No. 657,210. Patented Sept. 4, 1900.

W. F. BRADBURY & D. E. WASHINGTON.

TRIPPING CUT-OFF.

(Application filed Oct. 2, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

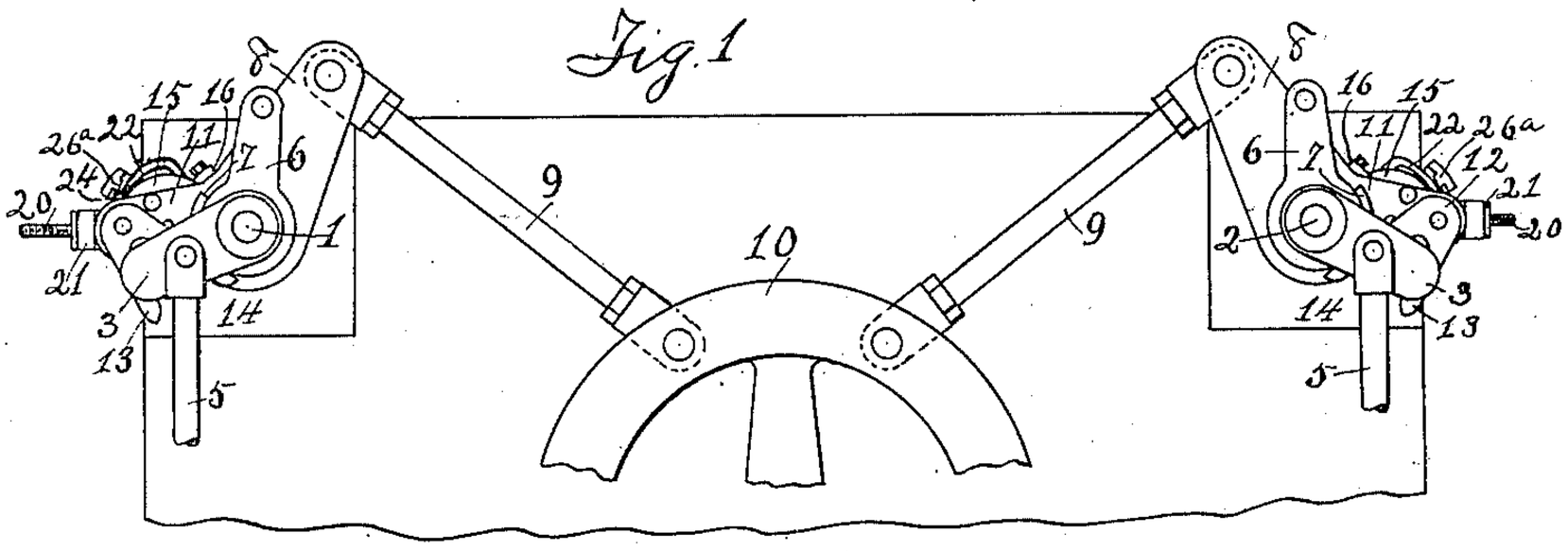
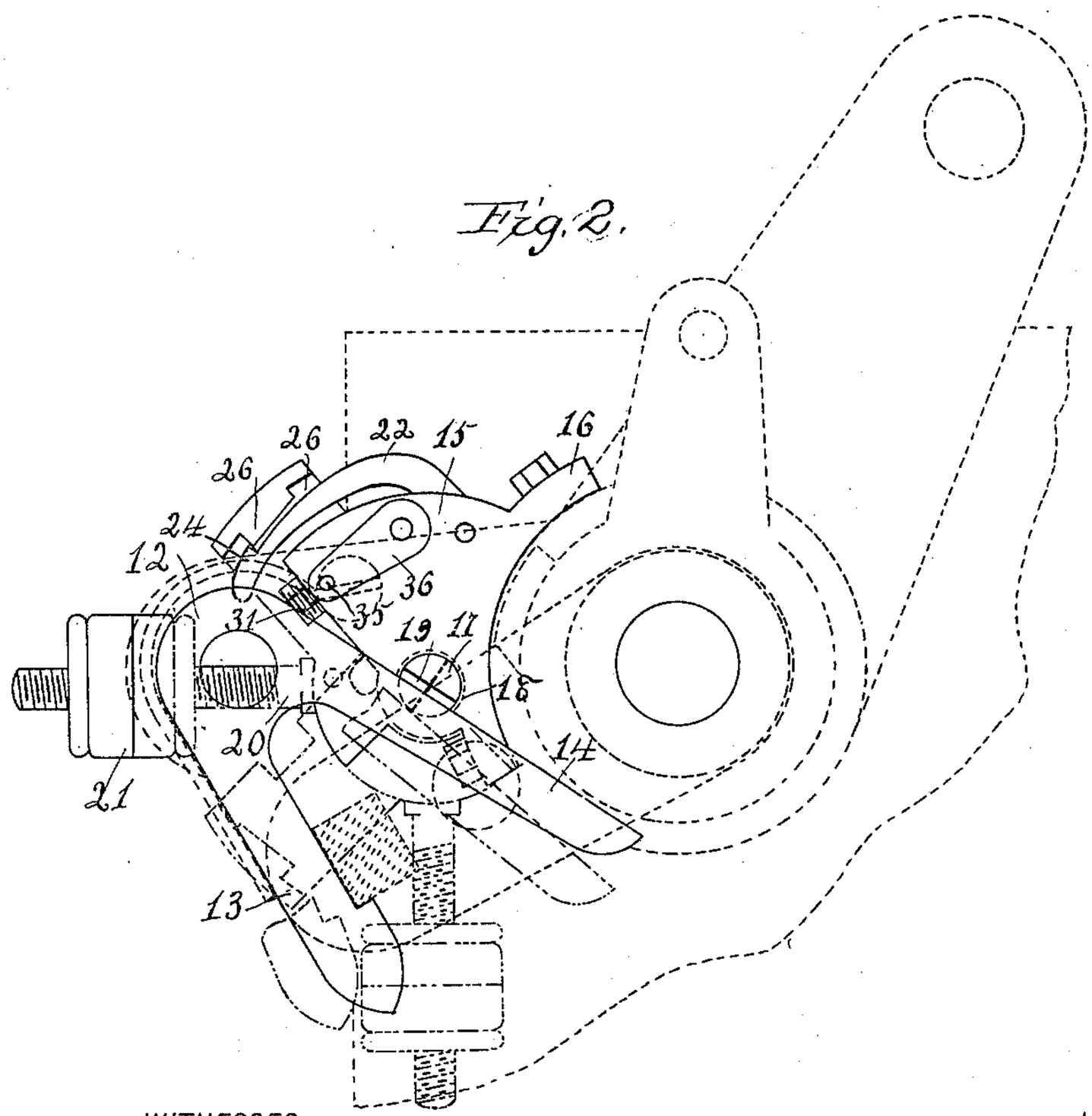


Fig. 2.



WITNESSES:
L. L. Perrine
W. F. Heid

INVENTORS
W. F. Bradbury
D. E. Washington
BY
J. L. Brown
ATTORNEY

No. 657,210. Patented Sept. 4, 1900.

W. F. BRADBURY & D. E. WASHINGTON.

TRIPPING CUT-OFF.

(Application filed Oct. 2, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

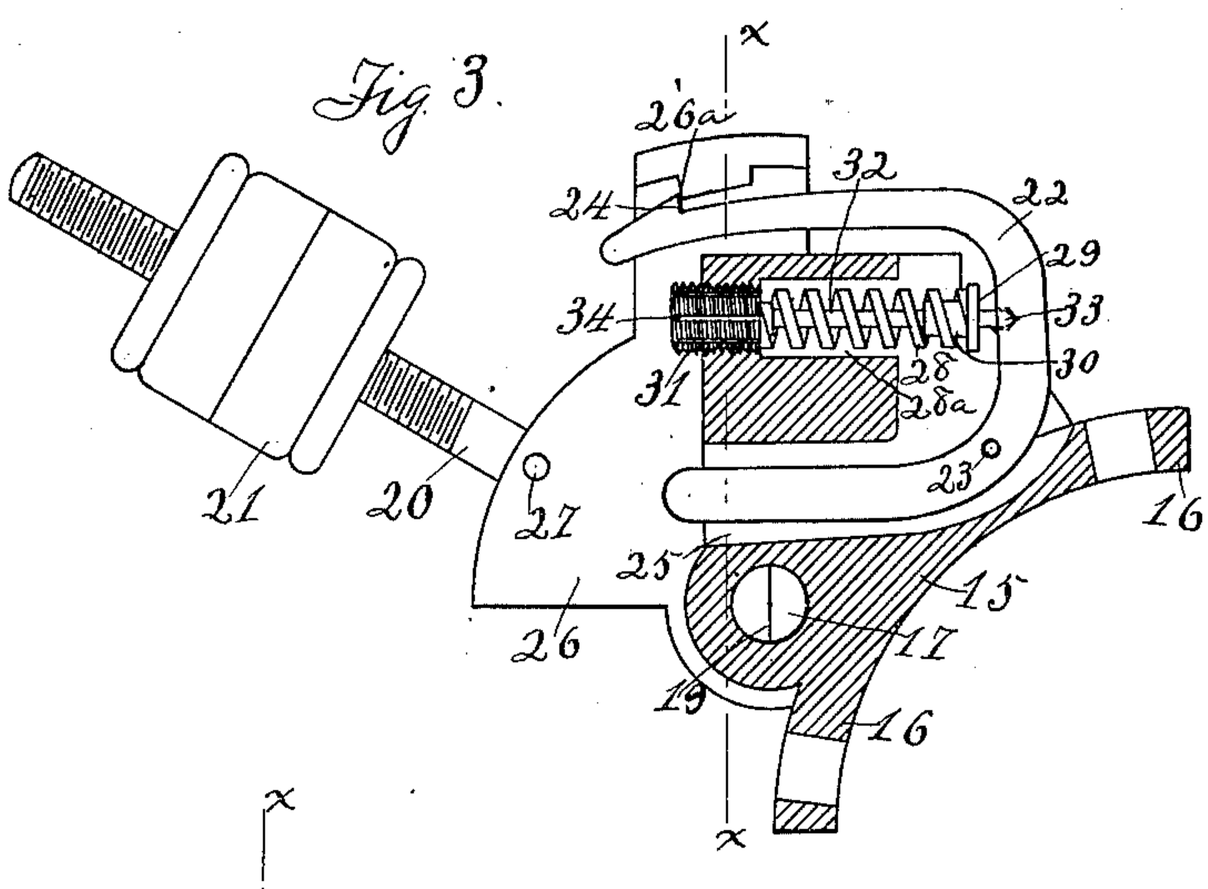
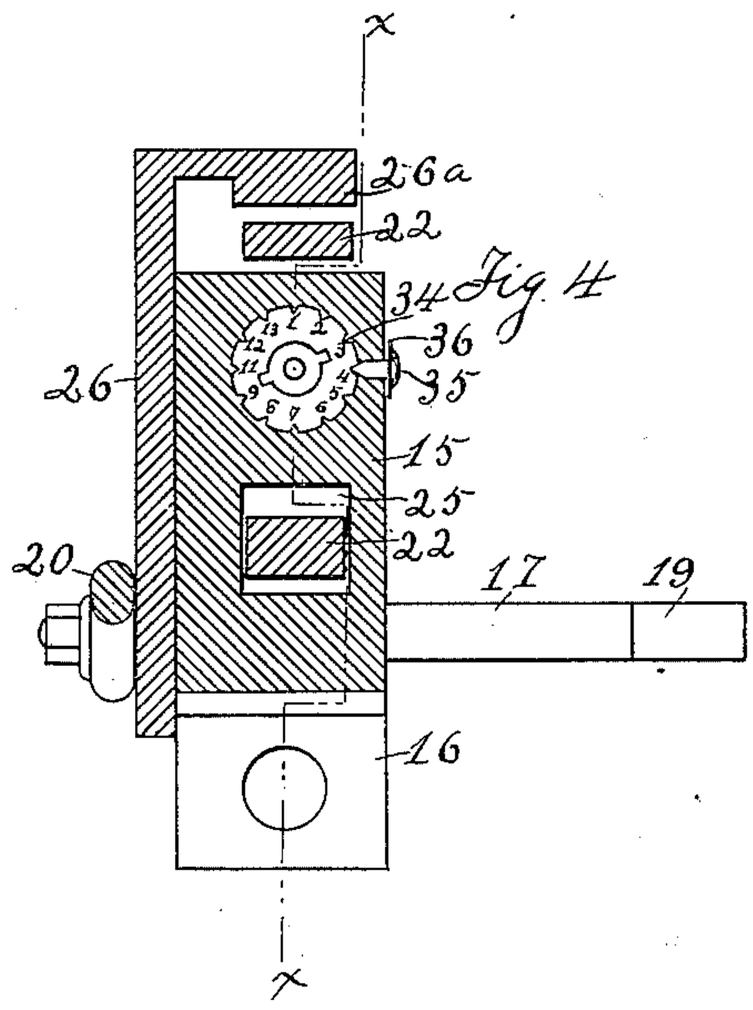


Fig. 4.



WITNESSES:
L. L. Perrine.
W. H. Howe

INVENTORS
W. F. Bradbury
D. E. Washington
BY
J. L. Brown
ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM F. BRADBURY, OF KANSAS CITY, KANSAS, AND DIXON E. WASHINGTON, OF KANSAS CITY, MISSOURI.

TRIPPING CUT-OFF.

SPECIFICATION forming part of Letters Patent No. 657,210, dated September 4, 1900.

Application filed October 2, 1899. Serial No. 732,324. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM F. BRADBURY, of Kansas City, in the county of Wyandotte, in the State of Kansas, and DIXON E. WASHINGTON, of Kansas City, in the county of Jackson, in the State of Missouri, have invented certain new and useful Improvements in Tripping Cut-Offs, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to improvements in tripping cut-offs, having more especial reference to improvements in our safety device for Corliss engines for which Letters Patent of the United States were issued to us on the 5th day of December, 1899, No. 638,621, whereby the construction is greatly simplified and more accurate adjustment and more exact control and regulation are obtained. There being some forty or more different conditions familiar to the competent engineer under which the engine is liable to "run away," the necessity that a device to meet these different conditions should provide the most accurate adjustment and most exact control, so that while the device shall not be tripped before the determined speed limit is reached it may with the highest degree of certainty obtainable be relied upon to trip when such speed limit is reached, is apparent. Another relation important to be observed is that in many situations when under any of the different conditions the speed of the engine is accelerated and a run-away is threatened it is not desirable that the engine be shut down completely. As in a mill or elevator, if the engine be suddenly shut down completely the grain will choke and clog up the chutes and machinery, requiring a large outlay of time and labor to empty the chutes and clear the machinery before operations can be resumed. In such case if one valve of the engine can be cut out, the remaining valve having its cut-off set to a higher speed limit carrying the load until the danger is past, or if the danger still threatens under continued acceleration of speed, the second valve being cut out at such higher speed limit, the run-away, with its disasters, may be averted without a complete shut-down, with the labor and inconvenience incident thereto, while at the same time the danger from persistent acceleration of speed is provided against.

To accomplish the objects above indicated, our invention consists in certain features of novelty hereinafter described, and pointed out in the claims.

Figure 1 represents a side elevation of a Corliss engine provided with our improved tripping cut-off. Fig. 2 represents a detail end elevation of the valve mechanism. Fig. 3 represents a cross-section of our tripping cut-off on the irregular line X X of Fig. 4. Fig. 4 represents a cross-section on the line X X of Fig. 3.

Similar numerals refer to similar parts throughout the several views.

1 represents the valve-stem of the crank-end valve, and 2 represents the valve-stem of the head-end valve. 3 represents the valve-stem crank, on which are mounted the hook-pin 4 and dash-pot rod 5. 6 represents the knock-off crank provided with the knock-off clip 7. 8 represents the bell-crank arm connected by the steam-rod 9 with the wrist-plate 10. On the other arm 11 of the bell-crank is mounted the crab-claw 12, of which the steam-hook is represented by 13 and the trip-arm by 14. In relation to these parts common to Corliss engines having a tripping valve-gear our present device, as in the device of our former patent, No. 638,621, consists of a block 15, mounted by means of bolts through the flanges 16 upon the sleeve of the bell-crank, so that the block is given an oscillating movement corresponding to the oscillations of the bell-crank. In said block is journaled a shaft 17, the outer end of which passes through an opening 18 in the crab-claw arm of the bell-crank. Beyond said crank a portion (substantially half) of the shaft is removed, providing a flat face 19 on the diameter of the shaft, arranged closely adjacent to the face of the trip-arm 14 when the steam-hook is in engagement with the hook-pin 4. On said shaft 17 is fixedly mounted an arm 20, on which arm is adjustably mounted a weight 21, the preferable construction being to thread the weight upon the arm in the form of a lock-nut in two

parts, so that when the weight is adjusted to the desired point it may be there locked and secured against accidental displacement.

So far the construction is substantially the same as in our former patent, the relation of the weight to the shaft being such that when the weight is in elevated position the flat face of the shaft is in line with the face of the trip-arm 14, as shown in heavy lines in Fig. 2. To retain the shaft and weight in the position designated against the oscillating momentum of the weight imparted to it by virtue of its location upon the sleeve of the bell-crank, in our present construction is provided a horse-shoe-shaped latch-lever 22, pivotally mounted at 23 upon the block 15, one arm thereof being provided near its upper and outer extremity with a latch 24 and the other arm extending through the recess 25 in the said block to limit and restrain the movement of the latch. On the shaft 17 is fixedly mounted a catch-plate 26, and to more securely fix the relation of the weight and said catch-plate the weight-arm is connected therewith by passing through an eye secured upon the plate at 27. Upon said catch-plate is provided a catch 26^a, arranged to engage the latch 24. To retain the latch in engagement with the catch against the tangential pull due to the momentum of the weight, there is provided a tension-spring 28, arranged in a recess 28^a in the block 15 and compressed between the collar 29 on the sleeve 30 and the screw-plug 31, threaded into the block, a stem 32 of the screw-plug telescoping with the sleeve 30 to give stability to the structure, and a pin 33, connected with the collar 29, engages a recess in the latch-lever, so that the expansion of the spring tends to retain the latch in engagement with the catch. The compression of the spring and the expansive tension with which it bears against the latch are regulated by the screw-plug, and the facility with which the catch may be disengaged from the latch by the oscillating momentum of the weight is controlled by the spring. The point or speed limit at which the catch will be disengaged from the latch is also further regulated by the location of the weight upon the weight-arm, as is apparent. With this arrangement of parts the action of the trip is controlled to a very great nicety, it being possible to so adjust the correlation of the weight and spring that a half-revolution above normal speed will disengage the catch. The catch being disengaged, the weight swings on its axis, turning the shaft quarter around, and thereby acting upon the trip-arm of the crab-claw and throwing the steam-hook out of engagement with the hook-pin, and thereby preventing the opening of the valve and further admission of the steam at that end of the cylinder. It is necessary of course if the engine is to be shut down completely by the action of the trip that a trip be mounted upon each of the valve-gear, so that both the valves may be cut out. Now it is manifest that if the trip on each of the valves be so adjusted that both will be thrown off at the same speed above normal, when that speed is reached both trips will act and the engine be at once stopped. Hence in practice it is advisable to adjust one of the trips to be thrown off at a lower speed than the other above normal, for thereby one of the valves may be cut out without completely shutting down and the excessive speed brought under control, or if not and the speed continues to increase the second trip will act and the engine be shut down. This arrangement and adjustment for the successive operation of the trips is convenient under any circumstances, and in case the work on the engine is of such character that the sudden shutting down of the engine entails a large amount of labor before it can be again started, as in mills and elevators, in which the chutes and machinery will become choked and clogged, necessitating the emptying of the bins with shovels, such arrangement is manifestly of the utmost importance, for by cutting out one valve the speed may be reduced to normal, while the load will be carried by the single remaining valve and the work not interfered with, and at the same time if the engine shows a continued disposition to run away and the higher speed limit of the second valve is reached it will then act and the engine be shut down. The trip being thrown, to restore it by simply lifting the weight the catch is brought into engagement with the latch, and the device is in readiness for continued operation. When the tension of the spring is set by adjustment of the screw-plug, the plug may be locked in position by engagement in the grooves 34 in the plug of the pin 35, carried by the spring-arm 36, mounted upon the block 15, thus providing against accidental displacement of the plug and change in the tension of the spring and consequent interference with the reliable control of the trip. For convenience in observing and retaining the adjustment at the desired pitch the grooves in the plug may be numbered "1," "2," "3," &c., on the face of the plug, as shown in Fig. 4.

It is apparent that while our tripping cut-off is herein shown and described as applied to the valve-gear of a Corliss engine having the "Reynolds hook-motion" the device may be applied with equally effective results upon any valve-gear in which a releasing-valve motion is employed with but slight changes purely mechanical in the construction and arrangement of the parts operating to cut out the valve.

One of the leading features and principal advantages in the construction and operation of our tripping cut-off worthy of observation is that the desired and intended action of the trip being effected by the action of the weight and the weight being constantly under the influence of the constant force of gravity and acting independent of any force applied to it by the mechanism to cause it to act, the mechanism operating solely to restrain the weight

and prevent it acting under the influence of such constant force, it is apparent that any breakage or disarrangement of the parts will simply release the weight and permit the trip to act and not interfere with or prevent its action, as in a device in which the operative action of the trip is produced by the force exerted by the mechanism, and thus by its operative action being in obedience to a constant force independent of and opposed to the force exerted by the mechanism the trip is ready at all times and will respond with the utmost reliability under any and all circumstances and conditions.

Having thus fully described our improvements and their mode of operation, what we claim as our invention, and desire to secure by Letters Patent, is—

1. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a weighted trip mounted on the bell-crank sleeve and arranged to be operated by the momentum imparted by the oscillations of the bell-crank to trip the crab-claw at a certain predetermined speed limit, a catch connected with said trip, and a latch mounted on the bell-crank sleeve and arranged to engage said catch to control the trip until such speed limit is reached; substantially as set forth.

2. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a weighted trip mounted on the bell-crank sleeve and arranged to trip the crab-claw, a catch connected with said trip, and a spring-controlled latch mounted on the bell-crank sleeve and arranged to engage said catch to control the trip, substantially as set forth.

3. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a trip mounted on the bell-crank sleeve and arranged to trip the crab-claw, a weight connected with said trip, a catch-plate provided with a suitable catch connected with the weight, and a latch mounted on the bell-crank sleeve and arranged to engage said catch to control the trip, substantially as set forth.

4. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a trip mounted on the bell-crank sleeve and arranged to trip the crab-claw, a weight adjustably connected with said trip, a catch-plate provided with a suitable catch connected with the weight, and a spring-controlled latch mounted on the bell-crank sleeve and arranged to engage said catch to control the trip, substantially as set forth.

5. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a block mounted on the bell-crank sleeve, a trip mounted in said block arranged to trip the crab-claw, a weight connected with said trip, a catch-plate provided with a suitable catch connected with the weight, a latch mounted in said block and arranged to engage said catch, and a spring mounted in said block and arranged to bear on said latch, to control the trip, substantially as set forth.

6. A tripping cut-off consisting of the combination with a recessed block mounted on the bell-crank sleeve, a weighted trip mounted in said block arranged to trip the crab-claw, and a catch connected with said trip, of a ⊃-shaped latch-lever pivotally mounted on said block, one arm of said lever extending through a recess in said block and the other arm provided with a latch arranged to engage said catch, and a spring mounted in a recess in said block, and arranged to bear against said latch to control the trip, substantially as set forth.

7. A tripping cut-off consisting of the combination with a block mounted on the bell-crank sleeve, a weighted trip mounted in said block arranged to trip the crab-claw and a catch connected with said trip, of a spring-controlled ⊃-shaped latch-lever mounted in said block and provided with a latch arranged to engage said catch to control the trip, substantially as set forth.

8. In a tripping cut-off a recessed block mounted on the bell-crank sleeve, and a ⊃-shaped latch-lever mounted in said block, one arm of said lever extending through a recess in said block, and the other arm provided with a latch, substantially as set forth.

9. In a tripping cut-off a recessed block mounted on the bell-crank sleeve, a ⊃-shaped latch-lever mounted in said block, a screw-stud mounted in said block, a stem on said stud, a sleeve telescoping with said stem, a collar on said sleeve, a pin connected with said collar, and arranged to engage said latch-lever, and a spring mounted between said stud and said collar, substantially as set forth.

10. In a tripping cut-off, a recessed block mounted on the bell-crank sleeve, a ⊃-shaped latch-lever mounted in said block, a grooved screw-stud mounted in said block, a stem on said stud, a sleeve telescoping with said stem, a collar on said sleeve, a pin connected with said collar and arranged to engage said latch-lever, a spring mounted between said stud and said collar, and a spring-actuated pin mounted in the block and arranged to engage the grooves in said stud, substantially as set forth.

11. A tripping cut-off consisting of the combination with the valve-operating mechanism, of a block mounted on the bell-crank sleeve, a trip mounted in said block arranged to trip the crab-claw, a weight connected with said trip, a catch connected with said trip, a latch-lever mounted on said block provided with a latch arranged to engage said catch, a spring mounted in said block and engaging said latch-lever to control the trip, and means for regulating the tension of said spring, substantially as set forth.

12. A tripping cut-off consisting of the combination with the valve-operating mechanism, of weighted trips mounted on the bell-

crank sleeves and arranged to trip the crab-claws, catches connected with said trips, spring-controlled latch-levers mounted on the bell-crank sleeves, provided with latches arranged to engage said catches, and means for regulating the tension of the latch-springs whereby said trips are caused to operate to trip the crab-claws at successively-higher speeds, substantially as set forth.

WILLIAM F. BRADBURY.
DIXON E. WASHINGTON.

Witnesses:
WM. SMITH,
T. H. RIDDLE.