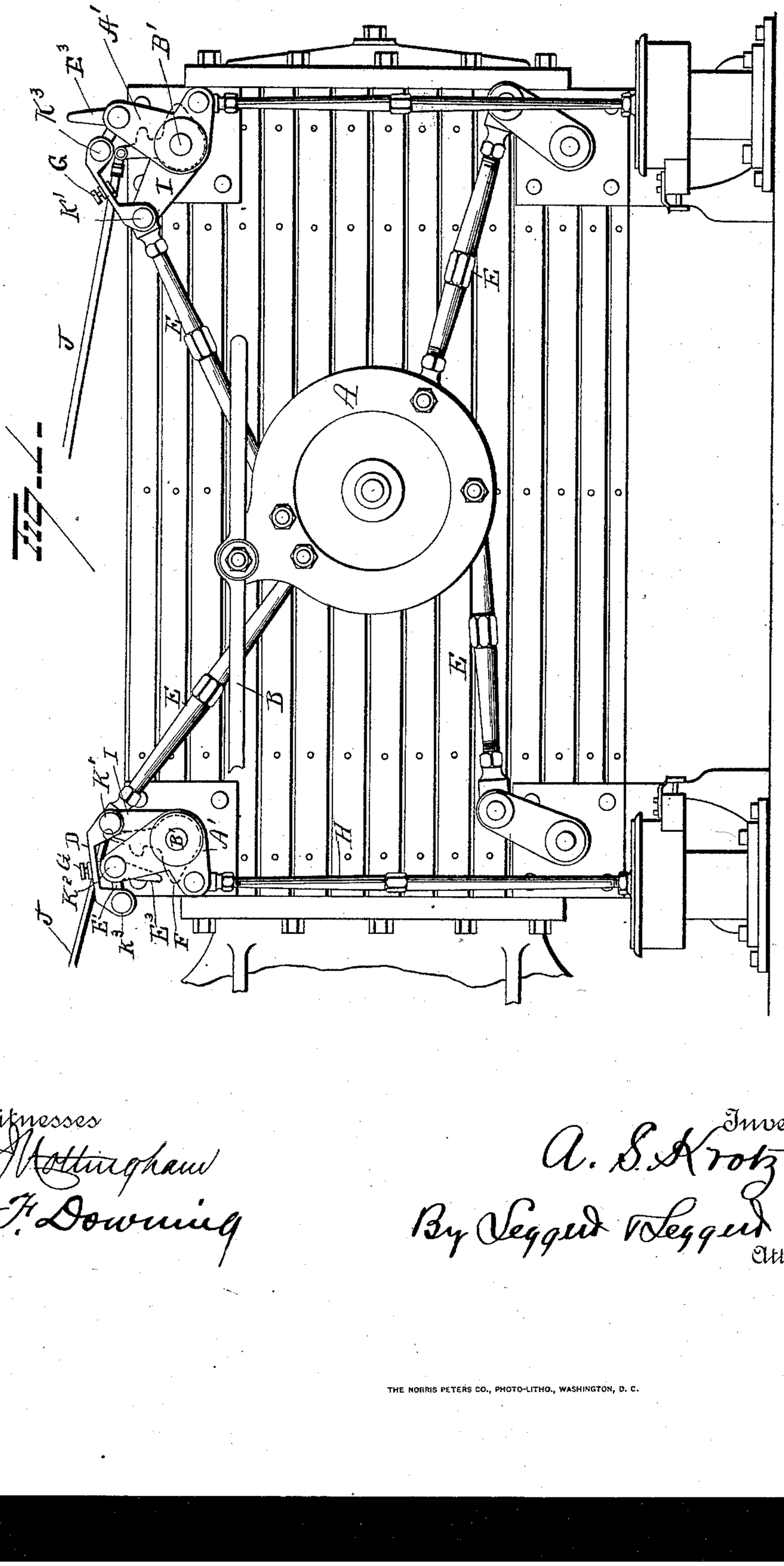
(No Model.) 2 Sheets—Sheet 1.

A. S. KROTZ.

VALVE GEARING.

No. 475,691. Patented May 24, 1892.



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(No Model.) 2 Sheets—Sheet 2.

A. S. KROTZ.

VALVE GEARING.

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Fig. 2.

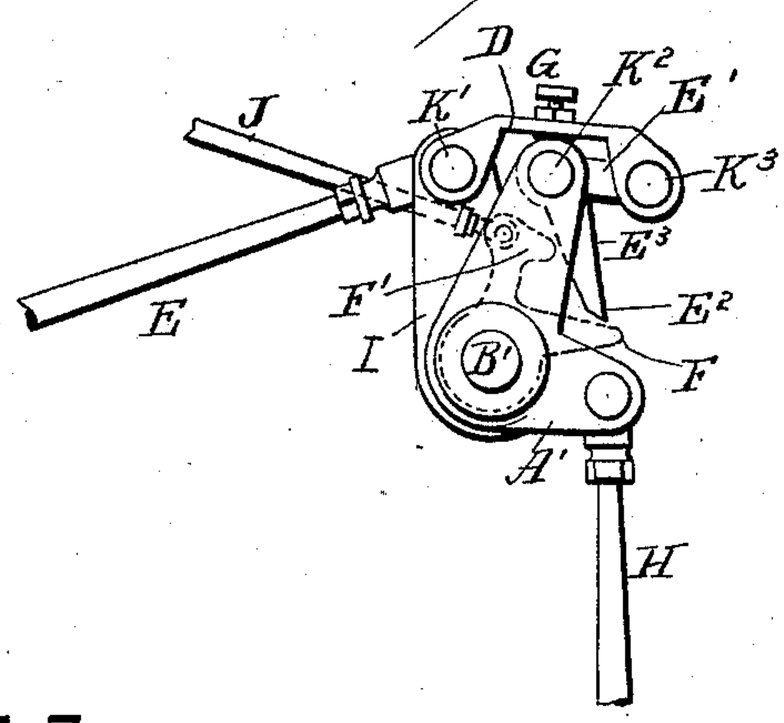


Fig. 3.

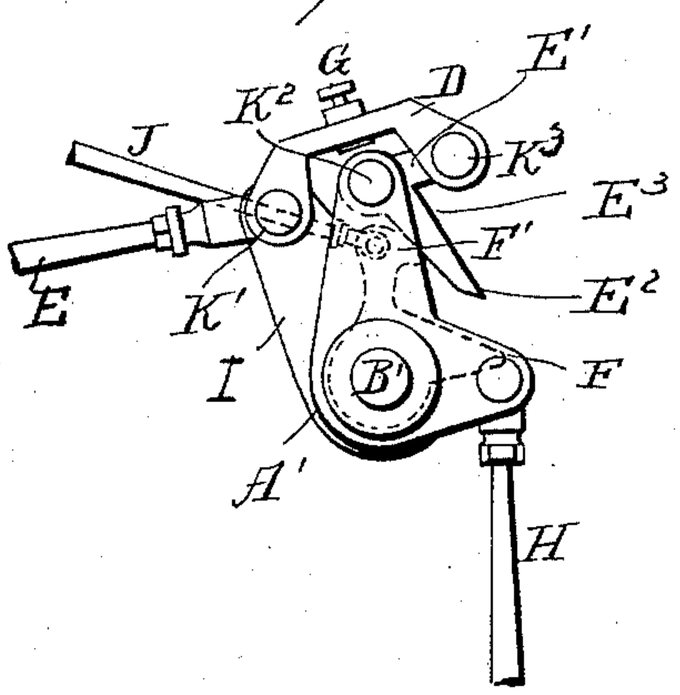


Fig. 4.

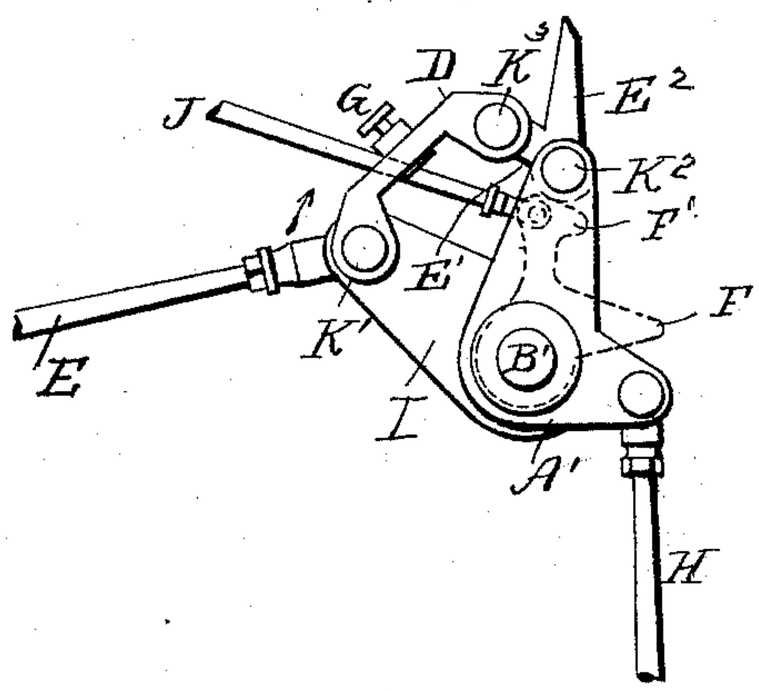
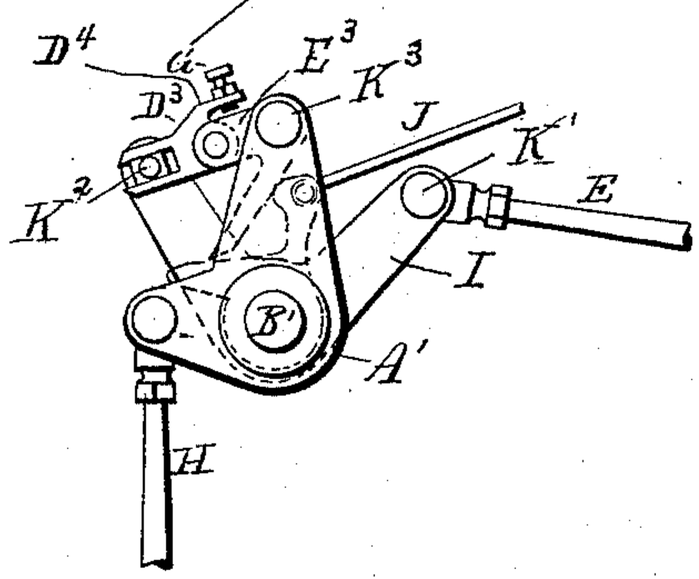


Fig. 5.



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UNITED STATES PATENT OFFICE.

ALVARO S. KROTZ, OF DEFIANCE, OHIO, ASSIGNOR OF ONE-HALF TO HENRY JOHN SMITH, OF SAME PLACE.

VALVE-GEARING.

SPECIFICATION forming part of Letters Patent No. 475,691, dated May 24, 1892.

Application filed July 21, 1891. Serial No. 400,255. (No model.)

To all whom it may concern:

Be it known that I, ALVARO S. KROTZ, of Defiance, in the county of Defiance and State of Ohio, have invented certain new and useful Improvements in Valve-Gearing; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in valve-gearing, designed more particularly for use on engines of the Corliss type, the object of the same being to simplify, cheapen, and lessen the liability to injury of parts by dispensing with springs and grab-claws heretofore employed and employing in their stead a simple and positive acting series of levers which are very sensitive in their action and not liable to injury.

My invention consists in the parts and combination of parts, as will be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in side elevation of a cylinder showing my improvement applied thereto. Figs. 2, 3, and 4 show the valve-actuating mechanism in various positions they assume; and Fig. 5 is a view of a modified form.

The valves and valve-operating mechanism are located at the ends of the cylinders, as shown in Fig. 1, and as they are alike in construction and operation a description of one will suffice for both.

A represents an oscillating plate, located at or near the center of the cylinder and oscillated by pitman B, which is actuated by a cam on the driven shaft. (Not shown.) This plate is connected to the four valves by the rods E, which, as clearly shown in Fig. 1, diverge toward the four corners of the cylinders. The upper valves, actuated by the rods E, are for live-steam, while the lower valves are for exhaust, and as the valves are all connected to oscillating plate A it follows that steam is admitted and exhausted at the proper time. The rods E, connecting plate A with the upper valves, are connected at their outer ends to the arms I, loosely mounted on the valve-stem B′. Each arm I is connected at or near its free end by a loose pivotal connection K′ with the link D, which latter is preferably cut away at its center on its under side for a purpose to be hereinafter explained. The outer end of this link D is connected by means of the pivot K^3 to the outer end of the smaller arm E′ of the bell-crank lever E^3, the said smaller arm being connected at its other extremity to the upper end of the bell-crank lever A′, rigidly secured to the valve-stem B′.

By referring now to Figs. 2 and 3 it will be seen that the pivotal connection K^2 between the bell-crank lever A′ and the smaller arm E′ of bell-crank lever E^3 is enabled by the cutting away of the link D to rest in a line passing through the pivots K′ K^3, and hence it will be seen that as the loose arm F is rocked by the rod E the bell-crank lever A′ is, through the intervention of the link D and the short arm E′ of bell-crank lever E^3, caused to rock in the same direction, and consequently actuate the valve-stem B′ and the valve thereon.

The adjusting-screw G in link D is for the purpose of adjusting the pivotal point K^2 relative to the pivotal points K′ K^3. From the foregoing it will be seen that so long as the three points K′, K^2, and K^3 are in line the valve will be actuated regularly. In order, however, to cut off steam before full stroke, it becomes necessary to provide means for breaking the connection between bell-crank lever A′ and arm E′, whereby the arm E is permitted to make a portion of its stroke without carrying with it the bell-crank lever A′, which, as before stated, is rigidly secured to the valve-stem B′. The mechanism for accomplishing this end consists of the tripping-block F, loosely mounted on the valve-stem B′ and located in a position to engage the long arm E^2 of the bell-crank lever E^3. This trip-block F is connected by rod J to the governor, (not shown,) and is moved by said governor back and forth according to the load, so as to engage arm E^2 of lever E^3 at some point during the stroke of said lever E^3. It will be seen at a glance that as soon as arm E^2 strikes the projection F′ of trip-block F the lever E^3 is caused to turn on its pivot K^2, and consequently elevate pivot K^3 above a line passing through the center of K′ K^2. This elevation of K^3 above K′ K^2 breaks the

connection between lever A′ and arm E, leaving arm E free to make the remaining portion of its stroke and the lever A′ free to be turned to a position to close the valve by a rod H, leading to dash-pot, which latter is of ordinary construction and operates in the usual manner.

Fig. 2 shows the position of the valve-actuating mechanism when the valve is closed, and Fig. 3 shows the position of the parts just at the point of breaking the connection between arm E and bell-crank lever A, while Fig. 4 shows the connection broken and valve closed.

As the arm E returns toward A′, as shown by arrow in Fig. 4, link D is carried over pivot K^2 and the arm E^2 of lever E^3 is turned downwardly from the position shown in Fig. 4 to the position shown in Fig. 3, and the parts are again locked for opening the valve.

The position of the projection F′ on the trip-block F is, as before stated, regulated by the governor and is dependent on the load. For a heavy load the block would be moved in a direction away from arm E^2 of lever E^3, and consequently would not engage said lever at all or engage it near the end of the stroke. With a light load the projection F′ on trip-block F would be moved toward said arm E^2 and trip the same earlier in the stroke.

I do not wish to be understood as confining myself to the three pivots K′, K^2, and K^3 being held in a line passing through the centers of same, as it is evident that precisely the same results would be accomplished if the pivot K^3 were permitted to fall to a plane below the centers of K′ and K^2. It is better, however, to so adjust the screw G that when the parts are locked the centers of the three pivots are on a line, as the action is more sensitive; but I can, if desired, adjust the screw so as to permit the pivot K^3 to fall slightly below the centers of K′ and K^2.

If the governor-belt should break, the governor will throw the trip around until the point *f* thereof is in close proximity to arm E′, thus tripping the valve at the commencement and preventing the parts relocking, thereby absolutely preventing the engine running away.

In the modification shown in Fig. 5 the arm I is made in the form of a bell-crank lever, one end of said lever being connected to the rod E and the other end carrying a link D^3, which latter is pivoted to the arm at or near the upper end thereof. The bell-crank lever E^3 is pivoted at its elbow to the upper end of lever A′ and is connected to the inner end of link D^3, the said link D^3 carrying a bracket D^4, having the adjusting-screw G therein. The trip-block is the same as before. With this construction we have the three pivots K′, K^2, and K^3, the pivot K^3, however, which connects the link with the bell-crank lever E^3, being between the pivots K′ and K^2 and not to the outside of the same, as shown in the other figures. With this construction as soon as the long arm E^2 of lever E^3 strikes the trip-block the adjacent ends of the short arm of lever E^3 and link D^3 are forced upwardly, thus breaking the connection between arms E and bell-crank lever A′.

It is evident that numerous slight changes in the construction and relative arrangement of the several parts might be resorted to without departing from the spirit and scope of my invention. Hence I would have it understood that I do not confine myself to the exact construction shown and described, but consider myself at liberty to make such changes and alterations as fairly fall within my invention; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a valve-stem, an arm rigid thereon, an arm loosely mounted on said stem, means connecting said arms whereby they are caused to move in unison, and a trip-block actuated by the governor and adapted to break the connection between said arms, whereby the loose arm is permitted to move independent of the rigid arm, substantially as set forth.

2. The combination, with a valve-stem, an arm or lever rigidly secured thereon, an oscillating arm loosely mounted on said stem, and a link and lever loosely connecting said arm and arm or lever and adapted when in one position to lock them, whereby they are caused to move in unison, of a trip-block loosely mounted on the valve-stem and actuated by the governor, the said trip-block adapted to engage an arm of the bell-crank lever and break the connection between the oscillating lever and the arm or lever rigidly secured on the valve-stem, substantially as set forth.

3. The combination, with a valve-stem, a bell-crank lever rigidly secured thereon, an oscillating arm loosely mounted on said stem, a link loosely connected to said arm, a bell-crank lever connecting the opposite end of said link to one end of the bell-crank lever rigid on the valve-stem, of a movable trip-block adapted to engage the long arm of the bell-crank lever connecting the link to the bell-crank lever on the valve-stem, and a rod-piston and dash-pot for closing the valve as soon as the connection between the oscillating arm and the bell-crank lever on the stem has been broken, substantially as set forth.

4. The combination, with a valve-stem, an arm loose thereon, means for oscillating said arm, a bell-crank lever rigidly secured to said stem, a link pivoted to said arm, a bell-crank lever connecting said link, and the lever rigidly secured to the valve-stem, the said parts being so arranged that when the pivots of the link, bell-cranks, and arm are in line, or approximately so, the parts are locked so that the oscillations of the arm are transmitted to the bell-crank lever fast on the valve-stem, of a trip-block actuated by the governor

and adapted to throw said pivots out of line, thereby permitting the loose arm to move independently of the bell-crank lever on the valve-stem, substantially as set forth.

5. The combination, with a valve-stem, the bell-crank lever rigid thereon, the arm loose thereon, means for oscillating the arm, the link and bell-crank lever connecting the bell-crank lever and arm on the valve-stem, and an adjusting-screw carried by the link, of a trip-block actuated by the governor and adapted to engage the bell-crank lever connecting the link and bell-crank lever on the shaft, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

AL. S. KROTZ.

Witnesses:
GEO. W. DEATRICK,
JOHN M. HENGSTLER.