ports and a by-pass, a piston valve adapted to close said ports and by-pass, a spindle connected with the throttle valve piston, two pistons connected with said spindle, an air controlling valve adapted to be opened at a predetermined air pressure to allow the air to act upon one of said pistons, a steam valve adapted to be opened to allow steam to act upon the other of said pistons, and means adapted to be actuated by the engine fly-wheel for causing the opening of the said steam valve.

7. In a compressor engine controlling apparatus the combination of, a steam throttle valve having two ports and a by-pass, a piston valve adapted to close said ports and by-pass, a spindle connected with the throttle valve piston, two pistons connected with said spindle, an air controlling valve adapted to be opened at a predetermined air pressure and when open to admit the air pressure to one of said spindle pistons, a steam trip valve normally held closed, and means for opening said trip valve at a predetermined engine speed to permit steam pressure to act on the other of the said spindle pistons.

8. In a compressor engine controlling apparatus the combination of, a steam throttle valve, a piston connected with said throttle valve, a steam valve adapted to be opened at a predetermined engine speed for allowing the steam to act upon the said piston, a secondary piston connected with the throttle valve, and an air valve adapted to be opened at a predetermined air pressure for allowing the air to act upon the secondary piston.

9. In a compressor engine controlling apparatus the combination of, a steam throttle valve, means for closing the throttle valve, an air valve adapted to be opened at a predetermined air pressure for allowing the air to act upon the throttle closing means, a normally closed steam valve, means adapted to open the steam valve and permit the steam to act upon the throttle closing means, a latch for normally holding the steam valve opening means retracted, and a lever adapted to be actuated by the fly-wheel for disengaging said latch from the means for opening said steam valve.

10. The combination with a steam engine throttle valve, of means actuated by fluid pressure of a predetermined amount for closing said valve, and means actuated by a moving part of the engine when the engine speed reaches a predetermined degree, for allowing fluid pressure to act upon said valve closing means.

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