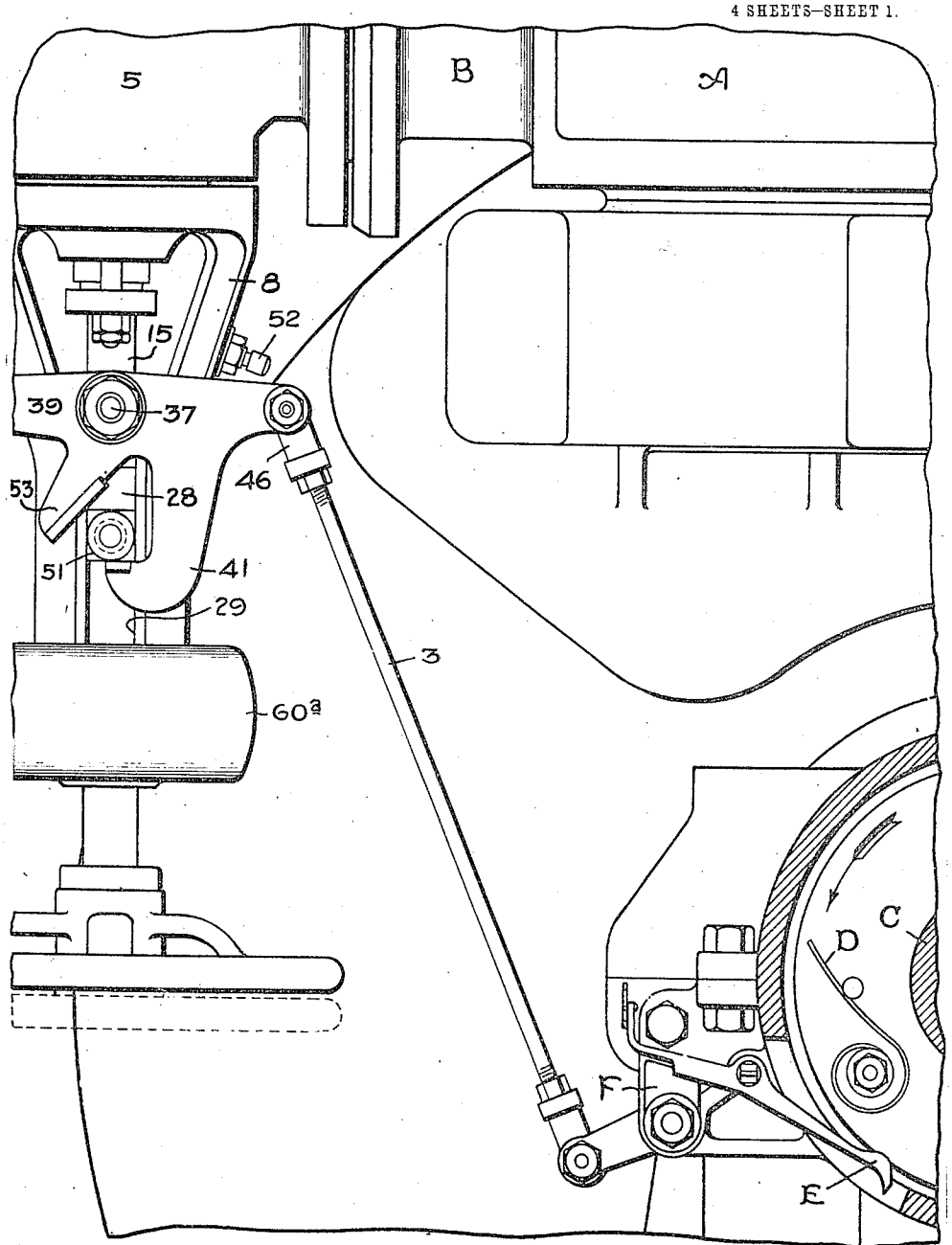
W. JOHNSON.

COMBINED THROTTLE AND EMERGENCY VALVE.

APPLICATION FILED JAN. 22, 1912.

1,041,478. Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.



Witnesses:
Marcus L. Byng,
J. Willis Sle

Fig. 1.

Inventor,
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by Albert G. Davis
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4 SHEETS—SHEET 2.

Fig. 2.

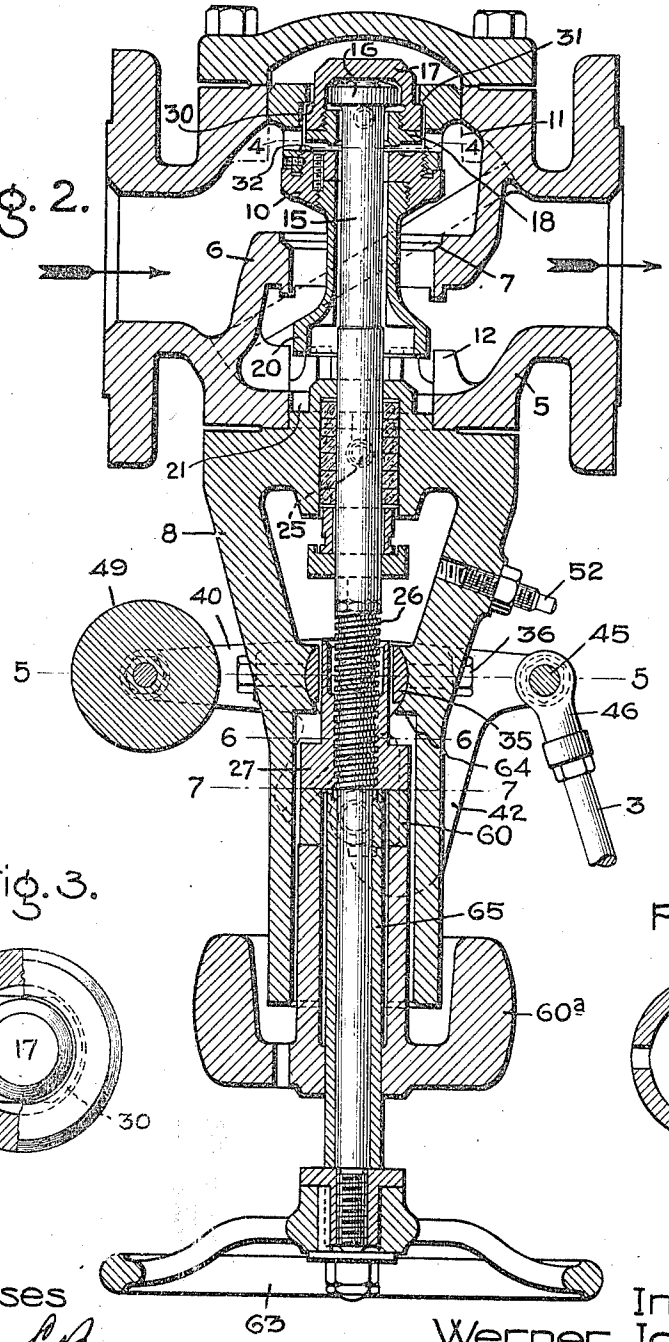


Fig. 3.

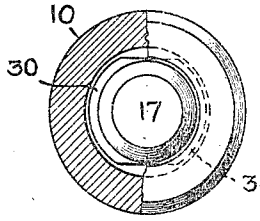
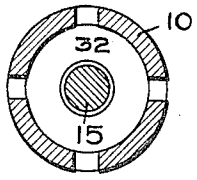


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

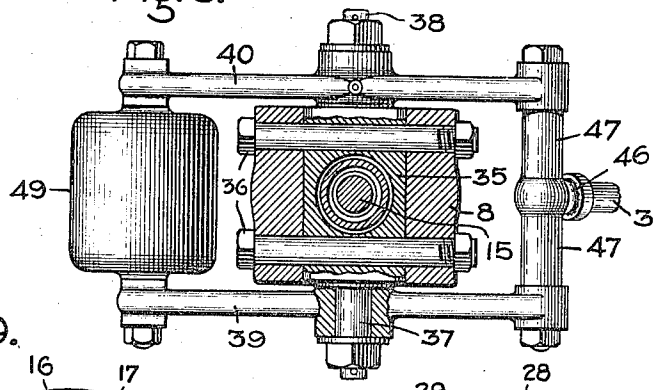


Fig. 9.

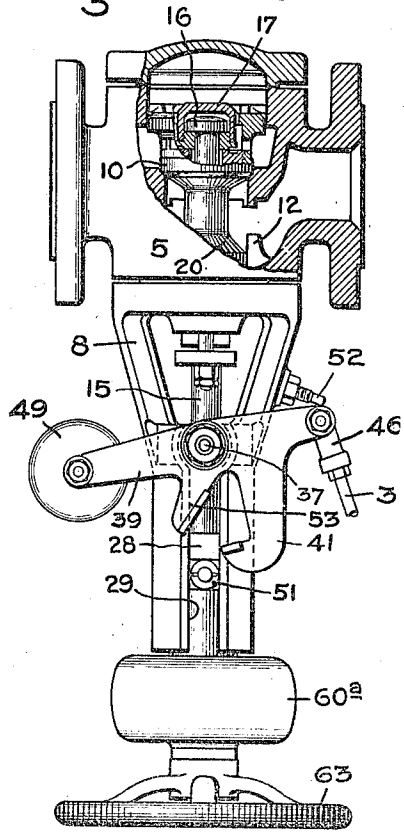


Fig. 6.

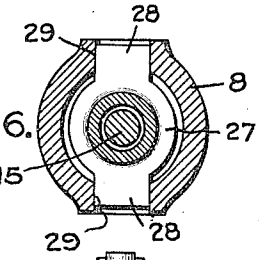


Fig. 7.

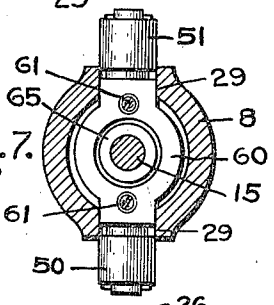
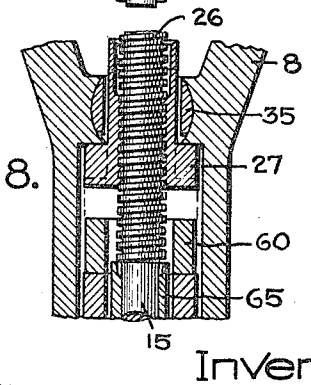


Fig. 8.



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4 SHEETS—SHEET 4.

Fig. 13.

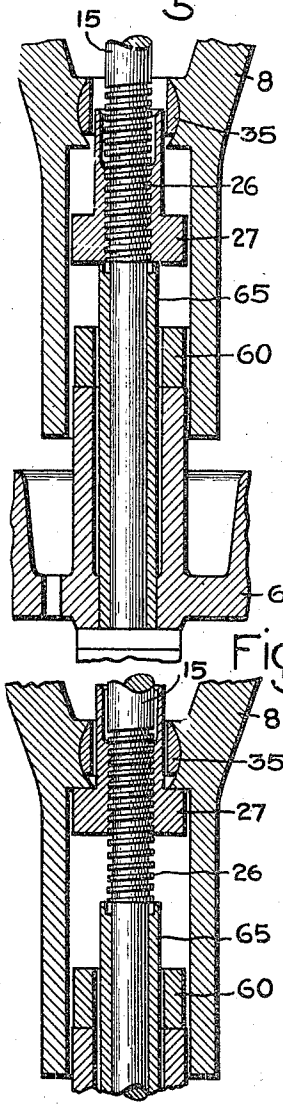


Fig. 14.

Fig. 10.

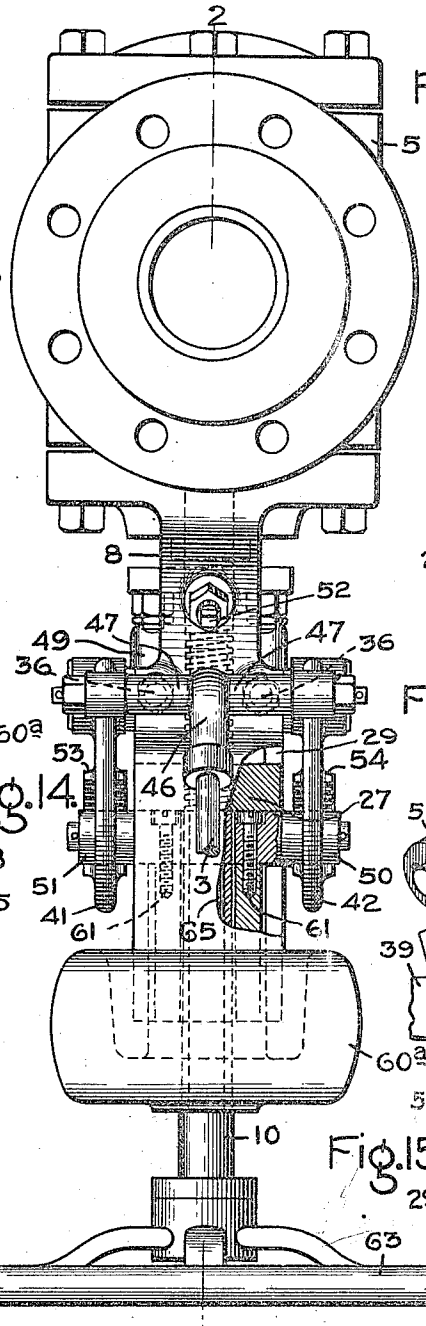


Fig. 11.

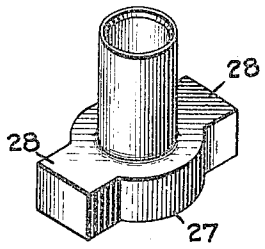


Fig. 12.

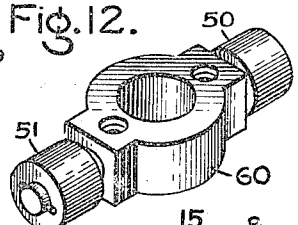
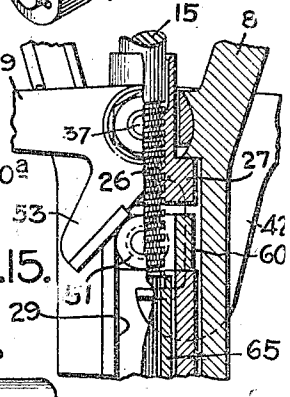


Fig. 15.



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UNITED STATES PATENT OFFICE.

WERNER JOHNSON, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

COMBINED THROTTLE AND EMERGENCY VALVE.

1,041,478. Specification of Letters Patent. Patented Oct. 15, 1912.

Application filed January 22, 1912. Serial No. 672,614.

To all whom it may concern:

Be it known that I, WERNER JOHNSON, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Combined Throttle and Emergency Valves, of which the following is a specification.

The present invention relates to valves which are employed to control the admission of steam or other elastic fluid to prime movers.

More specifically the invention relates to a valve that can be opened and closed by a hand wheel in the ordinary manner and which from any one of its positions can be closed suddenly, as for example by a speed governor driven by the prime mover receiving motive fluid through said valve.

The invention has for its object to improve the construction of such valves whereby they are rendered more certain and reliable in their action, the parts of the valve mechanism being of a simple, reliable character, readily manufactured and not liable to get out of order.

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 accompanying drawings is illustrated one of the embodiments of my invention, wherein—

Figure 1 shows a valve and its actuating mechanism with a tripping means which is operated by a speed responsive device; Fig. 2 is an axial section showing the internal mechanism of the valve; Fig. 3 is a plan view of the valve with a portion of it broken away; Fig. 4 is a cross-section of the valve taken on line 4—4 of Fig. 2; Fig. 5 is a cross-section taken on the line 5—5 of Fig. 2; Fig. 6 is a cross-section taken on the line 6—6 of Fig. 2; Fig. 7 is a section taken on the line 7—7 of Fig. 2; Fig. 8 illustrates the position of the valve actuating nut when the valve is in closed position, said valve having been operated by hand; Fig. 9 is a side view partially broken away, illustrating the valve in closed position, said valve having been closed by the speed governor; Fig. 10 is a side view of the valve and its operating mechanism; Fig. 11 is an isometric view of the valve actuating nut; Fig. 12 is an isometric view of the rollers and the trunnion member to which they are connected; Fig. 13 is a partial axial section taken through the nut and the valve closing weight, said figure showing the valve in closed position and the relation between the weight and the nut when in that position; Fig. 14 is a similar view showing the valve-closing weight in the same position as in Fig. 13, but with the nut in its upper position, this action being accomplished by rotating the hand wheel with the valve on its seat; and Fig. 15 is a view illustrating the resetting of the actuating nut and its releasing means.

Referring to Fig. 1, A indicates a portion of a turbine to which steam is admitted by the conduit B containing my improved valve.

C indicates a governor shaft driven by the main turbine shaft through suitable gearing. On the shaft is an emergency governor comprising for example a coiled spring D whose free end moves outwardly when the speed becomes too great and strikes the trigger E. This trigger normally holds the latch F which in turn prevents the valve closing weight from falling as will appear later. It is to be noted that automatic or emergency closing of the valve is controlled by the trigger E and that it forms the principal means for holding up the weight. It is also to be noted that it has no connection with the hand wheel so that the valve may be suddenly and automatically closed from any of its positions even though the operator be in the act of moving it by hand.

5 indicates a valve casing which is provided with a partition 6, Fig. 2. Formed in the partition 6 is a valve seat 7. Secured to the valve casing 5 is a split yoke 8 which is adapted to receive the valve operating mechanism. The yoke is made in a single piece and is bored transversely to receive a trunnion carrying member, and also longitudinally forming a tubular end to receive a tubular neck on the emergency weight. It also affords a guiding means for another trunnion member and the sliding nut by means of which the valve is normally actuated, as will appear later.

Centrally located in the casing 5 is a valve 10 constructed in three principal parts to facilitate manufacture and assembling. The valve 10 is guided in its vertical movements by means of projections 11 and 12 [illegible]

located at its top and bottom ends. Extending through the valve 10 is a spindle 15, the upper extremity of which is enlarged to form a head 16 and is retained in the cap 17 by means of the nut 18. The lower portion of the nut seats against a surface formed on the main valve. This cap construction in addition to transmitting movements of the spindle to the valve serves as an auxiliary valve for admitting high pressure fluid to the under side of the main valve for the purpose of balancing it during the opening operation. Without such an arrangement an excessive amount of power might be required to operate it if there was a heavy pressure on the upper side of the valve. When open the valve is substantially balanced but has a slight tendency to close due to the unbalanced area of the spindle and to the weight of the parts.

The lower portion 20 of the valve 10 is annular in formation and coöperates with the annular groove 21 when the valve is closing to prevent it from pounding. This is due to the fact that steam is trapped in the space between the parts 20 and 21. By the time the steam has escaped from the member 20, the valve is seated. In other words, these members have a dash pot effect which retards the downward movement of the valve and prevents it from striking the seat violently. Such action is of importance when the valve is suddenly closed under abnormal or emergency conditions. The passage 25 shown in dotted lines, Fig. 2, is for the purpose of draining off the water of condensation which accumulates in the valve casing.

Machined on the spindle 15 is a threaded portion 26 which coöperates with the longitudinally movable or sliding nut 27, Figs. 2 and 11. Cast with the nut 27 are rectangular projections 28, Figs. 6 and 11, which are located in the longitudinal slots 29 formed between the legs or parts of the yoke 8. These projections are for the purpose of preventing the nut 27 from turning while permitting it to move axially. By this construction it is evident that the nut has only a vertical movement up or down as the case may be. As this nut plays an important part in the operation of the valve, further description thereof will be given hereinafter.

Formed on the cap 17 of the valve spindle, Fig. 2, is a flange 30 which acts against the shoulder 31 of the valve 10. Hence any upward movement of the spindle 15 will lift the valve due to this flange and shoulder construction. Downward movement of the spindle 15 causes the nut 18 to come in contact with the surface 32 of the main valve, thereby forcing it to move downwardly.

Mounted in a bore in the yoke 8 is a trunnion member 35, Figs. 2 and 5, which is cylindrical in cross-section and is held in position by means of bolts 36, as shown in Fig. 5. As before stated, the yoke 8 is split longitudinally. In other words it comprises two legs that are united at their upper ends. By placing the trunnion member 35 as shown and clamping it by the bolts 36 the legs of the yoke are firmly held in position. By making the outer surface of said member round the machine operations are simplified, and owing to its shape, it is securely anchored against axial movement. Centrally drilled in the member 35 is a hole through which the spindle 15 and nut 27 extend. Formed on opposite sides of the member are cylindrical projections or pivots 37 and 38 on which is fulcrumed a lever comprising parts 39 and 40 which are held in position by means of nuts. Cast with the lever parts 39 and 40 are hooks 41 and 42, Figs. 1, 2 and 9. Connected to the levers 39 and 40 is a pin 45 held in position by means of nuts. Mounted on the pin 45 is an eye 46, Figs. 1, 2 and 10, which is threaded to the rod 3, said eye being held in a central position on the pin 45 by means of spacing sleeves 47. Under normal conditions the levers 39, 40, hooks 41, 42 and associated parts are held in position by means of the latch F controlled by the trigger E, Fig. 1. Under conditions of excessive speed the free end of the emergency governor D moves outwardly due to centrifugal force thereby causing the trigger E to release the latch F. The weight 49 then causes the hooks 41 and 42 to swing around from under the anti-friction rollers 50 and 51 until checked by the stop 52, as shown in Fig. 9. Cast with the levers and hooks are arms 53 and 54 which are so constructed and arranged in relation to the hooks that the rollers in their upward travel (the resetting operation) come in contact with said arms and cause the hooks to swing back under the rollers. When this is done, the tripping mechanism is reset and the valve members are held in their normal position.

The trunnion member 60 is secured to the upwardly extending tubular sleeve of the weight 60^a by means of screws 61, Figs. 7 and 10, and carries the rollers 50 and 51. It is also provided with rectangular portions that engage the slots or guides 29 in the yoke. I have shown the trunnion member separate from the neck of the weight to which it is attached for convenience in manufacture. The effect would be the same if these parts were integral. Hence from one point of view the sliding nut 27 is seated on the weight. Looking at it in another way, the weight forms the lower stop or support for the nut and when it is released the nut is permitted to slide downward carrying with it the valve spindle and the valve. Secured to the lower extremity of

the valve spindle 15 is a handwheel 63 for the purpose of operating the valve. Located on the spindle 15 between the handwheel 63 and nut 27 is a sleeve 65, Fig. 2, which serves as a stop for the downward movement of the nut 27 under certain conditions which will be referred to later in describing the operation of the valve. The weight is guided internally by the spindle and externally by the downwardly projecting part of the yoke. The arrangement of the weight and coöperating parts has the advantage of making a very compact structure with the mass of the weight so distributed as to permit of a relatively small external diameter. It will be noted that the weight 60^a when in its suspended position acts as a support for the sliding nut 27 and when released as an agent for suddenly closing the valve. By reason of this arrangement I am able to utilize the weight for two purposes whereas it has been only utilized for one heretofore.

Referring to Fig. 2 which illustrates the valve in the open position, to close it the hand-wheel 63 and spindle 15 are rotated in a clockwise direction. The slightly unbalanced pressure on the valve and the weight thereof and that of its associated parts, cause the valve to move downwardly, the nut 27 resting on the trunnion member 60 and hence on the weight 60^a. This movement continues until the main valve 10 rests on its seat 7. Further rotary movement of the spindle 15 in the same direction causes the nut 27 to move upwardly until it strikes a shoulder or stop 64 formed on the yoke 8. This stops the upward movement of the nut and as the spindle 15 continues to be rotated it causes the spindle to move downwardly through the nut by a slight amount, causing the valve to be firmly pressed against its seat.

If for any reason the valve should stick in any intermediate position, due for instance to the packing being too tight or dirt collecting on the valve spindle or seat, the clockwise rotation of the spindle 15 will cause the nut to move upwardly against the shoulder 64 which stops its upward movement and further rotation of the spindle in the nut causes the valve 10 to be pulled downward until it is closed.

Assuming the valve is closed, to open it the handwheel 63 is rotated in the opposite or anti-clockwise direction which first causes the nut to move downwardly into the position shown in dotted lines, Fig. 8, *i. e.*, until it comes in contact with the trunnion member 60 which acts as the lower stop. Further rotation of the spindle causes the said spindle to move upwardly through the nut, thereby raising the cap 17. This cap serves as an auxiliary valve and permits the motive fluid to circulate inside the valve and substantially balances it as to fluid pressures. The valve now being in a state of balance the operator can open it with ease by rotating the handwheel. If the valve was not balanced it would necessitate an excessive amount of power to operate it as will readily be understood.

As the spindle 15 moves upwardly, it carries with it the sleeve 65 which serves as a stop for the valve and spindle. To better understand the stopping feature; the nut will first be considered at rest. Any pressure or weight against the nut is in the downward direction and is taken up by the trunnion member 60. As the spindle is rotated the action of the thread in the nut 27 causes the spindle to move upwardly, the weight of the parts being taken up by said nut and the trunnion member 60 which is held in position by the hooks 41 and 42. As the sleeve 65 moves with the spindle, it is evident under these conditions that its movement will be upward until it comes in contact with the nut 27 which prevents further movement of the spindle and valve. This sleeve is of such dimensions as to permit the valve to have a proper opening on the one hand and not to strike the casing on the other.

The operation of the valve under emergency conditions will now be considered. Excessive speed causes the speed responsive device D to move outwardly due to centrifugal force, this movement releasing the trigger E and the latch F controlled thereby and by means of the weight 49, the hooks 41 and 42 are forced outwardly from under the rollers 51 and 52, which allows the main weight 60^a to drop and deliver a blow to the hub of the handwheel 63. This blow forces the wheel 63, spindle 15, nut 27 and valve 10 into the position shown in Figs. 9 and 13, thereby closing the valve. The next operation is to reset the valve actuating mechanism. The handwheel 63 is rotated in the valve-closing direction which causes the nut 27 to travel upwardly until it strikes the shoulder or stop 64, as shown in Fig. 14. Thus far the position of the valve is not affected. The weight is then lifted by hand until the rollers 51 and 52 pass by the hooks 41 and 42 and contact with the projections or arms 53 and 54. Further upward movement of the rollers causes the projections 53, 54 and levers 39, 40 to swing about the pivots 37, 38 and the weight 49 to move upwardly, thereby bringing the hooks 41 and 42 into the path of the rollers 50 and 51 when they are lowered, as shown in Fig. 15. This movement also forces the rod 3 leading to the governor, Fig. 1, downwardly, thereby resetting the trigger E and latch F and coöperating parts.

The space or lost motion between the nut 27 and the trunnion member 60, Fig. 15, is

for the purpose of allowing excess movement of the members in the resetting operation, thereby insuring the proper latching or catching of the parts. This is especially desirable in connection with the latch F and its coöperating trigger E. It is for this same reason that a space or lost motion is provided between the nut 27 and the shoulder or stop 64 on one side and the trunnion member 60 on the other.

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. In combination, a valve, a casing therefor, a spindle and movable nut for opening and closing the valve under normal conditions, a weight that acts as a support for the nut during normal operation of the valve and which actuates the valve when it is desired to move it suddenly, and means for holding the weight.

2. In combination, a valve, a casing therefor, a spindle and sliding nut for opening and closing the valve under normal conditions, a suspended weight that acts as a support for the nut during normal operation of the valve and which actuates the valve when it is desired to move it suddenly, and means for releasing the weight and permitting it to fall and the nut to slide.

3. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve actuating spindle coöperating with the nut, a member upon which the nut normally rests, means which support said member, and mechanism for releasing said means to cause the valve to close suddenly.

4. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve operating spindle coöperating therewith, a weight which when in its raised position forms a support for the nut, means for sustaining the weight, and means for releasing the weight to permit it to move the valve.

5. In a valve of the character described, the combination of a valve, a casing therefor, a yoke carried by the casing that forms a guide, a nut guided by the yoke, stops between which the nut moves with a limited amount of lost motion, means for moving one of the stops to permit the nut to slide and close the valve, and a valve actuating spindle that coöperates with the nut.

6. In a valve of the character described, the combination of a valve, a casing therefor, a split yoke carried by the casing, a pivot that is supported by the yoke and forms a means for connecting the parts thereof, a lever carried by the pivot, a weight that is sustained in position by the lever, a nut supported by the lever, and a valve actuating spindle that coöperates with the nut.

7. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve actuating spindle that coöperates with the nut, a weight having a tubular neck that surrounds the spindle, means attached to the neck for supporting the weight, said means also acting as a seat for the nut, a lever having hooks that engage said means, and mechanism which normally holds the said means but releases it under emergency conditions.

8. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve actuating spindle that coöperates with the nut, a weight having a tubular neck that surrounds the spindle, means attached to the neck for supporting the weight, said means also acting as a seat for the nut, a lever having hooks that engage said means, a yoke that is attached to the casing and supports the lever, and a speed governor that releases the lever and hooks under certain conditions.

9. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve spindle coöperating with the nut, stops between which the nut moves, a yoke attached to the casing that carries one of the stops, a means which carries the second stop, a device carried by the yoke which normally holds said means, and mechanism for releasing the second stop and permitting the nut and spindle to slide in a direction to seat the valve.

10. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve spindle coöperating with the nut, a split yoke carried by the casing which has a tubular end, a weight having a neck that surrounds the spindle and is guided internally by the spindle and externally by the tubular end of the yoke, said neck forming a seat for the nut, and means for sustaining the weight in its normal position and releasing it under emergency conditions.

11. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve spindle coöperating with the nut, a split yoke carried by the casing which has a tubular end, a pivot clamped in place between the parts of the yoke, a lever and hooks supported by the pivot, a weight, a member attached to the weight having trunnions that engage the hooks, said member also forming a seat for the nut, and means which normally serve to

hold the hooks in engagement with the trunnions and release them when it is desired to close the valve suddenly.

12. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut which is normally confined but has a certain limited amount of axial movement, a valve spindle that coöperates with the nut, a hand wheel for opening and closing the valve by hand, a suspended weight which when released closes the valve suddenly, said weight forming a seat for the nut, and means for releasing the weight when it is desired to close the valve suddenly.

13. In a valve of the character described, the combination of a valve, a casing therefor, a sliding nut, a valve spindle, a hand wheel therefor, a stop which moves with the spindle and engages the nut when the valve is fully open to prevent further travel, and a means for releasing the nut to permit the valve to close suddenly.

14. In combination, a main valve, a casing therefor, a spindle on which said valve is loosely mounted, a means that incloses one end of the spindle and acts to transmit axial motion of the spindle to the valve and also acts as an auxiliary valve to balance the pressures on the main valve, a sliding nut, a weight upon which the nut rests, and means for releasing the weight and permitting it to fall and the nut to slide.

15. In a valve of the character described, the combination of a valve, a casing therefor, a spindle upon which the valve is loosely mounted, an auxiliary valve located at the end of the spindle which is arranged to engage the main valve under certain conditions and force it against its seat, and a dash-pot to check closing movements of the main valve.

In witness whereof, I have hereunto set my hand this 18th day of January, 1912.

WERNER JOHNSON.

Witnesses:

JOHN A. MCMANUS, Jr.,

FRANK C. HATTIE.