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PATENTED APR. 17, 1906.

O. F. BRUMAN.
EMERGENCY GOVERNOR FOR STEAM ENGINES.

APPLICATION FILED OCT. 1, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

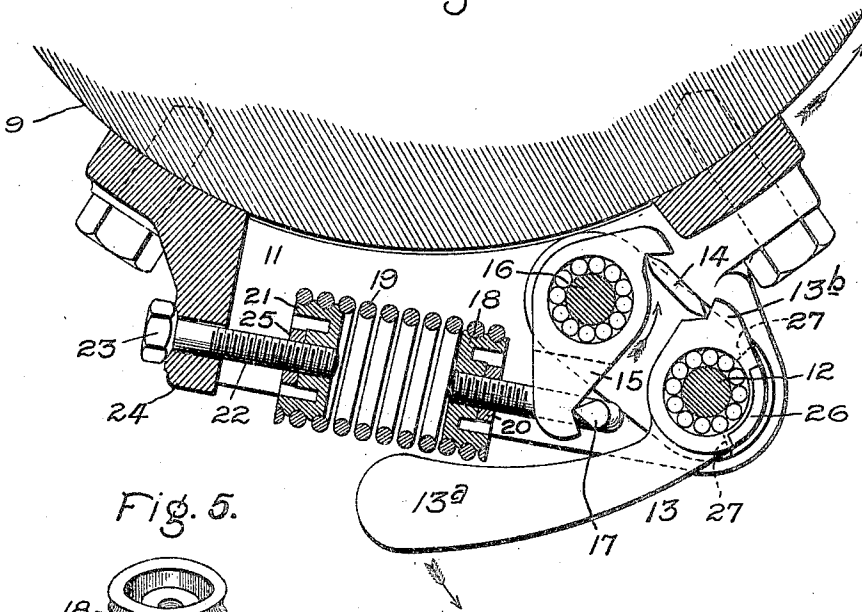


Fig. 5.

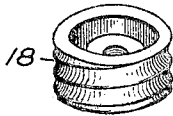


Fig. 2.

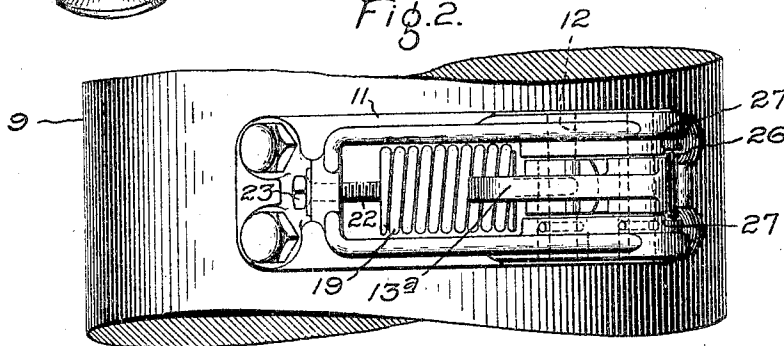


Fig. 3.

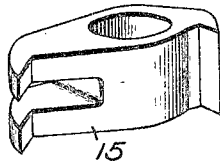
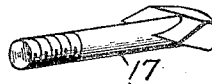


Fig. 4.



Witnesses:
William B. Hall,
Helen Oxford

Inventor:
Otto F. Bruman,
by *Alburt S. Davis*
Atty.

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2 SHEETS—SHEET 2.

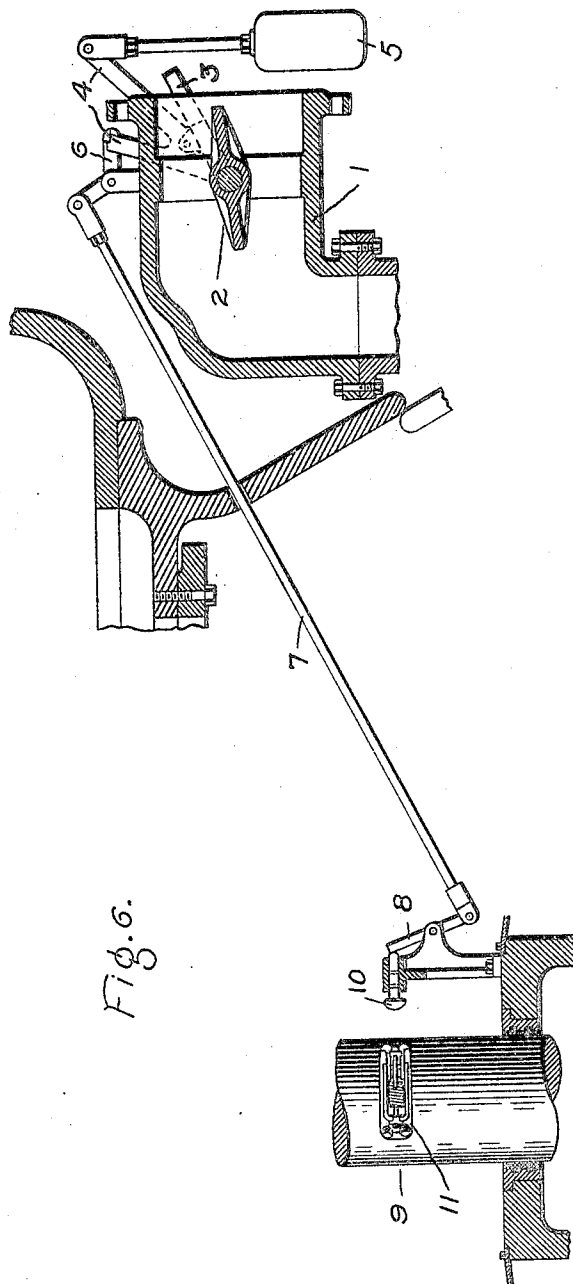


Fig. 6.

Witnesses:
Benjamin B. Hill,
Helen Oxford

Inventor:
Otto F. Bruman,
by *Albert S. Davis*
Att'y.

UNITED STATES PATENT OFFICE.

OTTO F. BRUMAN, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

EMERGENCY-GOVERNOR FOR STEAM-ENGINES.

No. 818,345.

Specification of Letters Patent.

Patented April 17, 1906.

Application filed October 1, 1904. Serial No. 226,730.

To all whom it may concern:

Be it known that I, OTTO F. BRUMAN, a citizen of the Swiss Republic, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Emergency-Governors for Steam-Engines, of which the following is a specification.

This invention relates to engines driven by elastic-fluid pressure; and its object is to prevent racing by automatically shutting off the supply of steam or other elastic fluid. Governors for doing this are not new, and my invention relates simply to the device which trips the valve mechanism. This device acts by centrifugal force, being usually mounted on the engine-shaft, so that when an abnormal speed is reached the tripper flies radially outward and strikes a lever which moves a catch and releases a weight, which drops, and thereby causes the closure of a butterfly or other valve in the steam-main.

In the accompanying drawings, Figure 1 is a plan view of my tripping device, partly in section. Fig. 2 is a side elevation thereof. Fig. 3 is a perspective view of the rocker. Fig. 4 is a perspective view of the T-headed bolt. Fig. 5 is a perspective view of one of the spring-supporting heads, and Fig. 6 is a view of one mode of connecting the tripping device with the emergency-governor.

Referring first to Fig. 6, it will be seen that the steam-main 1 is provided with a butterfly-valve 2, on whose spindle is an arm 3, to which is pivoted a bent lever 4, having a weight 5 suspended from one end. The other end of the lever is engaged by a pivoted catch 6, which can be pulled off by a rod 7. To move the rod, a lever 8 is provided near the shaft 9 of the engine. One end of said lever is pivoted to the rod. The other end is adapted to be moved by the centrifugally-acting tripping device on the shaft, which strikes a glancing blow either on the lever itself or on a plunger 10, engaging one end of the lever. Instead of a plunger I may use a pivoted arm, which is struck a glancing blow by the weight.

The tripping device which forms the subject-matter of this application comprises a curved frame 11, bolted to the shaft 9 and having at one end a transverse pin 12, on which is fulcrumed the tripper 13, the bearing being preferably a ball or roller bearing,

as shown. The long arm 13^a of the tripper lies normally near the frame, while its short arm 13^b has a transverse notch in which is received one end of a link 14. The other end of said link engages a notch in the short arm of a rocker 15, which is pivoted on a pin 16, mounted transversely in the frame 11, the bearing being preferably a ball or roller bearing, as shown. The ends of the link are preferably knife-edged, as illustrated.

The longer arm of the rocker is notched to receive a knife-edge on the head of a bolt 17. The bolt is preferably T-headed, and the rocker is bifurcated to straddle the shank of the bolt, which is screw-threaded to mesh with a tapped hole in a circular head 18, to which one end of a helical spring 19 is attached. The preferred mode of attachment is to form a deep helical groove in the periphery of said head and screw the spring over it. A lock-nut 20 on the bolt 17 prevents accidental displacement of the head 18 thereon. The other end of the spring is similarly connected with a head 21, which for convenience is a duplicate of the head 18. A bolt 22 engages with this head and has itself a head 23, abutting on the back of a bracket 24 on the frame. A lock-nut 25 secures the head 21 in place.

On the sides of the tripper 13^a are lugs 26, that cooperate with adjacent shoulders 27 on the frame 11 and limit the extreme outward movement of the tripper due to excess speed.

The operation of my device is as follows: It will be noted that the short arm 13^b on the tripper and the link form a toggle which when the long arm 13^a moves outwardly in the direction of the arrow tends to straighten out, and thus exert an increasingly-powerful thrust on the short arm of the rocker. The angle between the axis of the spring and the radius to the center of the rocker is made ninety degrees to give the very smallest angle of movement of the axis of the spring itself. It is essential that the centrifugal force of the spring be almost entirely taken up by the rocker-pin. The reaction in the notch due to the centrifugal force of the spring is in a direction parallel to a line connecting the center of gravity of the spring with the center of the shaft, and a line drawn parallel to said line will virtually pass through the center of the rocker-pin. It will be seen that the spring 19 and parts 17

and 22 constitute, in effect, a beam which is supported at two points, so that the forces exerted thereby are parallel to the radius of the center of gravity of the beam, and also that the reaction at the notch is virtually in line with the axis of the pin 16. The tripper can be small and light, since a weight of three-eighths of a pound at a distance of nine inches from the center of the shaft will exert a centrifugal force of twenty-four pounds at a normal speed of five hundred revolutions per minute. At five hundred and fifty revolutions its centrifugal force increases to twenty-nine pounds. It is desirable to have the tripper operate at this speed, which is ten per cent. above normal. The spring is therefore adjusted to be overpowered by the tripper at five hundred and fifty revolutions per minute. Owing to the toggle action of the short tripper-arm and the link, the tripper goes out with considerable acceleration to its full extent when it once starts. When the tripper flies out, it strikes a glancing blow on the plunger 10, which actuates the lever 8, and thereby trips the catch 6 and allows the weight 5 to drop. In its fall the lever 4 strikes the arm 3 a hammer-blow, thus closing the valve 2 instantly. By means of the toggle-joint the leverage exerted by the spring on the main lever in going out is decreased to about one-third, and therefore the centrifugal force has to drop a predetermined amount until the moment of the spring and the moment of the lever are in equilibrium. As an example, the speed may fall to four hundred and fifty revolutions per minute, or a decrease of ten per cent. below normal, before the tripper resets itself. The advantages of a device which automatically returns to its normal position after the cessation of the abnormal conditions which caused it to operate will be appreciated by those familiar with the handling of this class of machinery.

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 can be carried out by other means.

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

1. A self-setting tripping device for an emergency-governor for a steam-engine, comprising a pivoted tripper mounted to revolve, a spring for counterbalancing its centrifugal effect, and a toggle-joint between said parts which tends to straighten out when the tripper moves to its operative position.

2. A self-setting tripping device for an emergency-governor, comprising a pivoted tripper mounted to revolve, a spring to counterbalance its centrifugal effect, a rocker con-

nected with said spring, and a toggle-joint between the rocker and the tripper which tends to straighten out when the tripper moves to its operative position.

3. A self-setting tripping device for an emergency-governor, comprising a tripper and a rocker pivoted near each other and having notched arms, a link having knife-edges received in said notches, and a spring attached to said rocker.

4. A tripping device for an emergency-governor, comprising a pivoted tripper having a long arm and a short arm, a pivoted rocker having a long arm and a short arm, a link connecting said short arms and forming a toggle, and a spring attached to the long arm of the rocker.

5. A tripping device for an emergency-governor, comprising a pivoted tripper, a pivoted rocker connected therewith, and a spring attached to said rocker and so arranged that its centrifugal effect does not exert any turning moment on said rocker.

6. A tripping device for an emergency-governor, comprising a pivoted tripper mounted on a shaft, a pivoted rocker connected therewith, and a spring attached at one end to an arm of said rocker and arranged with its axis tangential to said shaft and at right angles to the rocker-arm.

7. A tripping device for an emergency-governor, comprising a tripper operating by centrifugal force against a spring, and constructed to exert an increasing leverage against said spring as it moves outward.

8. A tripping device for an emergency-governor, comprising a frame curved to fit a shaft, two transverse pins in said frame, shoulders on the frame adjacent to one pin, a tripper pivoted on one of said pins and having a lug to abut against said shoulders, a rocker pivoted on the other pin, a knife-edged link connecting the tripper and the rocker, an adjustable spring attached at one end to the frame, and a T-headed bolt connecting the other end of said spring with the rocker.

9. In a governor for prime movers, the combination of a pivoted weight, a spring for opposing the weight which is disposed so that the forces exerted by the ends thereof due to centrifugal force are parallel to the radius of the center of gravity of the spring, a fixed support for one end of the spring, a movable support for the other end of the spring, the reaction at the point of contact between the spring and support being in line with the axis of the movable support, and a connection between the movable support and the weight.

10. In a governor for prime movers, the combination of a pivoted weight, a spring for opposing the weight which is disposed so that the forces exerted by the ends thereof due to centrifugal force are parallel to the radius of the center of gravity of the spring, a fixed

support for one end of the spring, a movable
support for the other, the reaction between
the spring and movable support taking place
in line with the axis of the movable support,
5 a connection for transmitting motion be-
tween the support and weight, and a frame
to which the parts are secured.

In witness whereof I have hereunto set my
hand this 29th day of September, 1904.

OTTO F. BRUMAN.

Witnesses:

ALEX. F. MACDONALD,
GENEVIEVE HAYNES.