S. C. CARR.

SAFETY STOP FOR STEAM ENGINES.

APPLICATION FILED APR. 28, 1911.

1,041,239.

Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

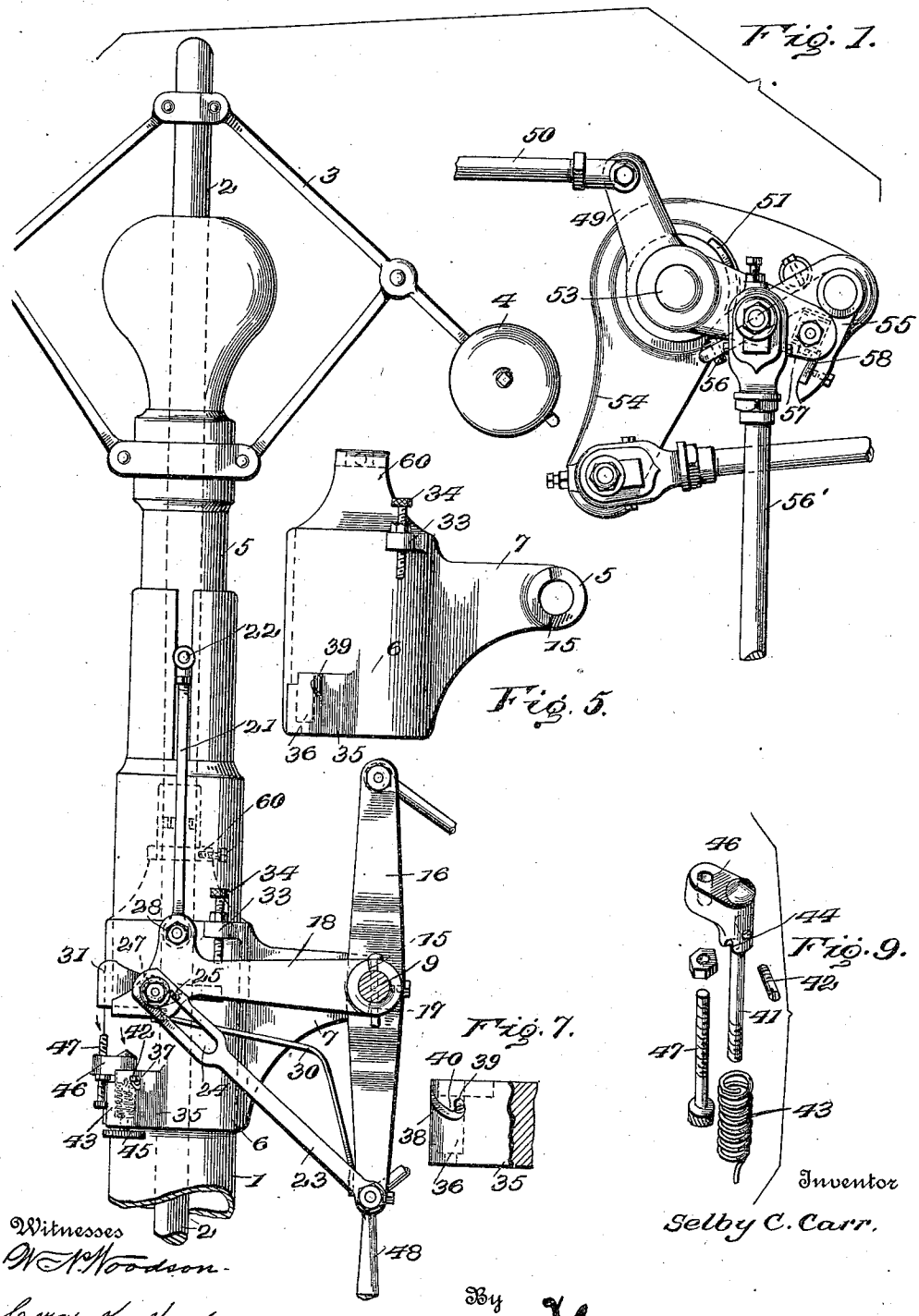


Fig. 5.

Fig. 7.

Fig. 9.

Witnesses

W. N. Woodson.

Cora N. Handy.

Inventor

Selby C. Carr.

By Adams Bacon, Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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4 SHEETS—SHEET 2.

Fig. 2.

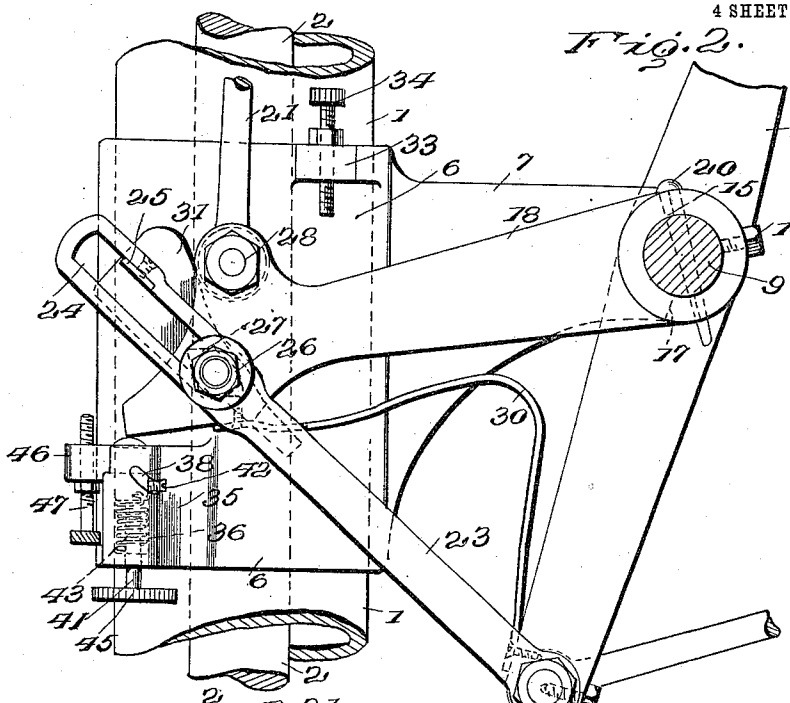
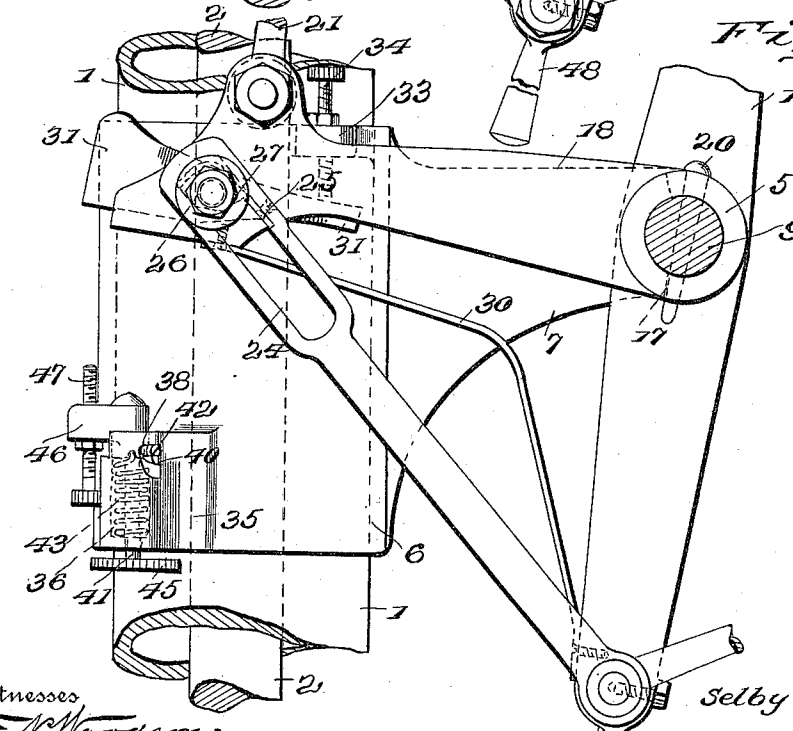


Fig. 3.



Witnesses

W. N. Woodson.

Cora N. Handy.

Inventor

Selby C. Carr.

By Marshall & Marshall, Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

S. C. CARR.

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4 SHEETS—SHEET 3.

Fig. 4.

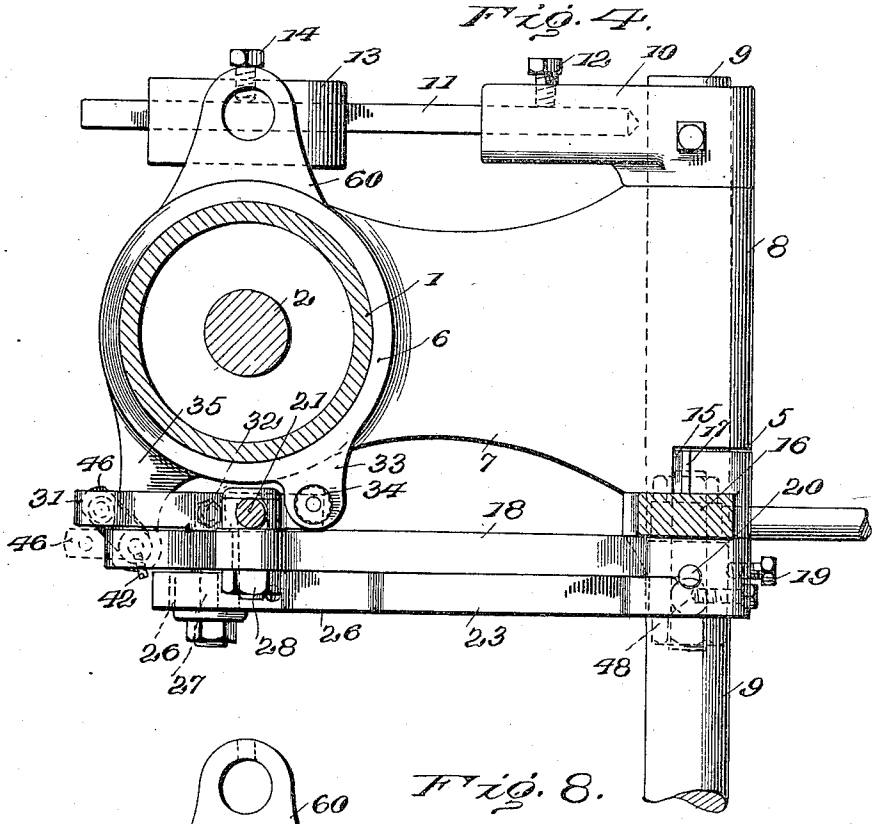


Fig. 8.

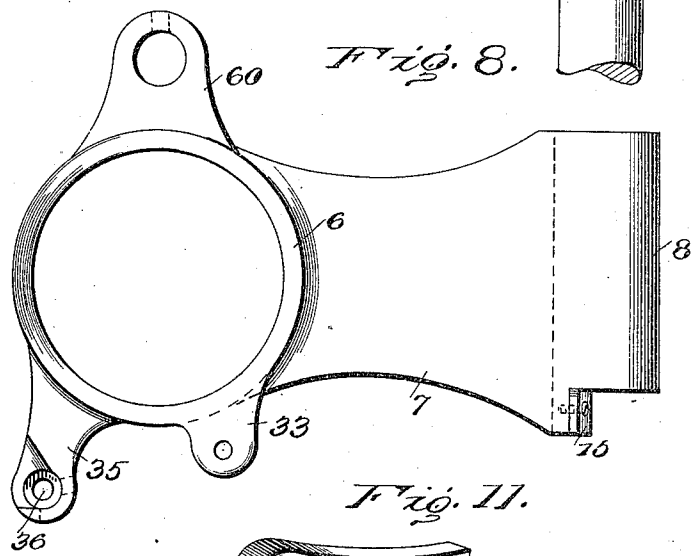
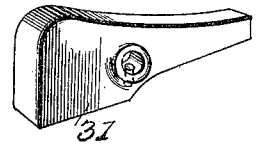


Fig. 11.



Witnesses

W. N. Woodson

Cora M. Handy.

Inventor

Selby C. Carr.

By Marrow, Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

S. C. CARR.

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4 SHEETS—SHEET 4.

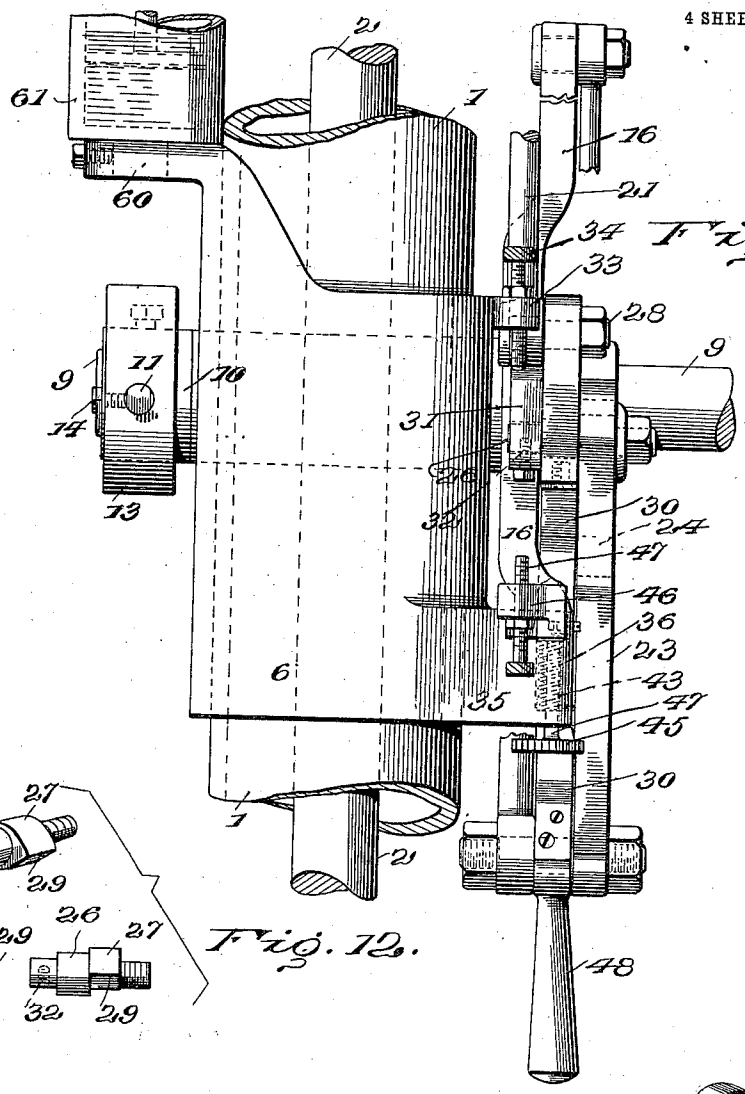


Fig. 6.

Fig. 12.

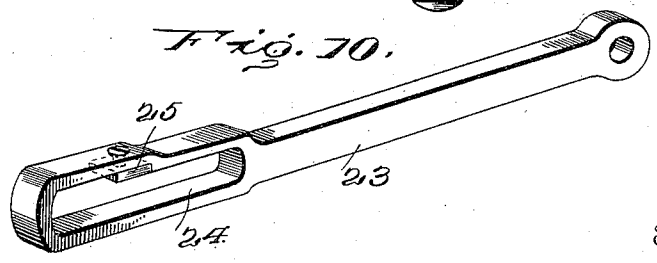


Fig. 10.

Witnesses

W. N. Woodson

Cora A. Handy.

Inventor

Selby C. Carr.

By Marshall & Marshall Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

SELBY C. CARR, OF MUSKOGEE, OKLAHOMA.

SAFETY-STOP FOR STEAM-ENGINES.

1,041,239. Specification of Letters Patent. Patented Oct. 15, 1912.

Application filed April 28, 1911. Serial No. 623,914.

To all whom it may concern:

Be it known that I, SELBY C. CARR, citizen of the United States, residing at Muskogee, in the county of Muskogee and State of Oklahoma, have invented certain new and useful Improvements in Safety-Stops for Steam-Engines, of which the following is a specification.

This invention relates to a safety stop for steam engines, and aims primarily to provide means for automatically cutting off the supply of steam to the engine when the engine is subjected to excessive load or when there is a tendency for it to race.

The invention also contemplates the cutting off of steam to the engine upon such injury to the governor as would render the latter inoperative.

It is also an aim of the invention to so construct the safety mechanism that it may be manually tripped or actuated to cut off the supply of steam to the engine without the necessity of operating the throttle valve, so that should the throttle valve be located in the vicinity of escaping steam or should it become expanded due to heat so as to be difficult to turn, the shutting off of the steam supply may be accomplished without risk on the part of the engineer.

The invention further aims to provide an automatic cut-off mechanism of the type mentioned which may be assembled with any ordinary steam engine and its governor without any material change in the construction of the governor.

It is also an object of the invention to provide for adjustment of the mechanism whereby it will be responsive to a predetermined increase in speed of operation of the governor, or to a decrease in speed of operation of the governor due to excessive load being imposed upon the engine, or due to such breakage of or injury to the governor as would render the latter inoperative.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a view in elevation of the mechanism embodying the present invention, the parts thereof being shown in the positions which they will occupy when the engine is running under normal speed and load conditions; Fig. 2 is a similar view, showing the parts in the positions which they will assume when the mechanism has been tripped due to an abnormal increase in speed of operation of the governor; Fig. 3 is a similar view, illustrating the positions of the parts when the mechanism has been tripped due to operation of the governor under excessive load conditions; Fig. 4 is a plan view, parts being shown in sections, of the mechanism, the parts thereof being in the positions shown in Fig. 1 of the drawings; Fig. 5 is a detail view in side elevation of the support for the mechanism; Fig. 6 is a view in side elevation of the mechanism, the parts thereof being in the positions shown in Fig. 1 of the drawings; Fig. 7 is a detail view in elevation of a portion of the support for the mechanism; Fig. 8 is a plan view of said support; Fig. 9 is a detail view of the supporting pin for one of the abutments for the trip mechanism; Fig. 10 is a detail view in side elevation of the rod constituting an element of the mechanism arranged to normally hold, against actuation, the lever for actuating the valve controlling mechanism of the engine; Fig. 11 is a detail view of the trip mechanism; Fig. 12 is a detail view of the abutment which coöperates with the arm shown in Fig. 10.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

While in the drawings there is shown a specific form of governor, although of a well known type, and a specific valve controlling mechanism, it will be readily understood that the safety stop mechanism embodying the present invention may be assembled with any other similar form of governor and any other similar form of valve controlling mechanism.

Of the governor, the tubular standard is indicated by the numeral 1, and working in this standard is the usual rod 2, to the upper end of which are pivoted the arms 3 carrying at their outer ends the centrifugal balls 4. These arms, in their revolution in different planes, raise or lower the usual sleeve 5 which works upon the rod 2, and this sleeve has a connection with the mechanism embodying the present invention which will be presently explained.

A casting, which constitutes the support for the working elements of the mechanism, includes, in its structure, a sleeve 6 which is secured upon the tubular standard 1 in any

suitable manner, and a lateral extension 7 which is formed with a bearing 8. A short rock shaft 9 is mounted in the bearing 8 and has secured at one end a head 10 in which is adjustably fitted one end of an arm 11, the arm being held at adjustment by means of a set screw 12 threaded through the head and bearing against its said end. A weight 13 is held, by means of a set screw 14, at adjustment upon the arm 11 and is designed to regulate the speed of the engine. For a purpose to be presently explained, the extension 7 of the support is formed at one end of its bearing 8 with a shoulder, which is indicated by the numeral 15. Loosely mounted upon the shaft 9 immediately outwardly of that end of the bearing at which the shoulder 15 is formed, is a lever 16 having an arm projecting below and an arm projecting above the said shaft. The hub of this lever is formed also with a shoulder, indicated by the numeral 17, which is arranged to cooperate, in a manner to be presently explained, with the shoulder 15 of the said bearing 8, the rocking movement of the lever in one direction being in this manner limited.

A rock arm 18 is secured by means of a set screw 19 and a taper pin 20 to the shaft 9 beside the lever 16 and projects beside the extension 7 of the support above described. To the free end of this arm is pivoted the lower end of a rod 21 which at its upper end is connected, as at 22, with the sleeve 5 of the governor, it being understood that as the governor is operated under high and low speed conditions, the rod 21 in moving up and down will rock the arm 18 and impart rocking movement to the shaft 9. In order that the lever 16 may move with the shaft 9 under normal conditions, there is provided a means which will now be described.

A rod 23 is pivoted at its lower end to the lower end of that arm of the lever which projects downwardly from the shaft 9 and this rod is formed with a slot which is indicated by the numeral 24, and is widened at its end which is adjacent that end of the rod opposite the end which is pivoted to the lever 16. A block 25 of hardened steel or other suitable material is secured in place upon one wall of the widened portion of the slot 24 and forms a shoulder having an abutment which is carried by the arm 18 and is clearly shown in Figs. 1 and 12 of the drawings. This abutment is in the form of a pin having a portion 26 fitting loosely in the outer end of the arm 18 and having a cam portion, indicated in general by the numeral 27, and fitting in the slot 24 in the rod 23. A nut 28 is threaded upon one end of the pin comprising the abutment and prevents disengagement of the rod 23 from the cam portion 27 of the said abutment. This portion 27 of the said abutment is so formed as to have a shoulder 29 which normally seats against the block 25 in the slot 24, although, when the abutment is rocked in a manner to be presently explained, this shoulder 29 will be disengaged from the block and the abutment will then be permitted to ride in the slot 24. A leaf spring 30 is secured at one end to the under side of the arm 18 at its outer end and is secured at its opposite end to the lower end of the lower arm of the lever 16, the spring being bowed between its ends and normally tending to rock the said lower arm of the lever in the direction of the tubular standard 1 of the governor. Such movement of the lever, however, is prevented by the engagement of the abutment 27 with the block in the slot 24 of the rod 23. It will be understood, however, that when the abutment is so rocked as to disengage its said shoulder 29 from the said block, the spring 30 is permitted to swing the lever 16 to approximately the position shown in Fig. 2 of the drawings.

As a means for oscillating the abutment to disengage from the block 25, there is provided a trip which is carried by the abutment and is arranged to engage with adjustable abutments upon the support when the arm 18 is rocked upwardly or downwardly to an abnormal degree in responding to the movement of the rod 21 when the governor is running under abnormally high speed or under excessive load conditions, and this trip is indicated in the drawings by the numeral 31, and is held upon the end of the abutment above described, opposite its threaded end, by means of a set screw 32. The trip 31 is in the form of a block which is so proportioned that its end which is opposite its end which is located adjacent to the shaft 9 will be heavier and will consequently tend to fall although it is normally prevented from such movement by reason of the engagement of the shoulder 29 of the abutment with the block 25. The sleeve 6 of the support for the mechanism is formed at its upper end with an ear 33 through which is adjustably threaded an abutment screw 34 having its lower end positioned in the path of movement of the minor end of the trip 31.

It may be stated at this point that when the arm 18 is swung upwardly to a predetermined degree due to the upward movement of the rod 21 when the governor is operating under excessive speed, the minor end of the trip will be brought into engagement with the lower end of the abutment screw 34 and the trip will then be rocked to about the position shown in Fig. 3 of the drawings. This rocking movement of the trip will serve to disengage the shoulder 29 of the abutment from the block 25 and will allow the spring 30 to swing the lower arm

of the lever 16 in the direction of the tubular standard 1 of the governor. Connection between the lever 16 and the valve controlling mechanism, to be presently described, will then cause the actuation of this mechanism to cut off the supply of steam to the engine.

The sleeve 6 of the support is formed at its lower end with a lug 35 which in turn is formed with a vertically extending bore 36 and with a slot having an upwardly extending end 37, a downwardly inclined portion 38, and a returned portion 39 which results in a shoulder 40 upon the upper wall of the slot between the portions 38 and 39. A pin 41 is rotatably fitted in the bore 36 in the lug 35 and this pin carries a stud 42 which projects into and works in the slot above mentioned. A spring 43 is fitted upon the pin 41 within the bore and at its upper end is connected with the head of the pin, as at 44, and its lower end is inserted through an opening in the wall of the bore 36. This spring normally holds the pin 41 elevated and also normally holds it rotated with the stud 42 seating in the end of the portion 38 of the slot in the lug 35. A hand or finger wheel 45 is secured at the lower end of the pin 41 and may be rotated for the purpose of turning the pin in the bore, during which movement the stud 42 will ride down the inclined portion 38 of the slot and will eventually seat in the portion 39 thereof and behind the shoulder 40, this movement of the pin being against the tension of the spring 43. The head of the pin 41 is formed with a laterally projecting portion 46 in which is adjustably threaded an abutment screw 47 which is normally positioned in the path of downward movement of the trip 31, it being understood, however, that by means of the hand wheel 45, the pin 41 may be so rotated as to move the abutment screw 47 out of the path of movement of the trip, in which position it is seen in dotted lines in Fig. 4 of the drawings. At this point it may be stated that should the governor be operating at low speed due to excessive load being imposed upon the engine or due to such damage to it as would result in its being rendered inoperative to control the supply of steam to the engine, the arm 18 will be swung downwardly due to the tripping of the rod 21 and the trip 31 will be brought into engagement with the upper end of the abutment screw 47. This will result in the trip being moved to the position shown in Fig. 2 of the drawings, and in a disengagement of the shoulder 29 from the block 25 as in the instance of the engagement of the trip with the abutment screw 34. In order to manually reset the lever 16 after its release, there is provided, at the lower end of the lower arm of the said lever a handle 48.

While, as before stated, the mechanism embodying the present invention may be assembled with any ordinary valve controlling mechanism, that shown in the drawings includes an arm 49, to which is connected a rod 50 which is connected either to the upper or to the lower arm of the lever 16, depending upon the relative arrangement of the mechanism of the invention and the valve controlling mechanism. At this point it will be understood that rocking movement imparted to the lever 16 will result in corresponding movement of the arm 49. This arm 49 is formed or provided with a cam portion 51 which is of course movable therewith. An arm 52 is mounted upon the shaft 53, upon which the arm 49 is also mounted, and is arranged to move the steam valve to cut off or admit steam to the engine cylinder.

The numeral 54 indicates an arm which carries a cam 55 having a portion 56 arranged to coöperate with the cam portion 51 of the arm 49. A rod 56′ is connected to the arm 52 and at its lower end is preferably provided with a piston (not shown) working in a dash pot. The arm 52 carries a block 57 which engages with a shoulder 58 upon one member of the cam 55 and normally connects the arms 52 and 54 for simultaneous operation. However, when the arm 49 is swung so as to bring its cam portion 51 into engagement with the portion 56 of the cam 55, the said cam 55 will be so rocked as to bring its shoulder 58 out of engagement with the block 57 and the arm 52 will then be released and the downward pull of the rod 56 will result in steam being cut off from the engine. Thus, the movement of the arm 49 controls the movement of the rod 56 and the admission of steam to the engine cylinder.

From the foregoing it will be readily understood that whether the arm 18 is swung upwardly or downwardly due to operation of the governor under abnormal speed or under excessive load conditions, the engagement of the trip 31 with the adjustable abutments 34 or 47 will result in a release of the lever 16 and in a movement of this lever, under the action of the spring 30 to so rock the arm 49 of the valve controlling mechanism as to release the rod 56 of this mechanism and cut off the supply of steam to the engine. It will also be understood that subsequent to the release of the lever 16 it may be readily reset by means of the handle 48 carried by its lower arm. It will also be understood that the trip 31 may be manually actuated either directly or by connecting to its major end a cord or like connection extending to a point remote from the engine and its governor. Thus, should the throttle valve of the engine become expanded to such degree as to prevent its

ready movement to closed position, or should steam be escaping in the vicinity of the throttle valve, the governor, or the valve controlling mechanism, the safety mechanism embodying the present invention may be manually actuated by rocking the trip 31 in the manner stated.

When the arm 18 is swung downwardly due to breakage of the governor mechanism or due to operation of the governor at an abnormally low speed, for example, when the engine is running under excess load, it will strike the upper end of the pin 41 and will depress this pin against the tension of the spring 43, thereby causing the stud 42 to ride in the slot in the lug 35 of the support, the trip 31 coming into engagement, however, with the abutment pin 47 immediately prior to such turning movement of the pin 41. Thus, when the arm 18 has swung downwardly to the limit of its movement, it will rest upon the pin 41 and will be supported by this pin and not by the abutment pin 47. This obviates injury to the pin 47 and its disarrangement from adjustment. By referring to Fig. 7 it will be observed that when the pin 41 is depressed, its head will rest upon the lug 35 and the spring 43 will thus be relieved of compression to such degree as would injure it.

While, as before stated, the invention provides means for automatically cutting off steam from the engine when there is a tendency for the engine to race or when the engine is subjected to excessive load conditions, the invention also provides means whereby the safety mechanism may be rendered non-responsive to excess load conditions when it is desired to carry an overload on the engine for a short time, by manually operating such means prior to imposing the overload, and it is contemplated that this may be accomplished without rendering the mechanisms non-responsive to conditions of excessive speed.

The invention also contemplates that the mechanism shall be automatically rendered responsive to conditions of overload as soon as the engine has been relieved of the overload, to carry which the mechanism was manually tripped. In this respect the operation of the mechanism is as follows:—When the engine is running under normal load conditions and at a normal speed, the trip 31 will occupy a position substantially as shown in Fig. 1 of the drawings and between the adjustable abutments 34 and 47. Should it become necessary to impose an overload upon the engine, the hand wheel 45 is manually rotated against the tension of the spring 43 thereby rotating the supporting pin 41 and causing the stud 42 to move down in the slot 38, passing the shoulder 40 and entering the returned part of the slot, or more specifically, the notch 39, the spring 43 serving to seat the stud in this end of the slot after it has passed the shoulder 40. As the stud is engaged behind the shoulder 40 and the tendency of the spring is to force the pin 41 upwardly, the return movement of the pin will be prevented. The movement of the pin to the position stated will result in the abutment 47 being swung out of the path of the trip 31. When the overload is first imposed upon the engine, the governor will drop in order to admit steam for a longer period of cut-off, and bring the engine to normal conditions. If the overload is great, the arm 18, through the movement of the rod 21, will drop down and rest upon the supporting pin 41, lowering this pin against the tension of the spring 43 and disengaging the stud 42 from the end 39 of the slot 38, thus causing the laterally projecting portion 46 to rest on the cut-away portion of the lug 35 which at this time bears the weight of the governor. As the engine resumes normal working conditions, and speed, the arm 18 will be lifted by the governor and will move away from the lug 35 and pin 41, the spring 43 causing the pin 41 to follow the arm 18 in its upward movement. As the pin moves upwardly, the stud 42 will ride around in the slot 48 and the abutment 47 will be brought to position in the path of movement of the trip 31.

If for any reason the engine should be subjected to a second overload, the trip will engage with the abutment 47 and the mechanism would automatically cut off the supply of steam to the engine. At this point it will be observed that the hand wheel 45 serves two purposes. In the first place, it may be manually rotated to move the abutment 47 out of the path of movement of the trip 31 in order to prevent the safety mechanism being operated when it is desired to carry a heavy load on the engine for a short time, the abutment pin 47 being automatically brought into the path of movement of the trip 31 when the engine is relieved of its overload. In the second instance, the hand-wheel may be manually rotated to swing the abutment 47 out of the path of movement of the trip 31 when shutting down the engine, thus rendering it unnecessary to reset the trip on again starting the engine, abutment 47 being automatically brought into the path of movement of the trip, as above described, when the engine is again started. It will at this point be understood that by adjusting the screws 34 and 47 the mechanism may be adapted to shut down the engine under any speed or load conditions desired, within the speed range and load capacity of the engine.

The automatic operation of the mechanism is as follows:—When the speed of the engine is greater than that for which the abutment pin 34 is set, the minor end of the trip 31

strikes this pin, thereby rotating the abutment 26 in the arm 18 and disengaging the shoulder 29 of the abutment from the shoulder in the slot in the rod 23. The spring 30 will then act to throw the lever 16 in a direction to prevent steam from being admitted to the engine, connection being made to the valve-gear by the rods 50. Movement of these rods serves to rotate the arm 49 carrying the block 51 until the end 56 of the cam 55 rides upon the block 51 during its complete circular movement. This engagement of the cam 55 with the block 51 serves to hold the shoulder 58 out of position to engage the arm 57, and no steam being admitted to the cylinder, the engine will cease to run. As the engine slows down, the arm 18 will drop and rest upon pin 41, the weight of the governor rotating the pin and throwing the adjustable abutment 47 out of the path of movement of the trip 31 so that the trip may be reset before starting the engine. By providing the shoulder 15 on the bearing 8, coöperating with the shoulder 17 on the hub of the lever 16, the lever 16 is prevented from throwing the arm 49 past a position to prevent steam from being admitted to the cylinder of the engine when the safety mechanism is actuated. At this point it may be stated that the arm 49 and the lever 16 would be moved considerably farther from the perpendicular when the safety mechanism operates due to excessive speed, than they would when the mechanism is operated under excessive load conditions, due to the fact that the governor, through the lever 16 and rods 50, would have rotated the arm 49 toward cut-off position prior to the tripping of the safety mechanism under excessive speed conditions. Owing to the provision of the shoulders upon the lever and bearing, however, the ends of the lever are not thrown through as great a distance when the trip is operated under excessive speed conditions as when it is operated under excessive load conditions, yet the lever assumes the same position in both instances. This is due to the fact that the governor has moved the lever 16, under excessive speed conditions, to a position other than that to which it moves the lever under excessive load conditions, prior to the operation of the trip under excessive speed or excessive load conditions.

Another purpose of the shoulders on the lever and its bearing is to prevent the shoulder 29 of the cam 27 from striking the lower end of the slot in the rod 23, which would result in battering of the shoulder. When the trip is brought into engagement with the abutment 34, the cam will be rocked to disengage its shoulder 29 from the shoulder in the slot in the arm 23, and abutment 27 may then move down in the slot in the said rod until the arm 18 is resting on the supporting pin 41, at which time the shoulder 29 of the abutment 27 is near the lower end of the slot in said rod but does not engage against the same. It will be observed from an inspection of Fig. 12 of the drawings that the abutment 27 is formed with two of the shoulders 29, and may be reversed when either one of the shoulders becomes worn. When the load on the engine becomes greater than that for which the abutment 47 is set, the arm 18 drops down bringing the trip 31 into engagement with the said abutment. This engagement of the trip with the abutment 47 serves to disengage the shoulder 29 from the shoulder in the slot in the rod 23, at which time the trip will assume about the position shown in Fig. 2 of the drawings. The spring 30 will then throw the lever 16 to position to cut off the supply of steam to the engine cylinder, and will also move the rod 23 to about the position also shown in Fig. 2 of the drawings. The arm 18 continues to drop, strikes upon the upper end of the pin 41 and depresses this pin against the tension of the spring 43, the stud 42 riding down in the slot 38, as before described. The stud 42 does not, however, enter the notch 39. This movement of the pin 41 throws the abutment 47 out of the path of movement of the trip 31 and allows the mechanism to be reset before the engine is again started. Due to the fact that the major end of the trip 31 strikes the adjustable abutment 47 before the lever 18 strikes the upper end of the pin 41, it follows that when the mechanism is reset, the major end of the trip 31 will be lower than the top of the abutment 47, and hence it will be seen that it is necessary that the abutment 47 should be rotated out of the path of movement of the trip 31 in order to permit of resetting of the mechanism after tripping. At this point it may be remarked that the trip 31 is heavier at one end than at the other for the purpose of causing engagement of the shoulder 29 of the abutment 27 with the shoulder in the slot in the rod 23 when resetting the mechanism. At this point it will also be understood that in order to trip the mechanism manually it is only necessary to rock the trip until the shoulder 29 is disengaged from the shoulder in the slot 24 in the arm 23.

It is preferable that the block 25 be in the form of a square and held in place by a centrally located screw, so that its four edges may be successively presented to the shoulder 29 of the abutment 27, as they become worn through use.

It is to be understood that in place of the hand wheel 45, a short hand lever may be used and, if desired, a buffer of hard wood or soft metal may be arranged between the striking points of the shoulders on the lever 16 and its bearing 8 to absorb the shock when the shoulder on the lever strikes the shoulder

on the bearing. In fact, the elements of the mechanism may be re-arranged in numerous ways without departing from the spirit of the invention.

A support 60 is preferably cast integral with the sleeve 6 and supports a dash-pot 61 provided in connection with the governor.

Having thus described the invention, what is claimed as new is:

1. In mechanism of the class described, the combination with the movable element of a governor, a rock member connected with the said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut-off position, an arm pivoted to the lever and formed with a shoulder, a trip pivoted to the rock-member, a reversible abutment movable with the trip and normally engaging with the shoulder upon the said rod whereby to hold the lever against such movement, and means for actuating said trip upon abnormal movement of the said rock arm to disengage said abutment from said shoulder.

2. In mechanism of the class described, the combination with the movable element of a governor, of a rock-member connected with the said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut-off position, a rod pivoted to the lever and provided with a slot having a shouldered wall, a trip pivoted to the rock-member, an abutment movable with the trip and normally engaging the shoulder of the said rod whereby to hold the lever against such movement, an adjustable means for actuating said trip upon abnormal movement of the said rock-member whereby to disengage said abutment from said shoulder.

3. In mechanism of the class described, the combination with the movable element of a governor, of a rock-arm connected with the said element of the governor, a valve controlling lever movable independently of the rock arm, means tending to move the lever to cut-off position, a rod pivoted to the lever and provided with a shoulder, a trip pivoted to the rock-arm, an abutment movable with the trip and normally engaging the shoulder upon said rod whereby to hold the lever against such movement, and adjustable means for actuating said trip movement of the rock-arm responsive to abnormal increase in speed of said governor whereby to disengage said abutment from said shoulder.

4. In mechanism of the class described, the combination with the movable element of a governor, of a rock-member connected with said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut-off position, an arm pivoted to the lever and provided with a slot having a shouldered wall, a trip pivoted to said arm, a reversible abutment movable with the trip and normally engaging the shoulder of the said rod whereby to hold the lever against movement independently of the said rock-member, and means arranged to actuate said trip upon movement of the rock-member responsive to abnormal increase or decrease in speed of the governor whereby to disengage said abutment from said shoulder.

5. In mechanism of the class described, the combination with the movable element of a governor, of a rock-member connected with the said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a slot having a shouldered wall, a trip pivoted to the arm and movable therewith, an abutment carried by the trip and normally engaging with said shoulder whereby to hold the lever against such movement, an abutment arranged to engage with the trip upon movement of the arm responsive to abnormally high speed movement of the governor whereby to disengage said abutment from said shoulder, and an abutment arranged to engage with said trip upon movement of the arm responsive to movement of the governor under abnormal load whereby to disengage said abutment from said shoulder.

6. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with said element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut off position, a rod pivoted to the lever and provided with a shoulder, a trip carried by the member, an abutment movable with the trip and normally engaging with said shoulder to hold the lever against such movement, means arranged to actuate said trip upon movement of the member responsive to the operation of the governor under excessive load whereby to disengage said abutment from said shoulder, and means arranged also for engagement by said trip to move the latter means out of such engagement.

7. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut off position, a rod pivoted to the lever and formed with a slot having a shouldered wall, a trip mounted to rock upon the rock member, a reversible abutment movable with the trip and normally engaging

with said shoulder upon the rod whereby to hold the lever against such movement, the said abutment being arranged to move in said slot upon disengagement of the abutment from the shoulder, and means arranged to engage with said trip whereby to so disengage the abutment upon movement of the member responsive to abnormally high speed and excessive load affecting the governor.

8. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with said movable element of the governor, a valve controlling lever movable independently of the said member, means tending to move the lever to cut-off position, a rod pivoted to the lever, a trip arranged to rock upon the member, an abutment movable with the trip and normally engaging with the rod whereby to hold the lever against such movement, an adjustable abutment arranged to engage with said trip upon movement of the said member responsive to operation of the governor under excessive load conditions whereby to release said rod and permit of such movement of the lever, and manually operable means for moving said adjustable abutment out of the path of movement of said trip.

9. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected to the movable element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip mounted to rock upon the arm, a reversible abutment movable with the trip and normally engaging with said shoulder whereby to hold the lever against such movement, an adjustable abutment, a movable support for said abutment, means normally holding the support to position the adjustable abutment in the path of movement of the trip when moved by said member responsive to operation of the governor under abnormal speed conditions, and means operable to move said support to position the said adjustable abutment out of the path of movement of the said trip.

10. In mechanism of the class described, the combination with the movable element of a governor, of a rock-arm connected with the element of the governor, a support for the rock arm, a valve controlling lever movable independently of the rock arm and mounted upon said support, connection between said support, means tending to move the lever to cut-off position, a rod pivoted to the lever and provided with a shoulder, a trip mounted to rock upon said arm, an abutment movable with the trip and normally engaging with the shoulder upon the rod whereby to hold the lever against such movement, and oppositely arranged abutments upon said support adapted to engage with the trip upon movement of the arm responsive to operation of the governor under excessive load and abnormal speed conditions whereby to disengage said abutment from said shoulder and permit of said movement of the lever.

11. In mechanism of the class described, the combination with the movable element of a governor, of a member connected with the said element of the rock governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a rod pivoted to the lever and provided with a shoulder, a trip mounted to rock upon said rock member, an abutment movable with the trip and normally engaging the said shoulder whereby to hold the lever against such movement, a spring-rotated pin mounted in the path of movement of said rock member, and an abutment carried by the pin and normally held thereby in the path of movement of the trip when moved by said rock member responsive to abnormal load conditions affecting the governor, the said pin being rotatable against the tension of the spring to move the abutment carried thereby out of the path of movement of said trip.

12. In mechanism of the class described, the combination with the movable element of a governor, of a rock-member connected with the said element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip mounted to rock upon said member, an abutment movable with the trip and normally engaging the said shoulder whereby to hold the lever against such movement, a spring-rotated pin mounted in the path of movement of said member, and an abutment carried by the pin normally held thereby in the path of movement of the trip when moved by said rock member responsive to abnormal load conditions, the said pin being rotatable against the tension of the spring to move the abutment carried thereby out of the path of movement of said trip and means arranged to hold the pin when rotated to such position.

13. In mechanism of the class described, the combination with the movable element of a governor, of a support, a rock arm mounted on said support and connected with said element of the governor, a valve controlling lever mounted upon the support and movable independently of the rock arm, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip pivoted to the rock arm, an abutment movable with the

trip and normally engaging with the shoulder upon said rod whereby to hold the lever against such movement, the said support being formed with a lug having a slot, a pin rotatably mounted in the lug and having a stud working in the slot, a spring normally holding the pin rotated in one direction, an abutment carried by the pin and normally supported in the path of movement of the trip when moved by the rock arm responsive to operation of the governor under abnormal load conditions, and means manually operable to rotate said pin to position the abutment carried thereby out of the path of movement of said trip, the slot in the said lug having a wall formed with a shoulder engageable by the stud upon the pin whereby to hold the latter against backward rotation after being positioned.

14. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with the said element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip mounted to rock upon said rock member, a reversible abutment movable with the trip and normally engaging with the shoulder on the rod whereby to hold the lever against such movement, and oppositely arranged abutments positioned to cooperate with the trip.

15. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with the said element of the governor, a support for the rock member, a valve controlling lever movable independently of the rock member, a rod pivoted to the lever and provided with a shoulder, a trip pivoted to the rock member, an abutment movable with the trip and normally engaging the shoulder upon said rod whereby to hold the lever against such movement, and means for limiting the movement of the lever to cut-off position.

16. In mechanism of the class described, the combination with the movable element of a governor, of a support, a rock-member mounted upon said support and connected with said element of the governor, a valve controlling lever movable independently of the rock-member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip pivoted to the rock-member and an abutment movable with the trip and normally engaging with the shoulder upon said rod whereby to hold the lever against such movement, a pin mounted in the path of movement of the said rock-member, a spring normally holding the pin elevated and rotated in one direction, an abutment carried by the pin and normally held thereby in the path of movement of the trip when moved by said rock-member responsive to abnormal load conditions affecting the governor, said pin being rotatable against the tension of the spring to position the abutment out of the path of movement of the trip, and means for holding the pin in such position, the pin being arranged to be depressed by the engagement of the rock-member therewith and through its depression to be released from the holding means whereby to provide for automatic return of the pin to normal position and with the abutment located in the path of movement of the trip upon the upward movement of the rock-member.

17. In mechanism of the class described, the combination with the movable element of a governor, of a support, a rock-member mounted upon said support and connected with said element of the governor, a valve controlling lever mounted upon the support and movable independently of the rock-member, means tending to move the lever to cut-off position, a rod pivoted to the lever and provided with a shoulder, a trip pivoted on the rock-member and an abutment movable with the trip and normally engaging with the shoulder upon said rod whereby to hold said lever against such movement, a pin mounted in the path of movement of said rock-member, an abutment carried by the pin, a spring connected with the pin and normally holding the same in elevated position and rotated to position the abutment in the path of movement of the trip when moved by said rock-member responsive to abnormal load conditions affecting the governor, the pin being arranged to be lowered and rotated against the tension of the spring whereby to position the abutment out of the path of movement of the trip, and means for holding the pin when so lowered and rotated, the pin being arranged to be depressed by the rock-member upon the occurrence of abnormal load conditions and through such depression to be released from said holding means whereby to permit the spring to automatically return the pin to normal position with the abutment in the path of movement of the trip upon the upward movement of the rock member.

18. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with the said element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a trip pivoted to the said rock member, means connected with the lever and with the rock member normally holding the former against such movement, a rod pivoted to the lever and formed with a slot, a rectangular abutment block secured upon one wall of

the slot and reversible, and an abutment carried by the trip and having a shoulder normally engaging with the abutment block.

19. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with the said element of the governor, a valve controlling lever movable independently of the rock member, means tending to move the lever to cut-off position, a rod pivoted to the lever and formed with a shoulder, a trip mounted to rock upon said rock member, an abutment movable with the trip and normally engaging with the shoulder upon the rod whereby to hold the lever against such movement and oppositely arranged abutment screws adjustable to engage the trip to actuate the same at various speed or load conditions affecting the governor.

20. In mechanism of the class described, the combination with the movable element of a governor, of a rock member connected with said element of the governor, a support upon said rock member, a valve controlling lever movable independently of the rock member, an arm pivoted to the lever and formed with a slot having a shouldered wall, a trip pivoted to the said rock member, an abutment movable with the trip and normally engaging the shoulder of the said rod, means arranged to actuate the trip upon movement of the rock arm responsive to abnormal increase or decrease of the governor whereby to disengage said abutment from said shoulder, and means arranged to move the lever to cut-off position upon abnormal movement of said rock member responsive to excess speed and excess load conditions affecting the governor.

In testimony whereof, I affix my signature in presence of two witnesses.

SELBY C. CARR. [L. S.]

Witnesses:
W. H. STETLER,
J. S. WEATHERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."